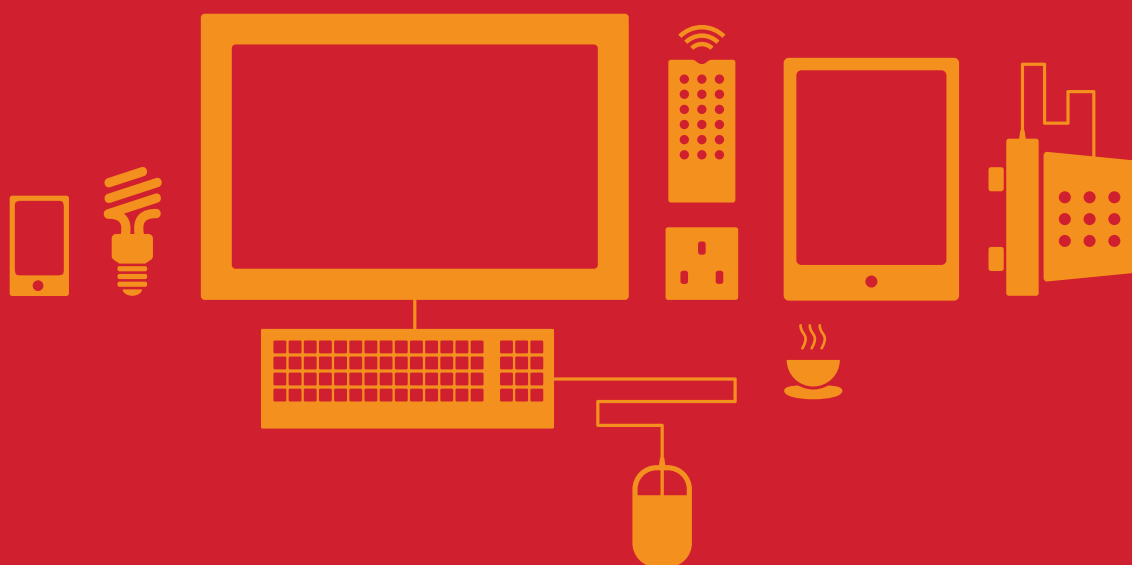Centre for Excellence in Universal Design

Elements and Systems 04

The building elements and systems should create a comfortable home that is easy to manage and understand, and affordable to run. The Universal Design Dementia Friendly Dwelling should promote well-being and good health, and anticipate the changing needs of not only the person with dementia, but all occupants including family members and carers.

Bridget and Paul live on the third floor of an apartment building in the suburbs and find the modest sized space with balcony very manageable.

Recently they renovated and find the new timber floors, light coloured painted walls and additional light fittings have made the apartment a lot brighter and more uplifting. Bridget finds it much easier to locate things which makes cooking much more manageable for her.

Elements and Systems - Overall Design Issues

Elements and Systems refer to a wide range of detailed issues such as finishes, ironmongery, signage, heating, lighting, or assisted living technologies. Careful detailing of a dwelling is critical to a Universal Design (UD) approach and while the Universal Design Homes for Ireland (UDHI) Guidelines provide much detail in this regard the following dementia friendly issues are important considerations in the treatment of Elements and Systems as part of a UD dementia friendly approach.

With regard to elements and systems consider these key **Design Issues:**

Participatory Design: this process will help select preferred finishes, colours, ironmongery, or technology that meet the needs of all users including the person with dementia.

Familiar Design: following on from the above, a dwelling's materials, finishes and fittings often represent the most identifiable items in the house. Ensuring that these are selected to align with the expectations and past experiences of the person with dementia is critical.

Personalisation: elements of the dwelling such as finishes and colours present a major opportunity for people to personalise their home.

Easy to Interpret and Calm: the detail encountered at this level of design will allow a focus on acoustic qualities, the specification of wall and floor finishes, artificial lighting design, or signage, all of which contribute to an easily understood and calming environment.

Good Visual Access: careful window and internal door design, coupled with good daylighting and artificial lighting, will enhance visibility within the dwelling.
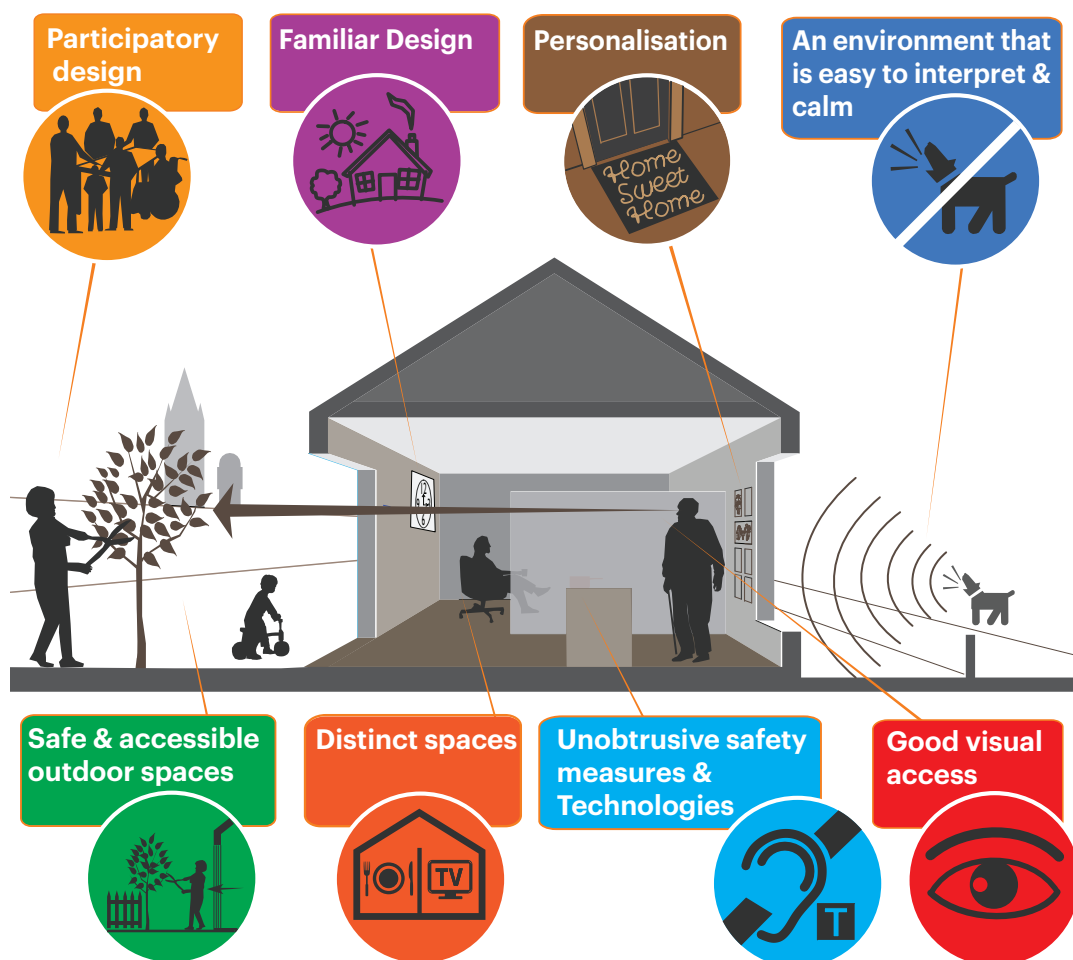
Unobtrusive Safety Measures and Assisted Technologies: careful design of elements and systems will support independent living and a good quality of life. Taking a participatory design process ensures that the design response is appropriate and supports positive risk taking.

Distinct Spaces: materials, finishes, colours or specific lighting can be used to create distinct spaces to reinforce associated activities such as dining, bathing, or dressing.

Safe and Accessible Outdoor Spaces: the specification of certain elements and systems, such as materials, finishes, or artificial lighting, or the installation of assistive technologies, can be considered in relation to outdoor space to ensure that these spaces are accessible, usable, easily understood and safe.

Please refer to the Introduction Section of this document for more detail on these design issues.

Participatory design

Familiar Design

Personalisation

An environment that is easy to interpret & calm

Safe & accessible outdoor spaces

Distinct spaces

Unobtrusive safety measures & Technologies

Good visual access

4.1 Building Construction, Materials & Finishes

Considering the progressive nature of dementia, a dwelling will benefit from built-in flexibility and adaptability to allow modifications in line with changing needs. This will result in less disruption for the occupant should any modifications be required.

01 *A strong load bearing structure will allow the future fitting of various forms of assistive technology ranging from ceiling hoists to grab rails or shower seats, as shown above.*

Building Construction

Design Considerations and Awareness

The UDHI Guidelines discuss flexible and adaptable design and this is also a crucial approach in terms of UD dementia friendly dwellings.

Dementia is a progressive condition that affects people in very different ways, so providing adaptable and flexible solutions is critical to their ongoing support. The needs and abilities of family members and carers will also change so the dwelling will also have to be adapted in this regard.

The design of a dwelling should minimise the need for major changes as this will allow a person to remain at home during any modifications. This would eliminate the anxiety often provoked by a temporary move and alleviate the stress associated with major changes to a familiar environment.

Beyond the issues mentioned above, the design considerations covered in the UDHI Guidelines provide enough information to ensure that adaptability can be designed into a dwelling and therefore cater to the future needs of people with dementia, their families and carers.

Please refer to Section 4.1 in the UDHI Guidelines for overall guidance.

02 *Front doors painted distinct colours to make them more recognisable.*

Photo Design Features

■ These doors are located opposite each other in the same corridor but the use of distinct colours creates a more recognisable entrance.

■ Memory boxes are placed adjacent to the front doors to personalise the entrance and make it more identifiable. This would need to be agreed with the overall building owner or the management company who are typically responsible for communal areas in a residential building.

■ Handrails provide support while a person is walking in the corridor and also as they open their front door.

Photo Design Tip

■ If the apartment numbers were larger they would be more visible for all users.

■ A light fitting above or adjacent to the door would provide higher levels of illumination which may be helpful when looking for keys or opening the door. It would also illuminate the door and make it more recognisable on approach.

Building Materials and Finishes
Design Considerations and Awareness

The UDHI Guidelines discuss the importance of building materials and finishes in terms of usability, health, safety and aesthetics. It also refers to the importance of legibility and comfort, and these are relevant for everyone including people with dementia.

Materials and finishes determine the interior visual quality of a dwelling through

colour, tone, reflectance, or the use of patterns. However, if they are well designed they can be used to compensate for visual, memory, or cognitive difficulties and help people living with dementia to remain living independently at home for as long as possible.

The following sections briefly discuss some of the key issues around building materials and finishes in the context of the UD dementia friendly dwelling.

Building Materials and Finishes: Colour, Tone and Contrast

Introducing colour and tonal contrast can be beneficial to people with both dementia and visual difficulties. Colour contrast can also help compensate for impaired reasoning. For example, contrasting colours or the use of sharply contrasting tones within the same colour, can help people to distinguish between different surfaces and between surfaces and objects. Contrasting colours can be used to distinguish doors from the surrounding walls and thus facilitate recognition of access points and make the environment easier to negotiate and understand.

03 Seating area with colourful contemporary furniture.

Photo Design Features

- While this is not a domestic space it illustrates how colour can be used to create distinct spaces.
- The dark sofas and the purple chairs stand out visually against the floor and walls.
- The yellow painted wall to the rear creates a distinct colour for this room and will help a person to identify this space as the living area.

When it comes to flooring, colour and tonal contrast may cause problems for people with depth perception difficulties as a sharp contrast in flooring can be perceived as a step or hole in the ground. For this reason, best practice is to choose one colour only and use this flooring throughout the home, including the kitchen, bathroom and living areas. The use of one material throughout a number of rooms on the same floor will eliminate the need for a door saddle or similar junction between materials at the door threshold.

Where door saddles or carpet bars are required, ensure that they are the same colour as the flooring at the threshold as this will reduce the risk of a person thinking that it is an object in their path that they must step over. In this case, since the saddle will not be visible, make sure it is not raised to the extent that it might form a trip hazard.

04 *Door threshold between tiled hallway and tiled bathroom.*

Photo Design Features

■ While the tiles in the hallway and the bathroom are different, the colour similarity and elimination of a door saddle creates a seamless threshold

Photo Design Tip

▲ The polished tiled floors may create a glare and may cause difficulties for people with visual difficulties.

▲ The white painted door, skirting and architrave set against white walls and a pale coloured floor creates little visual contrast between these elements. If contrasting colours or tones were used it would help distinguish one element form another.

Some people with dementia can mistake one room for another. While this is less likely to be a problem for a person living in their existing house, it becomes a greater problem if major extensions or adaptations are carried out to the person's original dwelling. It has been suggested that way-finding can be improved if care is taken to make each room distinctive in its décor so that it is visibly different. Using particular colours for specific rooms or fittings may act as a simple cue to help with recognition. While colour-coding can be a highly individual and creative exercise, it is imperative that the information being communicated through colour is consistent throughout the home. Predictability and order can be achieved in the environment through consistent repetition of colour systems.

Building Materials and Finishes: Surface Reflectance

Reflections on glossy surfaces can interfere with visual perception and can cause visual discomfort arising from glare. In some cases surface reflection could be misinterpreted as a water spillage, and that a surface is wet or slippery. This might cause an individual to alter their gait when walking over it, or attempt to step over the perceived 'spillage', and this, in turn, may result in a fall. This also applies to any person with a visual difficulty.

Therefore, matt finishes are recommended to reduce these reflections and glare. Where glossy surfaces such as tiles are used, careful location of these surfaces adjacent to windows or light fixtures is required to avoid these light sources from producing reflections close to the line of sight.

Floor finishes can also make a difference to carers, informal and formal, who depending on their circumstances (age and mobility) may be prone to falls.
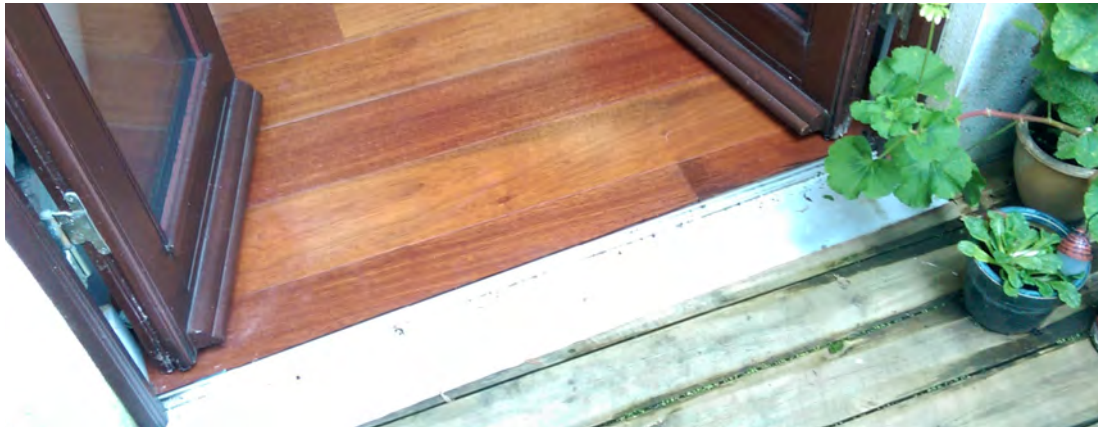
05   *Matt finish to timber floor.*

Photo Design Features
■ Even though this timber floor is adjacent to a south facing set of double doors the matt lacquered finish does not create excessive glare.

Photo Design Tip
▲ The colour contrast between the floor and the light colour of the aluminium threshold may be perceived as a step and every effort should be made to eliminate this.

Building Materials and Finishes: Surface Patterns

Research has found that patterned carpets or dark contrasting carpet borders may increase visual-spatial difficulties and present walking problems and falls for residents with dementia.

Patterns on floor coverings that represent real life objects can be problematic for some people with dementia. The use of plain and similar coloured floor tones is recommended; however, if a person has been living in a particular dwelling for a long period and the patterned carpet is familiar to them, then that person is less likely to have a problem. As mentioned earlier, carpeting can also hinder a carer assisting a person with a mobility aid to move about the home.

06   Floor finishes with strong patterns which may cause confusion. This image also shows how the junction of different flooring materials at door thresholds results in strong colour contrast that may be perceived as a step. White painted doors, white door frames and skirting boards set within white walls will make it harder to discern one item from another and therefore may cause problems for a person with dementia.

07   Plain floor finishes continued throughout all rooms will avoid any change in colour or tone at door thresholds. This image also shows a good colour contrast between the doors, walls, skirting boards and floor.

Bold and repetitive wall paper patterns and those with real life objects such as flowers can cause fear, restlessness, frustration, delusions and confusion for some people with dementia. It is widely recommended that walls are decorated with plain colours using muted or pastel shades - matt or satin finish paint is recommended as it reduces glare.

Please refer to Section 4.1 in the UDHI Guidelines for overall guidance.

UD Dementia Friendly Design Guidance

- Where colour is needed for increased legibility consider colours in the blue and green area of the colour spectrum, as opposed yellow and red colours, as these colours may be harder to differentiate for people with dementia.

- Use colour and tonal contrast to distinguish one surface from another, or to make certain objects stand out against their background.

- In line with the above, paint skirting boards and door frames a contrasting colour to walls and ceilings to ensure a clear contrast is made between floor and wall finishes.

- Paint doors a contrasting colour to the wall to make it visually stand out from the background. Ensure the door handle and any locks or similar door furniture is finished in a colour that stands out from the door.

- Use colour or tonal contrast to highlight handrails, grab rails, light-switches, wall mounted fittings and other important objects that need to be visually prominent.

- Avoid sharp colour or tonal contrasts on floor finishes as these may be misinterpreted as an object on the floor or a step. Maintain a similar finish and colour on any one storey, and minimise or eliminate internal door saddles or carpet bars at door thresholds which may be misconstrued as a step.

- Use colour or decor to distinguish one room from another as part of a design strategy to create distinctive spaces.

- Avoid glossy finishes with excessive reflectance. Use material with matt finishes; when choosing paint consider low sheen paints such matt or satin finishes.

- Avoid strong patterns on both floor and wall finishes as these may cause confusion or disorientation.

 Direct consultation with the person with dementia or family members may reveal certain materials or finishes that are familiar to the person with dementia and thus contribute to a recognisable environment.

Technical Sketch:
Typical Finishes and Colours which may cause difficulties
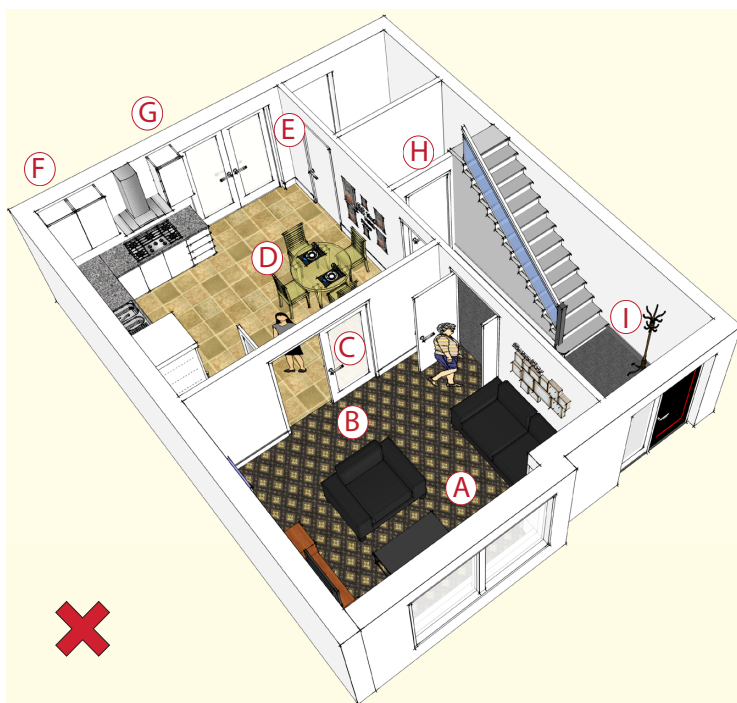
A. Patterned floor covering

B. Color contrast at door thresholds

C. Similar colour doors, walls and skirting boards

D. Furniture colour blending with background colours

E. Similar wall colours used throughout

F. Kitchen units blending into walls

G. Solid doors to kitchen units

H. Bathroom door blending into wall

I. No marking to first or last step on stairs

Technical Sketch:
Universal Design Dementia Friendly Finishes and Colour

A. Plain floor covering

B. No colour contrast at door thresholds

C. Colour contrast at doors, walls and skirting boards

D. Furniture colour in contrast to background colours

E. Wall colours to create distinct spaces

F. Kitchen units standing out from walls

G. Glazed front to kitchen units

H. Distinct colour to bathroom with signage

I. Marking to first and last step on stairs

4.2 Fit-Out Elements

It is through the fit-out elements of a dwelling, such as door handles or light switches, that occupants interface with the building. Fit-out elements include many objects that a person will engage with in a very hands-on manner, and therefore, well designed fit-out elements are critical to a UD dementia friendly dwelling.

Adaptable and flexible fit-out elements are important given the progressive nature of dementia. This will allow modifications that result in less disruption for the occupant should they be required.

07 *Contemporary bathroom fittings in an accessible bathroom.*

Photo Design Features
- The use of contemporary fittings helps create a bright and attractive bathroom.
- The plain colour, non-slip floor provides an easy to use floor surface while also creating a coloured contrast with the WC and the wash hand basin.

Photo Design Tip
▲ If the colour of the walls or tiled area to the rear contrasted with the colour of the WC and the wash hand basin it would make them easier to see for people with visual difficulties.

▲ If the toilet cover and toilet seat was a contrasting colour to the WC it would help make these elements more visible.

08 *This matt finished stainless steel window handle is easily grasped and is visually distinct from the timber frame window behind.*

Photo Design Tip

▲ The stainless steel handle may be cold to the touch and uncomfortable for some users and therefore plastic coated handles could be considered.

▲ Window should be easy to operate - some tilt and turn functions are complicated and difficult to use and this must be considered when specifying.

Windows, Doors and Ironmongery
Design Considerations and Awareness

The UDHI Guidelines cover most of the dementia friendly issues in relation to windows, doors and ironmongery. As stated throughout these current guidelines, familiarity and objects that are easy to interpret are critical for people with dementia. These design considerations are important to consider in relation to door or window handles locks, or other fittings.

Safety is an issue in all dwellings and UD can be used in designing dwellings to better protect people with dementia. Where necessary, unobtrusive and sensitively used environmental interventions such as a disguising exit points can be used to discourage a person with dementia from leaving the home but only where this would pose a risk. Devices that signal to a family member or carer when a door is opened can also be used where required, but should always be used in an ethical manner and every effort should be made to find a balance between being overprotective and respecting individual autonomy.

(See Section 2.1 for information about entering and exiting and Section 4.4 for information on entering and exiting technology)

Within the dwelling there may also be areas with potential hazards such as cupboards with cleaning products or service areas with electrical equipment. Where these present a risk to a person with dementia it may help to paint the access doors in a colour that matches the background to disguise these doors.

(See Section 4.4 for more information on safety and technology systems)

While safety is very important when considering windows, doors and ironmongery, this must be balanced with accessibility and visual access within the dwelling. As discussed in **Section 2.2,** good visual access to key spaces within the house will contribute to an easily understood and simply navigated internal environment. Careful design of internal doors will help to achieve this by ensuring that doors open back against adjoining walls or the use of extra-wide, or 'Cat and Kitten' type doors, as shown below.
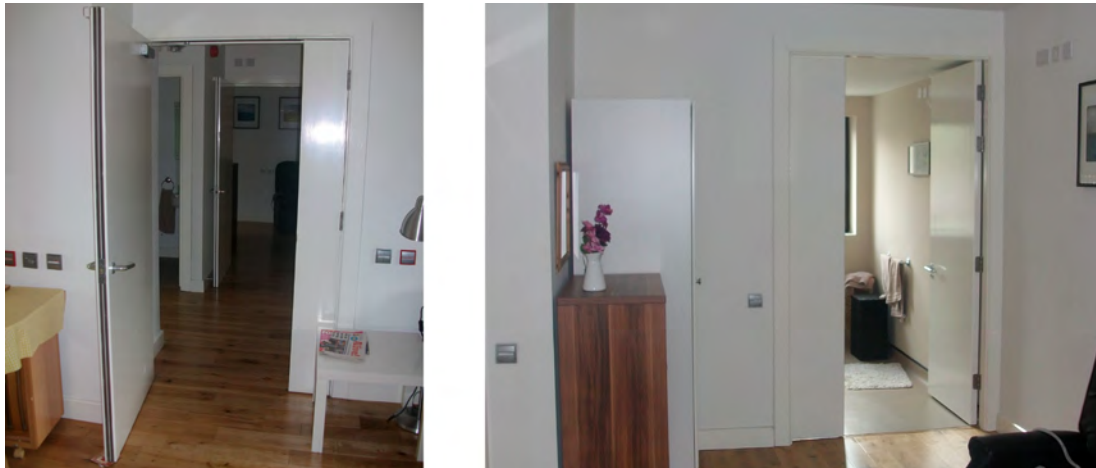
09 *'Cat and Kitten' internal doors as part of a spacious circulation area.*

Photo Design Features

- The 'Cat and Kitten' style doors when opened fully create wider door openings and therefore provide enhanced accessibility and visual access.
- The timber floor provides a good colour contrast with the walls and doors which gives greater visual clarity to these elements.

Photo Design Tip

- If the door was painted a contrasting colour to the wall it would make the door more visible within the dwelling.
- Contrasting colour skirting boards, door frames and architraves will help create better visual definition and make it easier to distinguish between the elements.

The windows of a dwelling control much of the interaction between inside and outside, not only in terms of views and daylight, but also in terms of sound and thermal insulation. Providing a view to natural settings has therapeutic benefits for many people, while views to everyday public activities on the street has proven to be very attractive for people who are confined inside. Therefore, windows should provide maximum views to the outside, allow a person to experience positive stimuli such as a summer breeze, bird song, or external activities, while also protecting the occupants from disruptive external noise, solar glare or excessive solar heat gains, or conversely, internal heat loss.
(See Section 4.3 for information regarding the internal environment)

Please refer to Section 4.2 in the UDHI Guidelines for overall guidance.

UD Dementia Friendly Design Guidance

- Avoid the deliberate use of complicated door locks as way of preventing a person from exiting a dwelling as this may cause frustration and agitation. Instead consider disguising the door by painting it to match the background. However, this approach will also disguise a door at all times, including when it is safe or indeed beneficial for a person to go outside. It may also cause problems for family members or carers with visual difficulties.

- Instead, consider fixing a curtain rail to the inside of the front door to allow a curtain to be drawn over the exit, and if necessary drawn over associated objects such as coat rack or umbrella stand, to eliminate a direct view of the door and thus remove the inclination to leave.

- Internal doors should be hung so they open against an adjoining wall to allow maximum views to the room from adjacent spaces when the door is open. For non-fire rated doors consider using a door hold-open device to keep the door fully open to maintain visual access.

- Consider using extra wide doors or 'Cat and Kitten' doors to provide maximum physical access and also good visual access.

- Use internal door ironmongery that is intuitive and simple to use and that is familiar to the extent that it is consistent with the occupant's expectations around appearance and function.

- Paint doors a contrasting colour to the wall to make it visually stand out from the background. Ensure the door handle and any locks or similar door furniture is finished in a colour that stands out from the door.

- Ensure that window cill heights and window transoms do not obscure the view to the outside for a person when seated or lying on a bed.

- Provide window systems (including frames and glazing) that minimise glare and sound transmission while also balancing solar heat gains and internal heat losses.

Direct consultation with the person with dementia or family members may reveal certain approaches to the design of windows, doors and ironmongery that will help provide a balance between usability, comfort and safety.

10 *Heating controls along with alarm and light switches.*

Photo Design Features

■ The colour of these electrical fittings contrasts with the colour of the background.

■ The large rocker-style switches are easy to operate as they require less streng*th.*

Electrical Fittings
Design Considerations and Awareness

Many retrofit projects will include a level of electrical works and this may facilitate UD dementia friendly measures without too much impact on the dwelling. it is important that fittings are familiar, easy to use, and easily seen.

Electrical fittings, such as switch or socket plates, should be placed in logical locations where users would expect them to be. For instance, light switches or alarm key pads within entry hallways should be in a convenient location inside the front door that will not be obstructed by the door swing or furniture.

Please refer to Section 4.2 in the UDHI Guidelines for overall guidance.

UD Dementia Friendly Design Guidance

● Use electrical fittings such as light switches, socket plates, ventilation or heating controls, immersion controls or alarm panels that are familiar to a person with dementia and intuitive to use.

● Ensure that all switches or controls are placed in a logical location, are clearly visible from within the room and are finished in a colour that makes them stand out from the background.

● In some cases, electrical fittings, such as electrical distribution boards or cooker switches, may need to be disguised. If this is the case, place these fittings in concealed cupboards or use switch plates that merge with the background. These must still be usable by family members or carers.

Consultation with the person with dementia or family members may ascertain which electrical fittings are unproblematic to the person with dementia, their families and carer(s). It will also reveal potential risks and highlight certain electrical fittings that could be concealed or disguised.

11 *External signage giving directions to residential units.*

Photo Design Features

■ The signage is at standing eye level where it is readable by people of small stature or people in a wheelchair. The white text on blue background makes the signage clearly legible.

Photo Design Tip

■ The slightly glossy finish to the signage may cause light reflections that coud be problematic for people with visual difficulties.

Signage, Labelling and Other Written or Pictorial Information

Design Considerations and Awareness

As discussed in the introduction, short term memory loss associated with dementia can make it difficult to remember the layout of a physical environment, while cognitive difficulties can impair spatial processing resulting in disorientation and anxiety. In this regard clear and easily understood signage can help with way-finding in public spaces, on approach and entry to a building, and as part of the internal circulation.

12 *Signage in a retail context using large, bold signage to provide directions and identify key spaces.*

Photo Design Features

■ While the signage above is in a retail context it shows how large, bold signage can be used to provide directions and identify key spaces such as stairs or a lift. Signage such as this could enhance way-finding and legibility in the communal areas of apartment blocks.

Photo Design Tip

■ The location of the call button so close to the stairs makes it harder for certain people, such as a person in a wheelchair, to approach and use the call button. It may also cause conflict with people coming down the stairs.

Some people with dementia may also find it hard to distinguish one room from another or identify objects, appliances or equipment within rooms. Labelling of rooms or objects with simple text or images can increase legibility by helping a person identify the location and function of certain spaces. Examples include a label with a picture of a toilet outside the bathroom, a label showing an image of keys beside the front door, or images on kitchen cupboards to indicate what is inside (See Image 13).

Written and pictorial signage on kitchen cupboards.

Photo Design Features

■ The signage and images shown above can help people identify the contents and may prompt them to carry out activities such as making a cup of tea.

Photo Design Tip

■ If the doors to these kitchen units contained clear glazing allows a person to see the contents and may provide a more direct visual cue than the signage shown above.

Written and pictorial information regarding the month, date, or time can help to orientate people in relation to seasons and time of day. Image 14 on the next page shows an example of how this can be achieved by using a standard clock and some large format printed words. This could be maintained by a family member or carer and could be located in a few key rooms such as the kitchen or living area.

14 *Written and pictorial information about the time, date, or season.*

15 *A 'memory box' located adjacent to the front door of a dwelling accessed from a communal hallway.*

Photo Design Features

■ The memory box, which contains a person's name and personal photographs, helps to personalise the dwelling and may assist a person with dementia to locate and identify their own door.

■ The handrail provides physical support while the contrasting colour on the handrail and the door will enhance visual access.

While images, text and objects can improve way-finding and legibility, they can also reinforce identity. The placement of 'memory boxes' that contain family photographs or personal objects in strategic locations, such as beside a front door, will facilitate personalisation and help to identify dwellings, and maintain a sense of control. In an apartment building this would have to be agreed with the management company who are typically responsible for these areas.

As people with dementia may often have increased reliance on their senses, it is helpful to use multi-sensory cues, such as sounds, smells, or tactile surfaces, to reinforce way-finding and legibility. Aromatic or tactile planting, wind chimes, or water features that create a sound, or can be touched, or gently reflect light, should be considered along with words and images to provide multiple modes of communication to cater for a wide variety of sensory or cognitive conditions.

Signage and labelling are low cost measures that will cause minimal intrusion and can be undertaken as a stand alone measure or part of an overall retrofit. They should be considered from the start in new-build projects to ensure an integrated design is achieved where signage and labelling are optimised.

Please refer to Section 4.2 in the UDHI Guidelines for overall guidance.

UD Dementia Friendly Design Guidance

- Provide appropriate signage at all spatial scales, whether this is in a public space approaching a residential development, as part of external on-site circulation areas leading to a dwelling or apartment block, within the dwelling, or on specific objects to identify their function.

- Where possible, use multiple modes of communication, including both written and pictorial, and multi-sensory cues such as sound, touch and smell to reinforce way-finding and legibility.

- Ensure that the format and style used for any signage and labels would be familiar to people with dementia.

- Ensure all signage and labels use clear, large font and images where the font colour or image contrasts with the background colour. **(See the Signage section in Section 4.2 of UDHI for more details on signage).**

- Use matt or satin finishes for all signage and labelling to avoid glare. Ensure they are very well lit without causing excessive shine or reflection.

- Use 'memory boxes' or similar devices to create dedicated places for personalisation, and the installation of images or objects that will help a person identify their own home.

Direct consultation with the person with dementia or their family will help to identify problematic objects and spaces, and also identify the format of signage or labelling that might be familiar.

Mirrors and Other Highly Reflective Surfaces

Design Considerations and Awareness

For some people with dementia, mirrors may create confusion if, for example, the person does not realise that the image in the mirror is their own. This can generate fear and may cause adverse reactions. Therefore, it would be useful if the mirrors in the home can be easily moved, removed completely or covered over.

On the other hand, condensation covered mirrors from bathroom steam may also cause problems if a person is unable to see their reflection as expected in the mirror. To combat this, proprietary heated mirror pads, which are simply electrical elements fitted to the back of a mirror, can be installed to keep mirrors steam-free.

UD Dementia Friendly Design Guidance

- Ensure all mirrors can be easily moved, removed or covered over.
- Where condensation on mirrors is causing problems for a person with dementia consider fitting proprietary heated mirror pads to keep mirrors steam free.

Direct consultation with the person with dementia, family members or carers will help to see if this is an issue in the first place, and then to determine the best approach to mirrors in general.

4.3 Internal Environment

This current section looks at how lighting, ventilation, heating and sound affects people with dementia, their families or carers. People with dementia will often be more sensitive to environmental conditions and therefore the creation of a comfortable and supportive internal environment is crucial to their well-being.

16 *Kitchen, dining and living area in a contemporary dwelling.*

Photo Design Features

■ Large, full-length, south-facing windows providing natural light, passive solar gain and views to external spaces.

■ Dining table located adjacent to the kitchen.

■ Colour contrast between the floor and the walls.

Photo Design Tip

▲ The highly polished tiled floors adjacent to south facing windows will create a glare and may cause difficulties for some people.

17 *Brightly lit dining area in refurbished 19th Century terrace dwelling.*

Photo Design Features

- Large, full-length windows and doors providing natural light, passive solar gain and views to external spaces.
- Dark brown window and door frames provide good contrast to the background.

Photo Design Tip

▲ The full length windows and doors would benefit from a frosted glass manifest or similar markings to prevent a person walking in to it by accident.

Natural and Artificial Light
Design Considerations and Awareness

Well designed natural and artificial lighting is important for people with dementia, for older people, and for people with visual difficulties. Good lighting can help with task visibility, place recognition, and raise awareness of hazards through increased visibility. Proper lighting design can also play a role in reducing sleep disturbances and thus reduce certain challenging behaviours, such as restlessness.

In terms of energy efficiency, automatic lighting controls (or the use of compact fluorescent lamps (CFLs) in place of traditional bulbs) will help reduce electrical energy consumption within common circulation areas or the home. However, careful consideration must be given to lighting controls that may not be familiar to a person with dementia, or controls that turn lights on or off automatically and thus confuse or frighten a person who is unaware of this function.

The following sections briefly discuss some of the key issues around natural and artificial lighting in the UD dementia friendly dwelling.

Natural and Artificial Light: Compensating for Deterioration in Vision

People with dementia and older people will often experience visual difficulties and therefore will benefit from higher levels of lighting.

Higher levels of natural light can be achieved through correct orientation, window location and window sizing. Careful design of curtains or blinds, along with reduced clutter on window sills, will maximise the available light entering through the window. **(See Section 3 for overall guidance in relation to natural light).**

Ensuring there are sufficient light fittings or simply changing existing light bulbs to a higher wattage will increase artificial light levels (Ensure that the bulb does not exceed the light fitting's ratings as set by manufacturer). The use of plug-in lamps can also be used to boost light levels within the dwelling.

18   *Kitchen, dining and living area in a contemporary semi-detached dwelling.*

Photo Design Features

■ The simple, uncluttered window dressing allows maximum natural light into the room while also maintaining maximum views to the outside.

■ The window design has eliminated the transom and therefore presents no visual barrier whether a person is seated or standing,.

Photo Design Tip

▲ The full length windows and doors would benefit from a frosted glass manifest or similar markings to prevent a person walking in to it by accident.

Natural and Artificial Light: Provide Evenly Distributed Illumination

Visual adaptation times from dark conditions to light, or from light to dark, increases with a person's age. Therefore, for older people, or people with dementia, uneven lighting can cause the following problems:

- Poorly lit rooms with a combination of brighter and darker areas can cause problems for people with light adaptation difficulties.

- Uneven light may create shadows and uncontrolled glare and reflections. This uneven lighting will impact on visual comfort, visual access and may create unsafe transition areas or act as hazards.

Therefore, evenly distributed illumination within a dwelling is important and in some cases it may be necessary to supplement daylight with artificial lighting to achieve the right conditions.

Any approach to uniform illumination must consider that the quality of light and how it is perceived is a very subtle and subjective issue which has many perceptual and psychological impacts. Overly uniform illumination minimises illuminance differences between surfaces and can reduce clues to the form of the room and hinder orientation. Indeed, a change in lighting levels can help residents to distinguish between various spaces. Light in itself attracts and people with cognitive difficulties are often drawn to light and thus light and shade can be used positively to attract people to certain spaces.

19 *Sunlight falling on a table beside a south facing window as an example of how light can be evocative and attract people towards certain spaces or objects.*

Photo Design Tip

▲ A darker or less glossy table would result in less reflectance and glare.

Natural and Artificial Light: Enhancing Task Visibility

While it is generally recommended that lighting levels should be uniform throughout the building, directed task lighting may be useful for people with dementia. For example, additional light sources in closets and cupboards will increase task visibility.

Extra and directional lighting may also be needed to view any cueing system, which may also include the use of coloured walls, objects or signage. It may also be used to accentuate stairs and handrails, so that people can move with confidence.

Dedicated lighting over counter tops in kitchens or in bathrooms will also help with activities in these areas. Good lighting will also make a difference to family members and carers who may also have some visual difficulties.

20 *Lighting fixtures fitted to underside of wall mounted kitchen units.*

Photo Design Features

■ The under-cabinet lighting provides task lighting to the hob for cooking or to the adjacent counter-top for food preparation or similar.

Photo Design Tip

▲ If the wall to the rear was a darker colour it would allow the kitchen units to visually stand out from the background.

▲ The stainless steel kitchen unit handles may be uncomfortable for some users.

Natural and Artificial Light: Reducing Effects of Glare

Direct natural light from windows or artificial light can cause glare, which tends to become more problematic with age. Glare can generally be divided into two types: (i) discomfort glare; and, (ii) disability glare. Discomfort glare results in an instinctive desire to look away from a bright light source. Disability glare makes it difficult to see an object or to carry out a task without causing discomfort.

Thus, windows should have a means of reducing excessive glare and excluding low-elevation sunlight such as blinds, curtains, awnings, solar reflective glass, or external solar shading devices.
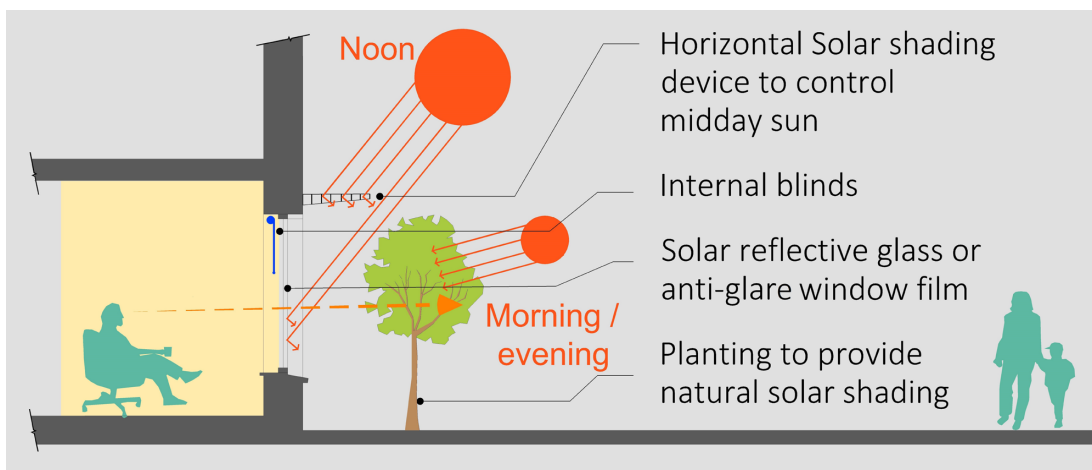
21 Section through external wall showing different options for solar control.

The positioning of artificial lights should be given proper consideration. For instance, lights at eye level can cause glare and therefore indirect sources of light are recommended. Sources of direct light within a person's field of view should be of low luminance, while free reading lights can be used to great effect in a room, this should not contain anything brighter than a 40W light bulb.

Natural and Artificial Light: Reducing Sleep Disturbances and Providing a Therapeutic Environment

As light plays a role in controlling important biochemical processes and balancing circadian rhythms (i.e. the human body clock), the use of lighting appears to be a promising approach in attempts at re-balancing circadian rhythms. There is good evidence from research that increasing levels of lighting (beyond that considered as normal) in the environment where people with dementia live, can improve sleep patterns and can reduce challenging behaviours.

High intensity light with a blueish tint has been shown to improve circadian rhythms in older people; it may positively influence restless behaviour, delay cognitive decline and decrease feelings of depression. Other studies have

shown that improving lighting in the home can have wide-ranging effects including better appetite, improved health, and self-confidence, and a decrease in loneliness.

Please refer to Section 4.3 in the UDHI Guidelines for overall guidance.

UD Dementia Friendly Design Guidance

- Fit higher wattage bulbs in light fixtures to create higher levels of artificial light (e.g. if a light fitting currently has a 60W bulb and a person finds it hard to see in that room, replace the bulb with a 100W bulb). Do not exceed ratings as set by light fixture manufacturer.

- Ensure window dressings, ornaments or other objects are not blocking natural light coming through the window.

- Enure windows are orientated and sized correctly to maximise daylight and minimise excessive solar glare. Typically for bedrooms, bathrooms and kitchens, where many morning activities are carried out, an east and south orientation is beneficial to capture morning and evening light. Living areas will typically benefit from south and west orientation in order to capture midday and evening sun.

- Provide evenly distributed illumination throughout a dwelling to reduce visual adaptation difficulties, and minimise shadows or glare. This can be achieved through careful window design, the installation of sufficient ceiling mounted light fixtures, and the use of plug-in lamps where required.

- Notwithstanding the above, consider how carefully designed variation in light levels can be used to highlight certain features, or draw people towards certain spaces or an exit door leading to a safe garden area.

- Provide ceiling, wall-mounted, or under-cabinet spot lights or strip lights, or plug-in lamps to provide task lighting in areas such as bathrooms, kitchens or bedrooms.

- In line with the above, consider lighting within wardrobes or other storage areas to help draw a person's attention to these areas and help to identify and find various items.

- Consider how window dressing, such as blinds, external solar shading devices, solar reflectance glass or anti-glare window film, can help reduce glare within a dwelling.

- Ensure careful placement of light fixtures or plug-in lamps to avoid glare from artificial lighting.

Direct consultation with the person with dementia, family members or carers will help determine the key issues around natural and artificial lighting within the dwelling.

22 *Living area with a sealed stove and an air supply vent on the sealing.*

Photo Design Features

- The sealed wood burning stove minimises heat loss from the room and burns fuel more efficiently than a traditional open fire.
- The ceiling mounted air supply vent provides pre-warmed fresh air to the room and eliminates the need for external wall vents which can cause a draught and allow warm air to escape from the room.

Photo Design Tip

▲ There are more traditional sealed stoves available and these may be more familiar to a person with dementia and therefore easier to use.

Heating and Ventilation Systems
Design Considerations and Awareness

People with dementia can be more sensitive to environmental conditions. This may be caused by perceptual issues, where a person with dementia may have a different understanding of the temperature in the home, compared to other occupants. Furthermore, a person with dementia may not realise that the room is too hot or too cold, or damp, or that there is a draught coming in from under the door - they may simply feel uncomfortable. Sometimes this discomfort is expressed through behaviour such as: attempting to leave the room; becoming agitated; undressing; or alternatively, trying to put on inappropriate clothing.

Diminished understanding of environmental surroundings or the cognitive difficulties associated with dementia may have other implications for heating such as: difficulties in judging the temperature of hot radiators or hot water pipes; an inability to operate heating or ventilation controls; or a tendency to adjust controls when this may not be necessary.

Efficient and responsive heating and ventilation systems are critical to a UD dementia friendly dwelling and these can be designed as part of an integrated approach. Some of the key elements of this approach are discussed further in the following sections and illustrated in the Technical Sketch on page 137.

Heating Systems

Maintaining healthy and comfortable room temperatures of between 18°C and 20°C is important for all people, but it is of particular importance for people with dementia, who may not be able to adapt their environment (i.e. put on clothing or close a window) or adjust the heating levels in order to remain comfortable.

Maintaining this temperature range in an energy efficient manner, especially in winter conditions, can only be achieved through an integrated approach where:
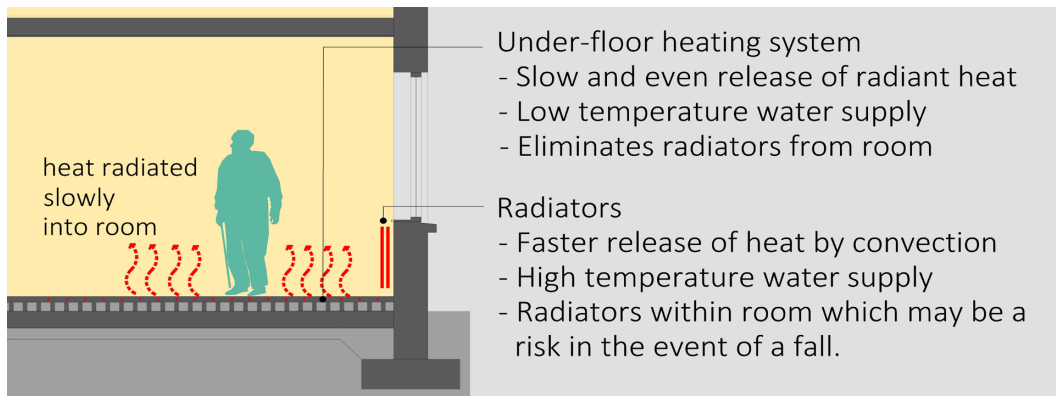
- Key living areas are orientated towards the sun to maximise passive solar gain.

- An energy efficient building fabric (i.e. walls, floors, roofs etc.) that minimises heat loss through high levels of thermal insulation; minimises thermal bridging (i.e. a building component that bridges across an external wall, roof, or similar, and creates channel for heat loss); and, reduces air permeability (to prevent loss of warm air and air infiltration from outside).
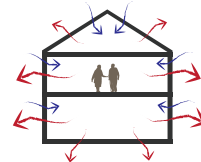
When the building fabric is well designed the demand on the space heating system is reduced. Space heating is typically carried out by radiators or an under-floor heating (UFH) system. In the context of dementia UFH has some advantages over radiators such as:

- UFH provides stable and evenly distributed heating throughout the house, requires lower temperature water than radiators, and is therefore more energy efficient.

- Eliminates the need for radiators, which may be hazardous for a person in the event of a fall. If a radiator gets very hot it may cause burns if touched accidently, or by a person with cognitive difficulties who may be unaware of the danger.

Under-floor heating system
- Slow and even release of radiant heat
- Low temperature water supply
- Eliminates radiators from room

Radiators
- Faster release of heat by convection
- High temperature water supply
- Radiators within room which may be a risk in the event of a fall.

heat radiated slowly into room

23 Section comparing radiators and under-floor heating.

Using a building's thermal mass will help to maintain stable room temperatures. Thermal mass is a term applied to a building material's ability to absorb and store heat. A material with a high thermal mass, such as concrete, brick or stone will absorb large amounts of thermal energy and release it slowly when the air temperature starts to drop. In this way, thermal mass can be used to reduce excessive room temperature fluctuations by slowing down the heating and cooling process.

While thermostats are required for controlling heating and hot water temperature, they can be troublesome for some people living with dementia. One solution is to introduce thermostat systems that require far less intervention on the part of the resident and only function within optimal thermal comfort range. Another is to disguise thermostat controls by covering them or placing them out of sight. More advanced control systems will sometimes combine several functions in a centralised control panel, and link these to an external weather compensator, which all form part of a building management system (BMS).
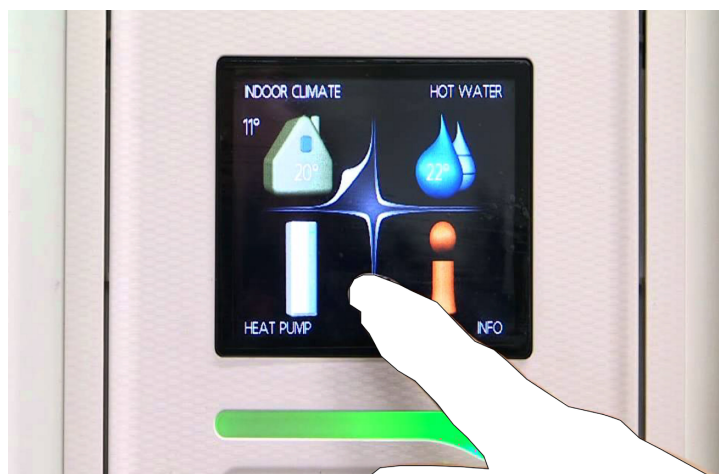

24 Example of an advanced space heating, water heating and ventilation control panel.

It is important that for both basic and advanced heating systems, controls should be designed in line with UD so that they are as simple and as familiar as possible and where the consequences for misuse are minimized.

Given the wide range of impairments and the progressive nature of dementia, it may sometimes be necessary to ensure that the occupant living with dementia cannot interfere with certain controls. As stated earlier, putting items, including the controls, in a location where they are not visible or accessible, or providing a cover over the control may be one solution.

Ventilation Systems

Ventilation is used for both cooling and for maintaining a healthy indoor climate. It introduces fresh air and removes pollutants and moisture. Natural ventilation provided by stack ventilation, or cross ventilation achieved by vents or openable windows (located at opposite sides of the building), can be used to create air movement to ventilate and cool.
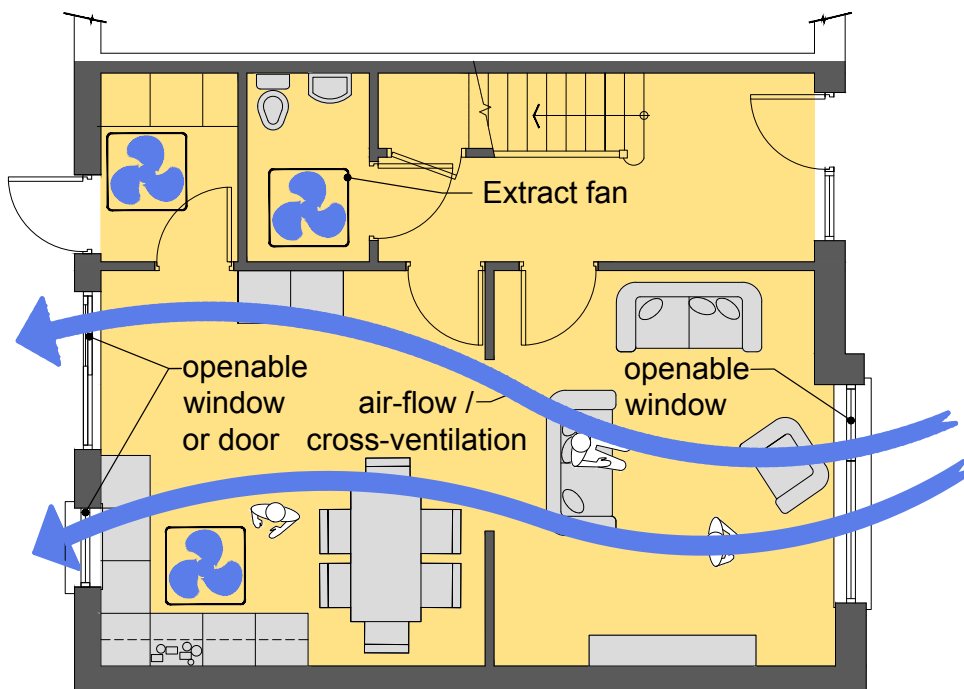
25 *Cross ventilation in a dwelling achieved by an open plan arrangement to allow the cross flow of air and openable windows or doors on either side of the building. Rooms such as the utility, bathroom and kitchen will be supplied with extract fans.*

However, air movement can be a problem if it is perceived as an uncomfortable draught, or if is strong enough to cause curtains to move, or other light objects to move, which could be disconcerting if a person does not understand why. Mechanical ventilation is important in all bathrooms, and can be of great benefit to a person with dementia, their families and caregivers, as a steam-filled room can be stressful for a person with dementia.

Caution is needed though in relation to the use of noisy fans for ventilation as this can cause distress. Fans that are activated automatically when the light is switched on can be distressing and confusing for a person with dementia, as they may not understand how the fan was activated.

Mechanical ventilation, which can also be provided in ensuite bathrooms, utility areas and kitchens, can be linked to a mechanical heat recovery ventilation system (MHRV), which recycles waste heat from these areas and returns this heat to the house. However, MHRV systems typically require air supply vents in all habitable rooms and it has been reported that some of these can cause drafts, or can be noisy, especially at night. This would have to be carefully considered in the context of the UD of dementia friendly dwellings due to acoustic and environmental sensitivity and impact on sleep patterns.

In terms of sustainable design, energy efficient maintenance of comfortable internal temperatures is critical. In this respect, space heating, cooling and ventilation are interdependent and need to be carefully considered in the context of a UD dementia friendly dwelling.

Technical Sketch:
Key Heating and Ventilation Issues
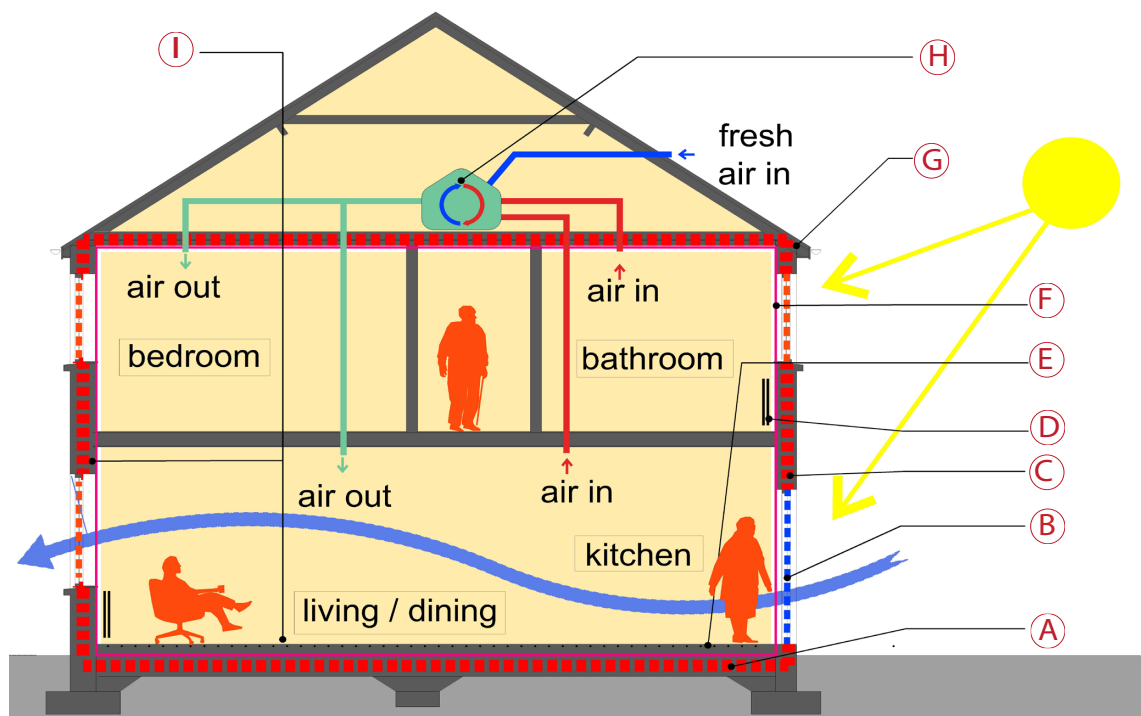
A. Floor insulation to achieve a maximum average U-value of 0.21W/m2K for unheated floors and 0.15 W/m2K where underfloor heating is used.

B. Windows to achieve a maximum average U-value of 1.21W/m2K. Careful design of windows or vents should maximise cross ventilation within the dwelling.

C. Walls to be insulated to achieve a maximum average U-value of 0.21W/m2K.

D. Traditional wall-mounted radiators.

E. Under-floor heating system.

F. Airtight building fabric to eliminate air permeability.

G. Roof to be insulated to achieve a maximum average U-value of 0.16W/m2K.

H. Consider the use of mechanical heat recovery ventilation (MHRV) system to extract waste heat from kitchens, bathrooms etc., and use this waste heat to warm incoming fresh air which is supplied via ducts to all habitable rooms.

I. Use materials with a high thermal mass to maintain stable room temperatures within the dwelling.

Note: U-value refers to thermal transmittance and it measures the rate of heat that passes through a component or structure. It is expressed in units of Watts per square metre per degree of air temperature difference (W/m2K).

All U-Values referred to above refer to requirements for a new dwelling. For further information and compliance issues see the Technical Guidance Documents Part L - Conservation of Fuel and Energy - Dwellings 2011.

Please refer to Section 4.3 in the UDHI Guidelines for overall guidance.

UD Dementia Friendly Design Guidance

- Create even temperatures within the overall dwelling by using consistent levels of thermal insulation on all parts of the building envelope, and by adopting appropriate window treatment to reduce overheating in summer or heat loss in winter.

- Utilise, or provide thermal mass within the building to reduce temperature fluctuations and maintain more consistent temperatures throughout the highs and lows of the winter and summer months

- Ensure high levels of building envelope airtightness to minimise draughts and the associated discomfort experienced by people with dementia.

- Consider the use of under-floor heating which can provide more uniform space heating and healthier radiated heat. This also eliminates the need for radiators which can be hazardous during a fall, or can cause burns when extremely hot. Under-floor heating also operates at a lower water temperature than radiators and thus can contribute to energy efficiency.

UD Dementia Friendly Design Guidance

- In terms of natural cooling and ventilation, consider how stack ventilation or cross ventilation can be incorporated into the dwelling. However, care must be taken not to create air movement that could be perceived as a draught or cause lightweight objects to move.

- Where mechanical heat recovery ventilation (MHRV) systems, or similar heating, ventilation and air conditioning (HVAC) systems are used, ensure that the fans associated with these systems do not create excessive noise or draughts. This can be a problem in the quiet of the night, and may compound any sleep disturbance issues.

- In new-build situations consider radiant slab cooling which provides a stable internal environment and reduces thermal discomfort by minimising vertical temperature differences and reducing draughts.

- Ensure high levels of ventilation and extraction from bathrooms where steam can be problematic for people with dementia. Care must be taken around automatic extractor fans in bathrooms or kitchens, where such operation may cause stress or disorientation for a person with dementia.

- Provide heating controls, both space heating and hot water controls, that are familiar to a person with dementia, and are intuitive and easy to use. Control panels should be placed in an accessible location where they are clearly visible. Ensure that any panel stands out from the background through the use of contrasting colours or tones.

- Consider using a more advanced heating system that requires less intervention from the occupant. Smart heating controls will often work in conjunction with internal and external temperature sensors and automatically control the heating based on a preset thermal comfort range.

- In some circumstances, where there is the risk that a person with dementia may interfere with heating controls to their own detriment, it may be necessary to conceal such controls, or provide 'false' controls that are disconnected from the heating system.

 In many cases, direct consultation with the person with dementia or family members will help to identify space and water heating controls that are familiar to or understood by the person with dementia.

Traffic noise on urban streets.

Sound

Design Considerations and Awareness

Good acoustics are a key element when designing or retrofitting dwellings for people with dementia. The basic principle for creating good acoustic environments is to increase sound - help a person with dementia hear important things; and at the same time reduce noise. It is not only about blocking things out, it's also about ensuring that a person can hear pleasant and stimulating sounds.

This issue of noise transmission between dwellings needs to be carefully treated in semi-detached, terraced or apartment buildings. Particular attention should be paid to sound insulation in separating walls, floors or staircases between dwellings. Dwellings close to sources of external environmental noise such as roads or railway lines must also be carefully designed.

Sources of internal noise generated by fans, water circulation pumps, or domestic appliances must also be addressed.

The importance of a good acoustic environment cannot be over emphasised in the UD of dementia friendly dwellings.

Please refer to Section 4.3 in the UDHI Guidelines for overall guidance.

> "...noise to people with dementia is like stairs to people in wheelchairs" Judd (1998).

UD Dementia Friendly Design Guidance

- Create spaces that reflect a peaceful environment away from sources of external noise and closer to sources of pleasant sounds such as bird life in a garden. This is of particular importance for a bedroom where sleep disturbance may already be an issue.

- While the UDHI Guidance suggests that acoustic separation should exceed the current building regulations (Part E - Sound) by up to 5 decibels (dB), it may be appropriate to aim for a higher performance if noise is a real issue.

- Choose mechanical, electrical and plumbing systems, plant and internal equipment with low noise emissions.
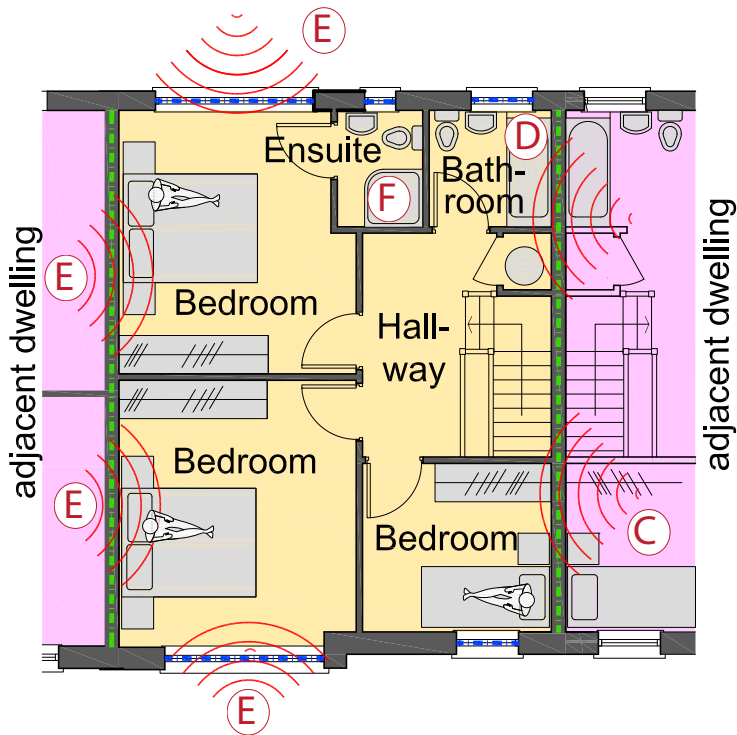
Key sound transmission issues (see floor plans on next page)

A. Provide acoustic separation between dwellings to exceed the current building regulations (Technical Guidance Documents - Part E - Sound) by up to 5dBs.

B. Ensure windows facing onto public road provide good acoustic separation particularly in urban areas or adjacent to busy roads.

C. Carefully design party walls paying particular attention to areas adjacent to stairs, which can be problematic in terms of noise transmission between dwellings.

D. Use non-habitable rooms such as utility areas, bathrooms or circulation areas as a sound buffer to adjacent dwellings.

E. Ensure good acoustic conditions to all bedrooms to minimise any disruption to sleep.

F. Specify domestic appliances such as washing machines or electric showers with low noise emissions. Provide sound insulation to internal mechanical or electrical equipment such as water circulation pumps.

G. Use external planting or screens to reduce the transmission of noise from areas adjacent, such as roads, to the site.
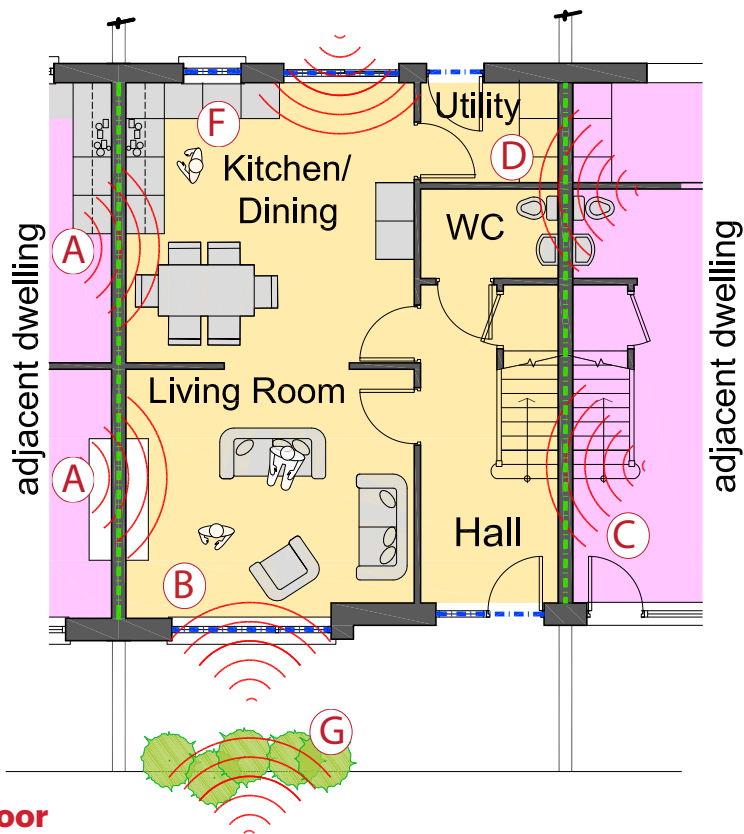
Note: Decibels (dBs) are the units used to measure sound intensity.

"People with dementia may have normal hearing, but they can lose the ability to interpret what they hear accurately. Underlying hearing disorders can also predispose a person to auditory hallucinations ... Excess noise can result in confusion, over stimulation, and difficulty communicating" (Bakker 2003).

Technical Sketch:
Floor plans of terraced house showing key sound transmission issues

First Floor

First floor plan labels: E, D, F, Ensuite, Bath-room, adjacent dwelling, Bedroom, Hall-way, Bedroom, Bedroom, C, E, E, E

Ground Floor

Ground floor plan labels: F, Utility, D, Kitchen/Dining, WC, adjacent dwelling, A, A, Living Room, Hall, C, B, G, adjacent dwelling

4.4 Safety and Technology Systems

While technology can offer much support to people with dementia, their families and carers, it is important that if installed in the home, this is done ethically, and that the rights and preferences of people with dementia are respected. Technology should never be used as a substitute for human care, but rather should be used to complement personal care services.

Dementia is a progressive condition, therefore all safety and technology systems should have built-in flexibility and adaptability to allow modifications in line with changing needs. This will result in less disruption for the occupant should modifications be required.
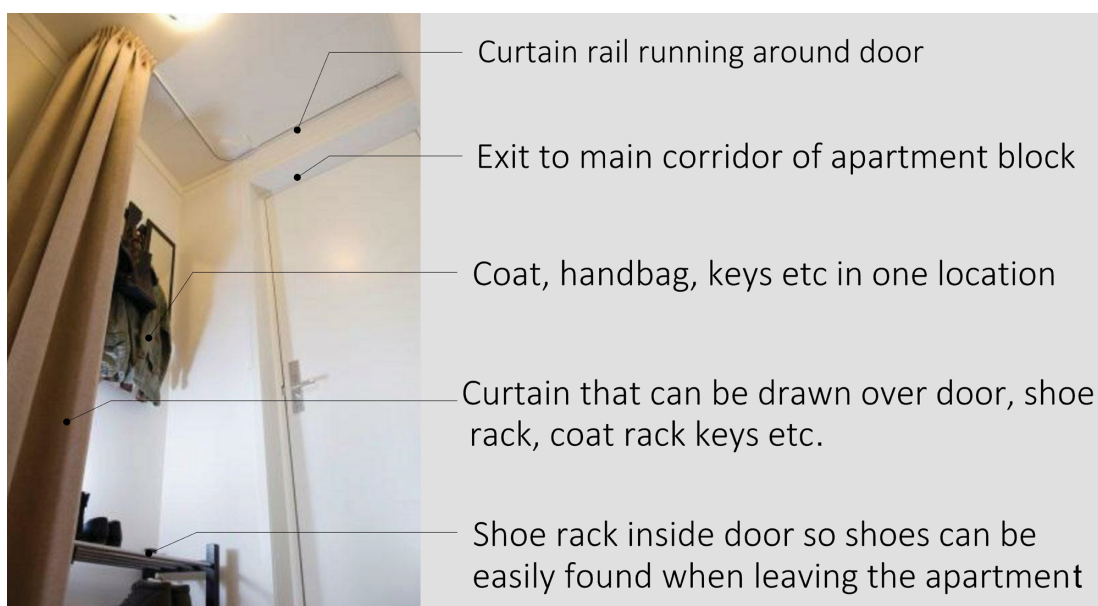

27 *Small service room outside an apartment, which is located in the common access corridor, adjacent to the entrance door to the dwelling.*

Photo Design Features

- The service room contains key electrical and other utility services that can be accessed independently of the apartment by utility companies, the management company, maintenance staff, or others, with the permission of the apartment residents.

- This reduces intrusion on the resident(s) and removes direct access to potential hazards from within the apartment.

Photo Design Tip

▲ If the front door was painted a distinct or contrasting colour it would make it more visible to people with visual difficulties.

Curtain rail running around door

Exit to main corridor of apartment block

Coat, handbag, keys etc in one location

Curtain that can be drawn over door, shoe rack, coat rack keys etc.

Shoe rack inside door so shoes can be easily found when leaving the apartment

28 The inside of an exit door with a curtain that can be drawn over the inside of the door.

Photo Design Features

■ The curtain can be drawn over the inside of the door at certain times, and also across other items such as the coat and shoe rack, to remove the visual cues that might prompt a person to leave the dwelling.

■ Locating the coat and shoe rack adjacent to the front door prompts a person to put on appropriate clothing and footwear when going outside.

Photo Design Tip

▲ If the inside of the front door was painted a distinct or contrasting colour it would make it more visible to people with visual difficulties during times when it is safe and appropriate to leave the dwelling.

# Safety Features

Design Considerations and Awareness

Safety is one of the main concerns families, carers and health professionals have when attempting to provide home care for a person with dementia. Poor design can pose risks, not only to people living with dementia, but also to family care givers or formal carers.

Wandering away from the home or getting lost, falling, being scalded and other domestic risks associated with, for example cooking, have been identified by families, carers and health service professionals as key concerns, especially when people with dementia live alone.

However, as reiterated throughout these guidelines, any safety features should be provided in an ethical and unobtrusive manner. Many health professional

and carers subscribe to an approach called 'positive risk taking' for people with dementia living at home. This is a way of balancing well-being and autonomy with safety.

Indeed, most of the design considerations discussed throughout these guidelines, (i.e. greater accessibility, increased legibility, enhanced visual access, mitigating visual-spatial difficulties by avoiding strong colour or tonal contrasts, or the provision of uniform lighting) will all contribute to the creation of a safer, more supportive environment.
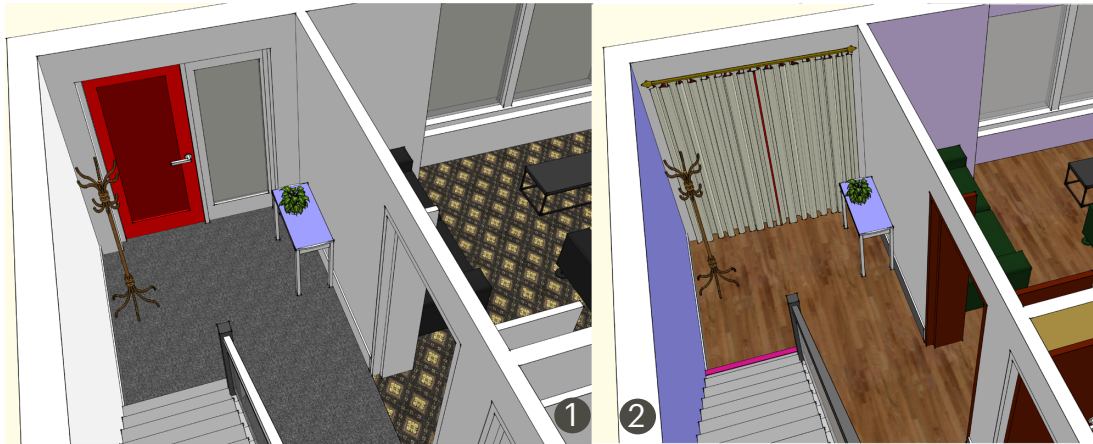
29 Image 1 shows a typical front door, while Image 2, shows a front door with a curtain drawn over the inside of the door to disguise the exit.

Specific safety measures will depend on the individual, the stage of dementia, and whether the person lives alone or not. In some cases there may be a need to limit access to certain hazards or provide assistive technology to protect the person. In this regard, consider the following:

- Disguising certain controls or exit points, if handled ethically and sensitively, will not be noticeable to a person with dementia, or will not cause frustration.

- Consider how a person with dementia may react to typical domestic safety or security systems, such as a loud fire or burglar alarm. This may be of particular concern if the person with dementia is unfamiliar with such systems (i.e. where they are retrofitted, or where the person moves into a newly-built dwelling).

Many of these issues have been discussed in previous sections of these guidelines. Additionally, Section 4.4. of the UDHI Guidelines outlines a range of UD issues around safety and security systems. However, given the importance of safety in the context of dementia, some of these key issues are reiterated below. Technology based safety measures are dealt with in the next section which discusses Assisted Living Technologies.

Technical Sketch:

Ground floor of semi-detached house showing key safety features
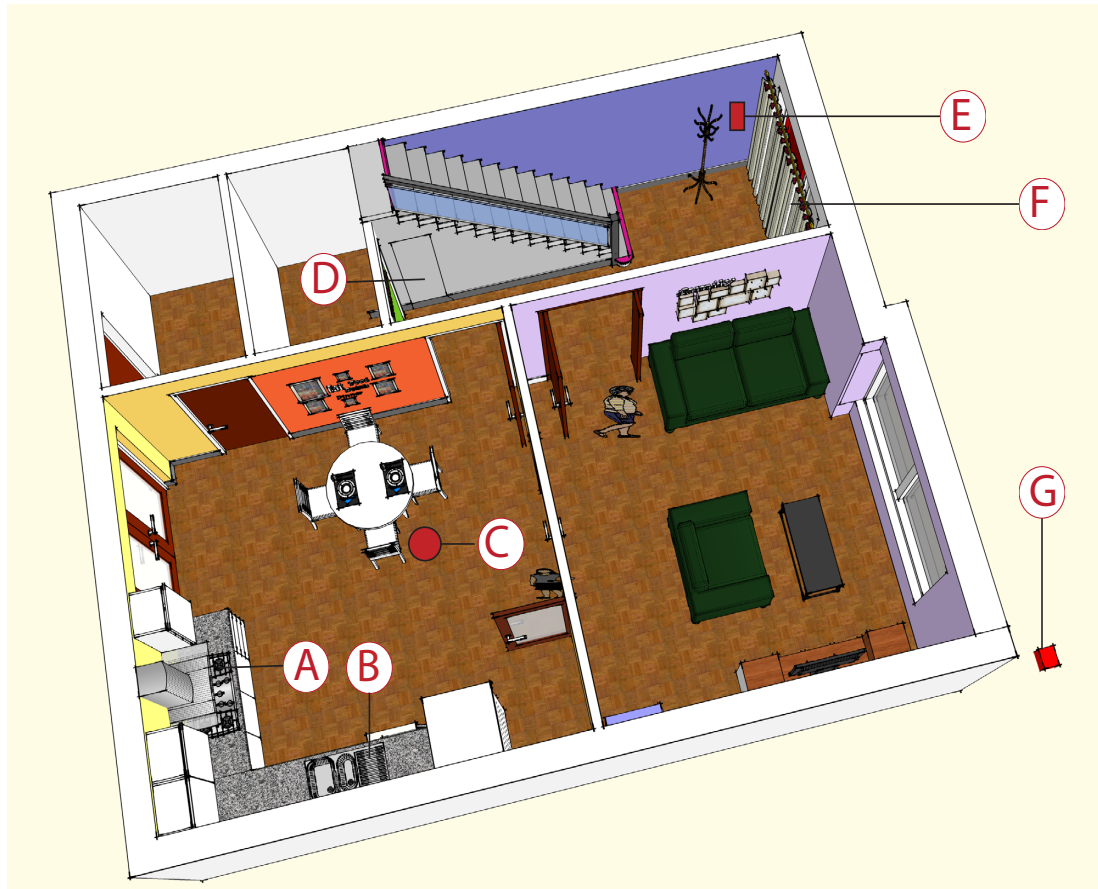
A. Automatic gas shut-off valves, or cooker and oven shut-down devices.

B. Automatic water shut-off valves.

C. Smoke and heat sensors linked to an alarm system.

D. Storage areas with potential hazards disguised by painting the door to match background

E. Exit risk messaging device.

F. Curtain to conceal front door from the inside.

G. Code operated key safe fitted outside the home where keys can be retrieved by carer or family member if required.

**Please refer to Section 4.2 in the UDHI Guidelines for overall guidance.**

UD Dementia Friendly Design Guidance

- Ideally, safe and accessible outdoor space should be provided to support the person with dementia to spend time outdoors in a multi-sensory garden or carefully adapted courtyard. In many cases a person with dementia may just want to go outside, and providing safe outdoor space may satisfy the desire and prevent them from travelling further afield if this presents a risk to their safety.

- In certain cases it may be beneficial to fix a curtain rail to the inside of the front door to allow a curtain to be drawn over the exit, and if necessary drawn over associated objects such as coat rack or umbrella stand, to eliminate a direct view of the door and thus remove the inclination to leave.

- Consider the installation of a exit risk messaging device or similar which can be programmed to alert a designated person if the front door is opened during certain predetermined times.

- Consider a code operated key safe fitted outside the home where keys can be placed. This can be accessed by designated people, such a family member or carer, if the person with dementia is unable to answer the door.

- Cupboards containing potential hazards such as cleaning products or dangerous implements, or service areas with electrical equipment, can be disguised by painting the access doors in a colour that matches the background. If these are also locked with discrete locking mechanisms they may not be noticed and therefore will not be a source of frustration.

- Controls for gas switches or cooker switches which may present a hazard can be disguised by blending them into the background, locating them out of view, or placing them in locked cabinets.

- Consider safety devices such as automatic gas and water shut-off valves, or cooker and oven shut-down devices.

- Consider the installation of anti-scald taps to kitchen sinks or thermostatic mixing valves to bath taps or showers to prevent scalding during bathing times.

- Smoke and heat sensors linked to an alarm system will enhance safety. These should not emit an excessively loud alarm sound as this could be very frightening and disorientating for a person with dementia. In some cases it may be best to link these to a carer alert system, or an external monitoring service.

Consultation with the occupants or family members may reveal certain preferences or design approaches that are familiar to the occupant, or that provide higher levels of safety.
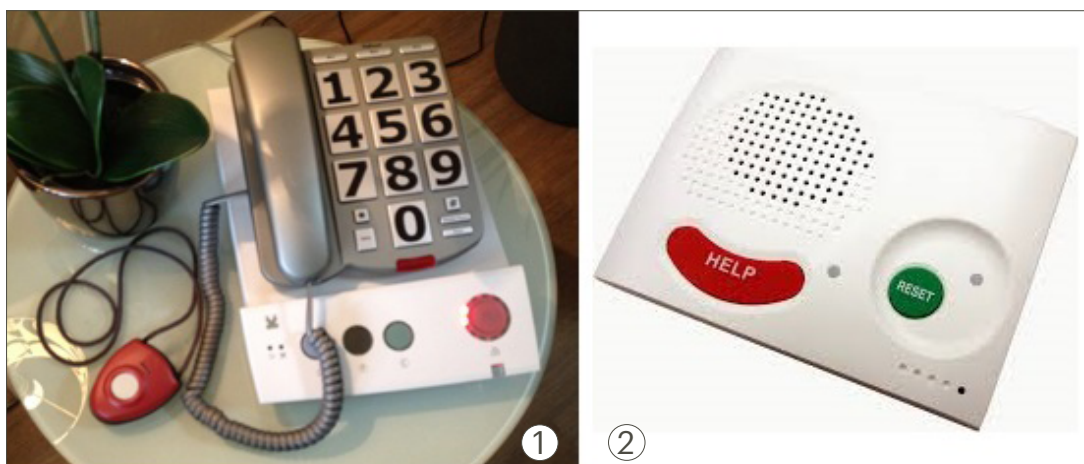
30 *Image 1 shows a personal alarm and a large format button phone, while Image 2 shows an emergency call unit. These are examples of technology typically used by people with dementia.*

Assisted Living Technologies
Design Considerations and Awareness

Technology systems in domestic dwellings have become more commonplace and the role that these can play in relation to the internal environment of a home, or communication and entertainment, is discussed in the UDHI Guidelines, under the heading 'Assisted Living Technologies'.

Design for unobtrusive safety is a key concern for UD dementia friendly dwellings, and in this regard technology can play an important role.

There is much crossover between Assistive Technology, Ambient Assisted Living, Telecare, and Telehealth systems. However, in the context of UD dementia friendly dwellings it is worth looking at each to understand how they may be best deployed.

Maureen lives alone but her daughter and son live close by with their families and they call in frequently. Last year, following a few incidents, when a gas oven was left on and a hand basin flooded the bathroom, Maureen had a Telecare system installed. This monitors a few key potential hazards such as the gas cooker while also providing carbon monixide and temperature sensors. This has put Maureen and her family at greater ease and she is now living safely and comfortably at home.

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Technologies: Assistive Technology

Assistive technology (AT) can be defined as products, equipment or systems aimed at supporting an older person or a person with a disability to undertake tasks they would otherwise find difficult or impossible. AT is also designed to help carers support a loved one or care recipient.

In the context of electronic equipment or systems, AT can range from a large button phone, or photo ID phone, to more complex whole-house technology, or smart home technology. In this regard there is much crossover between Ambient Assisted Living, Telecare, and Telehealth systems.

Where smart home technology is used as AT it can be designed as a comprehensive system that combines monitoring and automation and can be tailored to meet individual needs. Environmental Control Units (ECUs) are an example of smart technology used as AT in the home. ECUs can be used to control various items such as the lights or TV, and will help certain people to live with greater independence in their own home.

31 *This ECU uses a mobile phone or tablet interface to control a range of automated objects and devices within the dwelling.*

If required, ECUs can be linked to more complex home automation systems including automatic door, window, or curtain openers, and therefore enable a person who is frail or is living with mobility difficulties to independently control their environment.

If these technologies are carefully designed, and tailored to the needs and preferences of the person with dementia, they can be unobtrusive. (Smart home technology is closely related to Ambient Assisted Living as described next.)

Technologies: Ambient Assisted Living (AAL)

Ambient Assisted Living (AAL) centres on information and communication technology (ICT) enabling older people to live at home independently. AAL has a health and well-being focus and typically refers to embedded ICT to create more intelligent everyday environments to provide assistance, monitoring and care for everyday living for older people.

Digital day clocks are good example of simple and effective AAL technology which has been shown to be beneficial for people with the dementia. A day clock will help orient a person about the time of day, day of the week, or the month.

32 *Image 1 and Image 2 show examples of day clocks providing dates and times to help with temporal orientation.*

AAL is a rapidly developing area and will often encompass elements of both Telecare and Telehealth as outlined below.

Technologies: Telecare

Telecare uses various ICT to provide support and social care from a distance, supported by telecommunications, such as phone or video equipment.

Telecare packages can include pendant alarms, fall monitors, bed motion or bed occupancy sensors, and door entry/exit sensors. Other examples include sensors to record usual behaviour patterns and identify when deviations from the norm occur. Telecare can also include environmental hazard detectors including flood detector sensors to sense bath, sink or washing machine overflows, temperature sensors to monitor extreme temperatures and unusual changes in temperature, and natural gas detectors and smoke detectors.

These packages can also include bogus callers panic buttons, carbon monoxide detectors, fall and gas detectors.
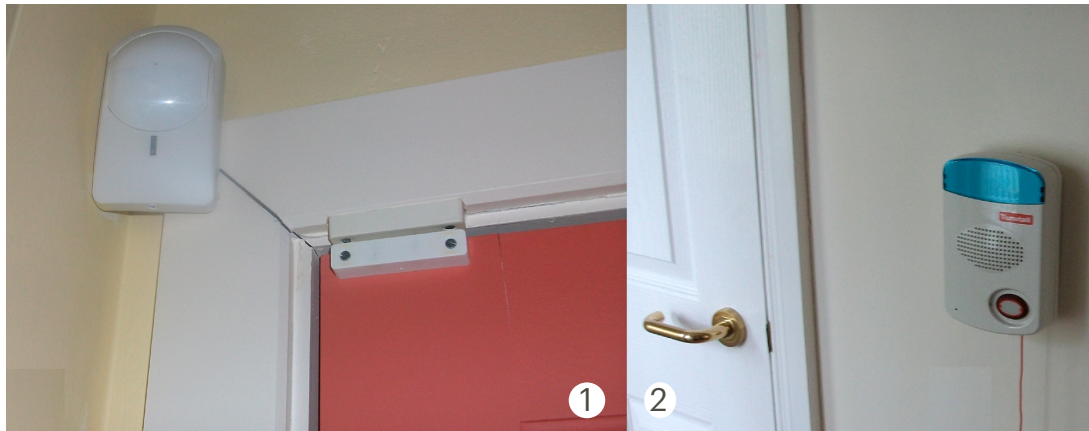
33 *Image 1 to the left, shows an exit sensor that sends a message to a control point (family member, carer or care provider) when the door is opened. Image 2 on the right, shows an emergency call unit with a push button and a pull cord.*

Technologies: Telehealth

Telehealth refers to the electronic exchange of personal health data from a person at home to medical staff at a hospital or similar site to assist in diagnosis and ongoing monitoring of the person's health condition.

An Enuresis Sensor placed in a bed and connected to a telehealth service is a good example of how teleheath might be used to support a person with dementia who may be incontinent. An Enuresis Sensor detects moisture in the bed and alerts the telehealth service which in turn records these events and reports findings to the appropriate healthcare worker(s).

34 *Enuresis Sensor that can be connected to Telehealth system.*

The various assistive technologies described herein are some examples of a wide range of assistive technologies which are increasingly being used as part of an integrated approach to independent living for older people and people with dementia. In light of this, the guidelines below specify a range of measures drawn from all of the above and can be considered on an individual basis, or part of an overall package.
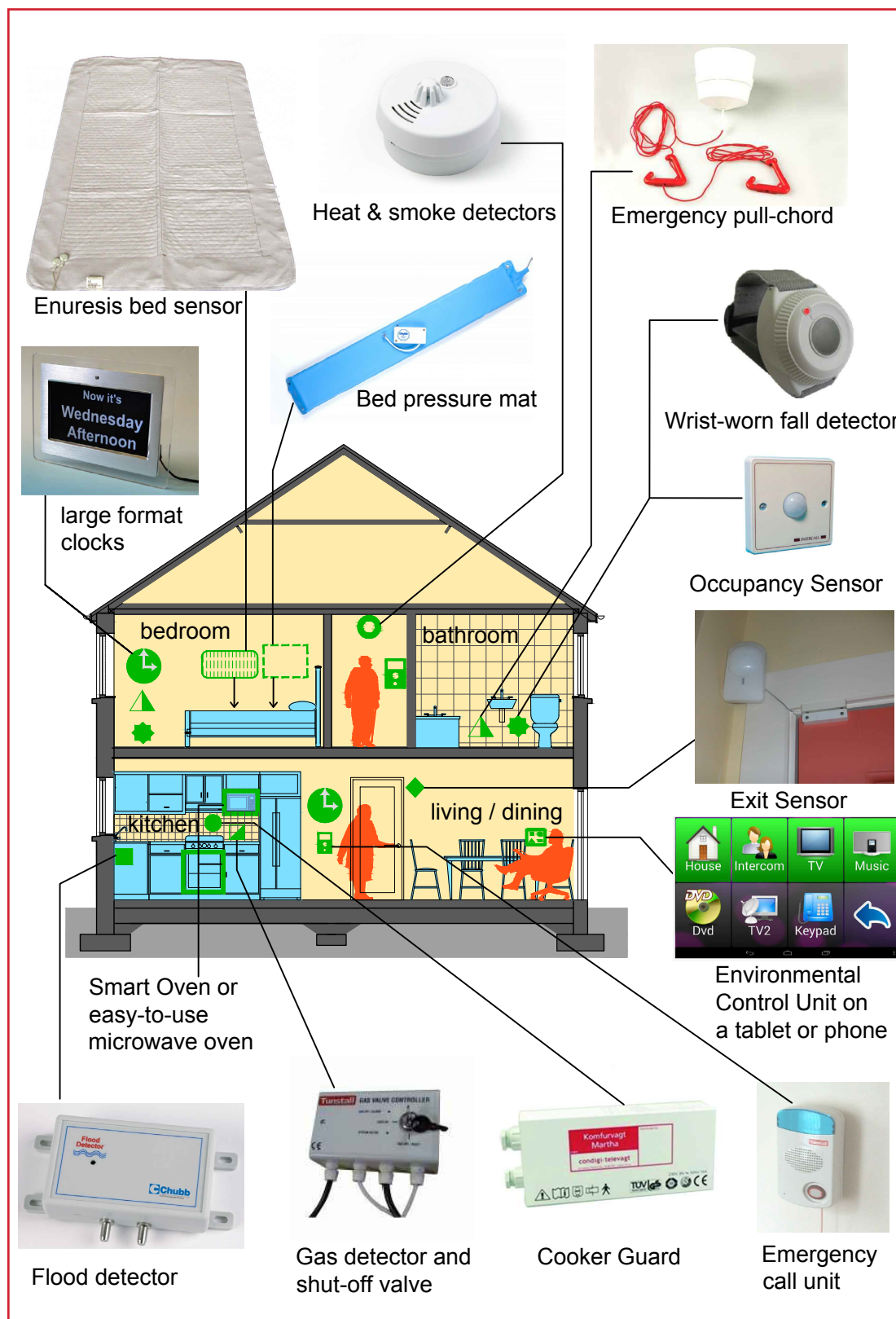

Patricia lives with her husband Seamus and they have recently refurbished their house. In the process they have had technology installed as part of an Ambient Assisted Living (AAL) service. They chose to do this as Patricia was diagnosed with Alzheimer's disease last year and has become increasingly confused. As part of this AAL they have digital day clocks to help with her orientation and exit monitors on the front and back door to alert the AAL centre if Patricia leaves the house between certain hours of the night, decided on by Patricia and Seamus.
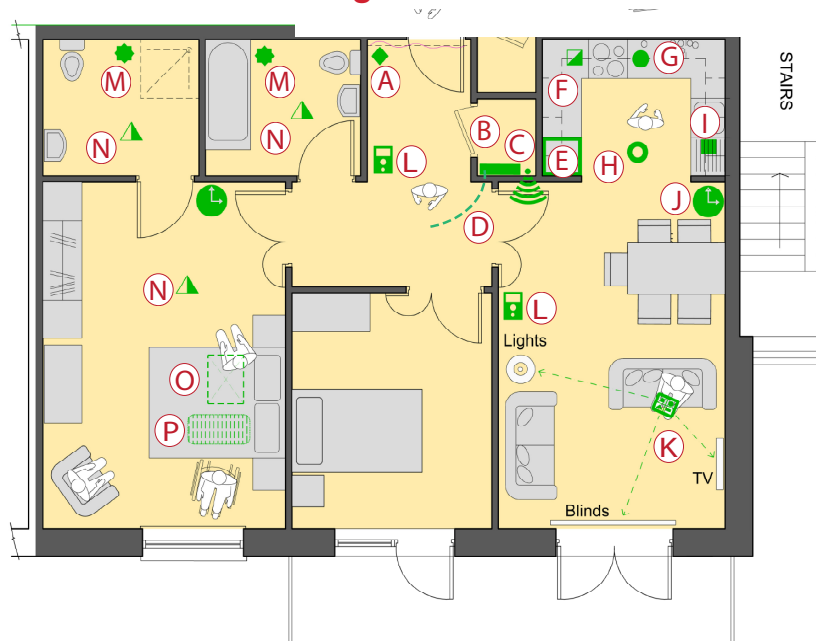
Technical Sketch:

Various Technologies combined to create an integrated approach

Enuresis bed sensor

Heat & smoke detectors

Emergency pull-chord

Bed pressure mat

large format clocks

Wrist-worn fall detector

Occupancy Sensor

bedroom

bathroom

Exit Sensor

kitchen

living / dining

Environmental Control Unit on a tablet or phone

Smart Oven or easy-to-use microwave oven

Flood detector

Gas detector and shut-off valve

Cooker Guard

Emergency call unit

Technical Sketch:

Apartment Floor Plan Showing a Selection of Assistive Technologies

A. Exit alert sensor connected to a control point or an exit risk messaging service.

B. Accessible, ventilated cupboard as a hub for assisted living technologies.

C. Ensure hub location, structure and materials facilitate WiFi technologies.

D. CAT 6 data communication and power cabling to key areas within the apartment.

E. Providing an easy-to-use microwave oven or 'smart oven'.

F. Cooker minder system with sensors to turn off cooker when smoke is detected. Also consider induction hob, but remember that a person with dementia may not be aware that the cooker is on since there will be no visible sign of heat so an induction hob may not always be appropriate.

G. Gas detector and shut-off valve.

H. Flood detector and shut-off valve.

I. Heat and smoke detectors.

J. Consider large format clocks and calendars.

K. Environmental Control Unit linked to TV, lights and blinds.

L. Emergency call unit with push button and pull cord.

M. Pull-cord emergency call unit linked to Telecare or similar smart system.

N. Infrared fall detection devices linked to Telecare system.

O. Movement sensors or bed pressure mats that turn lights on automatically at night if a person needs to use that bathroom or move about.

P. Enuresis sensor or similar sensor linked to Telecare or Telehealth system.

Please refer to Section 4.2 in the UDHI Guidelines for overall guidance.

UD Dementia Friendly Design Guidance

- As specified in the UDHI Section 4.4 of the UDHI Guidelines, provide an accessible, ventilated cupboard to act as a hub for the above devices. However, in line with safety issues described earlier, ensure that this cupboard can be disguised, or locked.

- To ensure maximum flexibility for the future use of technologies install CAT6 data communication and power cabling to key areas within the house for future use if required (See UDHI Section 4.4 for further guidance).

- Ensure hub location, structure and materials facilitate WiFi technologies

- Consider the installation of an exit risk messaging device or similar which can be programmed to alert a designated person if the front door is opened during certain predetermined times.

- In kitchens consider the following technologies:
  - Induction hobs only generate heat where the pot or pan sits while the rest of the hob's surface remains cool. These induction hobs can also be programmed for automatic shut-off after specified times or if an object accidentally falls on the hob.
  - Smart ovens and smart microwaves, some of which can be used and monitored remotely.
  - Sensor and timer-based cooker turn-off devices.
  - Gas detector and shut-off valves.
  - Flood detector and water shut-off valves.

- In bathrooms consider the following technologies:
  - Automatic taps or automatic flood detector and water shut-off valves.
  - Infrared fall detection devices linked to Telecare system.
  - Pull-cord emergency call unit linked to Telecare or similar smart system.

- In bedrooms consider the following technologies:
  - Infrared fall detection devices linked to Telecare system.
  - Pull-cord emergency call unit linked to Telecare or similar smart system.
  - Movement sensors or bed pressure mats that turn lights on automatically at night if a person needs to use that bathroom or move about.

- Consider large format clocks and calenders to help temporal orientation.

Consultation with the occupants, family members or carers may reveal certain behavioural patterns, needs or preferences of the person with dementia to inform the best AT, AAL, Telecare, or Telehealth option.

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Appendix A: Stakeholder Consultation Process

Appendix A
Stakeholder Engagement Process

These Guidelines are underpinned by in-depth research and supported by an extensive engagement process with key stakeholders. This stakeholder engagement process is outlined in the Research & Recommendations Report titled - **Research for Dementia and Home Design in Ireland looking at New Build and Retro-Fit Homes from a Universal Design Approach.**

To download this report please go to; www.universaldesign.ie/housing/

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Appendix B: Bibliography and Acknowledgements

Appendix B Bibliography & Acknowledgements

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Please note that an extensive bibliography of relevant literature is available in the Research & Recommendations Report as referred to above.
(see www.universaldesign.ie/housing/)

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Image of couple on page 105, image of lady on phone on page 148, and couple on page 152, courtesy of **Ambro at FreeDigitalPhotos.net**

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Appendix C:
Key Terminology

Lárionad Foirfeachta
i nDearadh Uiíoch
**Centre for Excellence
in Universal Design**

∩DA

National Disability Authority
Údarás Náisiúnta Míchumais

2015

Appendix C Key Terminology

Accessible
With respect to buildings, or parts of buildings, means that people, regardless of age, size, ability or disability, are able to both access and use the building and its facilities.

Acoustics
Characteristics relating to sound.

Activities of Daily Living (ADL)
Typical domestic activities such as washing, dressing etc.

Alzheimer's disease
Alzheimer's disease- named after the Bavarian doctor who first described it (Alois Alzheimer), in a 51 year old woman, this is an organic illness that affects the brain. There are 48,000 people in Ireland with dementia and most of these people have Alzheimer's disease. During the course of the disease, proteins build up in the brain to form structures called 'plaques' and 'tangles'. This leads to the loss of connections between nerve cells, and eventually to the death of nerve cells and loss of brain tissue. People with Alzheimer's also have a shortage of some important chemicals in their brain.

Ambient Assisted Living (AAL)
Ambient Assisted Living (AAL) centres on information and communication technology (ICT) enabling older people to live at home independently

Apraxia
Apraxia is an acquired disorder of motor planning, despite intact motor coordination. It is not caused by incoordination, sensory loss, or failure to comprehend simple commands but rather by damage to specific areas of the cerebrum in the brain.

Assistive Technologies
technological devices (equipment or systems) that are used to increase, maintain, or improve functional capabilities of individuals.

Bathroom
A room comprising a bath, WC, washbasin, and associated accessories.

Building
A permanent or temporary structure of any size that accommodates facilities to which people have access. A building accommodating sanitary facilities may include a toilet block in a public park or shower facilities at a campsite. A temporary building may include portable toilet facilities such as those provided at outdoor events.

Cardiovascular

Cardiovascular disease includes ischemic heart disease (heart attacks) and blood vessel disease such as strokes. A heart attack occurs when the blood flow to part of the heart gets blocked and similarly a stroke occurs when the blood vessel that feeds the brain gets blocked.

CAT6

A data communication cable standard for Gigabit Ethernet cable.

Cat and Kitten Door

This door set comprises of two door leafs; one leave is a standard width door (the cat - usually between 700-800mm), while the other leaf is narrower (the kitten-usually 300-400mm). Therefore, when opened at the same time a wider door opening is created .

Circulation

External or internal spaces to allow a person move from one place to another (i.e. External pathways or internal corridors)

Challenging behaviours

Sometimes known as "behavioural and psychological symptoms" of dementia. A person with dementia may exhibit one or more of these challenging behaviours during the course of the illness. Challenging behaviours include agitation, aggression, wandering, sleep disturbance, inappropriate eating, inappropriate sexual behaviour, delusions, hallucinations, paranoia, depression, anxiety and misidentification.

Clear width

The width between hardrails.

Cognitive impairment

A cognitive decline greater than that expected for a person's age and education level.

Decibels

Decibels (dBs) are the units used to measure sound intensity

Dementia

Global or umbrella term used to describe a group of diseases that have common symptoms but different causes. Symptoms include impaired memory, language, ability to communicate, mood and personality. By far the most common type of dementia is Alzheimer's disease.

Designated car parking

Car parking spaces reserved for the use of car users with disabilities, whether as motorists or passengers.

Door ironmongery
A collective term for components including hinges, handles, locks and self-closing devices, which are used to facilitate the correct functioning of a door. May also be termed 'architectural ironmongery' or 'door furniture'.

Dropped kerbs
A lowered section of kerb between a pavement and carriageway forming a level or flush crossing point. Also referred to as dished kerbs.

Dwelling
A private home (privately owned or rented) that can take the form of a detached, semi-detached, terraced house or an apartment

Enuresis Sensor
Detects moisture typically associated with bedwetting.

Handrail
Component of stairs, steps or ramps that provides guidance and support at hand level.

Instrumental Activities of Daily (IADL)
Typical daily activities which involve a higher level of organisation than ADLs. These include shopping, paying bills, etc

Leading edge
The opening edge of a door adjacent to the handle.

Matwell
Entrance Door Matting Systems set into a frame in the floor.

Mixed dementia
Mixed dementia is a combination of Alzheimer's disease and Vascular dementia. The diagnosis of mixed dementia is on the increase probably as a result of more refined technologies now used in the detection of dementia sub-types

M²
Metres Squared.

Nosing
An edge part of the step tread at the top of the riser beneath in a flight of stairs

Parietal Lobes
The brain comprises many different lobes (frontal, temporal, occipital and parietal) each with particular functions. The parietal lobes are found in the cortex of the brain and are where information such as taste, temperature and touch are integrated or processed. The parietal lobes enable us negotiate our way in the three dimensional world in which we live. Humans would not be able to to feel sensations of touch, if the parietal lobe was damaged.

Parkinson's disease

Parkinson's disease is a degenerative disorder of the central nervous system mainly affecting the motor system. The motor symptoms of Parkinson's disease result from the death of dopamine generating cells. Early in the course of the disease, the most obvious symptoms are movement related; these include shaking rigidity slowness of movement and difficulty with walking and gait. Later, thinking and behavioural problems may arise. Dementia is very common in the more advanced and severe stages of the disease. Parkinson's disease is more common in older people.

Passenger lift

A conventional motorised lift enclosed within a structural shaft and rising one or more storeys within a building. Lift and door movement is automatic.

Path

A pedestrian route that has no adjacent vehicle carriageway and includes paths in countryside locations as well as paths in urban and residential environments.

Pavement

A pavement is the part of a roadway used by pedestrians and is adjacent to the vehicle carriageway.

PIR

A Passive Infrared (PIR) sensor-activated light fitting.

Positive risk-taking

Positive Risk taking –refers to balancing the positive benefits gained from taking risks against the negative effects of attempting to avoid risk altogether. In dementia care, positive risk taking involves enabling the individual with dementia have some autonomy independence, dignity and choice whilst unobtrusively protecting that person from potentially hazardous situations.

Psycho-Social

Psycho-social environment refers to the culture, climate and ethos of the setting in which we live or where we work. The build environment in contrast refers to the actual architectural lay out of the setting. Examples of the psychosocial environment of a nursing home might include the ethos of care, respect for residents, quality of life, quality of care, and acknowledgement of employees' psychological well-being.

Ramp

An inclined plane 1:20 or steeper from the horizontal and intermediate landings that facilitate access from one level to another..

Retro-fit

Carrying out building works to an existing building.

Riser
The vertical portion between each tread on the stair.

Setting-down point
A designated area close to a building entrance or other facility where passengers can alight from a car or taxi.

Shower room
A room comprising a shower, WC, washbasin, and associated accessories, such as en-suite facilities in residential accommodation.

Soffit
The underside of any construction element, the underside of a flight of stairs.

Stairlift
A device mounted on a support rail that follows the incline of a stair and incorporates either a seat with footrest (chairlift) or standing platform and perch (perching stairlift). Stairlifts are designed for domestic use only. Also termed chair stairlift and domestic stairlift.

Step nosing
The leading edge of a step or landing.

Street furniture
Items located in street and other pedestrian environments such as lamp posts, litter bins, signs, benches, and post boxes.

Tactile paving surface
A profiled paving or textured surface that provides guidance or warning to pedestrians with visual difficulties.

Telehealth
A system that uses the electronic exchange of personal health data from a person at home to medical staff at a hospital or similar site to assist in diagnosis and ongoing monitoring of the person's health condition.

Telecare
The use of various ICT to provide support and social care from a distance, supported by telecommunications, such as phone or video equipment.

Through-floor lift
A simple one-person lifting car, suitable for someone standing or in a wheelchair, which can be easily installed in most homes. Travel distance is limited to between two floors only. It is usually self-supporting, motored by a free-standing vertical track, , and open above the car. The floor space on the upper level is closed by an infill lid attached to the lift car.

Transom
A horizontal crosspiece in a window frame usually dividing the window into a top and bottom section.

Tread
The part of the stairway that is stepped on.

Urban Form
The layout, shape, height and design details of the built environment, including streets, roads, public space, buildings etc. in an urban area.

U-Value
U-value refers to thermal transmittance and it is a measures the rate of heat that passes through a component or structure. It is expressed in units of Watts per square metre per degree of air temperature difference (W/m2K)

Vascular Dementia
Vascular dementia is caused by reduced blood supply to the brain due to diseased blood vessels and results in symptoms that can include memory loss and difficulties with thinking, problem-solving or language

Ventilation Strips
vents integrated into a window frame that are in the shape of a bar or strip, and that can be controlled by opening or closing the aperture within the vent to different extents.

Vision panel
A fixed, glazed panel set into a door that enables people to see through from one side of the door to the other. May also be termed 'viewing panel.'

Visual contrast
Colour and/or tonal contrast between surfaces and fixtures, designed to improve visual clarity.

Wainscoting
Panelling (usually timber) fixed to the lower part of an internal wall and usually carried up to approximately 1000mm above finished floor level

Wayfinding
A collective term describing features in a building or environment that facilitate orientation and navigation.

Wet room
A shower room in which the floor and walls are all waterproof. The shower area can be accessed without crossing a threshold or stepping into a shower tray.

Appendix D:
Key Acronyms

National Disability Authority
Údarás Náisiúnta Míchumais

2015

Appendix D Key Acronyms

AAL - Ambient Assisted Living

ADL - Activities of Daily Living

AT - Assistive Technology

BMS - Building Management System

CEUD - Centre for Excellence in Universal Design

CPTED - Crime Prevention through Environmental Design

ECU - Environmental Control Units

F,F&F - Furniture, Fixtures and Fittings

IADL - Instrumental Activities of Daily Living

ICT - Information and Communications Technologies

MHRV - Mechanical Heat Recovery Ventilation

NDA - National Disability Authority

UD - Universal Design

UDHI - Universal Design Homes for Ireland

UFH - Under Floor Heating

Notes