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# DESIGN AS THERAPY: FACILITATING THE LIVES OF THOSE WITH ALZHEIMER'S DISEASE THROUGH ENVIRONMENTAL DESIGN

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## EL DISEÑO COMO TERAPIA: FACILITANDO LA VIDA DE LAS PERSONAS CON LA ENFERMEDAD DE ALZHEIMER A TRAVÉS DEL DISEÑO AMBIENTAL

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### Abstract\_

The aim of this research was to combine research methods with the architectural design process in order to put forward a current and relevant proposal for a supportive environment for people with Alzheimer's disease, their family and carers. A review of the literature identified the environmental design features considered most relevant to the topic. Visits to and analysis of three 'exemplary' London-based dementia facilities revealed further design issues first-hand, whilst testing how successfully the features identified in the literature review are integrated into these designs. User preferences were identified through first-hand conversations with patients' relatives and nursing staff and by consulting conversation threads in Alzheimer's forums.

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### Resumen\_

El objetivo de esta investigación fue la de combinar los métodos de investigación con el proceso de diseño arquitectónico con el fin de presentar una propuesta actualizada y relevante para un ambiente de apoyo para las personas con enfermedad de Alzheimer, sus familiares y cuidadores. Una revisión de la literatura identificó las características de diseño del medio ambiente consideradas más relevantes para el tema. Visitas y análisis de tres instalaciones "ejemplares" para demencia con sede en Londres reveló cuestiones adicionales de diseño de primera mano, mientras que las pruebas con éxito como las características identificadas en la revisión de la literatura, se integran en estos diseños. Preferencias de los usuarios fueron identificados a través de conversaciones directas con familiares de los pacientes y el personal de enfermería y consultando temas de conversación en los foros de Alzheimer.

**Palabras clave:** alzheimer, demencia, diseño, medio ambiente.

## Background to the problem\_

### The Dementia Epidemic\_

Dementia currently affects 750.000 people in the UK (Alzheimer's Society UK, 2010). The most common form, Alzheimer's Disease, was first described by German psychiatrist Alois Alzheimer in 1906 and affects around 417.000 people in Britain. It is the most common degenerative brain disorder and is defined as a progressive mental deterioration manifested by loss of memory, ability to calculate, and visual-spatial orientation; confusion and disorientation (Stedman's Concise Medical and Allied Health Dictionary, 2001).

There is no cure in sight and, despite the forecasted gravity of the situation, a mere 3% of the government's medical research budget is being spent on dementia research, compared with the 25% being spent on cancer research (Alzheimer's Research Trust, 2009). Government forecasts estimate the number of dementia cases will rise by 70% to approximately 1.2 million by 2028, increasing further to 1.71 million by 2051 as life expectancy increases. Professor Martin Knapp, from the London School of Economics, predicts a rise of 88% by 2031, when close to 400.000 will be in long-stay institutions (Donnelly, 2008). Despite this, nursing home places for elderly people with dementia have fallen by 9% over four years (Beckford, 2008).

### Therapy by Design: The case for a non-pharmacological approach\_

The challenging behaviour associated with Alzheimer's Disease often becomes unmanageable at home, or a danger to the individual, and it is at this point that most dementia sufferers move to a care facility. Due to the high demand this behaviour puts on staff, antipsychotic drugs are often administered unnecessarily for their sedative effect. However, research at the University of California (2008) has revealed that stress hormones can rapidly increase cognitive decline in Alzheimer's disease, with scientists suggesting that stress management and reducing the use of some medications could significantly stave off deterioration of patients (LaFerla, 2008). The design of supportive environments could play a key role in stress reduction and thus improve quality of life. The Hearstone Alzheimer's Family Foundation, founded in 1995, aims to

improve way-finding, or produce positive emotions and the use of nature, gardens, plants, and animals as therapeutic milieu (The Hearthstone Foundation, 2008). Anne Kapf (2008) also describes the benefits of a sensual environment promoting seeing, hearing, touching and smelling. Design recommendations and criteria encountered throughout the research process were documented in sketch form, which led to one of the first products of this research; a booklet entitled 'Design for Dementia- A visual snapshot' (Figure 1).

## User preferences\_

Relatives of those with dementia know exactly what they like and dislike when selecting a home for their loved ones. The building seems to play as important a role as the care received in the selection of a facility. In response to many queries about how to choose a care home, a lady in one Alzheimer's forum described in detail the process she used for choosing a facility for her husband:

*"When I go to any care establishment, I look at the layout of the place. I have to bear in mind that Ken's particular form of dementia means that he needs to wander around constantly. If the home has only one room where residents are expected to sit around - then that is immediately crossed off my list" (Alzheimer's Talking Point, 2008).*

Snyder (2000) claims that meaningful activity is crucial for those with Alzheimer's, as 'there is often an imbalance between activities forfeited to the effects of Alzheimer's, and new activities established in their wake' which may in itself reduce quality of life. The assumption that those in care homes are no longer capable of doing normal, everyday things can lead to lack of meaningful activity and leave people despondent and discouraged, with one person commenting "I have some depression sometimes but I don't think it needs to be analysed. I attribute it to doing the same thing over and over and over. Day to day there isn't as much to look forward to" (Snyder, 2000).

## Case study buildings\_

Main observations from the case study visits included: social exclusion and lack of visitors; an institutional rather than homely feel; restless pacing along dead-end corridors and the success of a looped circulation route when present; a lack of personal control over environmental conditions, such as high internal temperatures and strong smells; a lack of personal space to accommodate visitors and personal belongings; and restricted access to outdoor spaces due to lack of opportunities for efficient supervision. The location of residents in all three buildings was noted, showing that residents had more tendency to gather in centralised spaces (Figure 2i). Analysis of the three case study plans with the Space syntax 'Depthmap' software show that the spaces observed as being most populated in all three buildings were also the most integrated (Figure 2ii). Syntactic analysis is 'the measurement of the relations between all parts of a system', with integration being defined as 'mathematical closeness', or as 'the proximity and visibility of each segment to all others in a system' (Hillier, B. lecture, 2010). Lack of such proximity seemed to correlate with residents being found more frequently in their own rooms.

## Architectural Strategy\_ 'The Walled Garden'\_

The aim of the design component of this research was to explore the possibility of creating an easily legible and orientating refuge, which also invites people in. The location of the chosen site is to the west of Addenbrooke's Hospital, adjacent to the planned Clay Farm Residential Development of 2,300 homes in Cambridge (Figure 3). The architectural strategy of creating a beautiful walled environment set in lavishly landscaped gardens (Figure 4) aims to bring this outside community in through the garden walls and thus provide activity and life within the facility. In addition to the landscaped courtyards the

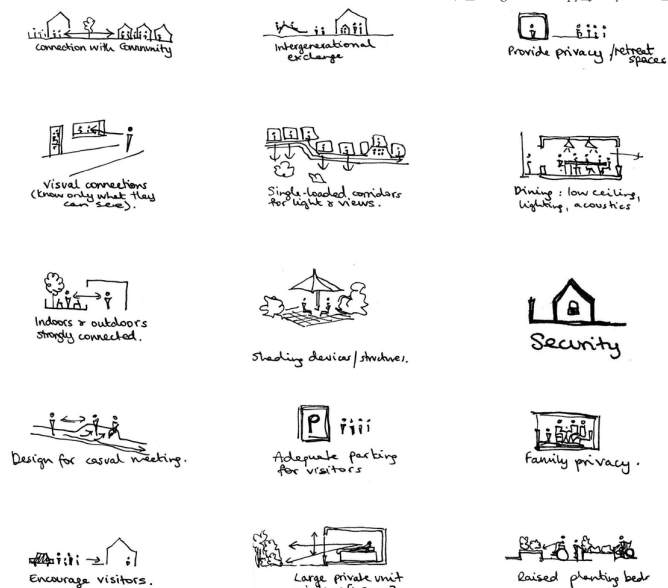


Figure 1\_Cover image of 'Design for Dementia- A visual snapshot' showing examples of thumbnail sketches used to visually document the research process.

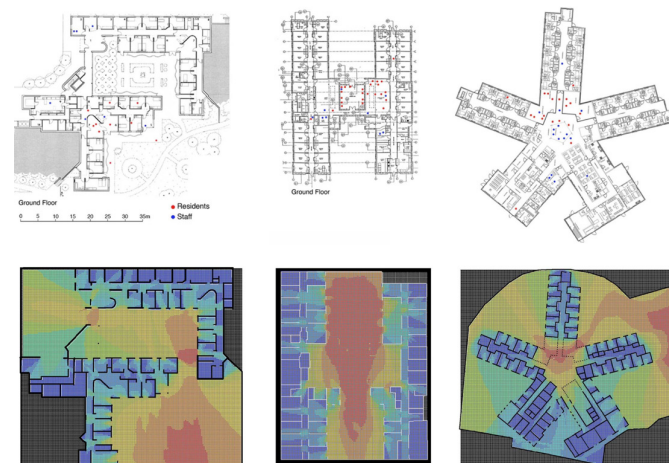


Figure 2i\_Location of people as observed during visits to three case study buildings in March 2009.

Figure 2ii\_Space syntax analysis of the building plans using Depthmap. Red shows the most integrated/public spaces and dark blue shows the least integrated/ most private spaces.

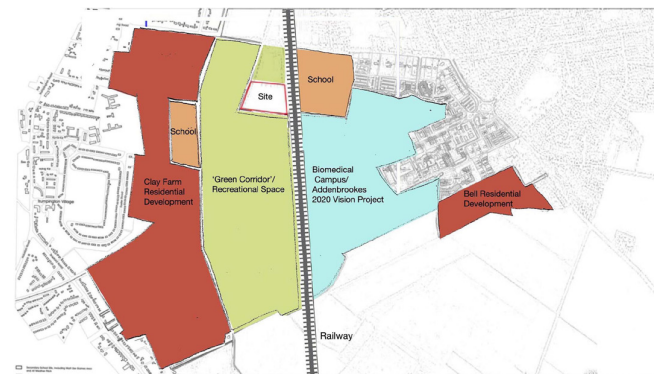


Figure 3\_Site context plan.

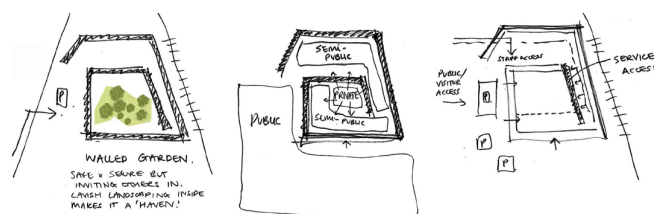


Figure 4\_Sketches showing architectural strategies.



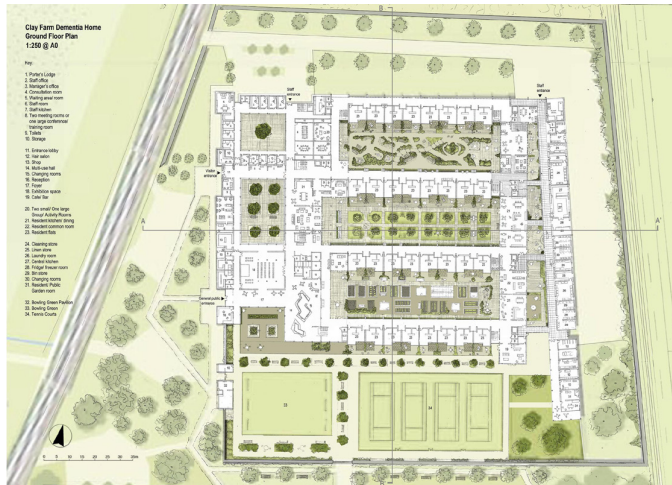


Figure 5\_Ground floor plan and immediate site context.

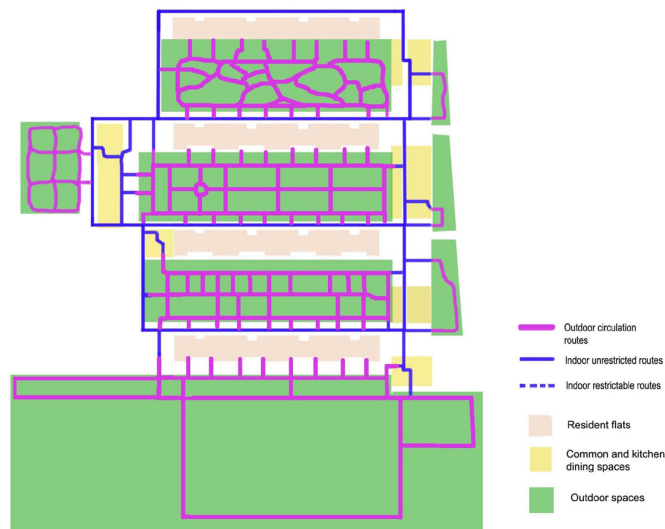


Figure 6\_Diagram showing a network of looped circulation routes linking common, private and outdoor spaces.

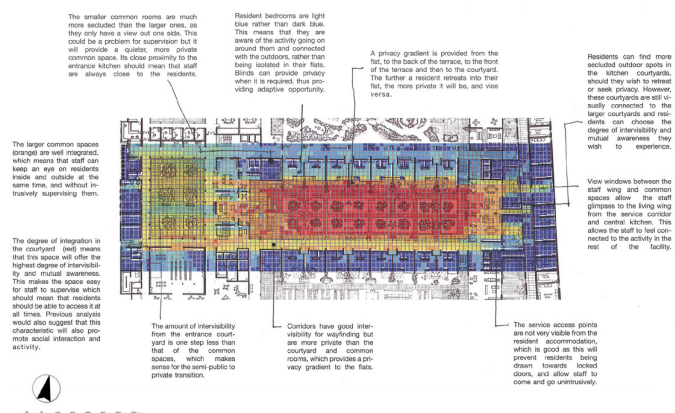


Figure 7\_Space syntax analysis showing spaces with varying opportunities for privacy, mutual awareness, supervision and orientation.

**Layout.** This strategy required a certain degree of control and clarity with regard to access to the facility, as well as a clear spatial hierarchy in the form of a privacy gradient, the lack of which is one of the distinguishing features of institutional buildings (Thompson et. al, 1996; in Hanson, 2003). A back of house theme was established to the north and east, and a public interface to the south and west. This leaves a central core in which the rest of the accommodation can be enclosed (Fig. 5). The deeper one ventures into the building the more privacy there will be, with the south and west edges of the building offering the greatest opportunities for interaction with the outside world. This is ideal for creating the security and privacy required by the residents of this facility, as well as differing degrees of mutual awareness for avoiding feelings of social exclusion.

Within this structure the building has been organised into a series of progressively private and secure spaces and courtyards (Figure 5). The circulation between these spaces is arranged in looped routes to accommodate the wandering behaviour of residents; who find a sense of relief in continuous movement (Figure 6). Distinct public, staff and resident areas provide zoning for both functionality and security. Access control points block access between resident and staff zones, and allow mediation of access between the resident and public zones, should this be deemed necessary by staff.

**Common spaces with varying degrees of privacy.** Evidence and guidance suggest that social interaction is important for maintaining physical and cognitive function, as well as personal well being (Alzheimer's Society, 2007; Steeman et al, 2006). Some care models move all residents into one central room in order to facilitate efficiency. However, this is not something which should be imposed, as too much activity and interaction can be overstimulating for some residents. Instead, the building should offer residents opportunities for adapting their position in relation to others. For example, they should have the opportunity to withdraw completely or to sit back and watch without actively participating. A range of common and more private spaces is therefore provided throughout the building, in order to provide opportunities for varying degrees of social interaction and mutual awareness. Space syntax analysis of an individual courtyard can help to provide insight into how these spaces would be used (Figure 7).

**Personal space: Flats rather than bedrooms. A home with space to receive visitors.** One of the aims of this design was therefore to provide residents with small flats, which would allow them to create their own homes within the scheme. At 43 square metres the size of the accommodation may be challenged, as most resident rooms in present facilities do not exceed 15-20 square metres. However, if the resident is active it will give them space to live, arrange personal belongings, take pride in their environment and even entertain visitors. The moveable partition at the centre of the room can allow shielding of the bed space during the daytime (Figure 8) If the resident is bedridden it should help them feel less confined, as by folding it away the space is enlarged and the resident can become part of a living space. This means that visitors do not have to sit at the residents bedside as if they were in hospital. A homely and comfortable private space, enabling a spouse or family members to make themselves comfortable, could encourage longer and more frequent visits for the resident, thus improving their well-being.

**Residential appearance.** The flat appears residential from the outside, and can be accessed from a familiar street- scene. (Figure 9) Objects from everyday life such as post boxes and street signs provide a sense of community and normality. Residents also have their own front garden and letter box for receiving mail. The openness of the facade means that residents beds can be wheeled out onto the terrace on warmer days. This provides immobile residents with fresh air and daylight, whilst making them feel part of any activity going on in the courtyards (Figure 10).

## Environmental Strategy: Maximising indoor-outdoor connections and exposure to nature\_

**Use of a courtyard plan.** The environmental strategy to maximise both contact with and awareness of the outdoors, was one of the main sources of inspiration for the use of a courtyard plan. Cox (2006, p. 5) has described courtyards as organisational devices which provide sheltered communal space, privacy and security whilst maintaining contact with the changing seasons. The ability of the courtyard building to orient and relate people to the outdoors is particularly relevant to challenging behaviour known as sundowning in which some residents experience the onset or exacerbation of delirium during late afternoon or early evening (Stedmans Concise & Allied Health Dictionary, 2001). This behaviour is related to a disruption in circadian rhythms often associated with Alzheimer's Disease. As elderly residents in institutional environments often experience a lack of exposure to daylight and the outdoors (Brawley, 1997), the building design could play a key role in regulating these rhythms by maximising indoor-outdoor connections. Arranging the accommodation around courtyards helps create shallow plans maximising views and contact with the outdoors from every point in the building (Figure 11).

**Building Orientation.** Room orientation was identified as a problem in all case study buildings, with some resident rooms having more favourable orientations than others. As part of the environmental strategy, the courtyards are therefore oriented with the major axis of the residential accommodation running east-west. With the major elevations oriented towards the north and south, passive solar heating in winter can be facilitated with south glazing, which can be more easily shaded in summer than east and west-facing glazing. Shading simulations helped size the courtyards, and ensured that the building would not overshadow itself at noon in mid-December (Figure 12). Some may challenge this south-facing strategy, arguing that some older residents may not like the sun. However, studies on this topic have revealed that people would rather be offered the choice to block out the sun, for example, with shading devices, than to be stuck with the static and grim orientation of a north-facing room (Choi, 2005).

**Thermal comfort: Adaptive opportunity and winter and summer modes.** In the case study facilities, the temperatures were extremely high (24.6- 26.7C) and seemed to render residents lifeless and drowsy. As institutionalised individuals often lack exposure to a range of temperatures, their senses can become numbed and inert. The building is therefore 'convertible' with both summer and winter modes and maximises stimulation of the senses via contact with the outdoors (Figure 13). The north facing cloister corridors, with insulating shutters applied at intervals along the facade, act as buffers to the north, shielding the north walls of the resident units from heat loss in winter. Opening up of the north and south facades will effectively provide two exposed walls in summer, which will increase the surface area available for cross-ventilation and heat loss. In addition, a concrete labyrinth beneath the timber building provides thermal mass which pre-cools ventilation air in summer and pre-warms it in winter. If the flat feels too warm, it is also possible for the resident to sit outside their room in the cooler living and circulation space to the north. The building thus provides adaptive opportunity.

**Lighting levels and quality.** High levels of natural light have been shown to be useful in regulating circadian rhythms of those with Alzheimer's, as well as providing heightened visibility for ageing vision. For this reason, the window heights in the bedroom are aimed at maximising light penetration to the centre of the room, whilst clerestory glazing and a view window to the back of the room allow light penetration from the skylight and glazed cloister corridor (Figure 13). This avoids dark spots to the rear of the bedroom plans, a problem that was encountered in the case study facilities.

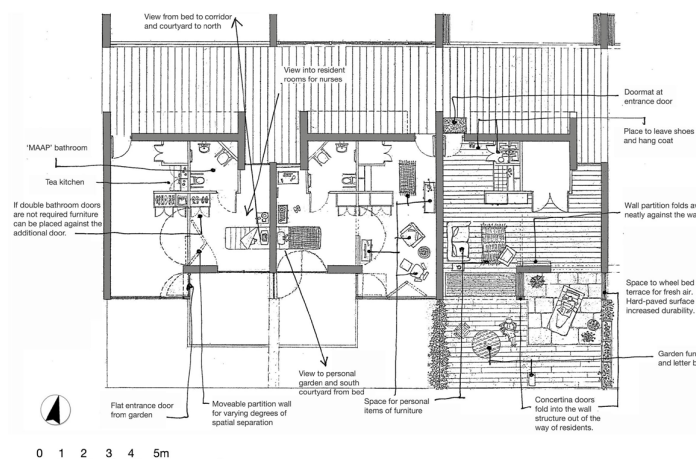


Figure 8\_The resident flat.



Image 9\_A familiar, residential scene on 'Cherry Street'.



Figure 10\_Residents in all flats have access to their own generously sized outdoor spaces, which aim to encourage an increasing number of visitors.



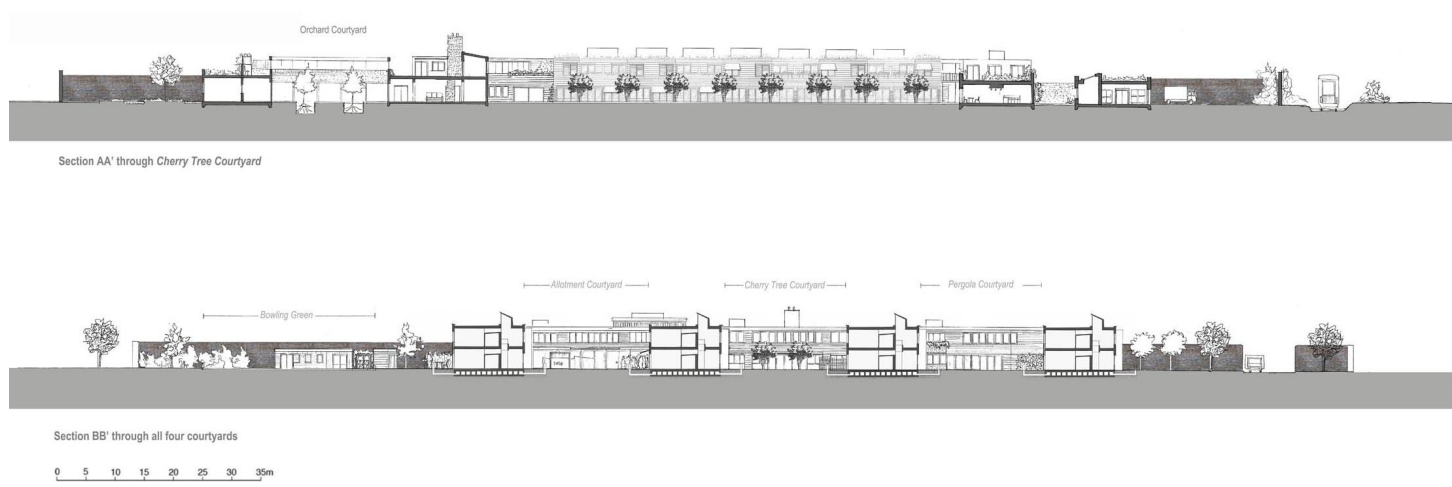


Figure 11 \_Sections through the site showing shallow plans opening onto generous courtyard spaces.

**Maximising wayfinding and stimulation of remaining cognitive abilities.** Those with Alzheimer's often experience difficulty organising sequences of events into a single process (Zeisel, 2009) but studies have revealed that wayfinding and elementary problem- solving remains unaffected when decisions are made in direct relation to explicit environmental stimuli (Passini et. al, 2001). In particular, those with Alzheimer's retain the inbuilt responses to stimuli found in natural surroundings, such as sunshine, shade, flowers and trees (Zeisel, 2009). With cognitive deficits being a serious problem in those with Alzheimer's, the importance of identifying and maximising use of those which are very much intact is paramount. Use of outdoor spaces as useful external reference points for orientation is therefore particularly valuable. Different landscaping strategies will help residents to identify the location of their own living wing within the overall layout of the building, with each courtyard also having a different name according to the landscaping theme.

**Seasonal orientation and year-round interest.** Thought has been given to the seasonal orientation of residents by ensuring that the planting strategy will provide sensory stimulation at different times of year (Figure 14). For example, the 'Malus Spondour' Crab Apple trees in the entrance courtyard (Figure 15) were chosen for their visually stimulating feast of colour and fruit, which gives the fullest effects of the autumn season to help orient residents to the time of year. The fruit could also be collected by residents in order to make apple pie or crumble, an activity which may be reminiscent of times when they use to cook or eat in their family homes. The 'Prunus Shirotae' Cherry trees put on an equally impressive performance in spring, with their pretty white blossoms fluttering in the breeze and decorating the ground around them.

The bowling green, tennis courts and associated public landscaping (Figure 16) aim to make reference to English sport and garden traditions, with their well-kept green lawns, beds of thornless roses and garden wall perimeter. The activity of maintaining these lawns will help generate routine and provide interest. When not in use, the space will serve as a neat and expansive green garden for residents to look out on.

Walled courtyard gardens outside the kitchen and dining areas provide intimate places for sitting or eating outside and will be more familiar to people who have been used to compact city gardens of terraced houses or flats (Figure 17).

## Conclusion\_

The research stage of this thesis revealed the potential for architecture to improve quality of life in Alzheimer's settings. Design guidance suggests architectural features capable of compensating for cognitive impairments, reducing both challenging behaviour and use of anti-psychotic drugs. Despite this, case study visits and user consultation revealed fundamental flaws in current practice. Such problems included a disconnection from the surrounding community and a lack of visitors. Residents also appeared to be disorientated by the long corridors of undifferentiated accommodation. There was a distinct lack of both communal and private space, which meant that residents had very few personal possessions. The environment did not seem to allow for personal routine or individuality, which resulted in an institutional rather than homely atmosphere.

The design element of this research has aimed to provide an alternative 'image' for a building type currently surrounded by stigma. The creation of an attractive, spacious and homely environment amongst extensive landscaping aims to make visitors feel welcome. Access to large outdoor spaces and increased amounts of circulation help relieve stress by accommodating the wandering behaviour associated with Alzheimer's Disease. The ability to walk in continuous loops both inside and out will enable residents to release frustration which can otherwise lead to aggressive behaviour. If residents are calmer, this could help reduce stigma surrounding the disease. It could also facilitate the work of staff and provide a less distressing experience for visitors and family members. This will ultimately benefit the patients, as the administration of anti-psychotic drugs is likely to be reduced. As one of the ultimate objectives of any healthcare facility is to improve or prevent the decline of patients' medical conditions, benefits such as these help to highlight the potential of architecture to improve quality of life and stave off cognitive decline in residents of dementia care facilities. □□□

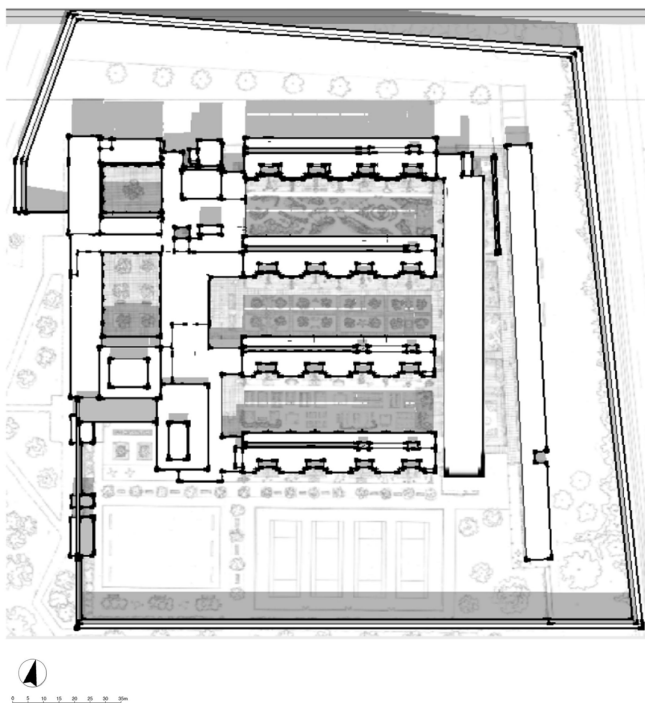


Figure 12\_Shading analysis which shows that the building does not overshadow itself at noon in mid-December.

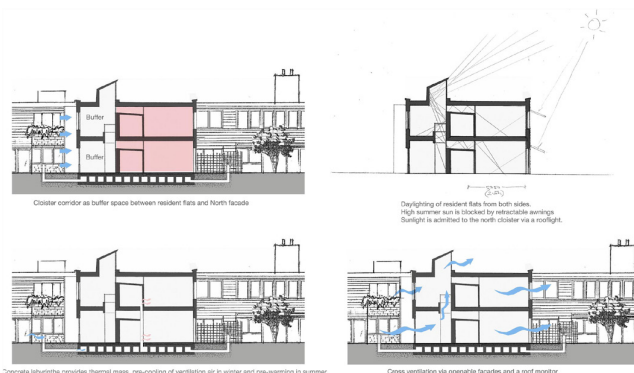


Figure 13\_Environmental sections.



Image 14\_The hard landscaped semi-public 'Orchard Courtyard', as well as the public entrance square, which can become an extension of the foyer and serve as a location for fairs and markets.



Image 15\_An 'English Village Green' with Bowls, tennis and a place under a tree to sit and watch.



Image 16\_The secluded 'city kitchen garden', with shady spots to have tea outside.

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