Designing Architectural Spaces for the Mobility Impaired

A Thesis on Equitable Design Ideology

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Abstract

Each year in Australia, 300 young persons under the age of 50 living with a disability are admitted into nursing homes or aged care facilities. They join the growing number of 6000 other young individuals nationwide who are already living in these facilities. These young people often suffer from severe disabilities as a result of an Acquired Brain Injury, or illnesses such as Huntington's Disease or Multiple Sclerosis, which affect their ability to function physically, mentally and sometimes emotionally. Their lives are marred by boredom, loneliness and a sense of isolation from society and their peers. Often they end up in these unsuitable living environments simply as a result of no other suitable accommodation being available to them which is designed for their specific needs. Australia currently sets out standards in the Building Code of Australia, the Disability Discrimination Act and the Australian Standards to provide construction standards to accommodate persons with disabilities, but for some with extreme disabilities these standards fall short of their requirements. This thesis will analyse the current demand for provision of accommodation for these young people in our society; how their disability affects how they interact with the built environment; what accommodation models might be suitable to address not only their physical, but social requirements; and finally, this thesis will investigate how more equitable accommodation may be procured for these young persons to have access to, keeping them away from nursing homes and a life marred by depression and isolation.

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Introduction

According to the Summer Foundation Annual Report 2013/14, Each year in Australia, 300 young persons under the age of 50 living with a disability find themselves admitted to nursing homes[i]. They join a growing number of 6000 other young Australians with disabilities who are already living currently in nursing homes or aged care facilities[ii]. Young people with severe disabilities often end up in this situation as a result of there being little, or no other suitable disabled access accommodation available for them to occupy which is designed to accommodate their advanced physical needs.

Recently, the Australian Government initiated the development of the National Disability Insurance Scheme (NDIS), which is to be rolled out into full operation by 2019. The NDIS has been developed to provide Individualized funding to persons living with disabilities, rather than providing funding for more generalized disabled services[iii]. According to the Australian Housing and Urban Research Institute (AHURI) Final Report, titled 'Moving to my home: housing aspirations, transitions and outcomes of people with disability', the NDIS estimates that there is presently an unmet need in affordable housing for between 80,000 and 120,000 NDIS participants[iv]. The AHURI Final Report addresses key barriers which are preventing persons with disabilities from securing suitable accommodation, with the outcome of these barriers translating to a vast majority of persons living with disabilities having to accept less than suitable living arrangements, or in the worst cases, may find themselves institutionalized and marginalized from society by being admitted to aged care facilities, or nursing homes.

The issue of providing socially and physically appropriate accommodation for young persons with disabilities is as much a problem that has to be addressed by those with the ability to change or influence the built environment, as much as it is an issue that must be addressed by society, and politics both on a local and national level. This thesis will examine ways in which the construction industry could facilitate suitable housing alternatives for disenfranchised youth living with a disability. Its main focus will be on: the design needs for persons living with a disability; what housing models might be suitable to construct in order to provide alternative housing for disabled persons and in some cases, their families; and the procurement methods available which may be suitable for the development of these new alternative housing models.

Methodology

The method used throughout this thesis will consist of an analysis of information from professions such as the medical and architectural industries. To truly understand the needs of young people living with disabilities in terms of how they interact with their built environment, it is necessary to understand not only what their disabilities are, but how their disabilities affect their movement and interaction with the built environment around them. Different disabilities would result in different outcomes for each individual, all of whom have a varying degree of vision, mobility or mental impairment which requires varying degrees of adaptation of their living environment to allow them to live as autonomously as possible.

In addition to an analysis of how disabilities affect the individual, an analysis of the current state of equitable housing within Australia will be discussed, this will be conducted in order to assess in general terms how much demand there is within Australia for equitable accommodation in order to proficiently accommodate those in the population who are suffering from severely debilitating disabilities.

Once the needs of the disabled individuals are understood, this thesis will go on to discuss what Australian building guidelines are in place to ensure that disabled people are not disadvantaged when it comes to attaining accommodation. This will consist of information regarding the BCA, DDA and Livable Housing Design Guidelines. Following this, a case study will be investigated, which will look at what equitable accommodation is currently being built by an organization which was developed in order to attempt to address this need for equitable accommodation for young disabled people at risk of entering into nursing homes.

Demand for Equitable Housing for Disenfranchised Youth living with a Disability

Presently in Australia, there is a high demand for suitable accommodation which can be occupied by young persons living with disabilities. According to the AHURI Final Report, there are many barriers which prevent young persons living with disabilities from being able to secure appropriate accommodation. These barriers include*:

- People living with parents or in group homes become low priority for current housing allocations
- A limited supply of accessible or adaptable social housing being available
- Affordability of private rental accommodation (affording rent on a pension)
- Discrimination by private landlords
- A limited supply of accessible or adaptable private rental housing being available
- Affordability of home ownership or cost of refitting for disabled access or equipment, or
- Difficulty being approved finance for home loans on a pension or low income

*the above barriers adapted from the AHURI Final Report[v]

The AHURI Final Report also states that the NDIS estimates a current unmet need in affordable housing for 80,000 to 120,000 NDIS participants[vi], many of whom may also be counted among the 6000 Young persons under the age of 50 whom the Summer Foundation, A foundation created to create alternative accommodation options for young disabled individuals at risk of entering into nursing homes, claim are currently living in unsuitable living arrangements such as in nursing homes or aged care facilities Australia wide[vii]. Further information from the Summer Foundation suggests that of these young persons confined to living in nursing homes*:

- 52% Won't be visited by a friend within a year
- 13% may never go outside
- 82% will seldom or never visit their friends, and
- 32% will never participate in community based activities such as shopping, leisure activities, or visiting friends or family.

*statistics sourced from Summer Foundation Annual Report 2013/14

Another report by the Summer Foundation and Monash University titled 'Young People in Nursing Homes: White Paper' suggests that "Aged care facilities are not designed or resourced to facilitate the active involvement of young people with high clinical needs in everyday activities or support their continued participation in the life of their community"[viii]. The White Paper goes on to explain that "Young people with disabilities are one of the most marginalized and isolated people in our society" [ix], adding that "they generally lead impoverished lives, characterized by loneliness and boredom"[x]

An important policy highlighted by the Summer Foundation in White Paper, is that of the United Nations (UN) convention on the Rights of persons with Disabilities (CRDP). In the CRDP, Article 19, states that "people living with a disability have a right to live in the community[xi]. The exact wording of Article 19 in the CRDP states that persons with disabilities should have the "opportunity to choose their residence and where and with whom they live on an equal basis with others, and not be obliged to live in particular living arrangements"[xii]. Yet despite this, in Australia, thousands of Young persons living with disabilities have no alternative but to live in 'particular living arrangements' whether it be in unsuitable homes, or aged care facilities, due to their being scarce other suitable accommodation made available to them, or presently being constructed to suit their particular living requirements.

Social and Societal needs of Young Disabled Persons

Young persons in Aged Care

According to the White Paper, young people who are unfortunate enough to end up in nursing homes may have a range of disability types, including:

- 58% having an Acquired Brain Injury
- 13% having Multiple Sclerosis
- 9% having Huntington's Disease, and
- 20% other disability types

*statistics sourced from Young People in Nursing Homes: White Paper p9

Acquired Brain Injury may affect a persons cognitive, physical and emotional functions, and is often the result of accidents, assaults, falling from heights or diving into shallow water[xiii].Multiple Sclerosis is a disease which affects the central nervous system and interferes with the transmission of nerve impulses throughout the brain, spinal cord and optic nerves, causing severe physical disablement in many who may have the disease[xiv]. Whereas, Huntington's Disease is an inherited neurological disorder which gradually deteriorates the physical, cognitive and emotional functions of the individual[xv].

The main similarities between these types of disabilities include:

- Impairment of Cognitive, Physical and Emotional Functions
- No known cure for Huntington's Disease[xvi], or Multiple Sclerosis[xvii]. and
- The prognosis for Acquired Brain Injuries can often be uncertain and the damage permanent

Aged care facilities are typically occupied by individuals at the end of their life cycle, with the average age of persons in aged care homes being 83 years of age[xviii]. These facilities are often quiet, highly regimented and provide little social activity, which is not ideal for a young person with a disability. Young people, although disabled, still have active minds which require social interaction and stimulation to a degree which cannot be provided in an aged care environment. Aged care homes also typically have a highly regimented daily routine, which would affect the self-esteem of a younger individual who would still benefit from the independence associated with maintaining control of their own routine. Routines which may include preparing meals, and engaging in social or private activity when they feel the desire to do so and not at strictly planned times as may be the case in a nursing home environment.

Alternatives to Aged Care Facilities

There is currently in Australia a need for alternative accommodation models to be developed which would prevent the need for young persons with disabilities from having to accept placement in a nursing home or aged care facility. Alternative accommodation should be available which allows young persons with disabilities:

- The ability to remain within the community
- To maintain as high a degree as possible of independence which is important for their mental health and self esteem
- To still have access to assistance from carers on a daily basis, when required, or in emergency situations
- To be able to live among people their own age and engage in social activities when desired such as
    - Getting outdoors
    - Going to the shops (accommodation should be close to activities zones)
    - Accessing public transport
    - Having access to onsite activities or social areas

Disabled Housing Models

Community based Accommodation

The Australian Psychological Society publication 'Psychological sense of community and its relevance to well-being and everyday life in Australia', explains how for all Australians, a sense of belonging to a community and the ability to network within a community plays an important role in the mental health and well-being of all individuals. According to the Australian Psychological Society, 'Social epidemiologists have demonstrated how community connections, belonging, networks, cohesion, and social capital play a significant role in the health, well-being, and mental health outcomes of populations and sub-groups'[xix]. From previous chapters in this thesis, Young persons who suffer from disabilities and who are living in aged care or other socially isolated environments are not experiencing this much needed sense of community which at their young age is still required for them to maintain a sense of belonging and self-esteem. The Publication by the Australian Psychological Society goes on to explain:

> "when we have asked young people questions about community, they have responded with considerable insight and opinion about their neighbourhoods, and the larger physical and political communities in which these neighbourhoods are embedded. Hundreds of interviews with high school students in regional southeast Queensland (Chipuer et al.. 1999) as well as with primary school children in Western Australia (Pooley, Pike, Drew & Breen, 2002), indicate an understanding of belonging and support within neighbourhoods, characteristics of good neighbourhoods, and sensitivity toward the quality of built and natural environments. Furthermore, the inclusiveness of this awareness is evident not only across developmental stages from nine to nineteen years, but also amongst youth with intellectual disabilities who are often positioned as 'clients' of community integration programs (Pretty, Rapley & Bramston, 2002)"[xx]

Although these interviews were conducted with youth of a much younger age than the majority of individuals this thesis is concerned with, it highlights the concern that when any person, regardless of age, and whether in some way disabled or not, feel they are marginalized from their community, their sense of belonging and sense that they are being supported by their community diminish. For this reason, it is important that individuals suffering from severe disabilities not only have their physical needs considered, but also their social needs. Young individuals suffering from a disability would also most certainly be suffering mentally from the constraints that having a disability has placed upon them, one such constraint would be their ability to socialize and interact with other individuals closer to their age demographic and who are not considered a part of their nursing or care team.

Community based accommodation is one of the main points covered throughout this thesis with community based housing options of various types being discussed in following sections. One such option that the design & construction industry should consider to accommodate young disabled individuals is that of the Equitable Living Village.

The Equitable Living Village

Equitable Living Villages share similar design principles to aged care villages, or retirement villages which are both gaining popularity by older generations of Australians as the new way to live after retirement. Villages could ideally be designed in 2 types: combined residential units in a single or multiple apartment complex, as shown in Figure 1: village typology 1; or an alternative to a multi res design would be to incorporate separate equitable dwellings in a village layout around a central community space and health services, as seen in figure 2: village typology 2.

The benefits of each village typology is that individuals who have varying needs can live in independently owned or rented apartments within close proximity to a central community space and health center. The health center in each village can consist of any number of specialized services that may regularly be required by persons living with disabilities, these services may include:

- Physical rehabilitation clinics
- On site general practitioners
- Health spas and massage clinics
- On site counselling services
- Resident pool for both leisure and rehabilitation
- Specialized health services or clinic rooms for visiting health professionals which can be used by health professionals when visiting residents.
- Resident Activities and Entertainment

A major benefit of these villages is that residents can have the majority of their health needs catered to on site, without having to travel great distances to appointments for the purposes of their rehabilitation or treatment. Residents would also benefit from having on site security for their own safety, and on site medical staff and carers which could be accessed via a village emergency communication system.

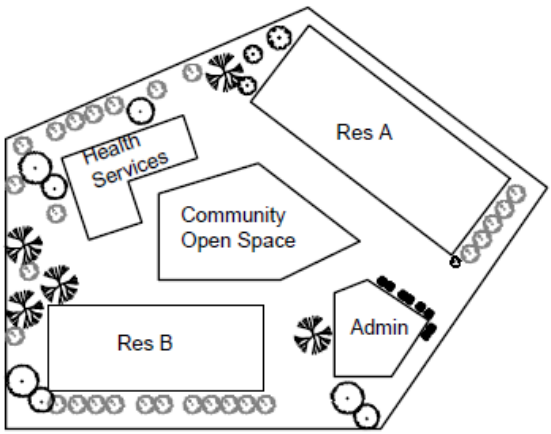

FIGURE 1: VILLAGE TYPOLOGY 1, AUTHOR: WAYNE A MORRIS

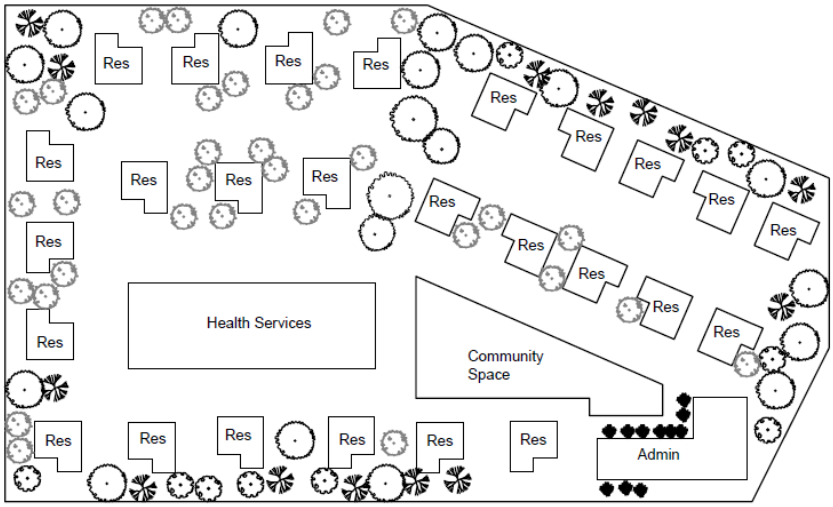

FIGURE 2: VILLAGE TYPOLOGY 2, AUTHOR: WAYNE A MORRIS

Current Design Requirements for Persons with Disabilities

Australian Standards 1428.1 states in its Foreword that in 1998, Australia had 3.6 million people living with a disability of some kind[xxi]. This figure accounted in 1998 for 19% of the population living with a disability, with 4% of this figure being children under the age of 4, and 84% of this figure being persons over the age of 85[xxii]. When analyzing these figures in terms of numbers of individuals living with a disability per age group, the 45 – 54 age group produced the largest number of individuals living with a disability at 551,300[xxiii]. The most common disabilities according to these 1998 statistics were musculoskeletal disorders which often resulted in these individuals requiring mobility aids of various types[xxiv]. 445,100 individuals in the survey stated that they used one or more types of mobility aids, including:

- 208,900 people using walking sticks
- 21,400 people requiring crutches
- 103,200 requiring a walking frame
- 123,500 people requiring manual wheelchairs
- 19,100 people requiring electric wheelchairs, and
- 13,500 people using motorized scooters as a mobility aid

*Statistics sourced from AS1428.1-2001

Translated into more current figures and according to the Disability, Ageing and Carers, Australia: Summary of Findings, 2012. 4.2 million Australians, or 18.5% of the population were living with a disability in 2012[xxv]. Of these 4.2 million Australians living with disabilities 3.4million, or 14.9% of the total population were living with core-activity limitation, with close to 1.4million people living with profound or severe limitations, 641,300 persons living with moderate limitations and close to 1.4 million persons living with mild limitations[xxvi]. Of these people 3.2 million were living in households not considered as 'cared-accommodation', leaving 184,700 persons living in cared accommodation[xxvii]. These figures do take into account persons of all ages, so are not indicative of the exact figures of persons living with disabilities only in the age group which this thesis is investigating. But this does provide an idea of the scope of people who are currently living with a disability within Australia based on relatively recent 2012 figures.

It might be worth noting here, that when defining these disabilities, the Australian Building Codes Board (ABCB) describes the definition of a disability as being people who:

- Are blind or have low vision
- Have learning or intellectual disabilities
- Are deaf or hearing impaired
- Have a physical disability
- Experience mental health or psychological difficulties, or are
- People with an acquired brain injury

*definition sourced from Module 5, Disability Access Presentation (ABCB)

Another important point to note from all this information is that from 1998 to 2012, the percentage of the population living with a disability has remained virtually unchanged. From this we can assume that the figures from the 1998 survey which indicated almost 19,100 people out of the 445,100 which required the use of an electric wheelchair for assistance, would still be consistent, but as a whole, the number of individuals requiring the use of an electric wheelchair nationwide, would have increased by a factor of 16%. It is hard to find statistics on just how many Australian homes are presently designed to accommodate large electric wheelchairs and their users, but it might be a fair assumption to make that the demand for housing which can accommodate the needs of users of large mobility devices, far outweighs the current supply.

Australia does have stringent building codes and policies in place which are meant to provide equitable and accessible public and private living environments for persons living with disabilities, but this is not a guarantee

that any new development would be suitable for a person living with a moderate or severe disability. For example, a new building could comply with all standards of the Building Code of Australia (BCA) in regards to disability access and Egress, but this would not prevent a complaint being made against the building for not complying with the Disability Discrimination Act (DDA) which could result in rectification work being ordered by the courts to make a BCA complying building provide better design adaptions for disabled persons [xxviii]. Additionally, to this information, a DDA compliant building may still not be suitable for habitation by a person with a severe disability whom may require further assistance, such as hoists, or more specialized assisted living equipment.

Hard Requirements

Building Code of Australia (BCA)

The BCA contains many clauses which define how a building must provide access to persons with disabilities, including access to certain internal spaces including amenities, and activities areas. As stated in the BCA, access for people with a disability must be provided*:

- To a building
- Within a building (including lifts, signage and hearing augmentation systems)
- To certain carparking spaces, and
- To suitable sanitary facilities

*information sourced from Module 5, Disability Access Presentation

It is important to note, that the BCA only covers the construction of the physical fabric and layout of a building[xxix] and does not cover requirements for internal fixtures or fittings, furniture or specialist needs for persons with advanced design needs due to more severe mobility impairments.

To resolve the issue of inconsistencies between the BCA and the DDA previously mentioned in this thesis, the Federal Government in 2001 requested the ABCB to address this inconsistency which resulted in the development of the Premises Standards and BCA Amendments[xxx]. According to the Australian Human Rights Commission: Guidelines on application of the Premises Standards, the purpose of the development of the Premises Standards and the corresponding changes to the BCA are*:

- To ensure that dignified, equitable, cost-effective and reasonably achievable access to buildings, and facilities and services within buildings, is provided for people with disability[xxxi], and
- To give certainty to building certifiers, developers and managers that if the Standards are complied with they cannot be subject to a successful complaint under the DDA in relation to those maters covered by the Premises Standards[xxxii].

Therefore, if a building is designed in accordance with the Premises Standards, then it will more than likely be deemed to satisfy the requirements pertaining to the construction of building elements covered in both the BCA and the DDA.

The Key Performance Requirements (KPR) covered in the BCA relating to disabled access to buildings include:

- DP1 Access to a building
- DP2 access within a building
- DP6 travel path to an exit
- DP8 accessible Car parking
- DP9 communication systems for hearing impaired
- EP3.4 Lifts
- FP2.1 Sanitary Facilities

As stated in the BCA, continuous access is required*:

- To a building from the allotment boundary
- Between associated buildings that are required to be accessible
- Between levels (via lifts, ramps and stairs)
- In most buildings, to all areas normally used by the occupants
- To signage including braille and tactile
- To required hearing augmentation systems
- To suitable sanitary systems

*Information sourced from Module 5 Disability Access Presentation

These previously mentioned parts of the BCA cover in more detail the following Key Performance Requirements:

DP1 stipulates that Access to a building must be provided to enable people to:

- Approach a building from the road boundary, associated accessible building and associated accessible carparking space[xxxiii]
- Get into a building and to all areas normally used by occupants including toilets[xxxiv], and
- Identify accessible facilities

DP2 Stipulates that People should be able to move safely to and within a building, with special attention paid to[xxxv]:

- Walking Surfaces
- Ramps
- Landings
- Doors
- Stairways
- Handrails

DP6 Stipulates that People must be able to safely evacuate the building, with the building use and the characteristics of the occupants, including their mobility, needing to be considered[xxxvi]

DP8 stipulates that carparking spaces suitable for use by people with a disability must be provided, and that spaces must be marked and easy to find[xxxvii].

DP9 stipulates that an inbuilt communications system, such as a lecture theatre PA system, must be suitable for people who are deaf or have a hearing impairment[xxxviii].

EP3.4 Stipulates that when a passenger lift is provided in a building required to be accessible, it must be suitable for use by people with a disability[xxxix]

FP2.1 Stipulates that sanitary facilities suitable for use by people with disabilities must be provided at convenient locations

In addition to these aforementioned KPRs, D3.3 covers minimum standards, maximum allowances and design requirements for elements of a building which must be accessible, these include[xl]:

- Ramps and Stairways
- Passenger lifts
- Passing and turning spaces on corridors
- Small building concession, and
- Maximum carpet pile height

Many clauses of the BCA are controlled by AS1428.1, which provides design specifications for building elements such as:

- Doors
- Handles
- Lifts
- Stairways
- Building Surfaces
- Car Parking
- Walkways
- Handrails
- Sanitary Facilities
- Seating
- Signage
- Lighting, and
- Hearing augmentation systems

Again, it is important to note, that although a building could be constructed in full accordance with the requirements of the BCA, Premises Standards and AS1428, it still may not provide suitable design features required for persons with more severe disabilities.

Disability Discrimination Act

The Disability Discrimination Act 1992, Compilation No. 30, Registered 18 June 2015, covers in Division 2- Discrimination in other areas, Section 25: Accommodation, the rights of persons with disabilities in regards to attempting to procure accommodation, whether it be rental accommodation in the form of a flat, house, unit, or a room in a boarding house, hotel or motel[xli]. The purpose of the DDA is to provide legal grounds which would make it against the law for an agent or landlord to*:

- Refuse an application for accommodation from a person with a disability
- Provide a person with a disability with accommodation on less favorable terms and conditions.
- Put the application of a person with a disability on the bottom of the list.

*sourced from Australian Human Rights Commission: D.D.A. guide: A place to live

Under Section 26: Land, the DDA provides legal grounds to make it against the law for an agent, landowner or other property agent to discriminate a person because of his or her disability, with Section 26 stating that an agent or landowner cannot:

- Refuse to sell land or property to a person with a disability, or
- Offer land or property to a person with a disability on less favorable terms and conditions

Livable Housing Design Australia Guidelines (LHD)

The Livable Housing Design Australia Guidelines breaks the elements of a building which require consideration for disabled access down to 16 elements. These elements include:

- Dwelling Access
- Dwelling Entrance
- Car Parking
- Internal Doors & Corridors

- Toilet
- Shower
- Reinforcement of bathroom and toilet walls
- Internal stairways
- Kitchen space
- Laundry space
- Ground (or entry level) bedroom space
- Switches and powerpoints
- Door and tap hardware
- Family/living room space
- Window sills
- Flooring

The LHD Guidelines has several levels of performance starting at Silver Level, then Gold Level for mid-range performing house designs, with their ultimate level of performance being label the Platinum level. According to the LHD Guidelines:

Silver Level: focuses on the key structural and spatial elements that are critical to ensure future flexibility and adaptability of the home[xlii]

Gold Level: provides more generous dimensions for most of the core livable housing design elements and introduces additional elements in areas such as the kitchen and bedroom[xliii]

Platinum Level: this level takes into account all 16 elements listed above in the LHD Guidelines, and describes design elements which would better accommodate people with higher mobility needs. More generous dimensions are required for most of the core livable elements of the house, and additional elements for features such as the living room and flooring are introduced[xliv]

Soft Requirements

Soft Requirements for disabled people consist of alterations to an apartment or house which are not a part of the building itself, but additional design features which can aid a disabled person living in the dwelling. Soft Alterations to a property would mostly be of an electrical or technological nature, and may include:

- 2 way intercom system with direct line to emergency personal or carers
- Tv/ surveillance equipment so that a disabled person can see who is entering their property
- Electronic gates, doors and/or windows which can be controlled by a remote or smart phone
- Visual communications equipment which can be set up for communication with family members or carers off site
- Pre wiring of apartments for later installation of any additional electrical equipment a future occupant may require

Universal Design

Universal Design can be known by several other names, including Life Span Design, Inclusive Design, or Trans-Generational Design[xlv]. The general principle of Universal Design is to consider human needs and abilities throughout the lifespan of a building[xlvi]. This means that a building can be designed to meet the needs of users, regardless of age, size, or physical abilities. Additionally, Universally Designed buildings would ideally be easily adaptable to meet special needs, or future needs of occupants[xlvii].

According to a U.S. Department of Housing and Urban Development Publication Residential Remodeling and Universal Design, there are a number of low cost, and easily installed universal features which could be considered for incorporation into all home designs. These features include:

- Use of lever handle door hardware and faucets
- Installation of large rocker-style light switches
- Use of extra lighting where necessary
- Installation of hand held flexible shower fixtures
- Installation of new electrical outlets and telephone jacks no lower than 15 inches above the floor surface and of new light switches between 36 inches and 48 inches above the floor surface
- Use of adjustable hanging closet rod and shelf systems.

Equitable Housing Requirements for Individuals with Severe Disability

How Life Cycle Affects Design Needs

However unfortunate, Different disabilities can carry with them different outcomes regarding life expectancy and quality of life anticipated throughout the progression or stage of the disability or illness. For some diseases or injuries, such as an Acquired Brain Injury, the life expectancy may be lengthy, and the disability permanent. For other disabilities such as Huntington's Disease, Life Expectancy might be short once the disease begins to take full effect, which is often reported to be only 10 to 30 years post diagnosis, with death resulting usually from heart failure or pneumonia as a complication related to the disease[xlviii]. Similarly, sufferers of Multiple Sclerosis may have a life expectancy of only 13 to 20 years post diagnosis, often resulting in death caused by Paralysis of the respiratory system, Bronchopneumonia, Pyelonephritis, Uremia, or Sepsis, and not typically resulting directly from the disease itself[xlix]

Subjective to the disability, the design needs, and type of accommodation which would be suitable for the type of disability would depend on the specific characteristics related to how that disability affects the individual, not just presently, but throughout the progression of the illness, or the lifetime of the individual. Things to consider in designing equitable living environments for persons with disabilities would include:

- Are the design requirements static (unchanging), or dynamic (needs will change) as the illness or disability progresses
- What is the anticipated duration of the illness or disability (temporary resulting in death, remission or cure; or permanent with no alteration to life expectancy)
- How many (if any) able bodied individuals may share residence with the disabled person (importance of Universal Design)

Static v Dynamic Design Requirements

Static Design

For sufferers of permanent Disabilities, whom may already require the aid of an electric, or manual wheelchair, their design needs would be consistent throughout their occupation in most suitable accommodation.

Dynamic

Disabled persons who may suffer from a progressive illness, such as Huntington's Disease, or Multiple Sclerosis, may have more complicated design needs. during the early stages of their illness, they may be self-mobile, which may alter to a state of complete reliance on mobility devices as the illness progresses. Occupants with Dynamic Design needs may benefit from designs which can be altered, or adapted to suit their changing needs as a disability progresses, or in some circumstances, diminishes.

How Disability Affects Design Needs of Occupants

Physical Effects of Huntington's Disease

Stage 1 & 2

In stage 1 & 2, patients with Huntington's Disease are considered in the Early stages of the disease, and still have a Functional Capacity of 11 – 13, and 7 – 10 respectively[i] (based on the Unified Huntington's Disease Rating Scale: Total Functional Capacity UHDRS: TFC). these patients are in the early stages of the disease and are considered closer to 13: Totally Independent, rather than having a TFC score of 0: Totally Dependent[ii]. Very little design alterations would be required to accommodate an individual with Stage 1 or 2 Huntington's Disease.

Stage 3

As a Huntington's Disease patient progresses to Stage 3 their TFC score reaches 4 – 6. Activities such as walking become progressively difficult and might be carried out with the use of assisted equipment such as a walking aid or a wheelchair[iii]. Concurrently, the ability to carry out household chores may diminish and the sufferer may require the assistance of a carer[iii]. Minor alterations in design would be required to make navigation around the home easier and safer, Such as:

Hard Design Requirements

- higher slip resistant flooring
- Removal of any steps or inconsistencies in floor level
- Removal of any raised thresholds at any internal or external doors
- Use of easier to use door and window handles
- Wider doorways on external and primary internal doors to allow for mobility aids
- Direct access from a bedroom used by the disabled person to a suitably designed disabled bathroom
- Incorporation of grab rails around the home or in the bathroom

Soft Design Requirements

- Emergency communications system in case of fall or injury
- Remotely operable doors, windows or shading devices

Stage 4 & 5

As a stage 4 or 5 patient with Huntington's Disease, TFC reaches 1 – 3, or 0 respectively. These patients are considered to be in the late or advanced stages of the disease[iv]. These individuals would typically present with almost complete loss of functional control, and would be in constant reliance of mobility equipment and personal assistance[iv]. Stage 4 & 5 Huntington's Disease patients would require all design alterations mentioned for stage 3 patients, with the addition of:

Hard Design Requirements

- Reinforcement of structure in disabled access bedroom including roof for installation of a hoist if required
- Reinforcement of walls and ceiling in disabled access bathroom for installation of a hoist if required and grab rails
- Wider door to bathroom with direct access to disabled bedroom for privacy
- Wider corridors if present in house for larger mobility devices

Soft Design Requirement

- Visual communications devices such as monitors for both security, and personal use such as skype, or video calling friends or relatives

Physical Effects of Multiple Sclerosis

According to 'Navigating Life with Multiple Sclerosis' by Kathleen Costello et al, Multiple Sclerosis does not have one predictable disease course[lvi]. That being said, based on how the disease begins and how symptoms present over time, doctors often describe 4 more common courses for the disease[lvii]. In the new classification of the disease, only 3 types of the disease are identified, being Clinically Isolated Syndrome; Relapsing-Remitting; and Progressive MS, which is further divided into Primary-Progressive MS, and Secondary-Progressive MS[lviii]. How this disease affects an individual's ability to interact with their living environment will now be discussed.

Clinically Isolated Syndrome is often characterized by neurological symptoms such as blurred vision as a result of an attack on the optic nerve[lix]. These signs on MS are often temporary and not initially diagnosed as MS because the symptoms still don't meet the other criteria for an accurate diagnosis of the disease[lx].

Relapsing-Remitting patients with MS can suffer from transient episodes of dysfunction caused by inflammation of the nervous system with rapid recovery[lxi]. As a result of these attacks, patients with Relapsing-Remitting MS can experience[lxii]:

- Paresthesia, or, numbness
- Diplopia, or, Double Vision
- Scotoma (Visual Anomalies)
- Sensory and motor disorders of limbs, and cerebellar incoordination (trouble balancing)

In later stages of Relapsing-Remitting MS, known as **Secondary Progressive MS**, patients can experience far more severe symptoms, including[lxiii]:

- Blindness due to retrobulbar neuritis
- Ataxia (loss of control of body movements)
- Incontinence
- Paraplegia, and
- Major system failure

In patients with Secondary Progressive MS, the disease will worsen over time often resulting in difficulties with motor function, but not all patients progress to a state of the disease which might require them to be in need of a wheelchair for mobility[lxiv]

in **Primary Progressive MS**, patients can also suffer from Cognitive Impairment as a result of a slow decline in neurologic function from the onset of the disease[lxv]. These patients also present with problems associated with:

- Mobility
- Bladder control, and
- Bowel control

Taking all these symptoms of the disease into consideration, a suitable design to accommodate occupants who suffer from either of these stages of Multiple Sclerosis would ideally incorporate:

- Easy to navigate floor layout for mobility and vision impaired occupants
- Direct and easy access to an accessible bathroom from both the living and disabled bedroom
- Level flooring for occupants with difficulty walking or requiring a mobility device
- Larger than usual switches or signage for occupants with vision impairment
- Grab rails
- Minimization of sharp corners or edges on walls or benchtops in case of a fall
- Access to an emergency communication system in case of fall or other emergency to notify carers that the occupant requires assistance
- Automated doors and windows for patients in advanced stages of the disease who may be immobile or suffer from paraplegia.
- Dynamic Design which can be adapted to the changing or worsening condition of the occupant

Physical Effects of Acquired Brain Injury

Brain Injury can affect people in many different ways. For some, a less severe brain injury may present with symptoms of tiredness, or lack of concentration. But for people with severe brain injury, especially as a result of a major head trauma, they may suffer from complete loss of motor function, loss of speech, loss of sight or any number of major physical impairments. Designing for the needs of people with an acquired brain injury could consist of alterations as simple as providing adequate signage for a person to navigate their surroundings, or in cases of severe brain injury, an occupant may require any number of alterations, including:

- Floor layout design to cater for larger mobility devices
- Reinforcement to ceilings for installation of hoist equipment
- Wider doorways to accommodate larger mobility equipment
- Non slip, even flooring with no alteration to surface levels
- Easy access into and out of the apartment and to all internal living spaces
- Automated doors and windows
- Emergency intercom system accessible in all rooms in the apartment
- Reinforcement to walls for grab rails if required
- Larger kitchen possibly with cabinetry removed from under some bench space and sink
- Larger bathroom design

Equitable Social Housing

Currently in Australia, the Government has a system in place so that economically disadvantaged individuals and families can apply for accommodation in what are known as Social Houses. Many of these individuals would be in receipt of social security benefits, and are considered to be long term economically disadvantaged individuals who qualify for placement in government owned, low rent housing ranging from single bed dwellings to multi room family homes.

One of the intentions of this thesis is to propose a solution for finding accommodation for the thousands of physically and often economically disadvantaged individuals who struggle to find suitable accommodation or end up being admitted into aged care facilities. One solution to this problem would be for the Australian Government to consider providing a selection of community based dwellings which have been refitted to accommodate severely disabled people in desperate need of affordable accommodation. These equitable Social houses do not have to necessarily be new village style equitable complexes as previously discussed in this thesis.

As in the case of current community housing provided by social services, suitable preexisting houses with favorable design characteristics could be purchased by the government, with these houses having the potential to be altered to meet livable housing design guidelines platinum level requirements. This may be a far cheaper option than commissioning the construction of new individual houses, multi residential developments or equitable housing complexes.

As with current social housing, a range of houses could be refitted and provided as low income housing to individuals with disabilities, or families of individuals with disabilities whom can no longer stay together in the family home. These housing options will now be discussed.

Individual Unit

Single bed units could provide suitable accommodation for persons with a disability at any age. A younger person, perhaps in their 20's or 30's with no partner or children could accommodate a single bed equitable house which would allow them to maintain their independence. Similarly, an older individual possibly in their 40's to 60's, with no partner or younger dependents could find a single bed equitable house more than suitable for their needs and lifestyle.

Dual Occupancy Unit

For individuals with disabilities whom may have either a partner, or dependent child living in their care, a dual occupancy unit could be provided which typically would have one equitable bedroom and bathroom, and one standard bedroom with the rest of the unit being universally designed to accommodate both a disabled and an able bodied occupant.

Dual occupancy units would be ideal for a younger disabled person with a partner, or a child; or even an older disabled person whom has a partner or children that may stay permanently or on occasion. Dual occupancy units would also be ideal for disabled persons who may require a carer to be present on a frequent basis as the second bedroom could be used in the event that a carer must stay overnight, or spend a significant amount of time in the unit.

3+ Bed Family Home

Many people living with disabilities do not find themselves alone in the struggle to find suitable accommodation for just themselves. Often families are affected just as much by a disability, when one or more members of a family may be unable to continue living in a traditional family home due to the severity of their invalidity. Disability may affect a family at any stage of their lives, and any family member may find themselves having to live with a permanent or temporary disability. Children may be born who will require special mobility equipment for their entire lives, or older members of a family may be tragically struck down by a disability as a result of a disease or accident.

Often when a family finds themselves faced with the inevitable reality of having to adapt to living with a disability. the family home will become the center of many of the problems that they may face. The design and layout may be unsuitable for navigation by any form of mobility aid, or larger mobility aids; kitchens and living spaces may be too small or narrow, likewise with bathrooms and bedrooms that may be undersized to accommodate the needs of a disabled individual; entry and access to a traditional family home may be inappropriate, especially if the design accommodates the use of multiple steps or stairs to gain access to multiple levels in the house.

Families may face the reality that with their current home being unsuitable, they may have to sell the property, or face the prospect of costly renovations in order to make the design more accessible for the member living with the disability. but one thing to consider here, is not all families will find themselves indefinitely living with a disability. in some cases, the disability may be a result of an illness or disease which may only affect a family member for a short period before they inevitably succumb to the illness or disease. As much as it is sad to think of, families in a situation such as this may very well benefit from being able to lease temporary equitable accommodation so that they may continue to live comfortably with the disabled family member to see them through their illness. What they do with their family home is for them to consider, whether they rent it or just abandon it until such time as they are able to move back in. but the important thing for them would be to know they have access to another suitably sized equitable house, and the family will be able to maintain ownership of their current house without needing to sell it to finance more suitable accommodation.

Equitable family homes would of course also be suitable for low income families who are not in a position to afford an equitable family sized home themselves, or renovations necessary to their existing home to accommodate the needs of a disabled family member.

Case Study

Summer Foundation: Hunter Demonstration Project

FIGURE 3: INTERIOR, ABBOTSFORD HOUSING DEMONSTRATION PROJECT

The Summer Foundation was established in 2006 as an organization which works to change the human services policies and practices related to young people living in, or at risk of, entering residential aged care facilities[lxvi]. The first demonstration project which tested new innovative housing options for young people living with significant disabilities developed by the Summer Foundation in 2013 and was called the Abbotsford Demonstration Project[lxvii]. in the Abbotsford Demonstration Project, the Summer Foundation experimented with Apartment Design, buying several apartments 'off the plan' and converting them into more disabled accessible living environments. The Abbotsford Demonstration Project looked not only at how Design, but how technology implemented in the apartment can assist with more independent living for a disabled occupant.

The Hunter Demonstration Project was the second major project orchestrated by the Summer foundation. Its objective is to provide alternative accommodation to significantly disabled persons aged between 21 and 55 with acquired or late onset disabilities, in or at risk of entry to residential aged care facilities[lxviii]. The apartments in the Hunter Demonstration Project were designed to meet all the requirements necessary to obtain Platinum Level Certification under the Livable Housing Design Guidelines[lxix] previously discussed in this thesis.

Some of the Core Design Elements which influenced the design of the Hunter Demonstration Project Apartments are outlined in figure 4.

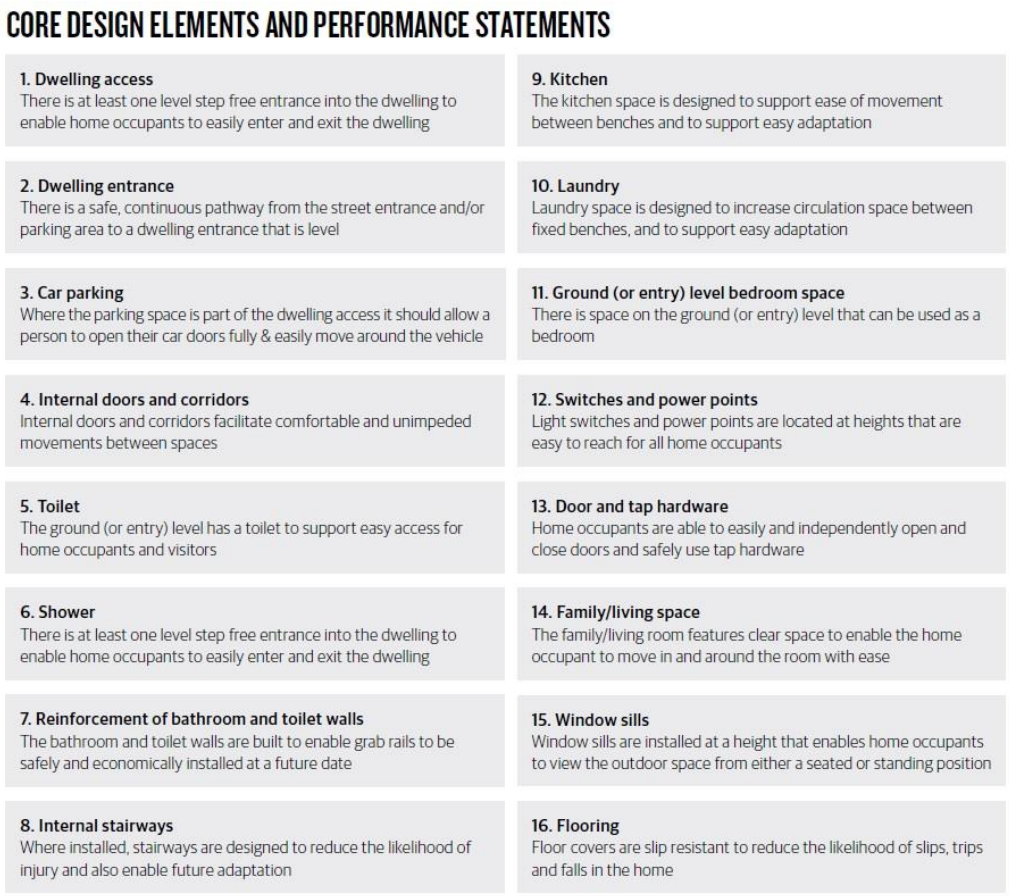

FIGURE 4: LIVABLE HOUSING DESIGN GUIDELINES: CORE DESIGN ELEMENTS AND PERFORMANCE STATEMENTS[lxx]

Summer Foundation General Housing Features

For the Hunter Demonstration Project, the Summer Foundation set out a number of required features sought after in apartments that would be considered suitable for the purposes of the project. as stated in the summer foundation publication 'New Housing Options for People with Significant Disability', these core housing related features included:

Central Location

The development must be centrally located close to public transport, services, and resources which participants in the project would require for daily living. This was to ensure that transport costs and support costs would be minimized and to enable a greater degree of independence regarding various aspects of daily life from shopping to socializing[lxxi].

General Building Accessibility

The building must be designed to support easy movement of wheelchairs on key paths around the project[lxxii]

Integrated and Non Identifiable Housing

Apartments for disabled occupants must be indistinguishable from standard apartments in the project. this is to ensure that disabled occupants are seen as an integrated part of their community and not perceived as being different from their neighboring tenants

Highly Accessible and Customizable Design

The intention of the project was to provide a built environment which maximizes individual capacity and supports a person to do as much as they can independently[lxxiii]. The designs chosen for the Hunter Demonstration Project had to have a high degree of accessibility, and customizability in their design. as stated in New Housing Options for People with Significant Disability, Hunter Demonstration Project Apartments were designed to achieve Platinum level certification under the Livable Housing Design Guidelines[lxxiv], in addition to this, they were also designed to meet the changing needs of occupants over time with designs that supported future adaptation[lxxv].

Internal Layout General Principles

The general layout of all apartments in the Hunter Demonstration Project followed the following design principles[lxxvi]:

- External window to Platinum Bedroom
- Direct access to Platinum Bathroom from both Accessible Bedroom and Living
- Rectangular open plan living/Dining/Kitchen
- Non- accessible second bathroom / toilet
- At least one second bedroom with either internal or external window

Examples of floor layouts which adopted these principles and gave high consideration to spatial relationships between living spaces are shown in figure 5.

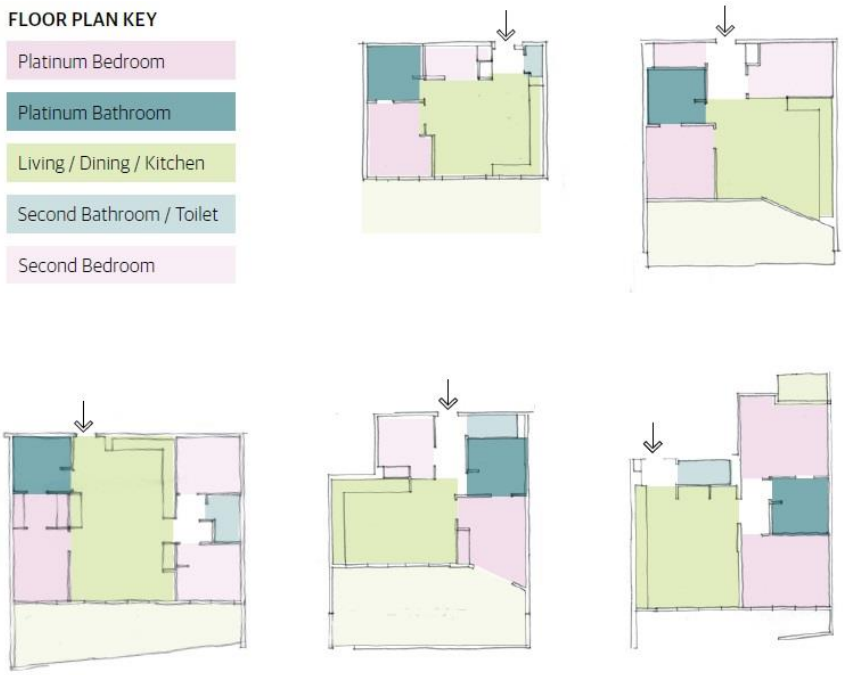

FIGURE 5: SPACE PROVISIONS AND SPATIAL RELATIONSHIPS

The ease of movement through the house and views to the outside from the kitchen are shown in Figure 6. these correspond to the relevant floor layouts shown previously in figure 5.

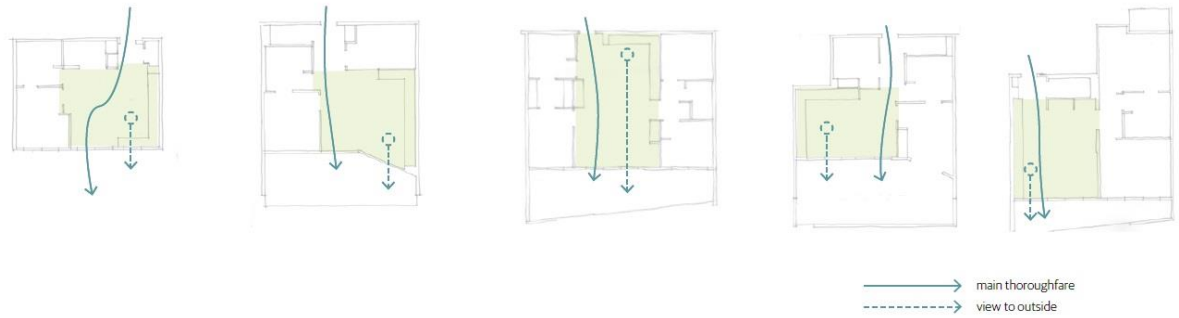

FIGURE 6: EASE OF MOVEMENT THROUGH, AND VIEWS TO OUTSIDE FROM APARTMENT

The Summer foundation strived to meet the requirements to attain Livable Housing Design Guidelines Platinum Level Certification in all of the 10 Hunter Demonstration Project Apartments[lxxvii]. This offers the highest level of accessibility to occupants and allows for navigation of apartments by occupants who may rely on larger electric wheelchairs for mobility. Key features of Platinum certified LHDG design include:

- Open plan living, dining and kitchen
- Level flooring throughout, including into external areas
- Larger kitchen than standard apartments to improve access for people in wheelchairs with capacity for a left of right side approach

The summer foundation also exceeds the LHDG Platinum Level Requirements by providing:

- Wider doors at 950mm nominal width to cater for larger wheelchairs
- Accessible wall mounted power points located at 600mm above FFL (typically 300mm above FFL)
- Increased head height over car parking to allow for larger vehicles (2.7m whereas 2.5 is standard)

*above information sourced from New Housing Options for People with Significant Disabilities p23

Figures 7 & 8 show examples of both a large and small apartment configuration which utilize these aforementioned design principles.

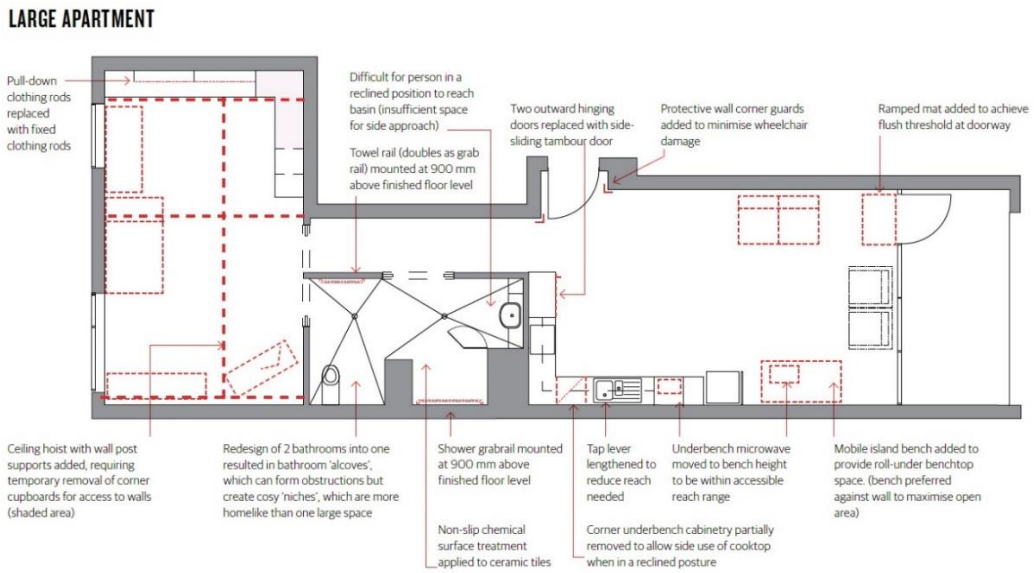

FIGURE 7: HUNTER DEMONSTRATION PROJECT, LARGE APARTMENT CONFIGURATION[lxxviii]

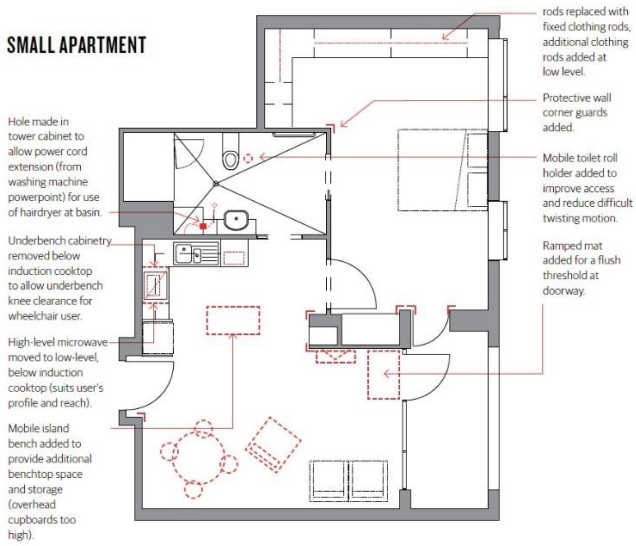

FIGURE 8: HUNTER DEMONSTRATION PROJECT, SMALL APARTMENT CONFIGURATION[lxxix]

Summer Foundation Principles for Accessible Bedroom Design

For a Hunter Demonstration Project Apartment bedroom to achieve LHD Platinum level certification, it must incorporate the following design parameters[lxxx]:

- 1540mm wide path in direction of travel
- Window sill no higher than 1000mm above FFL
- At least 10sqm in area with minimum wall length of 3m
- 1000mm wide path to one side and end of bed with a bed of 1530 x 2030 dimensions (queen size)

An example of a Hunter Demonstration Project bedroom design which meets all these requirements including additional requirements incorporated by the Summer Foundation is show in figure 9.

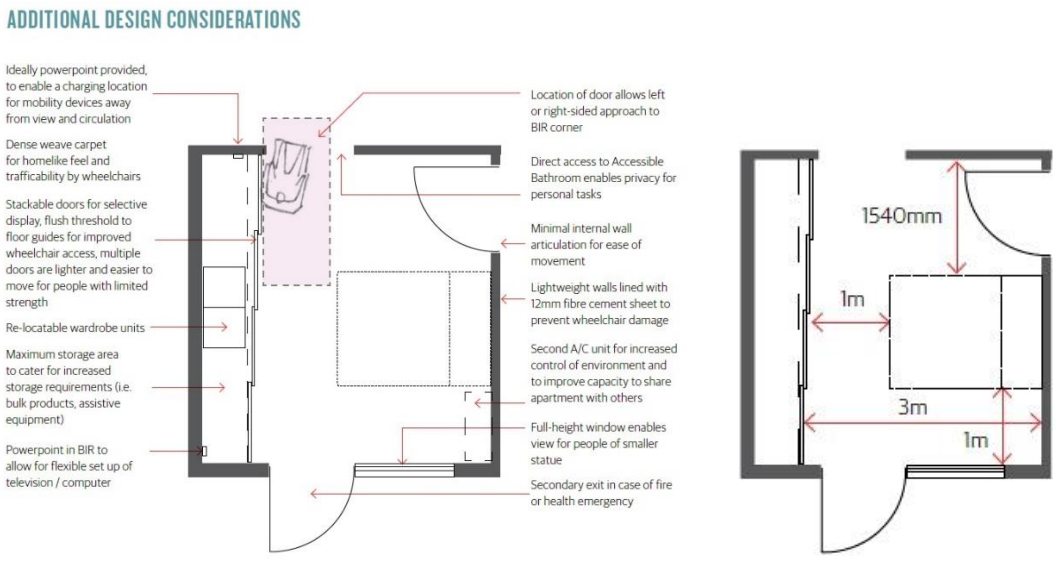

FIGURE 9: ACCESSIBLE BEDROOM DESIGN

Flexible Toilet Design

The Summer Foundation developed a flexible toilet design to address the needs of occupants with varying disabilities. While some occupants would require an approach to a toilet from a particular side, be it the left, or right, some might require access directly from the front. The problem with having to relocate traditional toilets to suit the differing needs of occupants would be the need to hire several trades in order to carry out a toilet relocation to suit different occupants. In order to negate the needs for several trades to be involved in the altering of a toilet, the Summer Foundation uses a flexible plumbing arrangement which can be altered for the trap to be connected on the left, right, or center of plumbing concealed within a nib wall. This arrangement can be seen in figure 10.

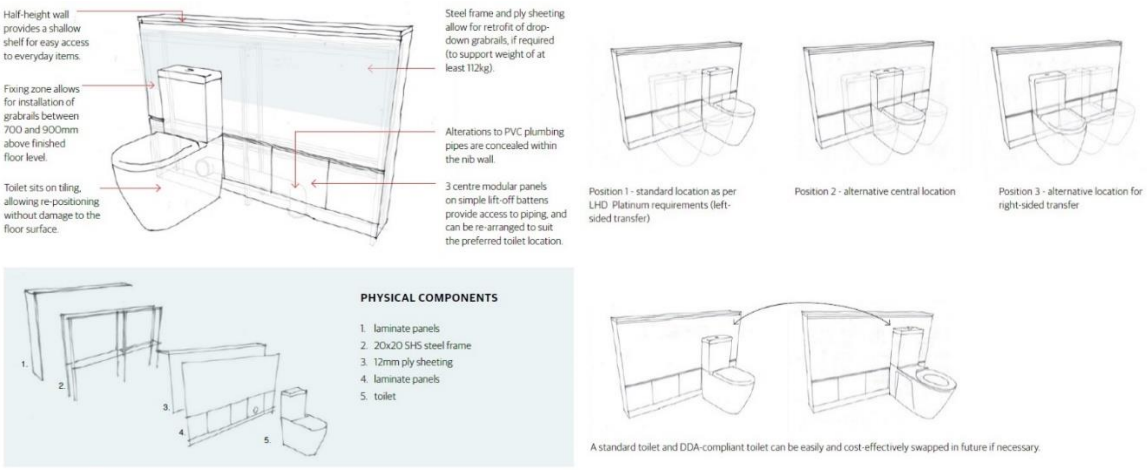

Figure 10: flexible toilet design concept and physical components[lxxxi]

Adjustable Basin Design

In order to allow for occupants with varying degrees of mobility, and using mobility aids of varying heights, the Hunter Demonstration Project Apartments were designed with basins which could be adjusted to suit the height needs of each occupant. This design feature was achieved by the use of a flexible pipe design which connects the basin water outlet to the plumbing fixed to the wall of the bathroom which is explained in figure 11.

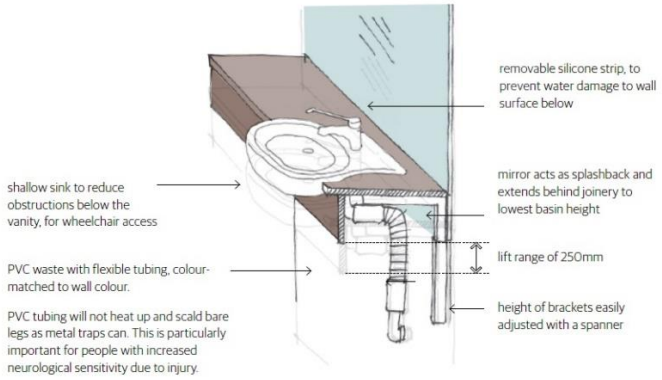

FIGURE 11: SUMMER FOUNDATION ADJUSTABLE BASIN DESIGN

Explained here is just a selection of design principles used in the Hunter Demonstration Project Apartments. This shows the level of ingenuity that is incorporated into both the Hunter Demonstration Project and the Abbotsford Demonstration Project. further in depth information about these demonstration projects can be found in the Summer Foundation publication 'New Housing Options for People with Significant Disability: Design Insights'

Procurement Methods for Developing Disabled Housing Projects

A selection of Procurement options for the construction of Equitable Housing in Australia will now be discussed.

Academically Funded Projects

Universities in Australia often make profits in the vicinity of hundreds of millions of dollars each year[lxxxii]. While this profit generally goes towards improvements of university buildings or developments such as the Deakin teaching hospital at Waurn Ponds, some of this profit could go towards funding the construction of equitable housing for young disabled individuals. The benefit of such projects would affect not only the disabled individual who is provided with suitable independent accommodation, but with the occupants permission, their care needs could be incorporated into practical experience for students studying such degrees as nursing, occupational therapy, psychology, architecture, construction or a range of other study areas which would benefit from having firsthand experience understanding how their respective industry can improve the lives of those who must live with a disability. ethically of course, those who are not comfortable with being part of a practical experience for students may choose to not participate or may not be eligible for acceptance into a university funded disabled housing program.

Public Private Partnerships | Government Incentives

A partnership between the Australian Government and the private sector may benefit both parties. The government currently provides many services for disabled persons, including more recently developing the NDIS which was developed in order to try and better allocate funding for disabled individuals. If the government finds that there is significant demand to provide more accommodation options for young individuals suffering from disabilities, but considers that there isn't sufficient funding available to address the issue, then they government could offer incentives to private construction companies to design and build equitable homes for disabled young people. Incentives could include offering tax benefits, discounts or waivers on government costs typically incurred on large projects, or provide partial funding for the construction or operation costs incurred if private organizations participated in constructing or operating equitable housing projects.

Government Funded

Holistically Government funded housing projects could be implemented which operate much in the same way as current social housing projects operate. The Government could allocate funding to purchasing and refitting suitable accommodation ranging from single bedroom dwellings through to family sized home. These homes can be refitted to accommodate one or more individuals who require advanced design needs. These houses and units can then be leased for an affordable rate to those currently on waiting lists for houses or participating in the NDIS and are eligible for housing assistance. Government funded houses would ideally benefit those disabled individuals suffering financial hardship, which are typically those most at risk of having to move into nursing homes or other less than suitable accommodation.

What the Australian Design & Construction Industry Can Do

Changing the Australian Standard and the way we think about housing design

The Australian Design & Construction Industry can easily address this issue. Looking at statistics on how many Australians are affected by disability, and the likelihood that any given house will be occupied by a person with a disability at least once during its usable lifecycle, it would be more than viable for architects and building designers to design virtually all new dwellings to meet at least one performance level of the livable housing design guidelines. In single level dwellings, and on at least the lower level of all multi-level dwellings, doorways could be designed at 900mm wide as standard to all lower living spaces and at least one lower level bedroom; floor surfaces could be made continuous as standard to accommodate wheelchair access to the lower living spaces and at least one bedroom on the lower level of all dwellings; kitchens could be designed with a standardized space between benches to accommodate mobility equipment; and at least one bathroom in the house could be designed with sufficient space to accommodate a wheelchair turning circle.

It may be too far to suggest that all new dwellings are built to platinum performance levels of the livable housing design guidelines, or to suggest that they must accommodate larger electric wheelchairs or mobility equipment. But designing and building all new dwellings to at least accommodate the needs of a disabled person who may require the use of smaller mobility equipment would provide more equitable houses for a significant amount of disabled individuals. It is also beneficial that larger doors, halls, living spaces, bathrooms and bedrooms are rarely seen as unattractive design features, as these features are already typically viewed as being common of more lavish housing design. With space and size being a drawing point to new houses and not a deterrent to new buyers or renters.

If these principles were adopted by the design and construction industry 50 years ago, then by 2016, virtually all residential properties available to buyers or renters would have designs which could accommodate at least one individual who requires a mobility aid around the house. In addition to this, the degree of design alterations which must be performed in order to accommodate larger mobility equipment would be less on a house already designed to accommodate a person who uses smaller mobility aids.

If we begin to change the standards of housing design now, then we could even begin to see a difference in as little as 1 year, with Australia currently building at an average rate of 150,000 new homes per year[lxxxiii] based on 2013 calculations. With 150,000 equitable homes becoming available within a year, this could provide affordable equitable accommodation for the thousands of young disabled Australians who are currently struggling to find accommodation in the Australian housing market. This may not be suitable for those individuals requiring more advanced design alterations, but the cost of altering an already disabled accessible design to accommodate hoists or larger mobility equipment would most likely be significantly less than the cost of altering a house or apartment the way they are currently designed.

This may be a good area for further research to be conducted, being the economic advantages or disadvantages of designing all new Australian dwellings to be equitable, and the comparative cost of altering an already equitable house for more advanced mobility needs as opposed to a currently non equitable dwelling design. The Australian government may even find that it is economically an advantage to change design standards so that all new houses are designed as equitable houses, as the cost in doing so may reduce the current cost of assisting young disabled people who currently are reliant on millions of dollars' worth of government assistance each year in order to provide them with suitable accommodation.

Conclusion

Throughout this thesis, the problem faced by thousands of disabled Australians regarding their need and difficulty in finding suitable accommodation has been discussed. Evidence of the impact that this problem has on the wellbeing of young disabled people living in Australia was shown which indicates that there are significant numbers of disabled Australians living lives of depression, and isolation because they have had to choose to live outside of their communities due to their condition. The reason for their marginalization from their community is not due to their condition in itself, but due to insufficient community based living environments being developed by the building industry, which can accommodate these individuals with more advanced demands from their living environments.

It has been discussed that there are several building related standards in place which are designed to make sure that disabled individuals are not discriminated against and can have access to suitable accommodation. These include sections of the Building Code of Australia, the Disability Discrimination Act, and the Premises Standards which was developed to address inconsistencies between the BCA and the DDA. But it has also been shown that for some disabled individuals, these standards still do not cater to their advanced design requirements.

Organizations such as the Summer Foundation have been developed to address the issue of finding, or constructing accommodation for thousands of severely disabled individuals who are in, or at risk of entering into nursing homes which are not well suited to accommodating younger Individuals typically under the age of 50. These organizations follow guidelines set out by the Livable Housing Design Guidelines Australia, which is a partnership between community and consumer groups, the Australian Government and the Building Industry which attempts to set out new standards for how equitable accommodation can be designed and awards Silver, Gold, or Platinum performance awards for designs which can accommodate disabled individuals.

Currently, the Australian Government spends hundreds of millions of dollars each year on the problem of attempting to find suitable housing options for young disabled individuals. Thousands of these individuals would receive help and funding through the newly developed National Disability Insurance Scheme, which allocated funding to individual participants which can be used in at least one way to attempt to create better living environments for them.

A significant portion of this problem can be resolved quite simply by the building industry itself, if architects and property developers had a little more understanding of equitable design, and universal design principles. As has been discussed in this thesis, if designers of new houses in Australia thought more seriously about equitable design principles and adopted these principles in every new house built in Australia. Within only a year, we could start to see hundreds, if not thousands of new homes on Australian markets which were better suited to the needs of a vast majority of disabled individuals. This would negate the needs for modification of existing homes to accommodate those with at least the lesser severe mobility impairments. And these design principles may be nothing more than designing doors to living spaces just 80mm wider than what are current Australian design norms.

We all have a right to live in our communities, and it is hoped that this thesis has provided enough evidence that there is currently a demand for more equitable housing to be constructed in Australia. And it is further hoped that the solutions suggested and studied in this thesis, may lead those in the building industry to consider themselves, what can they be doing to try to make Australian housing more equitable for all Australians.

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