

Mirvac Fini: Burswood Lakes

High-Density Dwelling Design for Older People



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Working Paper 10: *High-Density Dwelling Design for Older People*

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Burswood Lakes

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1.0 Introduction

As with the guidelines in *Working Paper 8: Public Open Space and the Needs of Older People in the Residential Environment*, these guidelines address the needs of older people living in the Burswood Lakes development. In this *Working Paper*, the emphasis is on the built environment, the interior of the residential buildings and the private dwellings within them. While it is acknowledged that the Burswood Lakes development is not being planned for older people in particular, a strong market segment will be members of the 55 and older age group.

1.1 Organisation of this report, authorship and acknowledgments

The research which is summarized in this *Working Paper* represents the contributions of many practitioners and analysts over a period of nearly twenty years. While none of the material provided here has been published in any other form, earlier versions of some of this material was provided for government agencies including the New South Wales Department of Housing and the Australian Department of Administrative Services in Canberra. These guidelines also benefit from extensive field research in retirement housing and medium density housing sites in Victoria, NSW, Queensland, Canberra, South Australia and overseas. Earlier versions of some of the site plan guidelines were first articulated in *Housing as if People Mattered* (1986), co-authored with Clare Cooper Marcus.

For their field work, illustrations, demographic analyses, survey research and crafting of planning and design guidelines, the authors acknowledge with deep gratitude the contributions of the following colleagues: Don Perlut, Pam Esdaile, Sevan Sivaciyan, Professor Ann Forsyth, Kevin Taylor, Kelvin Walsh, Terry Doherty, Kristin Stewart, Ann Cross, John Murray, Andrea Cook and Karl Langheinrich. We are particularly grateful to Andrea Cook for her excellent illustrations.

We also acknowledge many overseas colleagues whose path-breaking work in the design of housing for older people has greatly contributed to our understanding of this housing form. We thank particularly John Zeisel, Galen Cranz, Frances Carp, Victor Regnier, Diane Carstens, Clare Cooper Marcus, Jon Pynoos, M. Powell Lawnton and Gary Robinette.

1.2 The demand for housing for older people

It is the intention of Mirvac-Fini that the Burswood Lakes development contain a wide range of households and there has never been any suggestion that it should become a *de facto* retirement estate. Why, then, do we feel that it is necessary to focus on the

needs of older people in the residential environment? The reason is simple: Australia is becoming an ageing society and the characteristics which are now identified by demographers and analysts at all levels will be reflected in the sociodemographic characteristics of Burswood Lakes residents. The demographic statistics are a challenge to everyone working in the housing sector. For example, at the beginning of the past century, only 6 percent of the population were over the age of 60 years. By 1994 that cohort had increased to 16 percent of the population, and by 2030 it is estimated that 25 percent of the population will be aged 60 and older. Further, life expectancy, currently 74.5 years for men and 80.4 years for women, is expected to continue in the present century. The implications are that many people will spend as much as one third of their lives in retirement. The older members of this group will be predominately women with a higher proportion of the old-old people being women. Housing is a particularly important issue for older people, as its availability and quality have a direct impact on their quality of life (<http://www.apsl.com.au/ageism/htm>, accessed 4/4/03).

Australia's population is rapidly ageing, as is the population of Metropolitan Perth. As noted in Perth's State Training Strategy, "Perth at a Glance" (2000):

The population of the Perth region is forecast to increase from 1,410,011 people in 2001 to 2,077,969 people in 2031. However over the same period the region's share of the State's population is expected to decrease from 73.12% to 71.47%. Strong population growth will occur across all age groups in the Perth region over the next 30 years. The most significant growth will occur in the 65 plus age category, with the proportion of people in this age group increasing by an expected 34% between 2001-2031.¹

At the time of the 2001, there were 150,685 people aged 65 years and over in Perth, comprising 64,741 males and 86,944 females. The total population was 1,339,993: 656,798 male and 683,195 female. Currently, 52 percent or 257,164 of the Perth population is in the age range between 45-74 years.

The growing market for older persons' housing emphasises the need for the provision of affordable and appropriately designed housing to accommodate this market segment. Many older people choose to relocate to smaller, more manageable homes as they each retirement age. And, as recent research in Queensland and elsewhere has shown, a high proportion of so-called 'retired' people continue to work well beyond what used to be considered retirement age.

1.3 Satisfaction with multi-unit housing

Research in New South Wales has indicated that a very high proportion of older people surveyed (91 percent) were very satisfied or satisfied with living in multi-unit housing. The benefits they saw included:

¹ Source: <http://www.training.wa.gov.au/sub-sites/stswb/regions/perth/ataglance.htm>; accessed: March 31, 2003

- ◆ Lower maintenance;
- ◆ Lower running costs such as electricity and gas;
- ◆ Generally lower purchase costs than detached housing;
- ◆ Convenience; and
- ◆ Security (NSW Department of Urban Affairs and Planning, 1998: 1).

As the following data demonstrate, the ageing of the Australian population (see Figure 1) will have significant impacts on housing demand and the future of the housing industry.

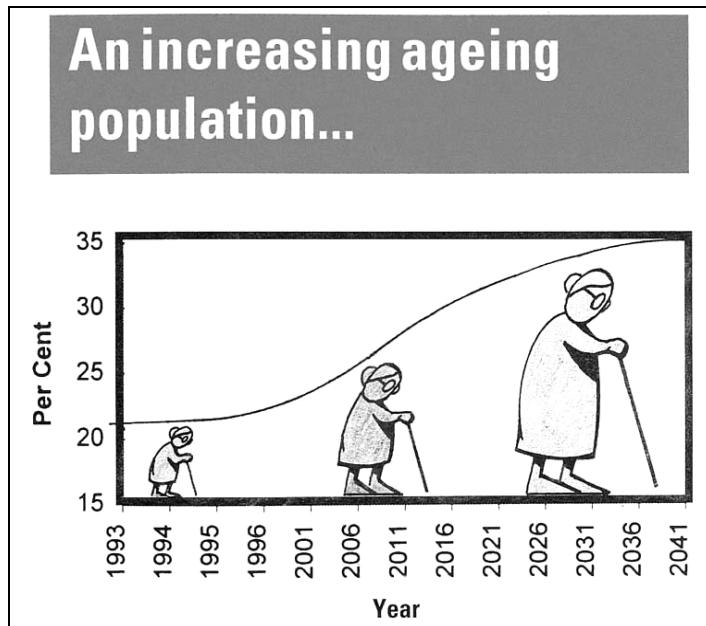


Figure 1: Ageing of the Australian Population

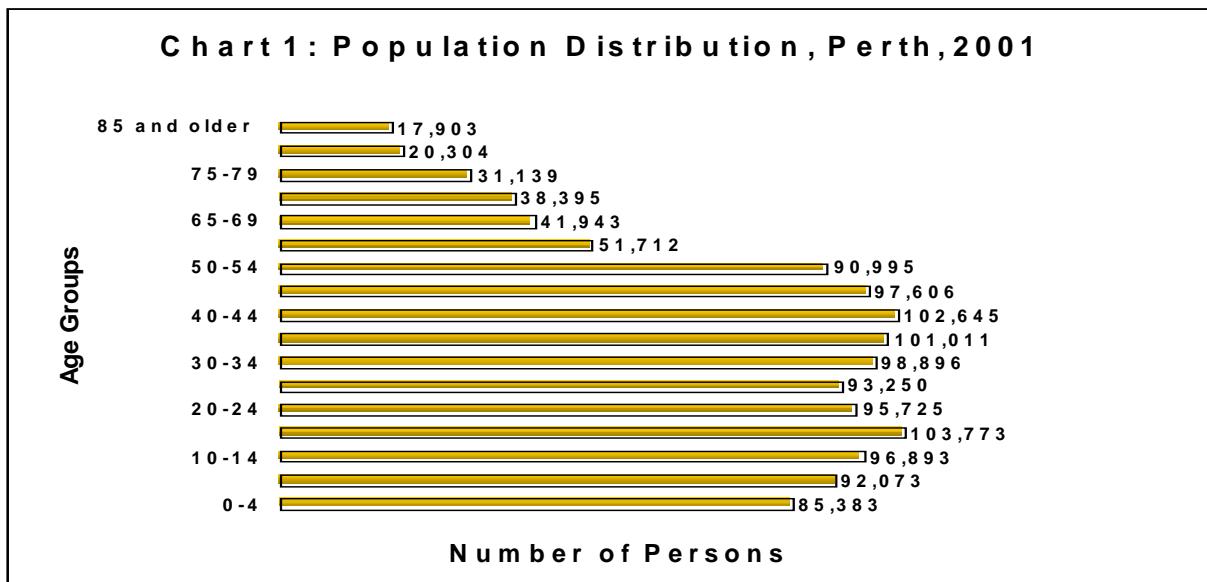
1.4 Population of Perth by age

The importance of independent, safe and secure housing and security of tenure in older age is emphasised by older people in community consultations. The data in the 2001 Census for Perth counter the myth that many older people live or will live in retirement villages, hostels, nursing homes or similar institutions. Within the next ten years, the current growth rate of residential stock in Perth is expected to become inadequate for the growing segment of the over 55-population. This frames the potential importance and marketability of the Burswood Lakes development to this growing age cohort.

Based on current ABS statistics, it is expected that over the next decade, the old-age dependency ratio², will increase in Perth. After 2011, the old-age dependency ratio is forecast to rise rapidly. By the year 2026, old-age dependency is expected to exceed young-age dependency as a consequence of the proportion of young persons in the population stabilising, while the proportion of older people is forecast to continue growing.

² The proportion of persons aged 65 and older per 100 persons of working age.

As revealed in **Chart 1**, the majority of the Perth population ranges between 15 and 55, the primary working ages. The dramatic increase in the older population expected during the next decade, raises questions as to the types of retirement living required. Further, the whole concept of 'retirement' is coming under challenge and can be regarded as a much more 'hybrid' experience than was the case in earlier decades (see Grey Army, Sydney³ and U3A [University of Third Age], Australia).⁴



Source: ABS, Perth, 2001

In all, 17.2 percent of the current population are older than 60. Within the next decade, however, a new generation of older people within the Perth community will embark on retirement or semi-retirement. These residents, aged between 40 and 55 (25 percent of the population), will place heavy demands on retirement-style living. Therefore, an increase in the order of 70 percent (163,189 to 291,246) from the current generation of older people shall emerge.

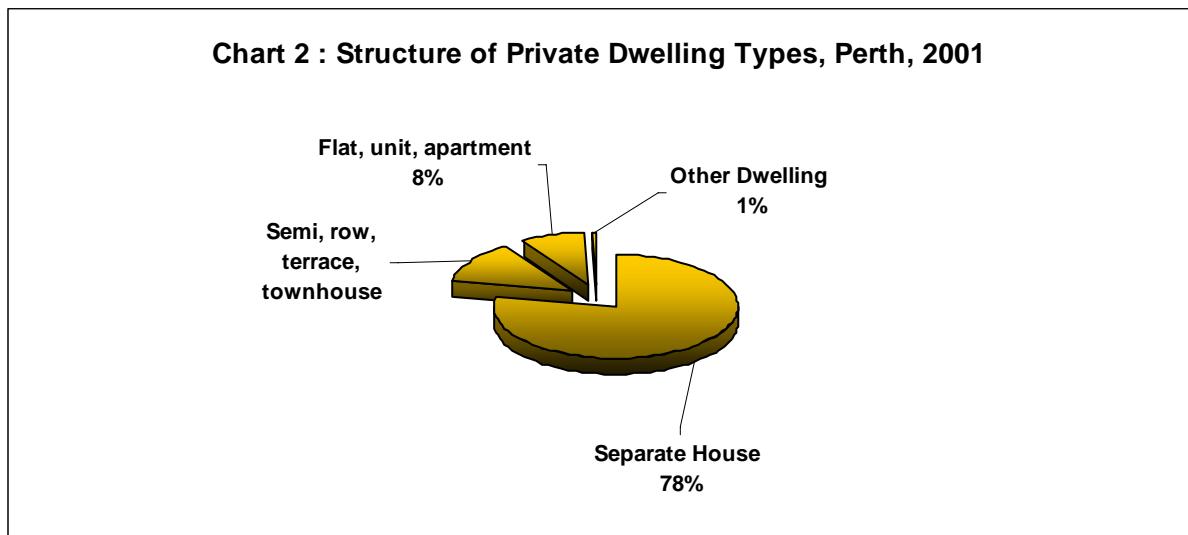
1.5 Typical dwelling structure within Perth

Analysis of the 2001 Census data, specifically dwelling structure and population distribution of Perth, reveals that (with design addressing the needs of older people), Burswood Lakes will be exposed to a greater potential market than Perth has previously experienced. As shown in **Chart 2**, dwelling types in Perth are dominated by separate housing, which accounts for 60 percent of total dwellings. Older people have different priorities from those of younger people. For example, issues related to dwelling maintenance and security will be incorporated into the property-selection criteria of

³ Source: <http://www.elderweb.com/default.php?PageID=1910>; accessed: 4/04/03.

⁴ Source: <http://www.u3aonline.org.au/>; accessed: 4/04/03.

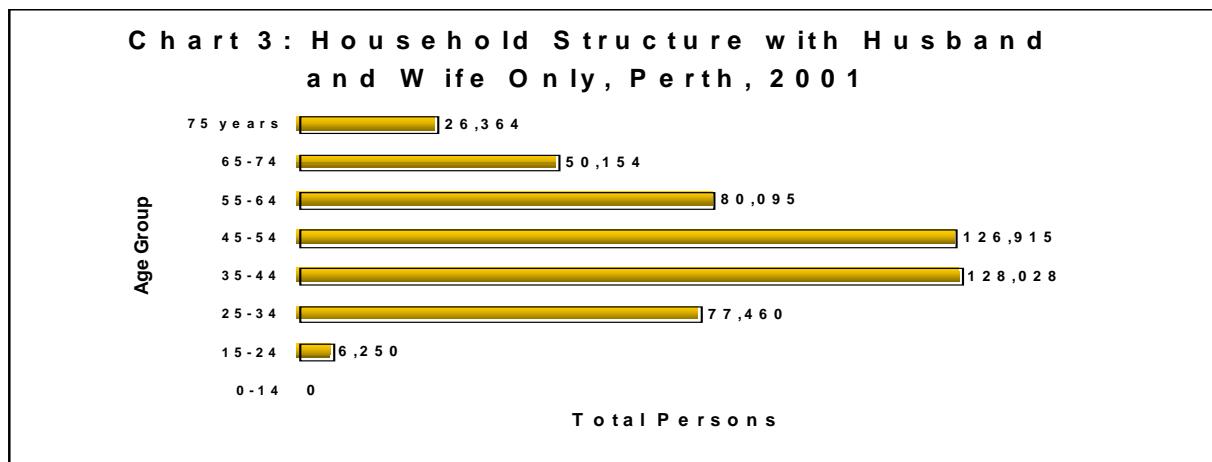
older people. These two issues are a reminder that high-density living addressing the requirements of older people is of marked importance and marketability.



Source: ABS, Perth, 2001

1.6 Household structure by age

Chart 3 displays the age groups in dwellings with a couple with no others. This includes no dependent children or family, meaning that the household is solely husband and wife: a market niche for Burswood Lakes.



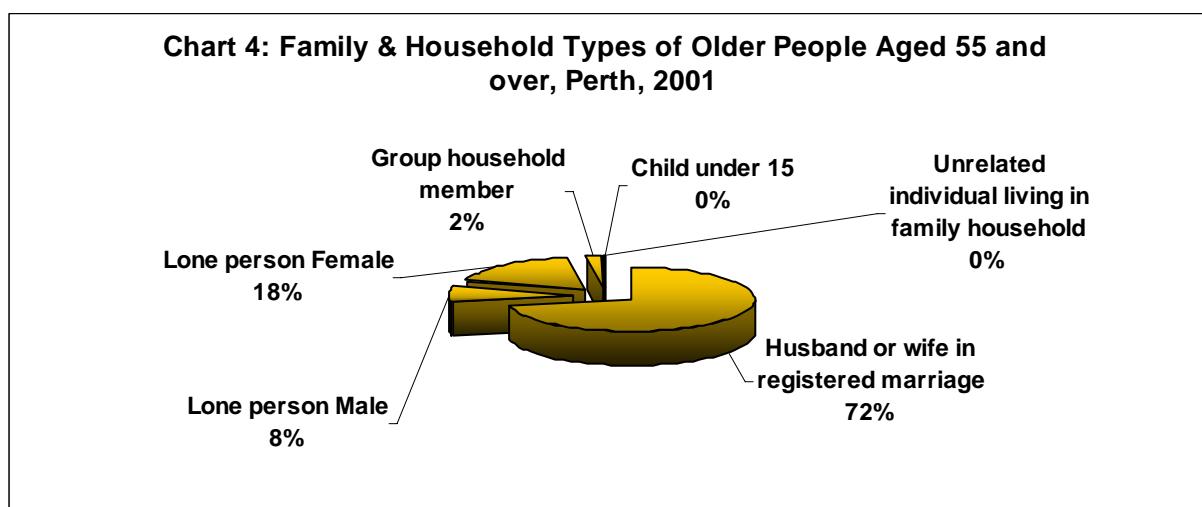
Source: ABS, Perth, 2001

1.7 Family and household types of older people

A very large majority of older people in Perth live in private residential dwellings and prefer to remain so. This trend is pervasive throughout Australia and is expected to continue. This is often referred to in social planning literature as 'ageing in place'.

We now examine the types and sizes of households of older people in Perth. As Chart 4 shows, a majority (72 percent) of people in Perth aged 55 and older live at home as a couple – without children. Older women living alone comprise the next largest group (18 percent), compared to older men living alone (8 percent). This finding has significant implications for dwelling design and the overall safety of the Burswood Lakes site (see *Working Paper 5*.

A recent report by APSLQ (Australian Pensioners and Superannuants' League [Qld.] Inc.)⁵ reported that older people prefer to stay in familiar neighbourhoods (within a 5km radius), in small-scale purpose-built or adapted housing with support services, close to facilities, transport and public amenity. Living in non-private dwellings (as the Census refers to them) and institutions may not be considered the primary or preferred option of older people in Australia.



Source: ABS, Perth, 2001

1.8 Tenure type

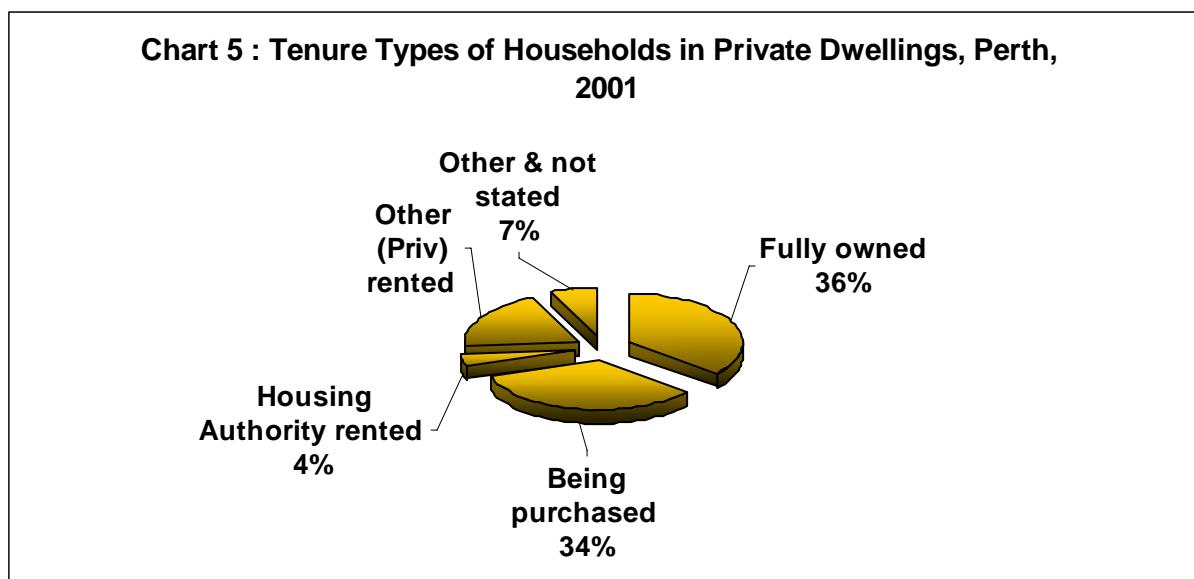
The majority of older people in Australia live in private dwellings. We now examine the different types of housing of older people in Brisbane in more detail using the 1996 Census, as comparative data for Perth are not available. These data are offered to highlight trends in Australia. For Brisbane, people aged 60 years and over:

- ◆ 74% live in separate housing;
- ◆ 14% live in semi-detached housing;
- ◆ 3% live in cared accommodation;
- ◆ 3% require nursing home accommodation; and
- ◆ 2% choose self-care retirement accommodation.

⁵ Source: <http://www.apsl.com.au/comet1.html>; accessed: 4/04/03.

Therefore, relating the Brisbane statistics to the situation in Perth the majority of the older population prefer to 'live at home'. The trend in this data is supported by a wide body of research.

While ownership with regard to age was not provided separately in the 2001 Census for Perth, analysis of tenure types in Perth, together with tenure types by age in Brisbane for 1996, provide an indication of the tenure security preferred among older people. **Chart 5** displays tenure types for Perth in 2001. Fully owned dwellings (36 percent) were the most popular option for the population of Perth, followed closely by dwellings in the process of being purchased (34 percent).



Source: ABS, Perth, 2001

Older people's levels of dwelling ownership, however, are not evident from Perth census data. The 1996 Census data for Brisbane demonstrate a trend that can be expected to be similarly evident in Perth:

- ◆ 82 percent of people aged 75 years and older were outright owners of their dwellings;
- ◆ 80 percent of people aged 65-74 were outright owners;
- ◆ 75 percent of people aged 60-64 were outright owners, and
- ◆ 68 percent of people aged 55-59 were owners.

Thus, we see that, particularly among people in the 'old-old' cohort, home ownership remains strong. Home ownership is also simply inaccessible to a proportion of the population born too late to benefit from low property prices.

If data for Brisbane parallel Perth's population trends, we can predict a high percentage of older people currently purchasing or owning their dwelling. Moreover, if buying and ownership of property in Brisbane, demonstrated as strong in 1996, parallels the

current buying or ownership patterns for older people in Perth, increase in older population over the next decade will ensure that housing is at a premium.

The following conclusions to be drawn from this brief analysis of Census data are:

- ◆ The most significant population growth in Perth is expected to occur in the 65+ age category, with the proportion of people in this age group increasing by an expected 34 percent over the next thirty odd years;
- ◆ By 2026, the old-age dependency ratio is expected to exceed young-age dependency as a consequence of the number of young people in the population stabilizing. The population of older people is expected to continue growing;
- ◆ There is a marked trend for older people to 'age in place' rather than choosing 'institutional' alternatives;
- ◆ The concept of 'retirement' is changing rapidly;
- ◆ The main determining factors in housing choice for older people are dwelling maintenance and safety, placing high-rise, high-density residential housing at a premium; and
- ◆ Older people value multi-unit housing because of: lower maintenance, lower running costs, convenience and security;
- ◆ Within the next decade the population of older people in Perth will increase in the order of 70 percent, which will have a dramatic impact on housing demand.

1.9 The importance of 'home'

For all people, housing is an important part of life. It is not merely 'shelter' or a commodity that is traded and earns a profit. It is a process, a 'verb', with deep symbolic meaning. So fundamental is housing for all people that the loss of housing or a move that is not prepared for can be a traumatic experience akin to grief over the loss of a loved one. Moreover, the importance of dwelling increases as we grow older. It is the place to display the memorabilia of a lifetime, to maintain their personal lifestyle, and cater for entertaining, hobbies, and family visits, and other requirements developed over many years. Given the physiological and psychological characteristics of ageing, it is clear that to be successful the dwellings of the Burswood Lakes development must look and feel like 'home'. They must communicate 'home-like' qualities. For many, this dwelling may represent the final 'home' in a chain of, perhaps, several homes in different locations.

Housing is simultaneously a basic human need; a commodity from which profits are made; and a powerful symbol, both of the Self and of the social structure of any society. For many people, home is the centre of the world. A great deal of emotional and physical resources, as well as financial ones, is invested in it. A home is a place where personal and social meanings are grounded, where private and public realms intersect. Home is a metaphor for belonging, just as leaving home is an expression of freedom, independence. Given these many and complex relationships between 'housing' and 'home', between the physical structure and its material and symbolic meaning, it is not surprising that the

provision, location, and design of housing are one of the most controversial arenas of planning and design. And nowhere are these issues more pronounced than in housing for older people (See Cooper Marcus, 1995).

1.10 The importance of the home interior

The home interior is the setting for the domestic and personal dimensions of a person's life. If it is to become a mirror of the self (see Cooper Marcus, 1995), it needs to be compatible in form, appearance and function with that person's lifestyle needs. It needs to be of 'permeable' materials, so that it can be modified, personalised and added to with individuality to make it home.

The importance of adequate space, a functional floor plan and careful design detailing cannot be overemphasised. Older people use their houses intensively. Older people working at home also spend a great deal of time in the dwelling. Some may spend prolonged periods indoors during the day. Some may be totally housebound or bedridden unexpectedly, often for long periods following illness or injury. They are acutely aware of which rooms receive sun for which periods, of problems with draughts and heating, scarcity of storage space and so forth.

1.11 Concerns with high-density housing in Australia

A professional review of high-density housing in Pyrmont Ultimo, Sydney, conducted by two of these authors for the NSW Department of Urban Affairs and Planning in 1997, revealed a number of significant social planning and design concerns with the dwelling units and the design of the buildings themselves. These issues are often highlighted in the research literature on high-density housing for older people. The concerns included:

- ◆ **Streetscape:** Blocks of high-density housing often lack a clear relationship to the street and may detract from the streetscape;
- ◆ **Dwelling entry:** Individual units lack well-defined entrances that clearly demarcate shared and private space;
- ◆ **Entry foyer:** A transition space or buffer zone from the public to the private realm is often inadequate or non-existent;
- ◆ **Frontstage/backstage:** There is often poor separation between space and activities that are shared and visible and those that are private and personal, e.g., a toilet visible or very audible from the living area, or audible from an adjacent dwelling;
- ◆ **Storage space:** This is often inadequate or non-existent especially in the kitchen or bathroom (for example, for winter clothing, bedding and heaters in summer; fans in winter; toys, bikes and prams; camping gear; cleaning and plant-care equipment);
- ◆ **Circulation within dwellings:** Frequently, the designed usage of spaces and throughways may become altered or unworkable once people and their belongings move in;

- ◆ **Lack of space:** Lack of adequate private open space (even a balcony);
- ◆ **Shower and toilet:** These facilities should be much more effectively screened to allow simultaneous use of the bathroom;
- ◆ **Furnishability:** Odd rooms, diagonal walls, oddly-shaped windows, and insufficient corners minimise options for furniture placement and window fittings;
- ◆ **Door and window hardware:** These were not always of appropriate quality to effectively discourage break-in;
- ◆ **Children's needs:** Playing areas that are safe both for the children and from the children were often not provided;
- ◆ **Adult recreation areas:** Often these areas were inappropriately located or furnished and did not appear to relate to residents' needs;
- ◆ **Cross ventilation:** This was not possible in almost every case;
- ◆ **Provision for home offices:** This requirement was poorly thought out, with little attention to storage and electronic communication refurbishments;
- ◆ **Kitchens:** These often had inaccessible features, awkward storage, poor daylighting and no outward view; and
- ◆ **Site characteristics:** These were often not considered so that views were not utilised, the natural light and warmth of solar access were lost or uncontrolled; prevailing breezes were ignored (see Figure 2).

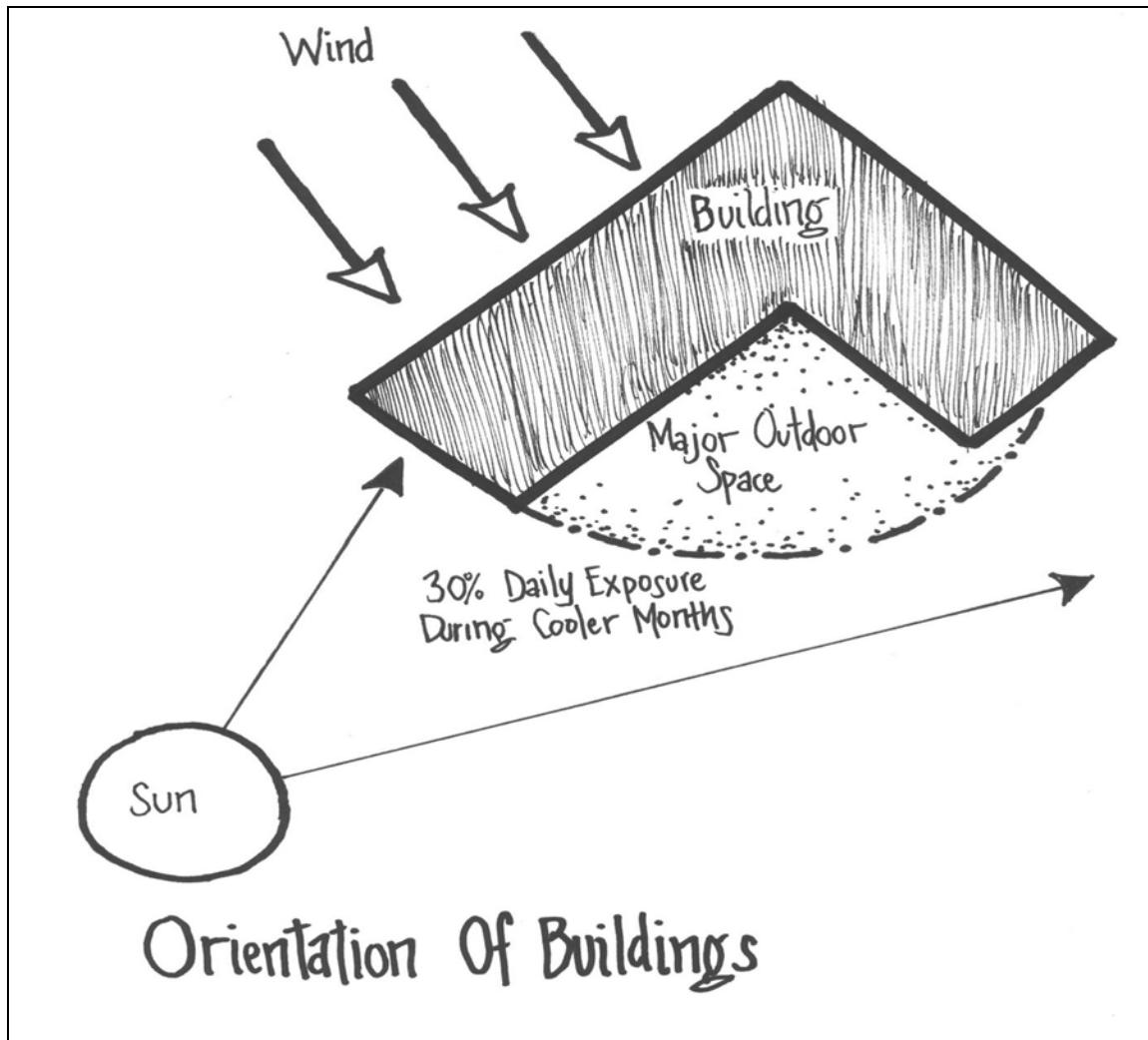


Figure 2: Orientation of buildings

1.12 The importance of an accessible residential environment

Although discussions about the limitations faced by people with a disability generally centre upon access to public services or government buildings, many people with a disability experience difficulties in gaining access to dwellings. Even the few people with a disability with the resources to secure an accessible dwelling live in relative isolation because their neighbour's homes are not accessible (see **Figure 3**). Bathrooms lack adaptive features, narrow halls and steps require that they be lifted out of wheelchairs to access certain areas. This compromise of their dignity associated with fear of social embarrassment, is a major obstruction to social equity. Negative occurrences at social gatherings are a shared experience for many people with a physical disability and reinforce their isolation.

Designing a home or product to be marketed to a broader audience that includes the able-bodied and people with a disability is not simply about social equity; it also makes good business sense. Unfortunately, few developers are incorporating universal design features in the interior residential built environment (see *Universal Design in Working Paper 9*). Most dwellings that have these features have been retrofitted by a small number of architects, designers and contractors who specialize in adaptive modifications. Nevertheless, providing accessible dwellings that eliminate the need for retrofitting or adaptations as residents age or experience special needs (pregnancy, elderly parents, incapacitation, etc.), will become increasingly sought after. Moreover, as the CFILC in "Residential Housing: Visitability and Universal Design Solutions" points out, "market studies have shown that universal design features are attractive to able-bodied home buyers as well as those with special needs."⁶

⁶ Source: http://www.cfilc.org/projects/cfilc_position_papers/visitability.html; accessed: March 31, 2003.



Figure 3: Dwellings with limited 'visitability' on the upper floor

In recognition of the importance of accessibility, and its potential to raise the utility and market value of homes, many governments have adopted housing universal design reforms. The United Kingdom adopted a new building regulation that took effect in October 1999 fostering 'visitability' for every home. Visitability requirements include:

- ◆ A zero-step entrance;
- ◆ At least a half-bath on the main floor;
- ◆ Wide halls and doorways; and
- ◆ Accessible switches and outlets.

Although in the United States, visitability proposals at the national level have been met with strong opposition from the National Association of Home Builders, universal design requirements have been imposed at the local and state level. Similar developments can be expected in Australia. This focus on the home environment is unique, as regulations in Australia focus only on public buildings. (Please see *Working Paper 9*.)

2.0 Some general principles for the design of housing for older people

The generic principles outlined in *Working Paper 9* also apply to dwelling design. These Universal Design principles are as applicable and important for the planning and design for housing for older people as for housing for people with a disability or special requirements. Below are some general principles for designing accessible, high-density dwelling interiors for older people.

2.1 General principles

Environments that support the needs of older people can make a significant difference to their health, empowerment and independence. To design appropriately for older people, consider the following:

- ◆ **Vision:** Age is often accompanied by a loss of visual acuity, narrowing of the visual field, slowed accommodation to temporal or spatial changes in illumination, sensitivity to glare, and diminished colour differentiation. Increased lighting levels (with caution to avoid glare) can solve many 'poor vision' problems; this is crucial in stairways, bathrooms, kitchens and reading areas. Well designed lighting can also contribute to the overall pleasantness of the environment. Where signs are used, they should have large lettering in strong contrast to the background. Colour can enliven an area and give a sense of orientation by enhancing the contrast between surfaces or when different areas or functions are colour-coded;
- ◆ **Thermal comfort:** Older people are more likely to complain of being too cold than too warm, typically requiring temperatures five degrees higher than younger people. Protection from extremes of both heat and cold is important. Humidity should be controlled to avoid respiratory illness, dehydration, and static electricity problems;
- ◆ **Manoeuvring:** Non-skid surfaces, an absence of sharp corners, sturdy graspable objects, clear pathways, resting places on long halls or stairways, and accommodation for wheelchairs, canes, and 'walkers' can minimise injuries and frustration;
- ◆ **Orientation:** Mental confusion can be reduced if one is frequently given cues by one's surroundings as to whom and where one is. Views to the outdoor provide reminders of locale, season, weather and time of day. Each room or area can have its own colours, lighting, and textures, increasing its identifiability;
- ◆ **Dignity:** The residential environment should be designed and planned to allow a person both privacy and interaction at will and to carry out useful and meaningful activities. It should enable older people to continue to function independently for as long as possible; and

- ◆ **Nature:** Contemplation of Nature takes on heightened meaning for older people. Accessible gardens, operable windows, planter boxes, houseplants, and the presence of wildlife and animals can provide direct and valuable experiences. Nature-related artwork, natural colour schemes, and the presence of natural materials such as wood, stone and water can enhance satisfaction for older people (Venolia, 1988: 165).

2.2 *Frontstage and backstage*

Social design literature often divides dwellings into two zones: *frontstage* and *backstage*. Residents often tend to separate these two zones in their perceptions and use. There are spaces for more formal behaviour (*frontstage*), such as entertaining and displaying special furniture, artwork, object or trophies and places for informal activity (*backstage*), such as the everyday activities of non-formal eating, cooking, cleaning, laundry, location of rubbish bin, toilet and bathroom. These distinctions are shown in Figure 4.

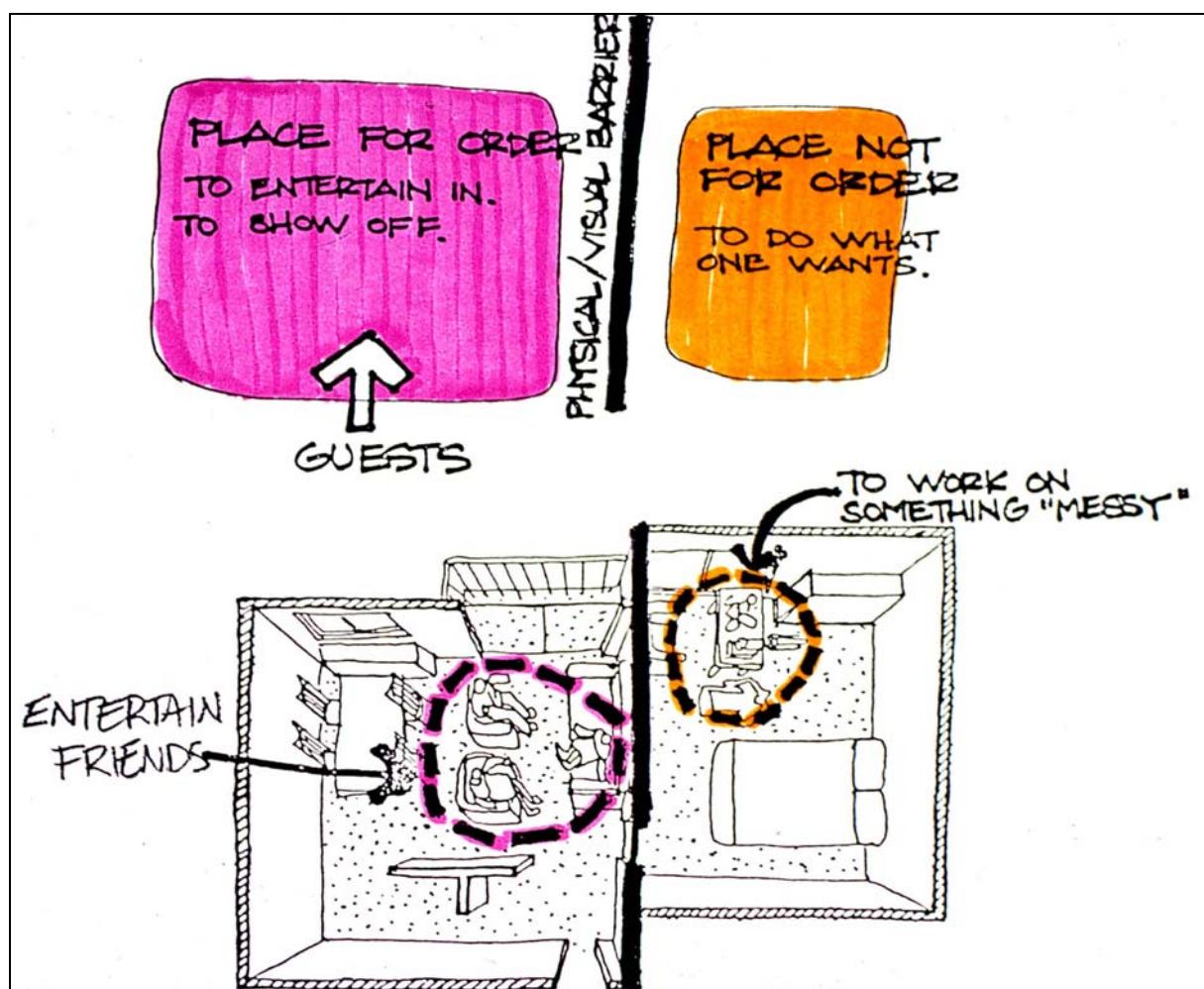


Figure 4: Frontstage and backstage of a dwelling

2.3 Obligatory and discretionary activities

Domestic activities can also be divided into 'obligatory' and 'discretionary' activities. 'Obligatory' activities relate to the nature and purpose of the home environment and are associated with a 'need'. 'Discretionary' activities, on the other hand, are activities that may be performed within the home environment and are associated with a 'want'.

Obligatory activities to plan for in a dwelling are:

- ◆ Food preparation;
- ◆ Sleeping;
- ◆ Eating;
- ◆ Housekeeping;
- ◆ Grooming;
- ◆ Laundry;
- ◆ Bathing;
- ◆ Dressing/undressing;
- ◆ Taking rubbish out; and
- ◆ Using the toilet.

Discretionary activities are:

- ◆ Watching television;
- ◆ Resting and relaxing;
- ◆ Listening to music;
- ◆ Looking outside;
- ◆ Talking;
- ◆ Entertaining;
- ◆ Performing hobbies;
- ◆ Working from home; (see *Working Paper 13*);
- ◆ Communicating via telephone or Internet;
- ◆ Using the computer;
- ◆ Playing games;
- ◆ Reading or writing; and
- ◆ Sewing or ironing.

2.4 Privacy

Privacy is described as a state relating to interaction with others: if I have my desired level of interaction, I have privacy. Privacy has many aspects: being seen or heard by others and seeing and hearing others when one would prefer not to, are aspects related to *dwelling* privacy. Privacy is a major concern of older people in high-density housing. This is to be expected, as many may have had little or no prior experience living in concentrated housing arrangements. The opportunity should be provided for residents to maintain the degree of privacy desired by their lifestyle. For example, even hearing-impaired people should be able to listen to radio and television programs without

disturbing the acoustic privacy of their neighbours. Each resident should have the right of freedom from outside observation, noise or physical intrusion. They should have visual privacy without necessarily having to draw curtains and blinds.

2.5 Personalisation

Personalisation and control over the home environment are important for self-esteem, satisfaction and efficiency. Some theorists argue that full human potential cannot be realised unless a person has opportunities to modify their immediate environment. Design and management policies should permit and encourage residents to project their own personality on the spaces by minimal, non-structural changes to suit individual needs and tastes.

Increasing options for furnishability tends to increase resident satisfaction (such as providing generous interior window ledges for display of objects, see **Figure 5**). People use furniture to make their home unique, to distinguish it from others and to reflect their personalities. The more the layout and design restrict options and decrease opportunities for furnishability and personalisation, the less expressive the home may be of the self, leading to dissatisfaction. Careful attention to social design principles can greatly enhance resident satisfaction.



Figure 5: Wide window sills permit personalisation in display of objects

3.0 Services, materials, amenities and facilities

This section addresses image and building form, pedestrian access to high-rise, high-density residential housing, recycling, composting and waste, mailboxes, shared interior open space, stairs, lifts and circulation.

3.1 *Image and building form*

The 'home-like' or domestic image of the Burswood Lakes buildings, particularly the high-rise buildings, will be a major contributor to resident satisfaction. Even at the high densities proposed for this site, careful attention must be given to making all the buildings look domestic and familiar. Therefore:

- ◆ Select 'home-like' building materials;
- ◆ Avoid clustering units to create a dense or 'institutional' appearance;
- ◆ Maintain 'domestic scale' in appearance and form to ensure housing looks 'familiar';
- ◆ Ensure that, while the housing will be modern-looking, it is not too unconventional in its design (see Figure 6);
- ◆ Avoid long continuous buildings, rows of buildings and long narrow corridors;
- ◆ Limit the number of households sharing an entry to between three and eight;
- ◆ Plan clustered units with exterior extensions, such as porches, balconies etc., closer than 30m apart to enable all outdoor cluster or shared spaces to be seen from surrounding units; and
- ◆ Try to ensure that residents on one porch can see residents on another porch within the cluster without intruding on their privacy (see *Working Paper 5*).

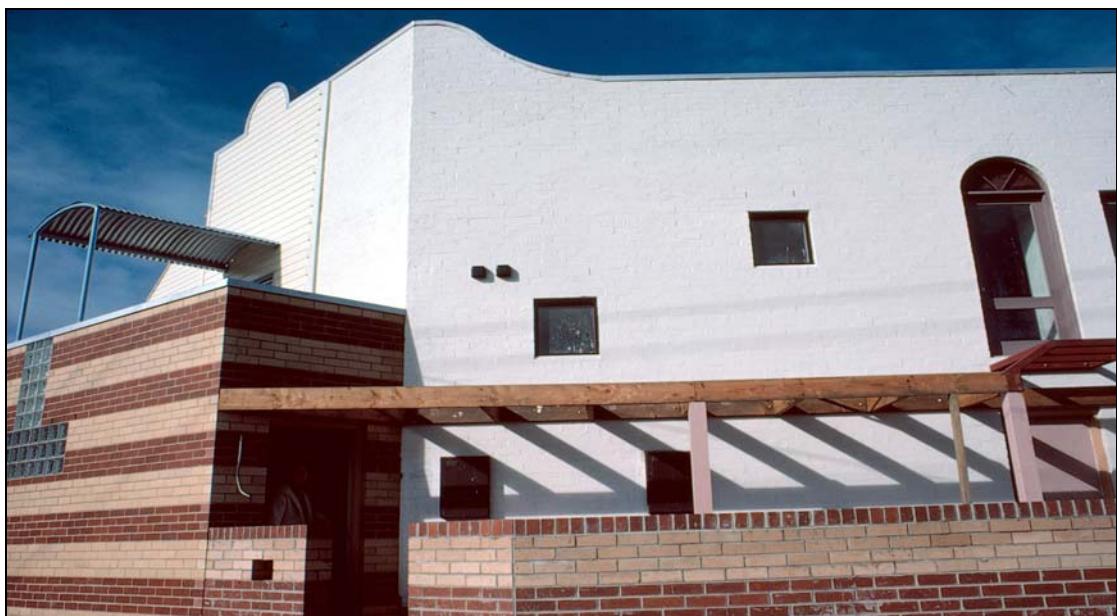


Figure 6: This unconventional design was regarded as not 'home-like' in Australian housing research.

3.2 Recycling, composting and waste

It is expected that before long residential refuse re-use, recycling, composting and waste disposal will be reflected in Council rates or tariffs. Rubbish removal will become increasingly based on the user-pays principle. Strengthening recycling and composting initiatives now will position Burswood Lakes well for the future and respond to increasing environmental concerns by residents and decision makers. Please see ***Working Paper 12*** for additional guidelines on recycling, compost and waste and associated information.

Recycling

Providing information on recycling is important for the resident. It would be advantageous to provide this and other information in a 'new resident's information kit'. This 'resident's kit' could be produced in conjunction with the Town of Victoria Park.

Some general considerations for recycling in high-rise, high-density housing include:

- ◆ Ensure recycling station locations are placed in clean, well-maintained, easily accessible and convenient locations;
- ◆ Share recycling stations in the development between 'clustered' or associated dwellings to foster a sense of responsibility and maintenance;
- ◆ Screen recycling stations from view with screens that are opaque and visually attractive;
- ◆ Provide consistent and legible signage outlining location and recycling process;
- ◆ Design recycling stations with security in mind; and
- ◆ Provide appropriately designed spaces within each dwelling for the sorting and temporary storage of recyclable materials.

Compost

In high-rise, high-density housing, composting of green waste and food scraps on site is to be encouraged. Composting significantly reduces waste removed to landfill, is an environmentally sustainable process and benefits landscaping on site. Further, this initiative responds to the well-documented environmental consciousness of the Baby Boomer population cohort, and women in particular. Throughout Australia, local and state governments are supporting these initiatives.

There are a number of options for composting in high-rise, high-density housing. The traditional methods are worm farms and vermicomposting, using a combination of worms and compost bins. Like all systems, they work well if managed, maintained and communicated appropriately. Therefore, the appointment of a person responsible for

managing, maintaining and communicating on-site composting and/or vermicomposting is essential.

All non-industrial organic treatment systems use only uncooked vegetative material (from kitchen and garden). Meat and dairy products are not suitable for inclusion; they become vermin-infested and rancid. This means that not all food waste can be used and separation of food wastes is very important. The design of the kitchen and ancillary spaces to support sorting and recycling is therefore very important. This information can be provided to new owners and residents of the Burswood Lakes development, either via a 'new resident information kit' and/or by the Town of Victoria Park.

Because of the relatively small size of the Burswood Lakes site, operation and maintenance could be shared by some avid gardeners and site/grounds maintenance staff, who could work together and link this enterprise to the formation of a resident's nursery or garden (see *Working Paper 8*).

Unit garbage disposal

Waste disposal is always a contentious issue in high-density housing. If systems are to be used appropriately (especially by older residents), they need to be highly efficient and carefully designed. Specialist expertise should guide their design. Some general guidelines are provided below:

- ◆ If possible, provide private garbage areas close to kitchen entrances: to provide for sorting of waste for removal to landfill, recyclable material and organic materials to be composted on-site;
- ◆ Private individual bins where possible, as large containers are unsightly and older people and people with a disability often experience difficulty using them;
- ◆ Ensure that all containers are screened from view of the dwelling interior and yard. Screens should be secure, solid and opaque;
- ◆ Liaise with the Town of Victoria Park regarding their rubbish removal requirements and build into the planning and design process;
- ◆ Provide for disposal of bulky items that cannot be handled in the normal way;
- ◆ Ensure that the waste station is secure; and
- ◆ Provide regular maintenance, supervision of use, and appropriate instruction and signage to explain what is expected.

Garbage chutes

- ◆ Where garbage chutes are provided, ensure that they are carefully designed and located; and
- ◆ Locate chutes so that they do not pass by bedrooms, causing disturbance with night use.

3.3 Mailboxes

The design of individual and grouped mailboxes requires careful attention. Sensitively designed and located mailboxes can become the focus of socialising and help to combat the loneliness experienced by some older people, especially women. Focusing 'social' space around grouped mailboxes also supports resident safety. Therefore:

- ◆ Locate mailboxes adjacent to shared spaces (but not blocking a passageway), in a location where people can comfortably gather (see **Figure 7**);
- ◆ Accompany indoor mailboxes by comfortable seating, lighting and tables for sorting and reading mail;
- ◆ Locate individual mail slots in property fences, for the individual dwellings;
- ◆ Ensure that exterior individual or grouped mailboxes are visible from dwellings, if possible;
- ◆ Specify mailboxes that are deep enough so that they cannot be opened with a stick;
- ◆ Specify mailboxes of sturdy, fireproof construction and fit them with a strong key-operated lock; and
- ◆ Provide contrasting address details and numbering on mailboxes.

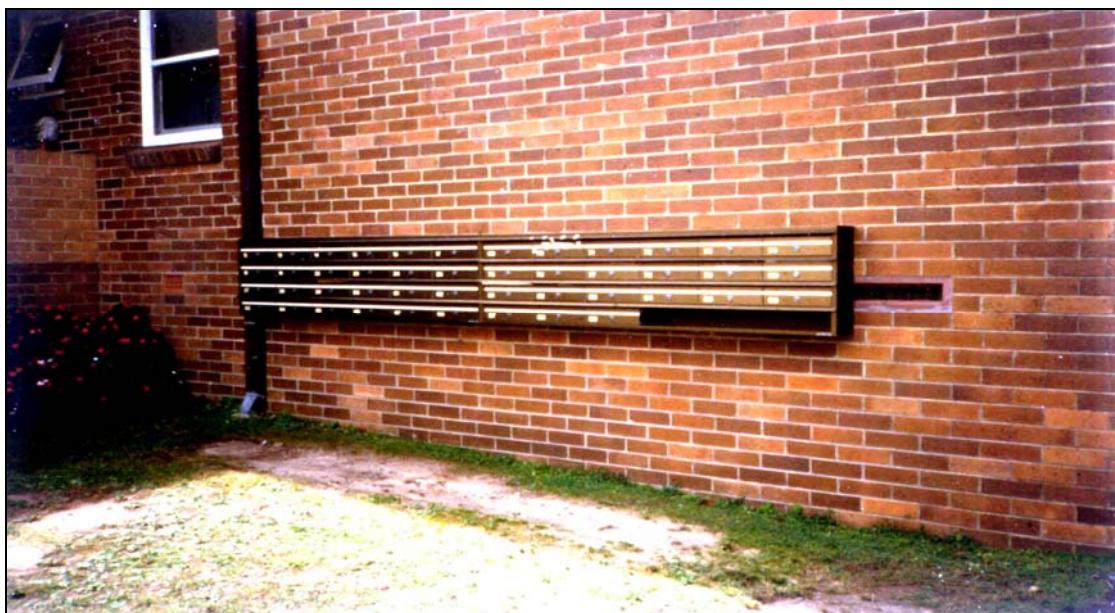


Figure 7: Exterior grouped mailboxes in a location that does not foster informal socialising

3.4 Shared interior spaces within high-rise, high-density residential housing

As many of the new residents of Burwood Lakes will have moved from detached, single-family detached housing, it is essential that the experience of higher density living not be associated with a decrease in amenity. Attention to the micro-scale design of interior spaces is therefore important. Planning and design of shared interior spaces

within high-rise high-density housing is a complex issue which needs to be informed by a number of factors.

Entry spaces and lobby

Entrances set the scene. Shared residential entrances need to convey a number of important signs, signals and symbols. Best practice design of the main shared entrance (and the lobby onto which it opens), is a principal factor in resident satisfaction and will significantly affect all further responses to the building's interior. Take the following guidelines into consideration:

- ◆ Design the building entrance lobby so that it is large enough for at least twelve people to sit comfortably;
- ◆ Locate lifts so that the entry does not bring people into residential corridors which they do not intend to access;
- ◆ Design entry lobbies with comfortable, movable seating and adequate circulation space for wheelchair users;
- ◆ Provide a clear view from the entry lobby or passenger pick-up and drop-off points;
- ◆ Provide public toilets nearby;
- ◆ Locate mailboxes to encourage unforced social interaction;
- ◆ Strategically place a notice board in this area;
- ◆ Locate the management office near the entry lobby so it does not dominate the space but provides natural surveillance;
- ◆ Make lift location apparent to non-residents entering the building;
- ◆ Aid orientation and direction by making it easy to exit the building by using appropriate signs and architectural features;
- ◆ The maximum length of the main path from front entrance to lifts should be 10-25m;
- ◆ Use a 900mm single-leaf front door that will not be too heavy to open, yet will let a person in a wheelchair through; and
- ◆ Preferably, all shared doorways should be sensor-oriented and automatic during daylight hours. Other measures may be more appropriate after hours.

Entry to a multi-unit building

- ◆ Clearly identify the building entry, with no grade changes between the entrance and facilities;
- ◆ Locate residents' shared facilities immediately off the entrance lobby (toilets, phones, drinking fountains, noticeboard etc.);
- ◆ Provide a wide canopy at the main building entry to act as a 'front porch';
- ◆ Extend the 'porch' canopy over the drop-off area to provide protection for less agile residents who take time getting in and out of a vehicle;
- ◆ Protect the entrance from inclement weather, as long as this does not create a dark entry area (see the guidelines in *Working Paper 5*); and

- ◆ Do not use abrasive surfaces on canopy supports, which residents may brush against or grasp for stability.

Entrance doors

- ◆ It is important to note that doors that open towards a person require a significantly greater circulation space than those that open away from the person and sliding doors require even less circulation space;
- ◆ To comply with AS1428.1 and AS1428.2, doorways should have a clear opening width of 810mm;
- ◆ Equip entrance doors to multi-unit buildings with automatic sliding doors, but ensure that the entry does not look 'institutional';
- ◆ If swing doors are used, 81mm single-leaf types are preferred;
- ◆ Preferred door pull pressure: 35kPa; 55kPa maximum;
- ◆ Specify controlled-speed doors if automatic;
- ◆ Kickplate: 300mm;
- ◆ Doors should remain fully open until area is cleared by users;
- ◆ Safety markings on all glass doors and glass walls; and
- ◆ Vestibule inside entrance door: 1900mm minimum depth.



Figure 8: Low lighting levels create glare problems at the entry

Visual adjustment on entering

As glare is a persistent problem for older eyes, design entrance and exit areas to accommodate the slower adaptation rate of the older eye. Otherwise, older people may

be momentarily blinded during entry and exit. For further details on the problems that glare pose for older people, (see **Figure 8** and **Working Paper 8**). Further:

- ◆ Provide a sheltered porch and landscaping around entries for shade;
- ◆ Provide bright but non-glare lighting in entry areas; and
- ◆ Avoid light colours, glossy or reflective surfaces at entry areas (indoors and outdoors).

Circulation and passageways

Careful design of circulation routes within the building can reduce the perception of density and contribute to the 'individual' sense of dwellings and their entrances.

Circulation design is extremely important for residents, visitors, cleaners, maintenance personnel and removalists and other people circulating within the building. Safety and accessibility are primary. Therefore:

- ◆ Design passageways to help orientation by avoiding repetitiveness and providing direct routes to units;
- ◆ Avoid right-angled turns or t-junctions;
- ◆ Use single-loaded corridors wherever possible to aid orientation and reduce monotony;
- ◆ In passageways, provide views, natural light, ventilation, and places to grow plants;
- ◆ Limit the number of dwellings along a passageway to between four and eight, so that residents can identify their units as part of a group;
- ◆ To avoid confusion finding units, provide directional signs and numbering systems reflecting the building's organisation and signs indicating dead-end passageways;
- ◆ Mark potential hazards such as switch plates and stair nosing with colours which stand out;
- ◆ Locate windows in lift lobbies in large buildings so people can see other parts of the building to orient themselves (but avoid creating glare problems with window location);
- ◆ Provide recessed apartment entry doors (up to 450-500mm deep) to relieve the monotony of corridors and allow residents to personalise their front doors (see **Figure 9** and **Figure 17**);
- ◆ Avoid windows at the end of corridors as they produce glare;
- ◆ Avoid hard polished floors; and
- ◆ Avoid corridors more than 30m long.

Figure 9 illustrates a number of these guidelines.

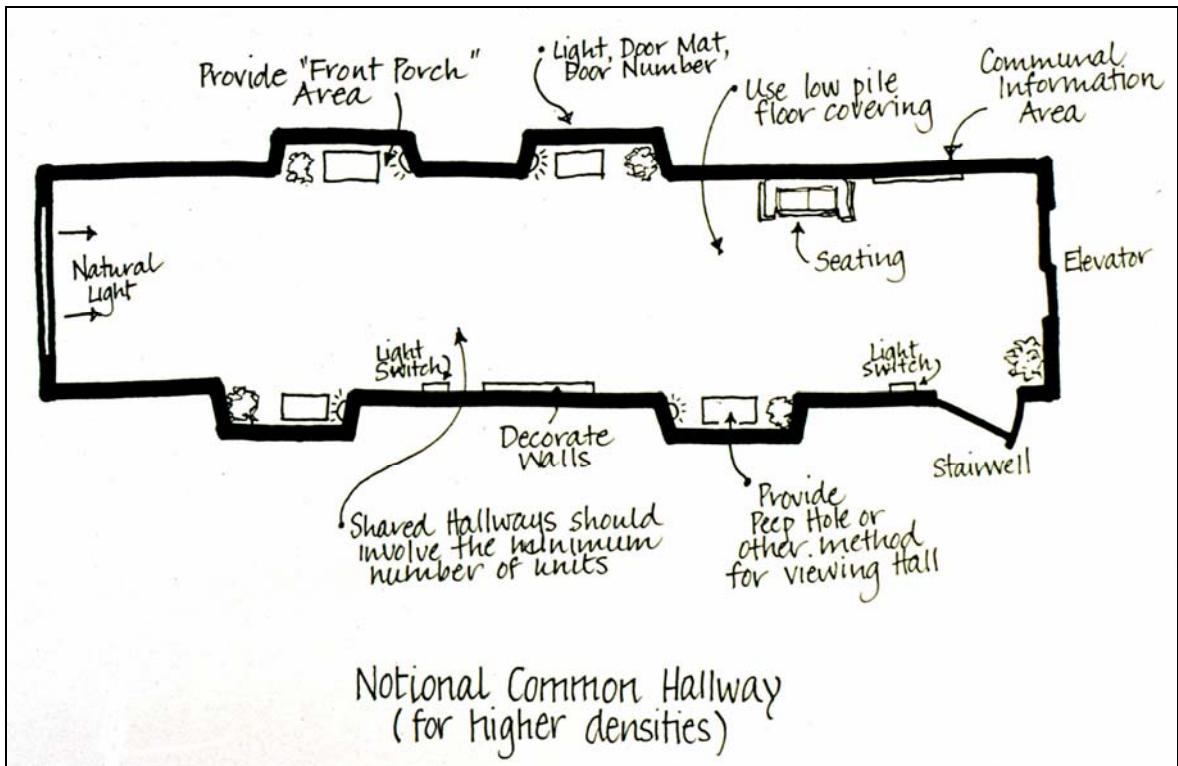


Figure 9: Shared hallways for higher density housing

Emergency access

- ◆ Ensure that there is an easy direct route from the drop-off area near the front entry to individual units for ambulance people with stretchers; and
- ◆ Provide clear signs inside and outside lobby indicating building layout and unit numbers.

3.5 Lifts

Some older people find the use of lifts frustrating if they are encumbered (with parcels, etc.) and are required to move quickly. Careful design of lifts to aid orientation and wayfinding may increase resident satisfaction. Well maintained, functioning, accessible, safe and legible lifts are extremely important for high-rise, high-density housing. To ensure lifts meet these requirements:

Lift location

- ◆ Make the lift location apparent from corridors and passageways, as well as from the main entry.

Lift lobbies

- ◆ Design the entry lobby to protect residents in the lift from views by, and direct confrontation with, others in the lobby;
- ◆ Provide enough space for people in wheelchairs to gather in a small groups while waiting for lifts;
- ◆ Provide enough room for people with a mobility aid to position themselves in front of lift without inhibiting the circulation path;
- ◆ Avoid locating apartment front doors in lift lobbies so that every resident can maintain privacy;
- ◆ Views out: provide a view out of the building at each lift lobby so that residents can orient themselves to the outside once they step out of the lift. Ensure that a window at the end of a lift lobby does not cause glare problems. Use window treatments, overhangs and recessed windows to reduce glare; and
- ◆ Locate the service door close to the lift to allow for moving large items and avoid disruption of shared spaces.

Lift design

- ◆ Always provide at least two lifts: a 'frontstage', more public lift and a 'backstage' lift (see **Section 2.2**) for daily chores like doing laundry, taking out the garbage and moving items;
- ◆ As dependence on and fear of lifts is magnified for older people with physical infirmities, select high-quality lifts with appropriate controls (see AS1428 for control standards);
- ◆ Select lifts with a display panel at eye level showing the floor it is stopping at;
- ◆ Specify lift doors that open wide, close gently, operate slowly and have pressure-sensitive or light-sensitive closing mechanisms;
- ◆ Select lifts with appropriately and intelligibly signed buttons; and
- ◆ Select lift controls to be easily employed by people with limited dexterity or motor-skill impairment and people of short stature or in a wheelchair.

3.6 Stairs

It is important to encourage use of stairs and make them accessible to older people to encourage raising of fitness levels. Locate stairways near lifts at each floor so that residents and visitors can easily find and use them for exercise or when the lift is broken down. Attention to security concerns will be necessary here.

Provide as much fire-rated glass as codes allow in stairwell doors or as side panels so that residents who want to use those stairs can preview if anyone is in them and be less afraid to enter. This is a basic CPTED principle. Residents will also be more likely to use

stairs if they know that others in adjacent hallways can see into the stairs and stair landings (see the safety guidelines in this *Working Paper, Section 4.5*).

To ensure that residents will perceive fire egress stairs as an inviting alternative to lifts, paint stairwells in attractive colours, provide windows to the outside, specify adequate interior lighting, and install signs at each door indicating what floor it is. Place an attractive and well-lit set of stairs directly off the entrance lobby so that residents who want to use it as an alternative to the lift can do so conveniently.

4.0 General guidelines for building interiors

Although Burswood Lakes residents will have a variety of needs and requirements, a number of generic guidelines can aid design of interiors of the residential buildings. The guidelines below are based on research and observation.

4.1 Furnishability

Older people, like all people, use furniture to make their home unique, to distinguish it from others and to reflect their personality. Personalisation and control over the environment are important for self-esteem and satisfaction. The more the layout and design restrict options, the less satisfaction will occur and the sense of 'home' will be compromised. A key interior design requirement, especially at higher densities where individual gardens are not provided, is the concept of 'furnishability'. Therefore:

- ◆ Ensure the building design allows for maximum diversity of furniture placement;
- ◆ Locate window sills high enough for dressers and small desks or tables to fit underneath;
- ◆ Ensure that there are several walls in one room long enough to accommodate a couch, a stereo, and/or bookshelves;
- ◆ Provide a maximum number of corners in a room;
- ◆ Locate window sills 750mm - 800mm above floor level; and
- ◆ Avoid allocating spaces under windows for large pieces of furniture, such as large tables or couches, but ensure that a seated person can see out.

A pattern of cluttering

Older people rely heavily on tactile involvement. They need lots of texture in the building, not just visual textural spaces (see **Figure 10** for an inappropriate uncluttered vision of one architect). Research reveals that older people prefer small 'cluttered' rooms to large 'non-cluttered' rooms. A 'pattern of cluttering' often characterises the décor of older people's housing. This may partly be explained by the reduction in peripheral vision and acuity associated with ageing. But, importantly, it also relates to the need to display valued objects and mementos (see **Figure 15**).

A cluttered spatial environment satisfies needs for:

- ◆ Heightened peripheral visual stimulation;
- ◆ Increased tactile involvement;
- ◆ Greater kinaesthetic awareness; and
- ◆ A sense of closeness important to interpersonal transactions.

Therefore:

- ◆ Provide wide window sills or ledges for displaying photographs and objects;
- ◆ Provide built-in bookcases or 'mantelpieces' for displays;⁷ and
- ◆ Pay attention to wall design and materials to allow pictures to be easily hung (see below).

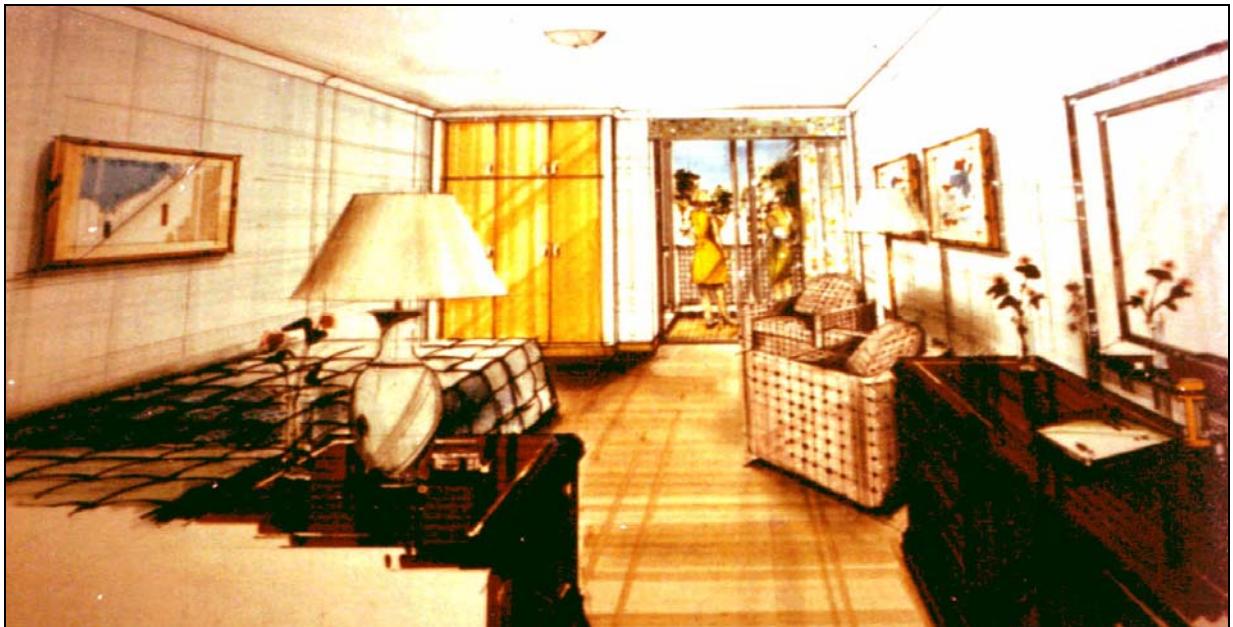


Figure 10: The architect's uncluttered vision

4.2 Materials

Health issues related to the residential environment are a major issue for older people and increasingly for all sectors of the population. Thus, this issue is addressed in *Working Paper 12*. Some basic considerations are summarised below.

Select finishes and materials that are:

- ◆ Environmentally sustainable;
- ◆ Non-toxic;
- ◆ Durable and stain resistant; and
- ◆ Easy to maintain, repair and clean.

4.3 Windows

Windows provide air, ventilation, light and exterior views. Windows are important for ventilation, sunlight, outdoor views, psychological health and natural surveillance (*Working Paper 5*). Because older people tend to spend more time at home than other people in other age groups, either by choice or due to mobility impairment or psychosocial factors, windows become an important portal into the environment. Window

⁷ Mantelpieces and alcoves can also double as alters and permit display of sacred objects (see *Working Paper 14*).

location can encourage social interaction if views of activity areas are provided. It is important to temper this with the awareness that older people are particularly susceptible to draughts, and therefore, the ability to control cross-ventilation is highly valued. Draughts then also impact on window placement. In addition, privacy should be violated neither by people looking in nor by being able to see into other dwellings.

Importantly, for high-rise residential buildings, windows should be designed with a transom at a height of about 1200mm to add a psychological sense of security.

Windows should provide for:

- ◆ Views out but not in (privacy);
- ◆ Ease of cleaning (inside and outside);
- ◆ Ease of use;
- ◆ Cross-ventilation;
- ◆ Winter sun but exclude direct summer sun;
- ◆ Glare reduction;
- ◆ Personalisation and window gardening; and
- ◆ Views and light from two sides of a room (this creates more pleasant living areas and can reduce glare and eye strain).

Window location and views

The location of windows affects outward viewing, natural light, furnishability, security, ventilation and natural surveillance among other factors. Therefore:

- ◆ Select window locations for viewing active, interesting and lively, rather than uneventful, non-active scenes;
- ◆ Locate windows to permit easy arrangement of furniture, especially in livingrooms;
- ◆ Ensure window placement minimises direct exposure of the major room entries to glare;
- ◆ For ground-floor windows: set windows back from outdoor pathways (see **Figure 11**. Changes in grade and plant materials can ensure privacy from those outdoors, while maintaining views from inside (see **Working Paper 5**);
- ◆ A diagonal exposure to the light source reduces initial exposure to glare, allowing time for adjustment to changes in illumination;
- ◆ Ensure windows provide outdoor views from a seated position;
- ◆ Ensure window location protects unit privacy, especially for bedrooms (see **Figure 12**);
- ◆ Windowsill height: high enough for dressers and small desks or tables to fit underneath, to aid furnishability and personalisation;
- ◆ Windowsill height: 750mm-800mm above floor;
- ◆ Maximum windowsill height: 1070mm;
- ◆ A low windowsill approximately 750mm from the floor will permit a seated person or a person in bed to look out (see **Figure 13**); and
- ◆ Bay windows can provide several views.

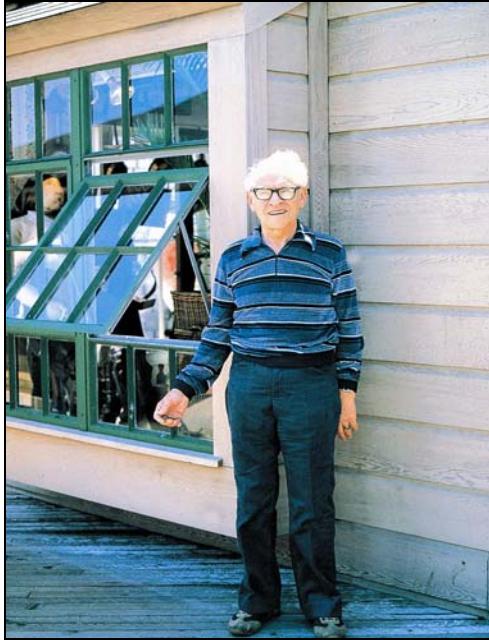


Figure 11: This window is a hazard for this blind man



Figure 12: Mailbox and window location violate dwelling privacy



Figure 13: Unable to see out from the bed

Window type

Selecting appropriate windows types is imperative for high-rise, high-density housing. Therefore:

- ◆ Avoid windows that slide as they generally stick and require more strength and co-ordination than those that must be raised, rolled or wound out;
- ◆ Avoid sliding doors and windows as a major (or only) ventilation source, as it is difficult to control cross-ventilation;
- ◆ Sliding windows often have recessed or small handles which are very difficult to grasp;
- ◆ If double-hung windows are used, select them specifically for ease of operation or provide a pulley system or a ring screwed into the centre of the top frame and a long pole with a hook in the end can be used to pull it up and down. Install tilt-type double hung windows (window demountable from frame) for easy cleaning when they are not accessible from both sides;
- ◆ Old-fashioned casements with push-out rods are among the easiest to use for older people;
- ◆ Opening mechanisms mounted 750mm - 1350mm above the floor;
- ◆ Window controls should be easy to grasp and operate, and should be mounted no higher than 1350mm above the floor;
- ◆ Locate handles at the bottom of the window as well;
- ◆ Odd-shaped or irregular size windows which require custom-made curtains, blinds, etc. and special tracks create an extra expense for older tenants (see **Figure 14**);
- ◆ Specify standard-sized windows wherever possible unless a special window is required as a feature;
- ◆ Avoid round or other odd-shaped windows, which are not 'home-like'; and
- ◆ Avoid reducing window sizes to reduce glare.



Figure 14: Non-standard windows are difficult to drape

Inside window ledges and seats

Provision of window ledges and seats can significantly contribute to the satisfaction and needs of the older person (see **Figure 16**). Therefore:

- ◆ Inside window ledges may serve as a place for planters and the display of memorabilia (see **Figure 15**), as well as a support for balance while observing the outdoors. A window seat or wide sill can double as a seat;
- ◆ Ledge depths: approximately 300mm; and
- ◆ Ensure that windowsill finishes are water-resistant.



Figure 15: Generous interior window ledge displaying memorabilia

Window cleaning

Window cleanliness tends to be major concern for older people in high-rise, high-density housing. To ease these concerns:

- ◆ Select windows and screens that are easy to open and clean without requiring fine muscle control, dexterity or strength;
- ◆ Design windows (other than balcony windows) so that the glass and insect screens can be cleaned from the inside; and
- ◆ Install tilt-type, double-hung windows (window demountable from frame) for easy cleaning when they are not accessible from both sides.

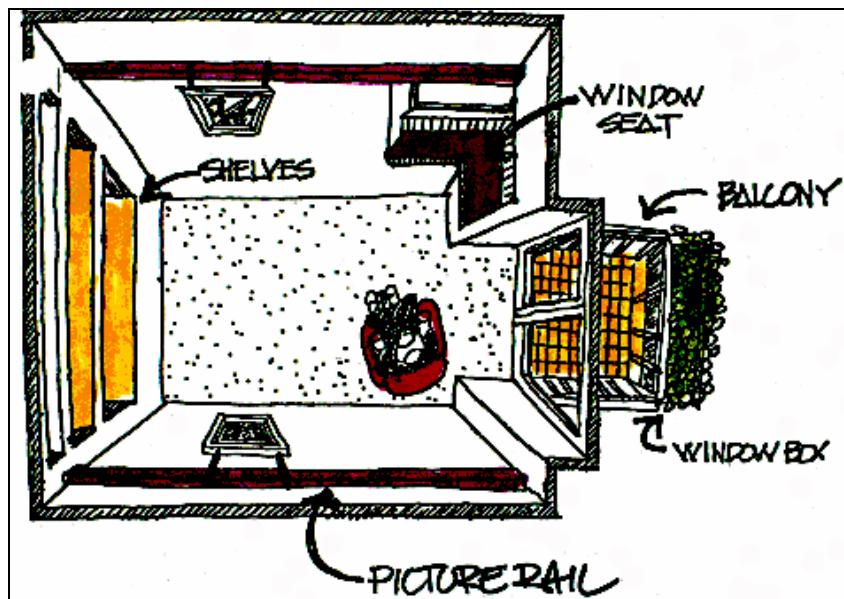


Figure 16: Window seats can enhance a small room

4.4 Circulation and doors

The individual dwelling should be designed for easy access and comfortable use by older people and for people with a disability (see *Working Paper 9* and Universal Design guidelines). Continuous accessibility from the outside to as many parts of the dwelling interior as possible is the objective.

Front doors of private dwellings

- ◆ Front doors of private dwellings should be individual, recessed and placed in clustered groups to help foster a sense of community (see **Figure 17**);
- ◆ Doors must be wide enough to permit clear passage of wheelchair for guests, if not for the resident;
- ◆ AS1428 recommends 810mm width for entrance doors;
- ◆ Door tension should reflect limited muscular strength of older people;
- ◆ Preferred door pull pressure: 35kPa; 55kPa is maximum;
- ◆ Provide appropriate space to manoeuvre into a position to open door for a person in a wheelchair: 600mm x 1200mm clear of door swings (see AS1428.1 and AS1428.2 for specific requirements); and
- ◆ Eliminate thresholds wherever possible or lower the threshold profile with bevelled edges.



Figure 17: Individual, recessed entrances create a sense of identity and allow personalisation

Door handles

Door handles are a major accessibility concern to older people, even those with mild arthritis in their hands. Elegant lever-type door handles are now available. Round knobs are very difficult for these (and most) people to use. Therefore:

- ◆ Door handles should be easy to grasp;
- ◆ Large lever handles should be 750mm - 900mm above floor;
- ◆ Locate handles 760mm - 815mm above floor (915mm maximum);
- ◆ Avoid round knobs;
- ◆ Angle handles so that they do not catch on clothing; and
- ◆ Specify rounded metal lever-type handles.

Door numbers

Should be easy to see by people with poor eyesight and easy to identify by touch;
1200mm - 1350mm above floor; and
Raised, screw-on numerals with high contrast colours work best.

Peepholes

Peepholes are often installed too high for older women and cannot be used by children. Therefore:

- ◆ Install peepholes at low height, approximately 1450mm from floor, for people in a wheelchair, older people, shorter people and children.

Windows to overlook doors

Small window to enable the resident to see who is at door before opening it; and Far enough from door handle to discourage intruders breaking the glass.

4.5 Safety and security

This matter is discussed in detail in *Working Paper 5*.

The older years are a vulnerable time, physically and psychologically. Many older people fear crime, and fear of crime can be as powerful a factor as crime itself. Surveys show high fear levels among older people and the relationship between age and fear is stronger in larger communities. Those who live alone generally experience more fear. Failing eyesight and reduced physical strength cause many older people to feel vulnerable in their housing environments.

If the older person is to feel secure, the environment should provide both direct physical and psychological supports. The three important components are security, orientation and control. Security is the sense of being able to move about day or night without being accosted or robbed. Security is a major concern of older people, especially in urban areas. Many older people live alone and most older people will probably eventually live alone. A very high proportion will be women. Fear of intruders requires designers to build crime-prevention features into housing designs.

Fear of victimisation can act as a deterrent to older people's use of the space outside the home. While victimisation rates for people aged 60 and over are markedly lower than for nearly all age groups, Australian crime research reveals that older people are considerably more fearful of crime than are members of all other age groups. Older people also take longer to heal than younger people. Thus, to encourage their wide use by older people, home environments must not only be safe, they must also be perceived as safe.

Security features should be coordinated with management strategies, design details and the emergency alert alarm system selected for this site. The location of the Body Corporate Office should be part of the security planning. A design that communicates a secure and 'sturdy' feeling can help older people to feel safe from personal attack and burglary. It is difficult to feel safe when other people can gain easy access to your home through easily broken, flimsy windows and doors or by standing on a nearby fence or roof or climbing up natural ladders (see *Working Paper 5*).

Household safety

Household safety is another important issue for older people, as a high proportion of personal accidents occur in the home environment. Essential safety items every home should have include:

- ◆ Smoke detectors;
- ◆ Carbon monoxide detectors;
- ◆ Radon-detector kit;

- ◆ Night lights;
- ◆ Hand rails;
- ◆ Child-resistant locks;
- ◆ Electrical socket protectors;
- ◆ Electrical safety switch/Ground fault circuit interrupters;
- ◆ Deadbolt locks;
- ◆ Sensor lights;
- ◆ Fire extinguishers;
- ◆ A designated space for a first aid kit; and
- ◆ Fire-safe window guards.

4.6 Interior storage space

Adequate storage space is essential for all residents, and it is imperative for older people who may have gathered objects over a lifetime. (Appropriate storage space is essential to avoid such unsavoury situations as pictured in **Figure 34**) As older people tend to reminisce, they place great value on these belongings and do not want to part with them. Some of these stored objects are rarely accessed but they are nevertheless important. Older people frequently complain about inadequate storage in smaller or high-density dwellings.

Therefore, storage areas should be:

- ◆ Of appropriate size;
- ◆ Located appropriately and conveniently;
- ◆ Easily accessible, particularly for people with mobility impairments;
- ◆ Designed and located to minimise the necessity to extend or stoop; and
- ◆ Designed to minimise excessive lifting and possible resulting strain and injury.

Design of storage space

- ◆ In smaller units, combined bedroom and linen cupboards save space if it is at a premium;
- ◆ Provide storage for items that need to be accessed often, as well as for objects that are accessed rarely;
- ◆ Provide upper shelves and drawers for things that are seldom needed (see **Figure 18**);
- ◆ Ensure everyday items are within easy reach;
- ◆ Baskets ensure stored items are visible at a glance;
- ◆ Avoid sliding doors with no handles or with recessed handles;
- ◆ Select handles on all drawers and cupboard doors so that they are suitable for the less dexterous and manually adept people;
- ◆ Consider the provision of a multi-purpose storage wall;
- ◆ Have jackets and short clothes on low rod; and

- ◆ Consider a pull-down hanging rod as a fitting.



Figure 18: Bedroom storage with high cupboards

Storage size

- ◆ A generous storage area within the dwelling is a major contributor to resident satisfaction. Inadequate storage has the opposite effect;
- ◆ Contents of a general storage area must be accessible from a wheelchair;
- ◆ Minimum recommended storage: 5.5m^3 ;
- ◆ Minimum clear door opening: 900mm;
- ◆ Clothes hanger rod should be adjustable in height: 1200mm - 1500mm above floor;
- ◆ Shelf above rod: maximum height of 1600mm;
- ◆ Shelves built in at side of wardrobe: adjustable or heights up to 1400mm; and
- ◆ Avoid doors that require a track or floor-level guide rail.

Storage shelves

Shelves are very useful in making maximum use of a limited area. Therefore:

- ◆ Provide adjustable shelves with secure attachments;
- ◆ Shelving should be easily customisable;
- ◆ Ensure shelving is sturdy and safe;
- ◆ Maximum shelf height: 1400mm for wheelchair users;
- ◆ All shelves: 400mm - 450mm in depth;

- ◆ Minimum width: 400mm; lowest shelf about 750mm from floor. Other shelves adjustable or spaced upwards 400mm apart;
- ◆ Higher shelves may be provided if able-bodied people can use them;
- ◆ In linen cupboards, shallow shelving, with shelves no more than 450mm deep provides suitable accessibility; and
- ◆ A proportion of higher shelving utilising 'dead space' for the storage of rarely accessed items may be appropriate and valued.

Storage drawers

It is generally easiest to reach drawers that are between knee and shoulder height. If you have use of only one hand, or need one hand to steady yourself, a centred drawer handle is best (in this case drawers cannot be too wide: maximum 500mm). Therefore:

- ◆ Fit drawers with glides on either side so that they open and close freely; and
- ◆ Consider providing wire baskets on runners instead of shelves to aid visibility, ease of access, and increase functionality.

Storing large and seasonal items

The simple broom closet is an essential space in any dwelling but is often missing from modern apartment designs in Australia. Residents do not want to put cleaning equipment in bedroom closets and older people, in particular, need to be able to access brooms, vacuum cleaners, buckets and ironing boards with ease. Therefore:

- ◆ Provide adequate storage for items not regularly accessed: furniture, suitcases, fans in winter, bedding in summer, seasonal clothing;
- ◆ Provide for storage of large items near the main entry for ease of access and removal;
- ◆ Plan for specific storage for tools and other equipment;⁸
- ◆ Ensure it is lockable and easily accessible;
- ◆ Provide storage space for bicycles, shopping trolleys, golfing equipment, etc.;
- ◆ Locate internal space near the main entry;
- ◆ If it is to house brooms or mops make sure that tall storage spaces are provided; and
- ◆ Adjustable shelves in the floor to ceiling cupboard, as well as spaces for the ironing board, bucket and vacuum cleaner (see **Figure 19** and **Figure 20**).

⁸ Communal storage for tools is probably not appropriate but lockable storage within individual garages or carparking spaces can address this need.



Figure 19: The humble broom closet

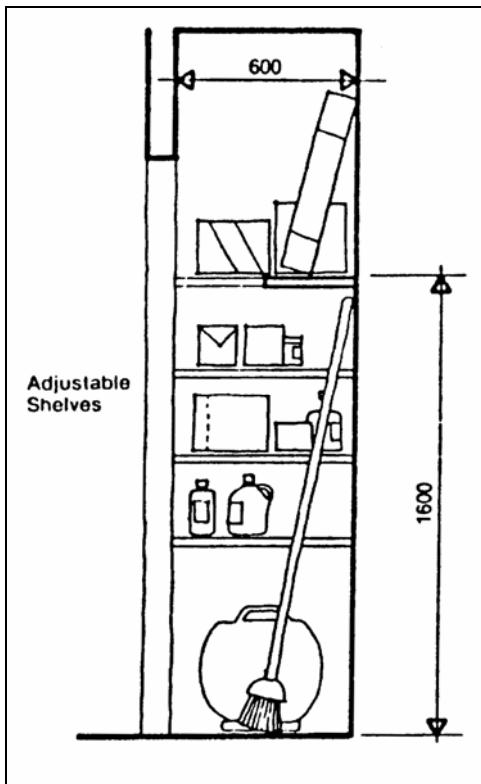


Figure 20: Broom Closet design

4.7 Walls and wall coverings

For information on wall colours, see **Section 4.13** of this **Working Paper**. For wall materials, see material guidelines in this **Working Paper** and the specific guidelines in **Working Paper 12**.

As interior wall colour, texture, materials and coverings constantly impacts upon people and their choice of visual display, appropriate planning is important. Consider:

- ◆ In all rooms of the unit, design wall surfaces so that residents can tack up photographs or nail hooks for pictures with minimal damage;
- ◆ Design space for display of personal belongings: provide at least one large wall surface of interior rooms without openings;
- ◆ Provision of picture rails in all rooms is one suggestion. With cement-rendered walls, provide a picture rail; and
- ◆ Reinforce walls for easy installation of handrails, particularly in bathrooms and toilets.

4.8 Floors and floor coverings

Floor coverings, using healthy and sustainable materials, promote a feeling of comfort and wellbeing. Most importantly, floor coverings provide safety and comfort in moving through the dwelling units and shared interior spaces. Slippery floors and uneven surfaces can be dangerous to older people and strong patterns can conceal real

obstacles, create visual confusion, contribute to loss of balance and appear to vary the height of the floor. Any of these may contribute to falls and serious injury. Changes in floor covering, colour and texture can warn of approaching hazards.

Floor coverings and finishes

See **Section 6.6** on bathrooms for details of floor finishes in those rooms. General considerations include:

- ◆ Floors should maintain non-slippery qualities even when wet. They should require the minimum of maintenance, as older people and people with a disability find washing, waxing and polishing difficult and busy people find it boring;
- ◆ Select flooring materials that require little maintenance, such as hardwood floors with a permanent low-gloss, plant-based finish, e. g., tung oil;
- ◆ While cork flooring provides a firm, smooth surface for wheelchairs and is warmer than vinyl, it does require regular maintenance and scratches easily. However, cork, correctly sealed, lasts quite well;
- ◆ Changes in floor surface such as carpet edges or expansion joints should not exceed 10mm in height and should be bevelled;
- ◆ Small unglazed (non-slip) ceramic tiles with square (not rounded) edges are recommended for bathrooms, but not for kitchens, as tiles are too hard for standing or falls and absorb grease and spillages. Floor tiles in the kitchen also make breakage of dropped items more likely;
- ◆ Avoid smooth vinyl flooring at entrances or in bathrooms, as it is dangerous when wet;
- ◆ Sheet linoleum (a much better alternative than vinyl) without joints is acceptable in kitchens, bathrooms and laundries only if it is non-slip and does not need to be polished; and
- ◆ If vinyl is used, solid vinyl products, rather than laminated ones, will last longer. In general, vinyl is not recommended for health reasons (see **Working Paper 12**);

Carpet

New soft floor finishes, the product of new technology, made from sustainable materials and processes, are recommended for dwellings for older people, as soft flooring is warmer and cushions impacts in the event of a fall. Importantly, these new soft floor finishes are hypoallergenic. There are many health arguments against carpeting and therefore the question of carpeting requires further investigation by Mirvac-Fini and its specialised consultants. See **Working Paper 12** for guidelines on healthy floor materials.

People using wheelchairs find travelling across carpeting requires more effort than an uncarpeted surface, but they generally accept this disadvantage to gain other benefits.

Carpet has significant advantages for other reasons: It is warm, reduces noise and seriousness of accidental falls, is long-lasting, easily maintained and reduces glare. However, as noted in *Working Paper 12*, it harbours dust mites and dirt. A central ducted vacuum system is the only effective system to prevent dust being vented back into the house. Therefore:

- ◆ Use only securely attached fitted, glued (non-toxic glue) and nailed carpets, not loose rugs;
- ◆ Wool carpet with natural jute backing, not rubber and glue is preferred, as it is easier to clean and there is less risk of noxious fumes in case of fire;
- ◆ Solid light colours are preferred;
- ◆ Avoid high-pile carpets: specify flat, short or looped pile (not tufted), dense weave, and high-density heavyweight carpets that are anti-static, hypoallergenic and easy to clean;
- ◆ Maximum pile height: 10mm;
- ◆ Carpet backing is important: use fire-resistant natural jute backing pads; and
- ◆ Consider nailing carpet directly to the floor, rather than using glue and underlay, as underlays and adhesives are often highly toxic (see *Working Paper 12*).

4.9 Acoustics

While acoustics is a specialised area, it is nevertheless important to identify the particular concerns and requirements of older residents.

Older people have a wide variety of sleeping and rest patterns, taking naps in the morning or afternoon and waking or retiring early or late. It is important that noise from external sources or adjacent dwellings does not disturb these patterns. Note that naps are often taken in the lounge room and this has implications for acoustic controls. Residents at work during the day appreciate quiet in the evening and early morning.

Many factors affect the way sound travels and how it is perceived within a dwelling. These include size, location and furnishings of different rooms, the amount of noise from outside, and the type and quality of the construction materials employed. Appropriate design and construction can help reduce the amount of noise heard from outside or inside dwellings. Protecting residents from excessive noise and vibration involves careful site selection and site planning and adequate sound insulation between and within dwellings. The following factors influence acoustic privacy within and between dwellings:

- ◆ Acoustic glazing of all exterior glass and windows will contribute to acoustic privacy;
- ◆ Plumbing and layout of nearby dwellings will impact on acoustic privacy;
- ◆ Floor plans should be mirrored so bedrooms are next to, above or below neighbouring bedrooms, and not near neighbours' living rooms or bathrooms which can be noisier;

- ◆ A resilient rail on one side of a wall enables the plasterboard lining to vibrate independently of the framing. This reduces noise transferring through the structure of the wall but can be compromised by adding shelves, appliances or anything that might attach the plasterboard lining to the timber studs;
- ◆ Concrete walls and floors are better at screening low-frequency noise such as music;
- ◆ While some walls and floors may have the same Sound Transmission Class (STC) rating, their ability to screen noise can be different, this is because STC ratings are based on high-frequency sounds like the human voice and do not reflect a building's ability to screen noise from televisions and stereos that can produce high volumes at a low frequency;
- ◆ A cavity of at least 50mm on either side of the concrete, with insulation, is needed to help reduce noise from human voices;
- ◆ Walls, storage spaces and hallways can act as sound buffers between dwellings;
- ◆ Hard-surfaced floors significantly contribute to residential noise; and
- ◆ Where noise will affect sleeping rooms, use acoustic barriers (in dwelling construction and site planning) to comply with Australian Standards (AS 2107).

External noise sources

Older people are often sensitive to external noise, as well as noise from neighbouring dwellings. Therefore:

- ◆ Protect dwellings from excessive noise and vibration (this is a particular issue in urban areas where noise from traffic and neighbourhood children can cause problems);
- ◆ All designs should comply with AS 2107;
- ◆ Locate sleeping rooms away from traffic, carparks and thoroughfares with passing pedestrian intrusion;
- ◆ Where noise and vibration will affect sleeping rooms, use acoustic barriers (in dwelling construction and site planning) to comply with Australian Standards;
- ◆ Site buildings away from children's play areas, schools, and sports grounds; and
- ◆ Employ architectural treatments like double glazing, weather stripping of windows, or specially designed balconies, where necessary, to reduce noise.

Noise between dwellings

Noise from adjacent dwellings is a major source of nuisance, often outweighing that caused by external sources such as traffic. Annoying noise problems can arise when hearing impaired people listen to radio or television at full volume and the occupant in the adjacent unit has normal hearing. Therefore:

- ◆ Design walls and floors separating dwelling units for older people for a sound transmission coefficient (STC) rating of 50, rather than the standard of 45;
- ◆ Provide adequate soundproof walls between units; and
- ◆ Ensure that sleeping rooms are not located above the garage or carports of any units.

4.10 Glare

Glare significantly influences the lack of perception of the environment by older people. The slow adaptation from low-light to high-light conditions in the ageing eye makes older people extremely susceptible to glare and this can cause real problems for them if this is not acknowledged. Floor surfaces are not a major source of glare. Even if glossy polished timber, they are relatively dark in colour. Therefore:

- ◆ Glare reduction should be a primary design goal;
- ◆ Use window design, placement and interior design to reduce surface glare;
- ◆ Use peripheral lighting (not direct intermittent lighting) where possible;
- ◆ To avoid glare, design deep window frames;
- ◆ Provide opportunities for residents to control the quality and quantity of light to rooms;
- ◆ Consider glazing that controls light as well as glare: window tinting, screens and blinds for light control, but ensure that adequate light is available; and
- ◆ Provide adjustable sun protection to windows to reduce heat and glare. Shading on the outside of windows is much more effective than internal shades, eg., shutters, awnings (to the north), and exterior blinds.

Light living areas

Glare reduction should not result in dark rooms, as older residents greatly appreciate light rooms. Therefore:

- ◆ Avoid reducing window sizes to reduce glare;
- ◆ Use other methods, including lined curtains to modulate light for individual needs; and
- ◆ Examine other ways to reduce glare, such as floor, wall and ceiling coverings and coatings, drapery materials and combinations of fibrous materials, as well as lighting sources that minimise glare.

4.11 Hardware⁹

This issue is also discussed above in **Section 4.4**. The architectural hardware used in most buildings has been designed and selected as though potential users will have no impairment or disability. But many people (not only older people) have sensory problems

⁹ Details of hardware specifications are also found, in particular, under **Section 6.3** and **Section 6.6**.

that interfere with the manipulation of controls used to manage, change, open, close, select and activate mechanisms. For example, the average doorknob requires a rotating motion that can contribute to the onset of arthritis. All hardware should be useable by people with mobility impairments, loss of strength and control and issues with hand-eye co-ordination. Therefore:

- ◆ All hardware should be useable by people with mobility impairments, loss of strength and control and problems with hand-eye co-ordination;
- ◆ Specify rounded lever-type metal handles;
- ◆ Locate them 760mm - 815mm above floor (915mm maximum); and
- ◆ Do not specify knobs that require a grasping operation or which are useable only by people with free hands and normally functioning fingers.

4.12 Signs

Legible environments

Legibility is the ability of the environment to communicate a sense of place and reinforce messages of orientation and direction. It is important to create 'legible' environments by:

- ◆ Building and site layouts;
- ◆ Colour and texture coding;
- ◆ Signs and graphics;
- ◆ Maps; and
- ◆ Variety of interior furnishings and window treatments.

Older people often fear getting lost more than people in other age groups do. Understanding one's surroundings is of great importance to the ability to function effectively. For older people, the ability to navigate the environment will lead to a sense of control and wellbeing. A hierarchy of appropriate signs can contribute to resident satisfaction. Thus, the three functions of a sign system should be to:

- ◆ Identify a place and indicate whether or not it is accessible to everyone;
- ◆ Indicate warnings where necessary; and
- ◆ Provide routing information.

Orientation and wayfinding

Confusion about floor numbers and dwelling location can be disturbing for older residents and visitors. In buildings with similar-looking floors, residents may inadvertently go to the right dwelling location on the wrong floor and be bewildered by their inability to get in or embarrassed by their attempt to open someone else's door. Therefore:

- ◆ Use readily visible numerals and colour-coding on floors and doors; and
- ◆ Where spaces are located some distance away from each other, provide directional signs.

Signs for people with a vision impairment

- ◆ For older people with a vision impairment, pay attention to sign design and location;
- ◆ Locate signs at the side of a door, pair of doors or openings (not on doors themselves, as they may be obscured when doors are open);
- ◆ Minimum setback: 457mm and placed at height of 1220mm - 1676mm;
- ◆ Small raised letters (to be touched) are easier to read than larger letters; and
- ◆ Raised letters are preferable to Braille, as only about 7 percent of the vision-impaired population can read Braille.

Tactile cues

Tactile cues are very important and may be more easily 'read' by many older people than auditory or visual cues. Thus, it is important to use changes in paving texture to signal upcoming stairs.

Sign hierarchy

Signs should be developed as a consistent system with a consistent pattern and hierarchy, as well as legibility. This makes sign identification easier, reduces clutter and makes really important messages stand out. Signs can also be used to create an image for the development as a whole.

Sign location

- ◆ Locate signs for easy visibility by people in wheelchairs but ensure they do not present a hazard;
- ◆ Hanging signs should allow a clear space of between 1980mm - 2100mm above grade to ensure safety;
- ◆ Locate signs at wheelchair height (915mm - 1320mm); and
- ◆ Locate pedestrian signs to ensure easy identification without obstructing walkways.

Sign design

The design of signage is a specialised area. However, signs often appear to ignore the particular requirements of older people. As sign design is important for older people:

- ◆ The figure-ground relationships of sign systems should employ a very high contrast ratio between the symbol and background;
- ◆ Apply the principle of the maximum brightness difference between the symbol and the background;
- ◆ For interiors use white symbols on dark blue or black backgrounds;

- ◆ If dark letters are used, they should be on a neutral grey background to reduce glare;
- ◆ If colour is used, warmer colours are preferable; avoid blue and green colour combinations, as they are not easily distinguished;
- ◆ Closely or loosely spaced letters are difficult to read;
- ◆ Space letters similarly to spacing on typewritten material;
- ◆ Use matte finish, durable, non-reflective surfaces;
- ◆ Use bold lettering styles *without serifs*: Helvetica or Futura typefaces; and
- ◆ Avoid extended or condensed styles.

Door signs

- ◆ Identification of doors and openings greatly assists people with visual impairments. However, do not place signs directly on doors but beside them, as often opening a door can obscure an important sign (eg., 'emergency exit').

4.13 Colour

General colour considerations

Colour was once thought to act on us only through our eyes; recent research indicates that we may have a 'radiation sense' independent of conscious vision that acts by way of our eyes and skin. Several experiments have shown that colours produce physiological effects on visually impaired people, just as they do on the sighted.

Although there are individual and cultural differences in colour preference and association, colours have fairly uniform effects on people within the Western European tradition. Red and blue are the two colour 'poles', in terms of human response. Red increases blood pressure, respiration rate, heartbeat, muscle activity, eye-blanks, and brain waves, while blue has the converse effect. Green or yellow-green produce a neutral response.

Similarly, experimenters have grouped colours into 'centrifugal' and 'centripetal' ranges. **Centrifugal** colours are 'warm': yellow, peach, pink orange, and red. They cause us to direct our attention outward, and are conducive to muscular effort, action, and cheeriness. **Centripetal** colours are 'cool': the blues, greens, greys, and turquoise. They foster an inward orientation and are appropriate for sedentary activities and those that rely on the eyes or the brain.

Clearly, colour choice is the domain of Burswood Lakes interior designers. These 'social design' considerations are offered to complement that professional expertise. When choosing colours for a given room, it is important to consider, firstly, the amount of daylight that enters that room and the warmth or coolness of that light. A dim, cool room can be noticeably warmed by highlights of reds, oranges, or yellows, and vice

versa. Consider also room use; in each room, the main colour should be appropriate to the room's function. Blues, causing introversion, tend to suppress conversation and would not be recommended for social areas; especially for older people. Peach stimulates the appetite and might be appropriate for eating areas. Red, as a tension producer, should be employed carefully (Venolia, 1988: 59-60).

In each room, we need some contrasts of dark and light, dull and bright and variety as we move from room to room. We need balance between warm and cool. At the same time, we need harmony, unity and order. A maximum of three colours is best in a room, with highlights of a single, bright colour; variety can be produced by changing intensity, value, and texture. Our eyes are most comfortably adjusted by neutral, non-distracting, cool colours. Too much white causes glare, constricting the pupil, affecting vision, which is a major concern for older people. Bright colours and high contrast can result in eye fatigue. These factors are important in areas where people perform visual tasks (Venolia, 1988: 60-61).

Colour and older people

The ageing process dramatically affects colour differentiation. Because older people have more difficulty distinguishing between colours because of decreased visual acuity, colours should be employed to achieve the following objectives:

- ◆ Provide a safe environment;
- ◆ Remove glare from the field of vision;
- ◆ Introduce sensory stimulation; and
- ◆ Provide for comprehension and orientation.

It is important to match colours to the tastes of the group to be housed; to consult with prospective residents, wherever possible, to determine colours for shared spaces.

Colour, mood and vision

Because of the discrete and almost universal psychological and physiological changes associated with ageing, the following considerations apply:

- ◆ Use colour variety for different rooms;
- ◆ Muted colours facilitate concentration on visual and mental tasks;
- ◆ Where differentiation between colours is desired, yellows, oranges and reds are more easily perceived because the eye lens yellows with age; and
- ◆ Avoid the dark end of the spectrum (blues, greens and violets), although light versions of these colours are acceptable.

Some paints contain heavy metals and chemicals called volatile organic compounds (VOCs) that can cause illness or dizziness (not to mention the impacts of their manufacture on the environment). Water-based latex paints with low or no VOCs and natural paints made from renewable raw materials are generally regarded as a more

acceptable option (Tagore, 2003). This matter is addressed at length in *Working Paper 12*.

Room colour

The research on design for older people reveals the following considerations with respect to room colour:

- ◆ Intensity is more important than hue;
- ◆ Older people have more difficulty in distinguishing between blues and greens than among the warmer hues of reds and oranges;
- ◆ Use colour differences or visual themes to give visual cues to location. Colour change on wall or floor surfaces can indicate floor level, the part of the building etc.;
- ◆ Use colour where visual confusion could occur. For example, to assist people to distinguish between floors and walls, use contrasting colours for floors and wall surfaces but do not use two contrasting intense colours. Avoid exactly matching the colours of two elements that are seen together so that they 'disappear'. Instead, provide contrasts by painting doorframes a different colour from the door; ensure all exposed pipes etc. are not 'painted out', creating a safety hazard;
- ◆ Dark-coloured wall surfaces bounded immediately by windows admitting bright sunlight make it difficult to see objects near the walls; and
- ◆ Avoid dark-coloured walls near windows.

5.0 Lighting, electrical outlets, telecommunications and climate control

5.1 *Lighting*¹⁰

Reviews of housing for older people in Australia reveal little sensitivity to the particular issues related to light and ageing. Older people need at least three times as much light in daylight and seven times as much at night as do younger people. They generally need an increased amount of light to see with the same acuity as 'normal' sighted younger people. The eyes of older people become increasingly sensitive to glare, making it difficult to distinguish outlines of objects and the older eyes take longer to adapt to changes in illumination, creating a special environmental hazard. Therefore, it is important to:

- ◆ Increase lighting intensity without creating glare problems;
- ◆ Create flexible lighting systems;
- ◆ Provide systems with a supplemental lamp and a variety of permanent fixtures;
- ◆ Use indirect or shielded lighting;
- ◆ Plan adequate lighting in transitional areas;
- ◆ Use lighting that reduces abrupt changes in lighting levels: night-lights, illuminated switches, increased exterior lighting; and
- ◆ Minimise fluorescent lighting (see *Working Paper 12*).

Adequate lighting levels

- ◆ Generally provide higher than normal and even lighting levels;
- ◆ Specify 150w for general lighting; and
- ◆ Place lighting fixtures to cast light directly without shadow cast by the person on areas of for specific tasks, e. g., oven, food-preparation areas, cooktop, sink or vanity.

Indoor lighting maintenance

- ◆ Select fixtures to enable ease of maintenance, as changing globes may be difficult and possibly dangerous for older people;
- ◆ Provide fixtures with more than one light globe for light until a replacement can be made; and
- ◆ Install ceiling fixtures with a retractable cord so the light can be pulled down to a lower height for close work.

¹⁰ Detailed lighting specifications are also provided for each room.

Accessible lighting

It should never be necessary to pass through an unlit area to reach a switch. Therefore:

- ◆ Provide a switch to a light fixture or to an electrical outlet at the entrance to every room;
- ◆ Provide illuminated light switches (locator lights) in entry hall, bedroom-bathroom corridor, bathroom and bedroom (at least one per room); and
- ◆ Consider using two-way light switches to switch a light on and off from more than one point without having to go back across a room or down a corridor.

Glare reduction

- ◆ To minimise glare, use peripheral lighting (not direct intermittent lighting) where possible;
- ◆ Provide opportunities to control the quality and quantity of light to rooms; and
- ◆ Ensure that glare reduction does not result in dark rooms (see also **Section 4.10** and **Section 5.1**).

Transitional lighting

- ◆ To allow older eyes to accommodate, try to reduce abrupt changes in lighting levels when moving from a light to a dark area.

Contrasting effects

- ◆ Use lighting and colour together to clearly identify stair treads and provide sharp contrast with the remaining part of the step; and
- ◆ Design doorways to contrast with walls to help people locate entrances.

Additional lighting

- ◆ Provide additional illumination for keyholes, door latches, public telephones, building directories, building or dwelling numbers.

Entrance lighting

- ◆ High illumination levels inside the entrance help to reduce the contrast in light levels between the inside and outside and to reduce accidents that often accompany an abrupt change from light to dark (see **Figure 8**).

Light switches

- ◆ To permit use by people in wheelchairs, lower light switches and ensure that they are large enough to use easily;
- ◆ Locate switches between 840mm and 1050mm from floor;
- ◆ Consider large 'rocker' switches for use by people with manual disabilities; and
- ◆ Consider using a switch that is available that responds to the warmth of any part of the body held against it.

Lighting and energy efficiency

It is important to consider energy-efficiency principles when designing the lighting plan for any building. However, there are some trade-offs involved in using fluorescent instead of incandescent lights. There is considerable debate about the health impacts of fluorescent lighting. Although fluorescent lighting is certainly energy-efficient and is, therefore, specified in order to reduce the energy load of a building, many people report symptoms of irritability, eyestrain, headaches, allergies, and hyperactivity when spending much time under fluorescent lighting. This issue is discussed in *Working Paper 12*.

Flicker, glare, hum and ultraviolet can also cause problems. Fluorescent lights also emit higher electromagnetic fields (EMFs) than other light sources and these may adversely affect some people. Some older fluorescent lights have starting devices that contain (and can leak) highly toxic polychlorinated biphenyls (PCBs).

The following guidelines balance these trade-offs:

- ◆ Create a lighting scheme that is well designed and specific to the activities in each room – adequate but not too much light in the right position, casting illumination in the right direction. (This requires notional furniture layouts to be determined in advance.);
- ◆ Reduce as far as possible reliance on artificial light;
- ◆ Increase the effectiveness of illumination by using light-coloured surfaces, taking care not to create glare;
- ◆ Bear in mind that a low-wattage lamp close to where it is needed is more energy-efficient than a stronger lamp positioned far away;
- ◆ Eliminate the unnecessary use of electricity by using control devices such as timers and dimmers. Though, the electromagnetic radiation (EMR) issues of dimmers are contentious (see *Working Paper 12*);
- ◆ Carry out a regular maintenance routine with all lamp fittings: inside dwellings, in whole buildings and shared areas; and
- ◆ Avoid standard fluorescent lighting; select only full-spectrum fluorescent lighting in windowless spaces.

5.2 Electrical outlets

Because bending, stretching, kneeling and squatting are sometimes uncomfortable for some older people, it is important to locate electrical outlets with care. Therefore:

- ◆ Locate power points so that they can be reached comfortably from a sitting position;
- ◆ Provide only double power points;
- ◆ Locate outlets between 375mm and 530mm above the floor;
- ◆ Use rocker switches also for outlets;
- ◆ Arrange wiring in dwellings so that the electromagnetic radiation of wires negates, rather than augments electromagnetic fields; and
- ◆ Place outlets so that appliances with high EMF are not close to people for long periods, eg., a television set or microwave oven should not be near a bed even if located on the other side of a wall.

See also *Working Paper 12* for further information.

5.3 Telecommunications

With advances in computer technology, it is essential that dwellings be designed to accommodate equipment likely to be used by household members, including children. Mirvac-Fini has considerable experience in this regard in other sites in Perth, as well as interstate. Therefore:

- ◆ Check computer cable ducting requirements for precise specifications;
- ◆ Telephone/fax/modem: provide for at least one fax/modem or separate fax and modem;
- ◆ Provide the infrastructure to use two of the following simultaneously: telephone, fax and modem;
- ◆ Consider surge/earth leakage protection, especially in locations with an unreliable power supply;
- ◆ Provide opportunities for doorbells or buzzers to be heard in the gardens of ground-level units; and
- ◆ Provide two telephone outlets: one in the hall or kitchen and the other in the bedroom, to increase convenience and safety and allow for flexibility.

These matters are discussed in detail in *Working Paper 13*.

5.4 Television

As older and retired people tend to spend a great deal of time in the home environment attention to home entertainment needs is a critical requirement. Therefore:

- ◆ Locate television cable outlets in the livingroom and bedroom, well away from the bed to minimise electromagnetic radiation;

- ◆ Provide a television aerial jack in the family room in location where glare is minimised (see **Figure 21** and note glare);
- ◆ Provide additional double power points for video/stereo systems; and
- ◆ Determine whether a television and/or video is likely to also be located in the lounge room or one or more bedrooms and provide aerial jacks and double power points in these places.



Figure 21: Television jack placement in a living room

5.5 *Interior climate control: heating and cooling*

Older people are sensitive to draughts and temperature changes. Generally, they prefer warmer interior environments, as well as climatic settings. Some older people tend to be sedentary and may spend a considerable amount of time in their dwelling unit. They are particularly susceptible to respiratory ailments. Wheelchair users may perspire freely because of the energy necessary for daily tasks and experience discomfort if the air around them does not circulate freely. Therefore:

- ◆ Provide systems that are economical, safe, individually controlled, designed for environmental sustainability and ease of operation for non-physically dexterous people;
- ◆ Ensure that walls and ceilings are well insulated to reduce heat loss;
- ◆ Provide heating that provides sensations of warmth without raising ambient temperature levels;
- ◆ Select systems to be economical, safe, individually controlled and easy to operate, especially for those with mobility impairments;
- ◆ Select controls that do not require the user to bend or get dangerously close to heat sources;
- ◆ Select controls that are clearly visible, distinctly marked and be large enough to manipulate easily;

- ◆ Combine passive solar features and planting, deciduous trees and vines to the north, evergreens to the east and west, to admit winter sun and exclude summer sun;
- ◆ Select a heating system capable of maintaining a temperature of 24°C at a height of 150mm from the floor. At 750mm above floor level, the temperature variation should not exceed 2°C; and
- ◆ Select adequate insulation and a suitable construction system needed. Super-insulation reduces heating and cooling costs by 50 percent. It is more effective and easier and safer to install than fibreglass.

Draughts

- ◆ Every effort should be made to reduce draughts; and
- ◆ Take extra care in sealing and caulking windows and doors, but ensure cross-ventilation is possible. See also *Working Paper 12* for information on indoor air quality.

Safe heating systems

While heating is not always provided in Australia, it is necessary to determine in advance the form of heating to be used (or recommended for Burswood Lakes).

Therefore:

- ◆ If central heating is not provided, provide appropriate features so the dwelling is easy to heat;
- ◆ Ideally, install a heating system, at least for the main living areas;
- ◆ Especially for older people who are often slow at drying after a bath/shower and are prone to respiratory infections that may be irritated by cold bathrooms, select wall or ceiling-mounted heaters;
- ◆ Consider providing a ceiling-mounted supplementary source of radiant heat in bathrooms (see **Section 6.6**); and
- ◆ Enclose radiators and all heating pipes because many older people with a disability lose sensitivity of their skin to direct heat and may inadvertently suffer burns.

Economical room heating

Heaters using low Greenhouse-impact fuel should be installed or recommended. Natural gas and LPG heaters and electric heat pumps generate only about one-third of the Greenhouse gases per unit of heat as electric heaters such as radiators, oil-filled heaters and slab heating. Only energy-efficient heaters and air-conditioners should be used, consistent with the Mirvac-Fini ESD policy. Therefore:

- ◆ Ideally, ensure that living rooms (or part of them) are able to be closed off so they can be heated efficiently and economically;
- ◆ Where possible, enclose any stairways leading from a main livingroom;

- ◆ Provide adequate roof and wall insulation;
- ◆ Ensure that windows are well fitted to avoid draughts; and
- ◆ Provide an air lock or at least a small foyer area at the entry to block draughts from the front door (see **Section 3.4**).

Ease of operation

- ◆ Locate heating controls within easy reach of older residents;
- ◆ Do not locate controls near floors or skirting boards; and
- ◆ Select temperature gauges with oversized and raised numbering and lettering.

Solar water heating

In high-density housing, especially in high-rise blocks, careful attention to ESD principles can enable the provision of solar hot water to dwellings. Individual solar systems are generally more expensive to install, but they can pay for themselves in four to six years. To apply this principle to the high-rise units in the Burswood Lakes development requires a compete reconceptualisation of traditional high-rise residential building design. In concert with Mirvac Fini's established ESD policies, solar water heating could be considered for Burswood Lakes, or at least for the low-rise, high-density dwellings. Therefore:

- ◆ Install solar or gas water heating in preference to electrical wherever possible. Solar-gas heaters produce only about 10 percent of the emissions and gas heaters 30 percent of the emissions of electric heaters;
- ◆ Traditional hot water system designs use either direct-fired water heaters or fluid-to-fluid heat exchangers, both of which involve high stress to the equipment and are energy-inefficient. New heat-exchanger technology overcomes these problems by keeping the fresh water separate from the water providing the heat, which recirculates in a closed loop so that scaling and corrosion are eliminated. This system provides instant hot water in copious quantities;
- ◆ Install water-saving shower roses, as they save both water and fuel bills; and
- ◆ Ensure that adequate resident information is undertaken (via the proposed new residents' manual) so that residents are not confused about or misuse unfamiliar systems.

6.0 Location-specific guidelines for building interiors

This chapter addresses the requirements of specific spaces or rooms within a dwelling to be occupied by an older person.

6.1 *Entrance hallway*

In high-density configurations, dwellings often lack a sense of individuality and residents may feel as if they are living in a hotel. This is a major weakness of much recent high-rise housing in Sydney, for example. A small transitional space with a place for hats, coats, umbrellas and/or shoes is greatly appreciated (see **Figure 22**). This space is an important buffer between the private area of the dwelling and the outside world. Because of the nature and function of the entranceway as a thoroughfare, an appropriate floor covering should be durable, fast-drying and easily cleaned, e. g., tiling. The entranceway should be brightly lit during the day to assist eyes to adjust from either coming inside or going outside; and softly lit at night-time.



Figure 22: Small transitional space at the dwelling entry

AS1428 recommends 860mm width for entrance doors. There should also be provision for people in a wheelchair to be easily able to open the door. The preferred door pull pressure is 35kPa (55kPa is maximum) and there needs to be a space for the wheelchair to be manoeuvred so that the door can be opened or closed with ease (space 600 x 1200mm clear of door swings).

Features of transitional entry spaces

- ◆ A small transitional space to allow for door opening, wheelchair manoeuvring, unloading packages and outdoor dressing/ undressing;
- ◆ A buffer between the public outside world and the private domain of the house;
- ◆ Space for small table or permanent shelf;
- ◆ Space for a chair near the door; and
- ◆ Wall space to hang or display small objects.

Draught reduction

- ◆ Reduce draughts from outside via door; and
- ◆ Provide a vestibule or screen wall between entrance and livingroom.

Telephone

The foyer/hallway is a popular place for telephone calls. Therefore:

- ◆ Provide a telephone jack in the hallway; and
- ◆ Space for a table or permanent shelf.

Entry storage

- ◆ Provide a permanent storage for coats, shoes and umbrellas;
- ◆ Provide a temporary storage for guests' coats etc.; and
- ◆ Consider providing a small wardrobe or a space to mount wall hooks.

Entry floor covering

- ◆ Select covering for ease of maintenance in rainy climates; and
- ◆ Tiling may be appropriate.

Foyer lighting

- ◆ Ensure this space is brightly lit to assist eyes to adjust to light changes outside; and
- ◆ Entry foyer ceiling light: 100w minimum.

Direct route to the kitchen

- ◆ Provide a direct route to the kitchen for delivery of packages; and
- ◆ Ensure that it is not necessary to pass through the living area to get to the kitchen.

Direct route to living area

- ◆ The entry hall should lead directly to the main living space without passing through more private or 'backstage' areas.

6.2 Living rooms

Older people spend a great deal of time in their units and residents value sunny, comfortable living areas, which are convenient for entertaining. Looking out, reading, crafts and television watching are important activities. In a climate with cool winters, the ability to heat the living area efficiently in the evenings is highly valued. Therefore:

- ◆ Try to provide a large north-facing window; and
- ◆ Enclose the livingroom with doors to enable efficient heating.

Living room's relationship to other rooms

- ◆ Screen living and dining areas from kitchen, especially views of the kitchen sink;
- ◆ Minimise views of sleeping areas and bathroom; and
- ◆ Avoid circulation routes that lead directly through the living room and can divide spaces and make them unfurnishable.

Livingroom size and layout

Every livingroom must have at least one uninterrupted wall for a couch/lounge and two end tables. Therefore, consider the following requirements:

- ◆ Minimum area: 14.9m²;
- ◆ 3000mm absolute minimum wall length;
- ◆ Couch: 900mm x 2000mm;
- ◆ End tables: 450mm x 750mm;
- ◆ Ensure furniture does not 'float' in space; and
- ◆ Use walls and corners to define living areas so that furniture can be located in a conversational arrangement.

Conversational furniture groupings

- ◆ Living rooms must accommodate a lounge, or couch, two large chairs, with a specific space for a favourite 'easy' chair;
- ◆ Chair: 750mm x 900mm;
- ◆ Three metres is a good conversational distance between chairs;
- ◆ Provide views out from the easy chair;
- ◆ Relate furniture grouping to a glare-free television location; and
- ◆ Ensure it is easy to locate the easy chair near a window for views out.

Hobby corner

- ◆ An area should be set aside for sewing, crafts, piano etc.;
- ◆ This can accommodate a desk or small table: 600mm x 1050mm in a niche (see **Figure 23**); and
- ◆ Choose locations for a niche that maximise options and provide a place to display crafts.



Figure 23: Singing with dad at the piano requires adequate space

Telephone use

- ◆ Conversing on the telephone requires a comfortable spot, with a place for messages/telephone books;
- ◆ Locate a telephone outlet near an end table; and
- ◆ Provide a place for a favourite chair.

Lighting

Lighting is covered in detail in a separate section; see **Section 5.1**. With respect to living rooms:

- ◆ Use other freestanding lights to control light intensity for a variety of activities to augment wall or ceiling-mounted lighting: television, sewing, reading and crafts;
- ◆ Permanent wall fixture: 1730mm - 1830mm from floor with two globes: one pointing up to reflect light from ceiling and one pointing down;

- ◆ Power point for freestanding lamp to augment lighting in craft/sewing area; and
- ◆ Dimmer control on main wall switch.¹¹

6.3 Kitchens

Fear of accidents or forgetfulness in the kitchen is a concern of many older people. As many accidents occur in the kitchen, ease of use and safety are the main objectives. Therefore:

Kitchen location

- ◆ Locate the kitchen on the outside wall with a view if possible and to accommodate some residents' preferences for barbecuing and cooking on the balcony;
- ◆ Provide a window with a view from the work area;
- ◆ Provide direct access from main entry, the path should not pass through other areas to get to kitchen; and
- ◆ Ensure that the traffic flow from other parts of the dwelling does not traverse the kitchen work space.

Relationship to eating area

The kitchen should double as a socialising space. Therefore:

- ◆ Provide a small eating area in kitchen for breakfast or light meals, which is directly accessible to the dining area if that is located outside the kitchen.
- ◆ Provide space for small table, minimum 610mm x 610mm; and
- ◆ Consider a hatch linking the kitchen benchtop directly with the dining table.

Kitchen size and wheelchair users

Extra circulation space is needed if wheelchair users are to be accommodated. Therefore, some dwellings could be specifically designed for wheelchair users. A moveable system that provides for different working surface heights could be considered.

¹¹ There are potential health hazards with dimmer switches and they should be used with caution (see *Working Paper 13*).

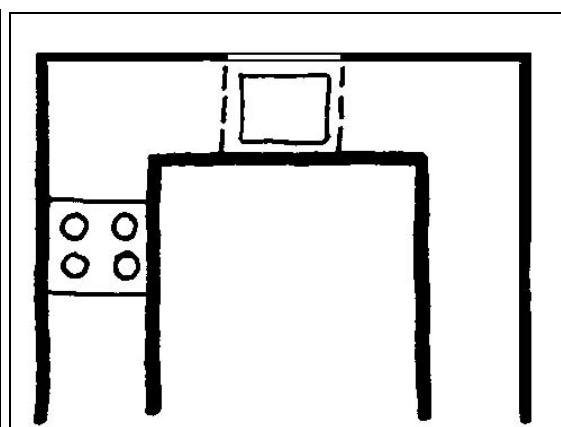
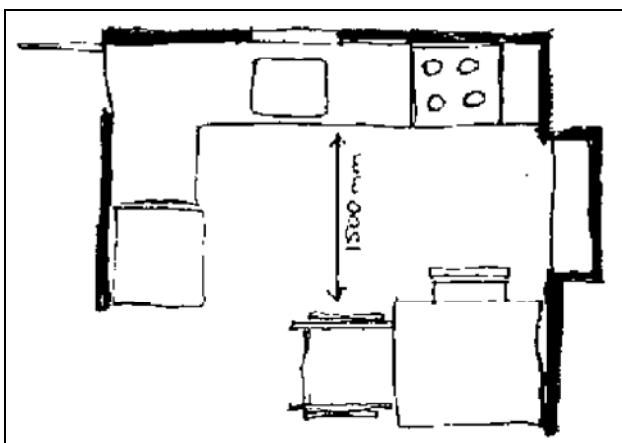
Kitchen size in general

The kitchen should accommodate use by two persons. Therefore:

- ◆ In a smaller two-bedroom unit, make it large enough to include some dining space;
- ◆ An extension of the counter could serve this function; and
- ◆ Space between cabinets or appliances opposite each other should allow for convenient use.

Kitchen layout

- ◆ The work area should form a triangular pathway between the sink, stove and fridge, to reduce the number of steps required and provide greater safety in the event of a fall. Therefore, select either U-shape or L-shape configurations:
 - ◆ **U-Shaped:** concentrates work areas and equipment: it is easy to move utensils from one surface. Disadvantage: lower counter storage at corners inaccessible; difficult to provide pantry (see **Figure 25**);
 - ◆ **L-shaped:** provides convenient access, concentrated work functions; only one internal corner. Pantry can be included and internal corner can be opened to adjoining room. If an L-shaped kitchen design is used, provide an open internal corner under the kitchen counter to the dining room for use as a storage cupboard (see **Figure 24**).
- ◆ Avoid 'in-line' kitchen designs; and
- ◆ Avoid open-ended corridor galleys.



Pantry

A thoughtful pantry design (see **Figure 26**) is a much-appreciated feature. Therefore:

- ◆ Provide full-height pantry cupboards with adjustable shelving and bi-fold or swing door but not sliding doors;

- ◆ Avoid overhead cupboards; and
- ◆ Specify narrow shelves on the inside face of pantry doors for ready access.

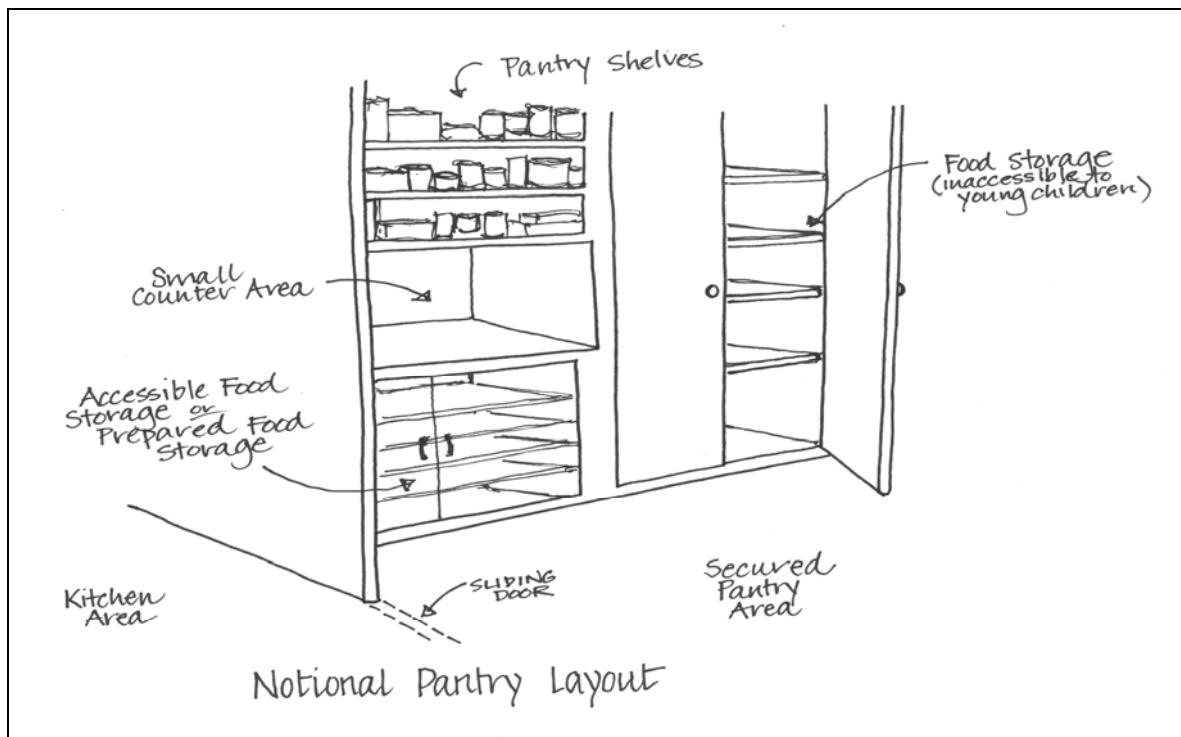


Figure 26: Thoughtful design of a kitchen pantry

Bench-top

Safety of use is primary aim of bench-top design. Therefore:

- ◆ Kitchen counters (bench-tops) should be continuous, at a uniform height and level with the stovetop.
- ◆ Heat-resistant surfaces adjacent to stove on two sides large enough to fit a frypan or large saucepan on each side;
- ◆ Splash-back at rear of bench-top;
- ◆ Front edge: raised lip to contain spillage and provide finger-hold for wheelchair user;
- ◆ Trim free of sharp edges;
- ◆ Easy-to-clean material;
- ◆ Ceramic tile covering; and
- ◆ Sturdy towel rail to counter if raised lip is not provided. (This could act as a grab bar in an emergency.)

Benchtops dimensions

- ◆ Height: 900mm - 915mm, but 850mm if residents use wheelchairs;
- ◆ Depth: without cabinets above: 760mm with cabinets 610mm;
- ◆ Knee space under counter at sink: 660mm high, 750mm deep; width 900mm; and

- ◆ Pull-out chopping boards or lapboards: 750mm height. If two or more are provided, one could have a hole 200mm in diameter to hold a mixing bowl.

Cupboards

- ◆ Maximum height: 1600mm above floor;
- ◆ Minimum height: 380mm above floor; and
- ◆ Separate tall broom cupboard for mop, broom, bucket, vacuum cleaner, etc.

Cupboard hardware

- ◆ Fairly large, easy to grasp handles with non-institutional appearance;
- ◆ Levers or bar-type handles with large handles; and
- ◆ Space between handle and drawer face: 40mm, minimum length 100mm.

Cupboard doors

- ◆ Ease of use and safety are major concern and sliding doors are safer than normal swing doors but are less efficient.

Cupboards and cabinets: wheelchair access

- ◆ Recessed toe space under all base cabinets: 220mm high, 150mm deep for wheelchair accessibility.

Overhead cupboards

Overhead cupboards, while useful for storage, are a source of accidents by older people and are completely useless for wheelchair users. They should be within reach of lower fifth percentile of population. Therefore:

- ◆ Avoid overhead kitchen cupboards above 1250mm - 1350mm;
- ◆ Do not place cupboards over a stove;
- ◆ Enclose the space between top of a cupboard and the ceiling to discourage use for storage;
- ◆ Narrow shelves mounted on back of a cupboard are very useful;
- ◆ Avoid cupboards over a fridge or sink;
- ◆ Depth of shelves: approximately 300mm; and
- ◆ Swing doors on overhead cupboards should be as narrow as possible to avoid projecting beyond the counter top.

Drawers, storage and shelving

Fixed shelves are almost totally inaccessible to a wheelchair user. Adjustable shelving is the most suitable. Therefore:

- ◆ Shelf height: should not exceed maximum height of 1600mm and minimum of 375mm from floor (see **Figure 27**);
- ◆ Shelf widths: approximately 300mm;
- ◆ Drawers on roller guides;
- ◆ Below-counter storage units on casters can be pulled out completely for knee space;
- ◆ Extra storage space for a wheeled trolley;
- ◆ Revolving shelf in corner cupboards; and
- ◆ Access to corner cupboard from adjoining room.

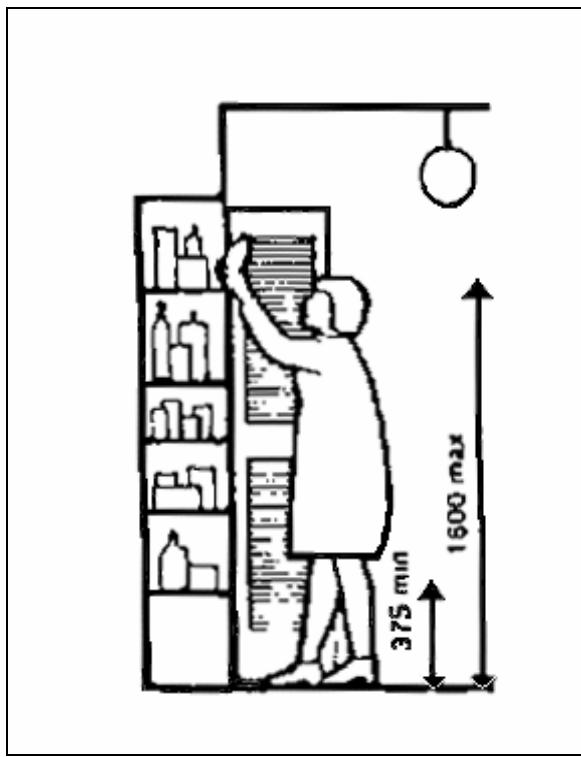


Figure 27: Accessible kitchen cupboards

Sink unit

- ◆ Sink should be stainless steel with a double bowl;
- ◆ Locate sink so that a seated person can use it in comfort (see **Figure 28**);
- ◆ Depth: 125mm - 150mm;
- ◆ 250mm open shelf under sink at height of 380mm from floor; and
- ◆ 100 watt light over sink.

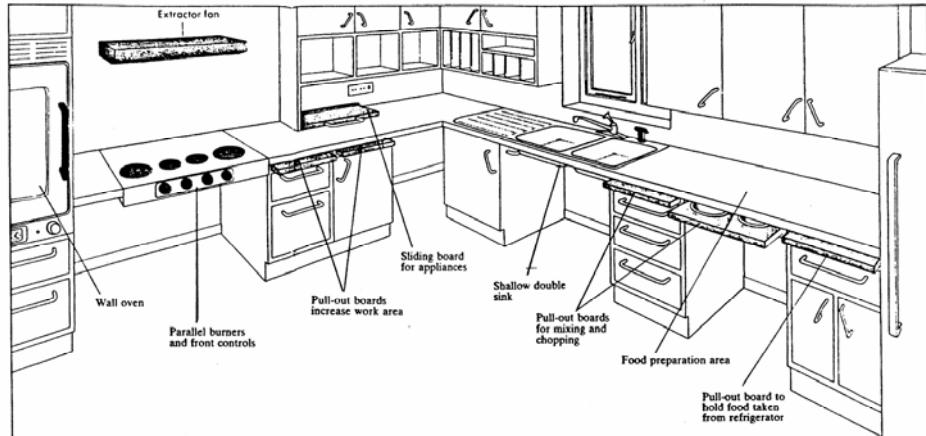


Figure 28: Accessible kitchen sink

Sink taps

Older people and others with arthritic hands find the simple task of turning a tap painful, often impossible. Therefore:

- ◆ Taps that provide maximum leverage and do not require a strong grip are essential; and
- ◆ Taps with large lever handles are best (see **Section 4.11**).

Lighting

Older people need much more light than younger people, particularly to work by. Kitchens which rely on 'borrowed light' may result in older residents cooking in poor light and inadvertently causing accidents. Where possible, locate the kitchen as close as possible to natural light and ventilation. Shadows cast on working areas in a kitchen can be a safety hazard. Therefore:

- ◆ Rely on natural light as much as possible;
- ◆ Avoid a single ceiling light;
- ◆ Provide at least one other fixture, preferably mounted on wall to cast light directly on sink, stove, counter;
- ◆ Specify 150w generally; and
- ◆ Specify 100w over sinks.

Appliances and equipment

Ease of use must be balanced against cost factors. Generally, standard appliances are adequate.

Stove

Although the stove is a potential source of danger, careful design can eliminate most hazards and prevent accidents caused by impaired vision, lack of strength or forgetfulness. Therefore:

- ◆ Controls should be identifiable by both sight and touch;
- ◆ High-mounted ovens are best;
- ◆ Gas ovens should possibly be avoided, as sense of smell often diminishes with age and lighting ovens may require stooping and manual dexterity with both hands;
- ◆ Ensure that cook-top is level with bench-top;
- ◆ Burner controls at front or side;
- ◆ Side-hung oven door reduces possibility of burns;
- ◆ Light over stove;
- ◆ Locate away from windows to reduce danger of setting curtains on fire; and
- ◆ Large heat-resistant surfaces on either side of the stove to put hot items in emergencies.

Select a stove with some or all of these additional safety features:

- ◆ Large, easily turned knobs;
- ◆ Light indicators;
- ◆ Raised markings (calibrations);
- ◆ Stove with timer may aid forgetful users;
- ◆ Wall-mounted oven reduces bending and stooping; and
- ◆ For wheelchair users, an adjustable, removable mirror may be fixed on the wall above the stove to allow wheelchair user to see into pans on top burners without removing them.

Microwave ovens

A space for a microwave oven that is easily accessible by people of short stature is much appreciated. A shelf 1300mm above floor height allows the user to see into the oven before removing the food, thus reducing the chance of accidents.

Refrigerator

- ◆ A standard model refrigerator with top or side-hung freezer door is acceptable;
- ◆ Side-by-side freezers and refrigerator doors are most convenient;
- ◆ Under-counter units are unsuitable, as difficult stooping is involved; and
- ◆ Energy-efficiency factors need to be taken into consideration, consistent with Mirvac-Fini's ESD policies.

Dishwasher

- ◆ Controls close to the front of the dishwasher make it easier for older people to operate; and
- ◆ Attention to energy-efficiency issues is essential (see above regarding ESD policies).

Garbage disposal

- ◆ Garbage disposal units are generally regarded as environmentally unacceptable. A composting system is recommended instead (see **Section 3.2**).

6.4 Dining areas

Entertaining over meals is highly valued by older people. Therefore:

- ◆ The dining area may be part of the livingroom, with little modification except space to 'park' a wheelchair in dwellings for wheelchair users and an increase in floor space for wheelchair use; and
- ◆ Privacy from the kitchen 'mess' is important, especially in small dwellings.

Size of dining area

The dimensions of the dining area are critical for resident satisfaction. Therefore, especially in smaller dwellings:

- ◆ Consider a table to fit against a wall when not in use;
- ◆ Accommodate a dining table to seat six to eight people when the table is opened up;
- ◆ One wall at least 2440mm and another wall at least 1070mm;
- ◆ Clearance of 900mm between walls and furniture;
- ◆ Overall size: not less than 9m²;
- ◆ Area 750mm x 1200mm for space occupied by a wheelchair at the table; and
- ◆ Uninterrupted wall area for a china cabinet near table.

Relationship of the dining area to other rooms

- ◆ A short, direct walk between dining and food preparation area is essential;
- ◆ A hatch linking dining room and kitchen can be useful; and
- ◆ Avoid level changes and turns.

Three design alternatives are possible:

- ◆ Eat-in kitchen;
- ◆ Pass-through counter; and
- ◆ L-shaped dining room.

Views out from the dining area

- ◆ Provide lower windows near the dining table for ventilation, light and views from seated positions at the dining table.

Dining area lighting

This room or space often doubles as a work and/or craft space. Therefore:

- ◆ Provide variable lighting;
- ◆ Provide an adjustable ceiling fixture that can be lowered for close work and changing globes;
- ◆ 200 watts with two globes; and
- ◆ A dimmer (see concerns expressed about dimmers above and in the health risks of dimmers in *Working Paper 12*).

6.5 Bedrooms

Regardless of independence level, older people occupy the bed for almost 40 percent of the total day for a range of activities. The bedroom should, therefore, accommodate all the activities associated with sleeping, dressing, access to toilet and bath, reading, snacking, napping, resting, sitting in bed, illness and impairment, medical treatment, having visitors and lovemaking, as well as other activities taking place in and around the bed. Therefore:

- ◆ The bedroom should be generous in size to allow for use and possible storage of a wheelchair;
- ◆ Provide direct and convenient access to the bathroom;
- ◆ Allow good views out from the bed (this requires careful attention to window height and placement); and
- ◆ Provide space for equipment controls for those likely to be confined to bed for extended periods.

Bedroom privacy

- ◆ Avoid direct views from the entry and livingroom; and
- ◆ Ensure that all areas used for sleeping are separated from living areas by a door.

Bathroom access

- ◆ Guests should not have to pass through any sleeping and dressing areas to reach the bathroom.

Bedroom location

- ◆ Provide a safe and direct route to the bath/toilet from the bedroom;
- ◆ Provide bathroom access from the hallway or entry without going through the living area; and
- ◆ Ensure that one does not have to turn corners when moving from the bedroom to the bathroom and toilet.

Bedroom size

- ◆ All units should accommodate one double bed or twin beds;
- ◆ Double bed size: approximately 2000mm x 1350mm;
- ◆ Single bed size: approximately 2000mm x 1000mm;
- ◆ Minimum area: 11m² to 15m²;
- ◆ One wall at least 3500mm; and
- ◆ Another wall at least 1070mm.

Beds against a windowless wall

- ◆ Design the bedroom layout so that beds are against a windowless wall, not under a window; and
- ◆ Design two-bedroom dwellings for possible conversion to one-bedroom dwelling with a studio (see *Working Paper 13*).

Bedroom windows

- ◆ Bedroom windows should be high enough to accommodate predictable furniture under them;
- ◆ Locate one window low enough to allow views out by a person seated or lying in bed (750mm) (see **Figure 13**); and
- ◆ Ensure that privacy is protected from those passing by windows.

Bedside tables

- ◆ Provide space beside each bed for a bedside table; and
- ◆ Place a power point, light switch and telephone jack on a windowless wall where tables are to be located.

Bedroom lighting

- ◆ Provide outlets for a variety of lamps and fixtures, including dresser lights and bed lights.

Bed making and dressing

- ◆ Provide access to the bed from three sides to facilitate bed making;
- ◆ Higher beds are more accessible: 510mm from floor to top of the bedding level allows for dressing without assistance, as well as getting in and out of the bed; and
- ◆ Ensure that no bed has to be placed in a corner.

Bedroom storage

- ◆ Locate a space for a dresser near the wardrobe;
- ◆ Provide adequate floor and wall circulation area near the wardrobe area;
- ◆ Allow space for a fairly large freestanding wardrobe;
- ◆ If including built-in wardrobes, use an 'intelligent' design (see **Figure 29**); and
- ◆ Allow a kneehole space for sitting at dressing table or counter.



Figure 29: Bedroom storage

Bedroom ventilation

- ◆ Allow for cross-ventilation which can be easily controlled; and
- ◆ Do not provide sliding glass doors to bedrooms as they create draughts that are difficult to control (see **Section 4.3** and **Section 5.5**).

Bedroom television watching

Television watching from bed or seated (and with visitors) is a popular pastime of older people, particularly during times of illness. Therefore:

- ◆ Locate the television antenna connection on a wall opposite the bed where it will not receive glare from a window; and
- ◆ Design the room layout to accept a television and chair, as well as regular bedroom furniture, to accommodate more than one person watching television.

6.6 Bathrooms

Bath-related casualties are the second highest cause of home accidents among people 65 and over. Conventional bathroom design can present many hazards: older persons may slip easily on the hard, smooth surfaces of bathtub or floor. Most common problems are impeded access, lack of manoeuvring space, and absence of grab bars.

The ideal bathroom is, sadly, rare. These guidelines reflect a bias in favour of access for people with mobility impairments, as experience has shown that they are particularly disadvantaged in using kitchens and bathrooms. Note that bathrooms are commonly used at night. Therefore:

- ◆ The bathroom(s) should provide reasonable conditions of comfort, safety and convenience without looking institutional;
- ◆ It should be designed to accommodate failing eyesight and physical stability;
- ◆ In some dwellings, complete wheelchair access to bathrooms should be provided;
- ◆ As a minimum, toilets on ground floors of all units should be accessible, to allow people with a disability to visit comfortably ('visability');
- ◆ The ideal wheelchair bathroom would have a door at least 800mm wide that swings outwards or slides;
- ◆ The clear floor space would be at least 1500m x 1500m;
- ◆ The toilet should be of a height for convenient transfer with handrails placed nearby as needed;
- ◆ A sink would be high enough to clear the wheelchair arms so that the chair could be rolled under it: it should have single-lever water controls and insulated water pipes;
- ◆ The bath should have a built-in transfer area, suitable handrails or a lift that could be used independently;
- ◆ The shower recess should be free of kerbs and have at least 1000mm of clear interior space with a folding seat at wheelchair height, and a single-lever water control within easy reach;
- ◆ The medicine cabinet and the mirrors should be at convenient accessible heights for a person in a wheelchair;
- ◆ There should be adequate and accessible storage;

- ◆ The floor should be slip-proof with an alarm system easy to reach from bath, shower and toilet;
- ◆ The ideal bathroom for someone who is ambulant, on the other hand, would have some different features. Whereas someone who is using a wheelchair requires a lot of space, a person with a disability who is ambulant often prefers a narrow room so that the solid fittings or the walls are within easy reach to provide stability when moving about; and
- ◆ The requirements of AS1428 should be applied in all cases.

Bathroom location

- ◆ Ensure a direct, unobstructed route from bedroom (especially for wheelchair users);
- ◆ Not in plain view of other living areas; and
- ◆ For ventilation, avoid 'interior' bathrooms where possible, that is, a bathroom without a wall extending to the dwelling boundary.

Bathroom size

- ◆ A slight increase in normal dimensions will make the bathroom useable by a wheelchair user;
- ◆ Approximate dimensions: 2250mm - 2350mm x 2000mm; and
- ◆ Allow sufficient space for a washing machine and clothes drier if a separate laundry space is not provided.

Bathroom layout

- ◆ Design the bathroom so that a person can pass through the door, manoeuvre beside or in front of the toilet, beside bathtub or shower and in front of washbasin;
- ◆ Some of the extra space may be used to store a toilet chair or for lateral transfer from wheelchair to toilet; and
- ◆ There is a great deal of potential in a modular approach to bathroom design where fixtures are part of the overall wall/floor structure.

Bathroom door

- ◆ Specify either pocket or sliding doors with a clear opening or hinged doors opening outwards;
- ◆ Sliding door: 760mm minimum clear opening;
- ◆ If locked: lock must operate from outside; and
- ◆ Hinged door: 810mm opening.

Toilet fixture and location

The toilet must be easy to use, as age and disability often result in frequent toilet visits. Because of the different needs of ambulatory and non-ambulatory users, two different designs should be available or modifications should be able to be made to an existing flexible unit. Therefore:

- ◆ Most convenient toilet fixture: wall-hung type with elongated bowl, which allows closer approach in a wheelchair;
- ◆ Open front for ease of access;
- ◆ Standard low toilet, seats (380mm - 430mm) are very difficult for people with arthritic knees to use, as the leverage for regaining a standing position puts pressure on the knees. The highest seat available commercially is recommended, ideally 430mm - 510mm above the floor.
- ◆ Provide a choice of lateral or front wheelchair access;
- ◆ Avoid concealed cisterns or close-coupled pans that do not allow enough depth for a wheelchair alongside or a commode over;
- ◆ Space in front: 1050mm; and
- ◆ Toilet paper dispenser beside toilet: 250mm in front of seat edge.

Toilet grab bars

- ◆ These need not look 'institutional'. Beautiful designs are available;
- ◆ Grab bars behind and on one side of toilet are necessary;
- ◆ See details on bathroom grab bars below;
- ◆ Non-institutional appearance; and
- ◆ All towel rails should be sturdy enough to double as grab bars.

Grab bars

Grab bars are necessary to help older people use the bathtub and toilet safely and conveniently. The number and location of grab bars will vary according to the arrangement of equipment. Therefore:

- ◆ Select grab bars to create a non-institutional appearance;
- ◆ Accurate location will ensure safe bathroom/toilet use;
- ◆ Provide three grab bars for bath/shower and one for toilet;
- ◆ Securely mounted to withstand 2kN pull;
- ◆ Smooth rounded edges;
- ◆ All towel rails to double as grab bars in case of slipping;
- ◆ Vertical bar (600mm) near tub/shower to aid stepping out;
- ◆ Second bar angled or 'L' shape a back wall over tub (to assist rising from sitting to standing position);
- ◆ Third bar mounted horizontally opposite taps also desirable; and
- ◆ Larger grab bar mounted diagonally beside the toilet.

Bathtub: general issues

While the bathtub is a source of potential danger, many older people and people with a disability enjoy soaking, especially for arthritic limbs. Ease of access and safety are critical factors. Many older people and people with a disability prefer a shower for access and hygiene reasons.

Bathtub selection

- ◆ Non-slip bottom is essential;
- ◆ 400mm rim;
- ◆ Flat tub bottom;
- ◆ Safety glazing and tempered glass for all enclosures and doors; and
- ◆ Tub could be raised 100mm above floor to aid a person who needs assistance with bathing. (Steps to climb up would be needed for people with mobility limitations.)

Bathtub fixtures

- ◆ Taps and drain controls should be easily accessible from a soaking position in the tub;
- ◆ Position all controls for minimum stooping 760mm - 1020mm above bottom inside surface of tub;
- ◆ Shower: hand-held, flexible cable-hose;
- ◆ Shower curtain rods should be of heavier-than-normal construction to withstand pulling in the case of an accident;
- ◆ Consider providing a small extendable clothes line in the shower recess and over the bath;
- ◆ Lever type tap handles with 1/4 turn action and ceramic washers.
- ◆ Controls clearly readable by those with a vision impairment;
- ◆ Consider fixtures mounted on a vertical 900mm long sliding rail set on a sliding mount;
- ◆ Do not use sliding shower doors;
- ◆ Provide two soap dishes: recessed; one accessible from sitting or standing position (1020mm - 1170mm above floor) and the other (c1200mm high) for standing use, soap dishes should be securely installed to double as a grab bar;
- ◆ May need to locate taps at the end of tub, as many people cannot reach across the tub; and
- ◆ Ensure that the drain control and tap spout are not located where the bather sits.

Shower design

Many older people prefer a shower to a bathtub. It is easier to clean and can be used by a wheelchair user. Also, showers are generally considered safer, as there is no change in body position from standing to sitting and no stress in awkward positions transferred through arms and legs. Therefore:

- ◆ The ideal shower is built-in, larger than a standard one and has no threshold; and
- ◆ The floor is gently sloped towards the drain.

Shower fixtures

- ◆ Hand-held telephone-type shower fixture;
- ◆ Bath spigot for testing temperature;
- ◆ All taps lever-type; and
- ◆ Consider a shower fixture mounted on a sliding rail for use when sitting or standing. Shower controls placed at the edge of the shower prevent people being burnt.

Washbasin design

Many older people have difficulty bending over and prefer a higher wash basin.

Therefore:

- ◆ Recommended rim height: 840mm - 900mm from floor (900mm for someone who is ambulant and about 130mm lower for someone who is a wheelchair user);
- ◆ When a sink is used by both ambulant people and people using wheelchairs, a good compromise is about 800mm;
- ◆ To permit close access for a wheelchair, it is best if the sink is wall-hung and does not have a pedestal. Sometimes it is necessary to set the sink out from the wall to allow room for wheelchair footrests. A wide wall-hung sink with two front legs or a sink built into a counter top provide space on which to lean and to keep toilet items;
- ◆ The pipes under the sink should be covered with a suitable insulating material;
- ◆ The vanity unit should have drawers that cannot fall out;
- ◆ Space underneath: 660mm wide and 750mm high; and
- ◆ All taps should be lever-type with 1/4 turn action and ceramic washers.

Special design requirements apply for wheelchair users:

- ◆ Shallow front apron;
- ◆ Extended waste pipe with trap located close to rear wall;
- ◆ Possibly a cantilevered basin set out at least 150mm from wall to bring bowl closer to user (edge load of 1kN.); mounted 850mm from floor;

- ◆ If near the toilet, the counter can provide support for toilet user; and
- ◆ Under-counter storage would have to be removed for wheelchair use.

Bathroom storage

- ◆ The conventional medicine cabinet set above the washbasin is not easily accessible to some people of low stature or people with a disability;
- ◆ If other cabinet space can be provided, an adjustable mirror should replace the medicine cabinet; and
- ◆ Height of lowest shelf: approximately 1450mm from floor.

Mirror

- ◆ Separate mirror above sink;
- ◆ Mirror lower edge maximum: 1000mm - 1390mm height;
- ◆ The sink, mirror and storage configuration should receive more attention than it has. Mirrors should be placed lower to the surface of the sink and possibly hinged or canted outward so that wheelchair users are able to see themselves with little difficulty;
- ◆ The sink should be shallow draft and the waste pipes, as well as the hot water feed-pipe, should be shrouded to prevent burns to the legs of wheelchair users; and
- ◆ Control devices should be easy to grasp and easy to use by people with very little strength in their hands.

Bathroom Cabinet

- ◆ Top shelf of cabinet: not higher than 1500mm above floor;
- ◆ Sliding doors with handles that are easy to use;
- ◆ Recessed in wall;
- ◆ No glass shelving: use timber or plastic; and
- ◆ Consider locating the medicine cabinet in the kitchen.

Bathroom floors

- ◆ Floors should maintain non-slippery qualities when wet. People using canes and crutches are particularly susceptible to accidents on slippery surfaces;
- ◆ Small unglazed ceramic tiles with square (not rounded) edges recommended;
- ◆ Avoid terrazzo or smooth vinyl flooring; and
- ◆ Select flooring that does not need to be waxed for ease of maintenance.

Bathroom lighting

Night use of bathroom requires even lighting in the connecting hallway and bathroom. See **Figure 30** for an example of a lighting hazard implemented by an elderly resident as a result of their lighting needs not being met. Therefore:

- ◆ One light is generally insufficient; two lights are preferred;
- ◆ Direct light over sink;
- ◆ Vapour-proof light over tub/shower;
- ◆ Overhead light: 150w; and
- ◆ Separate bathroom lighting and fan switches.



Figure 30: The elderly resident who installed this extra lamp seriously compromised bathroom safety

Bathroom ventilation

As many older people hang small items of personal laundry to dry in the bathroom, natural light and ventilation are recommended. Therefore, in dwellings where this is possible:

- ◆ Provide an easy-to-operate window;
- ◆ Select a location which receives some sun; and
- ◆ Skylights may be appropriate in low-crime areas.

Bathroom heating

Because bathroom/toilet use for older people or people with a disability may be time-consuming, a safe heating source should be provided. Accidents can easily occur if unauthorised electric space heaters are used in bathrooms. Therefore:

- ◆ Ensure that heating may potentially be independent of the bathroom light;

- ◆ Located over tub, if provided; otherwise central location; and
- ◆ Ceiling-mounted heat-light with a timer.

6.7 Toilet location

The arrangement of the toilet within the general shower and basin area is common in residential dwelling design and allows space for a wheelchair to be manoeuvred.

For other toilet guidelines see **Section 6.6**, above.

6.8 Laundries

The modern idea of laundry facilities in a cupboard is acceptable in the bathroom or a backstage circulation space, but not in the kitchen. The 'cupboard' needs enough space for the equipment and some soiled clothes storage and clothes-sorting space. In smaller dwellings, it is critical that the laundry be designed with care, as laundries are often the source of resident dissatisfaction. Therefore, the following guidelines address laundry design and location:

- ◆ Consider providing sliding doors to create a larger laundry work space;
- ◆ Provide efficient extraction fans with a low noise level. If condenser driers are installed, a less powerful fan may suffice;
- ◆ In top-floor apartments, consider skylights as an option for laundry ventilation and lighting;
- ◆ If ironing is to be done in the laundry, provide space to store and use an ironing board, to store iron and unironed clothes, and to put items as they are ironed;
- ◆ If general sewing repairs will be carried out in the laundry, provide space for storage and use of a sewing machine, sewing materials and a table;
- ◆ Where tumble-driers are used, provide either ducting or efficient, but quiet, extraction fans;
- ◆ Provide a drip-dry hanging facility over the laundry trough for items that cannot be spin or tumble-dried. A clothes-horse for indoor drying, or for airing may be needed;
- ◆ To improve efficiency, consider locating the laundry and kitchen (the main working areas in a dwelling) adjacent to each other; and
- ◆ Consider providing a counter space with nothing underneath it, to permit sitting at it while doing chores, eg., sorting/mending clothes, as well as storage for a stool.

Washing machines

- ◆ Specify front-load washing machines where possible, as they use less water and electricity, tend to be quieter, are gentler, and spin faster and drier than top-load models. While they are more expensive than the top-loading

type, they require less physical effort, especially if placed on a shelf to eliminate the need for bending;

- ◆ Design the area below the shelf to contain storage facilities, and/or provide a hinged shelf for sorting and folding laundry;
- ◆ For ease of operation, where possible, select machines with push-button or pad controls, common on front-load machines;
- ◆ Front-load, combination washer-driers are not recommended, as they have limitations: many models lack the capacity to dry a full wash-load. This increases energy costs; and
- ◆ Apply Mirvac-Fini's existing ESD policies here.

Clothes driers

Do not attach the clothes drier to the wall above the washing machine. Often this is too high for easy access for women and people of low stature. Fixing the drier at an accessible height often results in the launderer banging their head on it while loading or unloading the washing machine. Therefore:

- ◆ Consider placing the drier on top of, or beside, a front-load machine;
- ◆ Locating machines on a shelf greatly improves access for use, maintenance and cleaning;
- ◆ Where possible, specify models with the filter inside the door, as they are easiest to clean;
- ◆ Provide adequate ventilation to deal with: condensation created by tumble-driers: dampness and discomfort, mould and the necessity of more frequent cleaning or redecorating;
- ◆ Ideally, provide ducting from the laundry for exhaust from tumble-driers. Where this is not possible, use a powerful extractor fan. During extreme humidity, or when several loads are dried consecutively, extractor fans may be ineffective. One possible disadvantage is uncomfortably high noise levels, when combined with tumble-drier and/or washing machine noise; and
- ◆ Consider providing condenser-driers, which collect within the machine water extracted from washing. They have many advantages: an open window can maintain a comfortable laundry environment while the condenser-drier is operating, even during hot and/or wet weather. In a small laundry, especially one with no window, an extractor fan may be needed. Where the drier is in use for long periods (for drying several consecutive loads or during wet weather), heat and moisture will have to be extracted. While these driers are considerably more expensive than tumble types, ducting may not be required.

Recommended storage and shelving

Ensure that the following needs are accommodated:

- ◆ A shelf for sorting dirty washing, and to sort and fold clean laundry;
- ◆ Space for a laundry basket or other storage for dirty washing;

- ◆ An appropriate facility for soaking or storing soiled or smelly items (eg., babies' nappies, soiled clothing and bed linen of small children, or muddy, sweaty sports clothes) prior to laundering;
- ◆ Separate power points for iron, washing machine and drier, so that ironing may be done while either or both machines are in use;
- ◆ A laundry trough for hand-washing - many garments carry 'hand wash only' labels;
- ◆ A clothes-horse for indoor drying or airing;
- ◆ Indoor drying space for clothes which cannot be tumble-dried, or must be dried in shade;
- ◆ An outdoor drying facility, clothes hoist or line, where possible. While outdoor drying is not always an option, it does provide health and hygiene benefits;
- ◆ Storage cupboards for cleaning equipment and materials, including brooms, mops, buckets, vacuum cleaners, if no other 'broom closet' storage space is provided; and
- ◆ Space for drying wet shoes, umbrellas and street clothes.

Other laundry design factors

- ◆ Provide hanging rails or space for free-standing hangers so damp ironing can be aired during rainy seasons and times of high humidity;
- ◆ Consider providing a counter space with nothing underneath it, to permit sitting at it while doing chores, eg., sorting/mending clothes, as well as storage for a stool;
- ◆ High entertaining levels require either a large supply of table linen (for which adequate storage is needed), or the frequent laundering of a smaller supply; and
- ◆ Commercial machines are not recommended, as they are more expensive, tend to be larger, require more space, and are noisier than domestic models.

6.9 Balconies

Balconies significantly contribute to liveability and a sense of place. They provide a socialising space that is a physical extension of the living area in higher-density housing. They also provide opportunities for less able people to enjoy the outdoors and watch activity from a comfortable and secure place readily accessible from the dwelling. The balcony provides the essential immediate link with the outdoors. It offers a welcome change of air, a chance to see activity, a place to grow flowers and enjoy the sun. It may also serve as a fire escape route. When location, accessibility and dimensions are appropriate, balconies will be well used (see **Figure 31**) when not, they will be used inappropriately (see **Figure 34**).

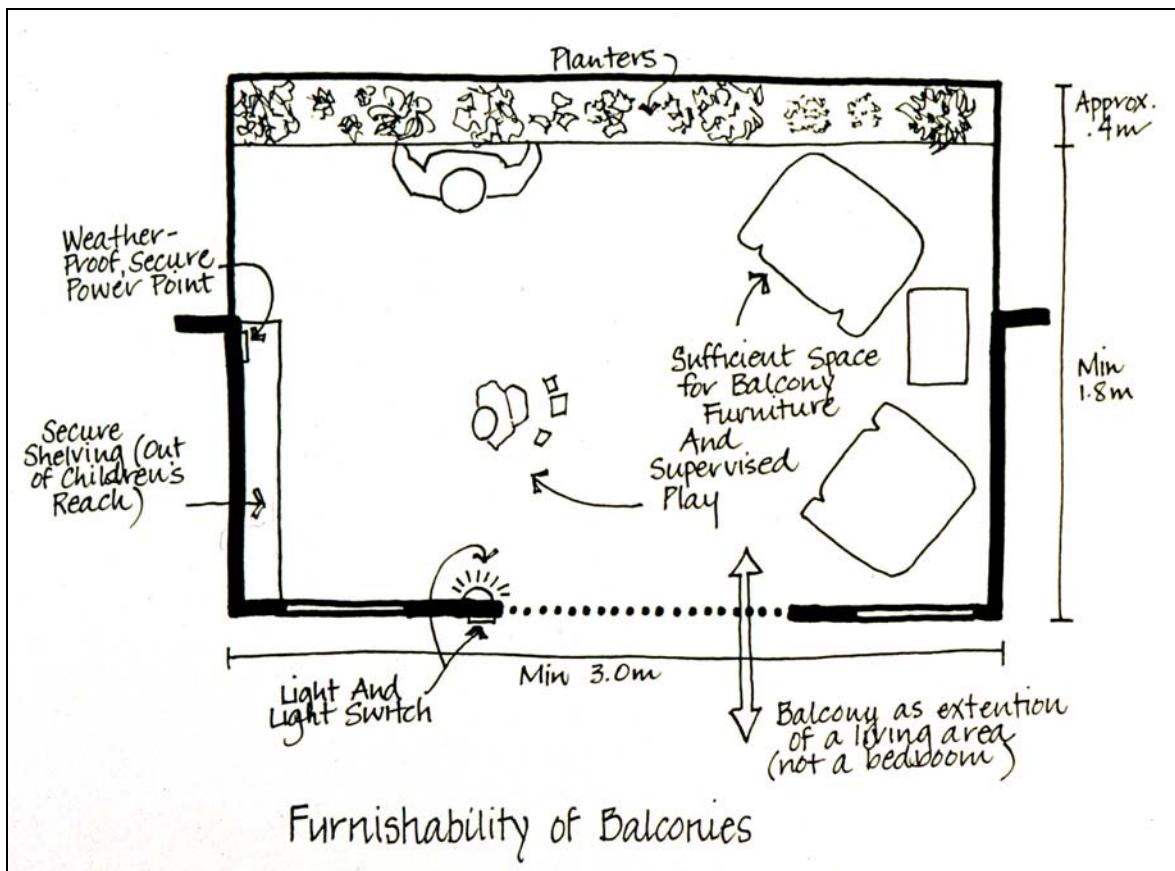


Figure 31: Balcony and furnishability: an extension of the living area

Therefore:

- ◆ All upper storey units should have private balconies if ground-floor patios are not provided;
- ◆ Provide opportunities for less physically able people to enjoy the outdoors and watch activity from a comfortable and secure place readily accessible from the unit;
- ◆ Design balconies for maximum sun penetration to encourage year-round use;
- ◆ Provide opportunities for personalisation;
- ◆ Provide a socialising space that is a physical extension of the living area (see **Figure 31**); and
- ◆ Ensure that it is useable, i.e., large enough, safe and psychologically secure.

Seeing the ground

Residents of upper storey units are essentially cut off from the ground if a balcony blocks views of the ground from the livingroom. It is necessary to have at least one window from which they can see the ground. Therefore:

- ◆ Place the balcony in front of the bedroom window but with a door from the livingroom window;
- ◆ Extend the balcony only partially across the livingroom window;
- ◆ Set units back to create windows in the corner of the livingroom;

- ◆ For privacy, recessed balconies are the best but most expensive option because of the increased number of walls;
- ◆ Do not provide sliding doors between bedrooms and balconies; and
- ◆ Do not provide sliding doors to balconies generally. They are a security risk and often malfunction. French doors are preferable.

Balcony privacy



Figure 32: Lines of sight from this balcony violate the privacy of an adjacent dwelling

Balconies will not be used if they are too exposed or if they offer views which violate the privacy of other dwellings or balconies (see **Figure 32**). Maintain privacy while providing views of activity. For visual privacy from neighbouring dwellings, consider:

- ◆ Recessed balconies;
- ◆ Screening walls;
- ◆ Planting;
- ◆ Physical separation of at least 6m (up to 30m) from activity areas;
- ◆ Semi-recessed balconies offer a combination of view, seclusion and a sense of safety; and
- ◆ Solid walls between balconies that are not recessed; screened for use as drying laundry.

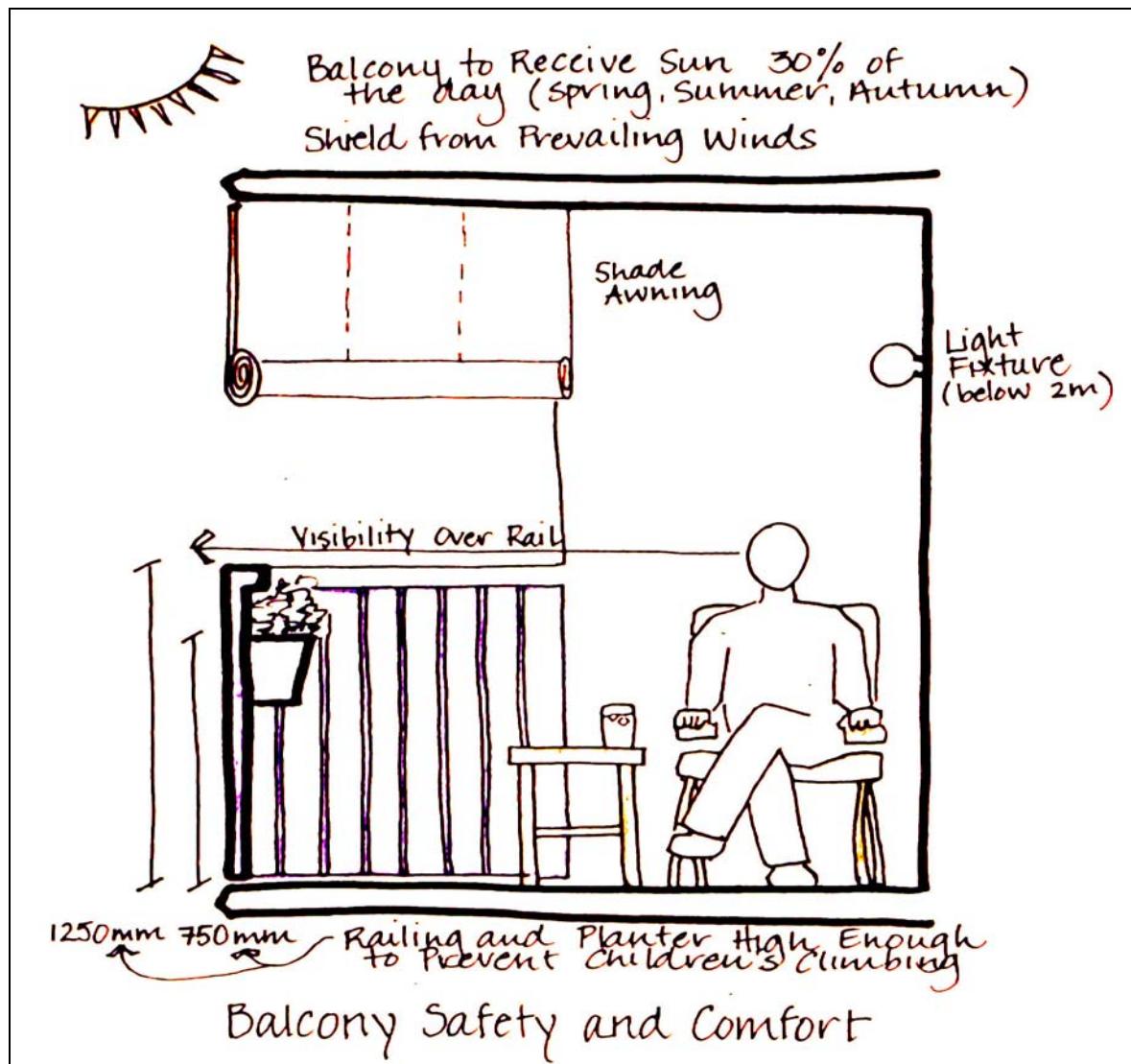


Figure 33: Balcony safety and comfort



Figure 34: This narrow balcony is used only for storage

Balcony location

- ◆ Design balconies for year-round use (see **Figure 33**);
- ◆ Orient balcony to protect from weather extremes and so it receives 30 percent of daily sunshine (see **Figure 35**);

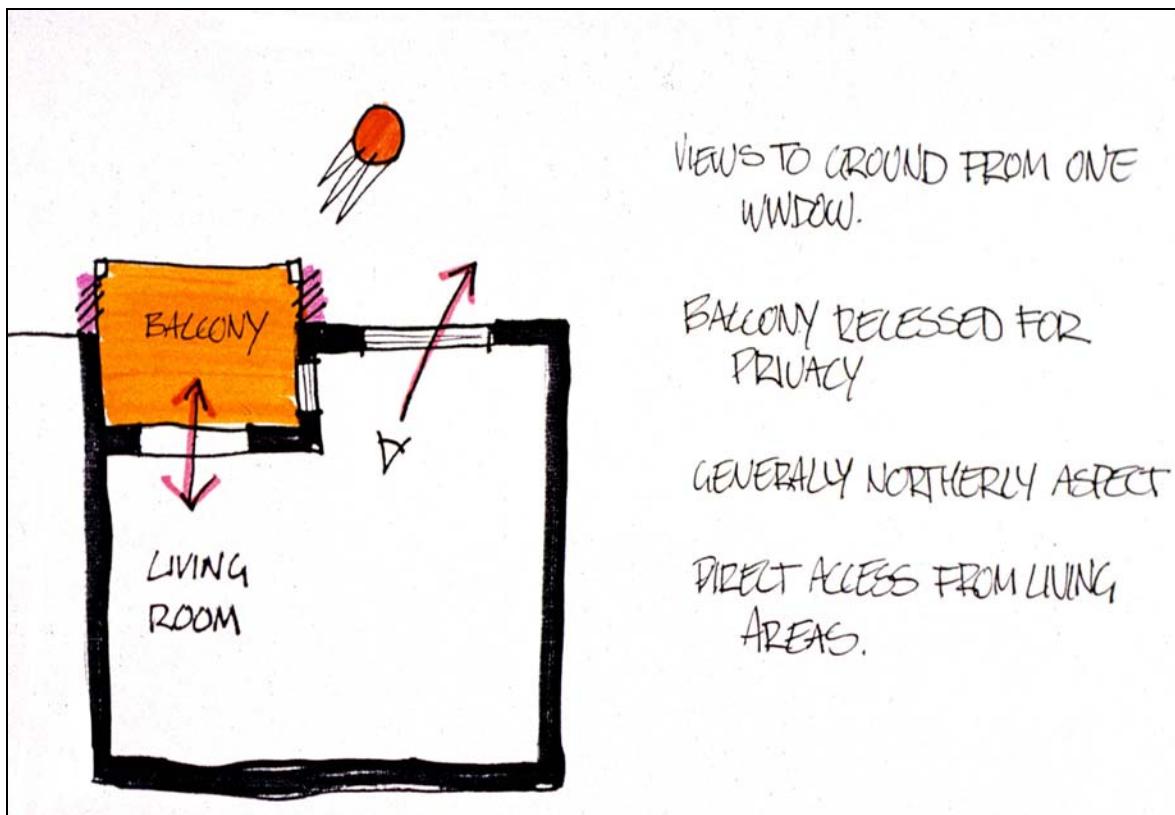


Figure 35: Balcony orientation

- ◆ Recess balconies, stack them or provide individual canopies;
- ◆ Provide the option to enclose or screen in balconies and porches;
- ◆ Locate balconies so that they are directly accessible from indoor living areas (see **Figure 36**);
- ◆ As older people are very sensitive to temperature changes and draughts, orient balconies to protect from weather extremes;
- ◆ Easy kitchen access encourages flexibility of use;
- ◆ A removable threshold allows wheelchair access but reduces problems of water penetration;
- ◆ Balconies off living areas should not block views of activity areas below (consider moving them slightly to the side);
- ◆ Provide adequate shade: about 50 percent in shade is ideal; and
- ◆ Protect from strong winds.

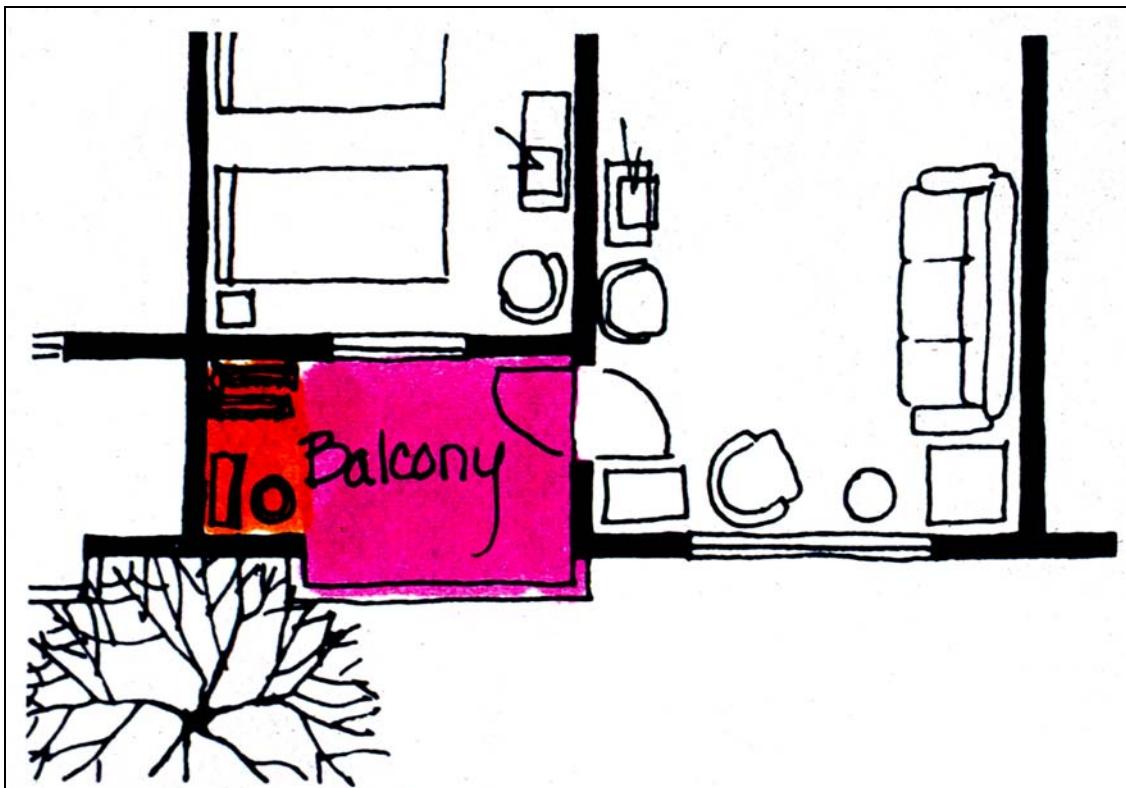


Figure 36: Balcony off living room

Upper storey balconies

Over the 12th floor, older people feel unsafe; balconies over the 20th floor may be used infrequently because of vertigo and winds. Therefore:

- ◆ Do not provide balconies above the 12th floor (when the ground wind speed is 10-15k/h, the wind speed at a height of 60m may be as much as 60k/h);
- ◆ Design higher level balconies with care to protect them from wind; and
- ◆ Consider enclosed balconies in these situations.

Balcony size

- ◆ Ensure that all balconies are of approximately the same size;
- ◆ Ensure that balconies can accommodate a person in a wheelchair;
- ◆ A clear space 1520mm x 1520mm is needed; 1980mm recommended for a smooth-pivot-u-turn in a wheelchair;
- ◆ Balconies should accommodate garden furniture: small table, chairs and a chaise lounge in a conversational arrangement;
- ◆ For 1 bedroom: minimum 4.65m²;
- ◆ For 2 bedrooms: minimum 5.6m²;
- ◆ Minimum clear dimension: 1500mm;
- ◆ For a person in a wheelchair: at least 1800mm deep;
- ◆ Ideal dimensions 3.2m x 2m; and
- ◆ A square or nearly square shape is best for conversational furniture arrangement.

Balcony railings

All balconies should have railings to increase feelings of security and privacy, and reduce visual intrusion. Therefore:

- ◆ Ensure that sturdy appearance is achieved;
- ◆ Upper rail: 1200mm to 1250mm;
- ◆ Avoid horizontal elements on balconies to low-rise dwellings where these could be used as a natural ladder for burglars;
- ◆ Ensure railings provide a comfortable grip;
- ◆ Design railings to allow a view outward and down from a sitting position; the top railing should not block vision (see **Figure 37**);
- ◆ Ensure that the upper rail is secure in both function and appearance;
- ◆ See-through railings can be used where balcony blocks view from a window;
- ◆ Spaces between vertical elements: not > 100mm;
- ◆ Design so as not to increase vertigo: wire mesh, plexiglass, iron or wooden bars above the eye level of a seated person (above 1250mm);
- ◆ Provide for space for planter boxes or flowerpots incorporated into the railing design, to be tended by a seated person; and
- ◆ Top of planters should be at a level of 750mm.



Figure 37: Balcony railings that block views out from a seated position

Balcony floors

- ◆ Floor finishes should be non-slip and non-glare;
- ◆ Floors should not include a step or raised sliding door tracks;
- ◆ A good surface is broomed or brushed concrete (stained);
- ◆ Avoid very light colours or reflective surfaces;
- ◆ Brick is acceptable if concrete is laid to ensure a continuous surface;
- ◆ Exposed aggregate is acceptable if small stones are used (1.0mm - 1.3mm) grade and stones are not overexposed;

- ◆ Avoid tile: it becomes too slippery when wet; and
- ◆ Space plants at least 1.3mm apart for wheelchair access.

Balcony detailing

- ◆ Shelves for plants must be sturdy, as residents may lean on them;
- ◆ Locate a light switch directly inside the dwelling by the door;
- ◆ Provide weatherproofed power points;
- ◆ Provide an outside tap for watering plants; and
- ◆ Position the light so that the globe can be changed without the need to climb on a stool, etc.

Doors and windows onto balconies

- ◆ A strong floor-level draught is created when sliding doors are open. They are not recommended as the only source of fresh air. Provide a separate hinged door and opening window. Use glass or partly glass (non-sliding) doors if possible;
- ◆ Provide windows that allow views over outdoor activities for residents sitting in the livingroom or lying in bed without sacrificing too much privacy in the unit; and
- ◆ The opportunity to install a cat door should be considered for lower units and especially for ground-floor units.

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