# Master thesis

# Active Outdoor Desgin for Elderlies
# Graduation Studio(SHE)
# 2017

Maryam Danaei Ahmadi
833337
maryam.danaei@mail.polimi.it

TU/e Technische Universiteit Eindhoven University of Technology

POLITECNICO DI MILANO

Prof.dr.ir M. Mohammadi
Dr. ir. G.I. Curulli

Prof.Postiglione Gennaro

# Contents

# Acknowledgement

This thesis has been conducted in Technical University of Eindhoven (TU/e). I would like to thank Professor Massi Mohammadi for giving me the opportunity to work with her team. This thesis was also not possible without the weekly supervision of Doctor Ireine curili. In addition, I would like to express my gratitude towards Professor Richard Ingresso, who acted as my internal supervisor at Polimi. Furthermore, it is necessary to thank my colleagues in SHE studio. Especially Lex Van Ewijk and Tim.

and

I am grateful to my dear friend Amir , This thesis was also not possible without his help and support.

# Project Description

# TU/e Eindhoven University of Technology

**Graduation Atelier Winter2017**

**(SHE) Stimulating and Healthy home Enviroments:**
**the design and science of Smart Architecture**
**7X545 Graduation Atelier**
**Chair Architectural Design and Engineering**

**Supervisors:**
**Prof.dr.ir. Masi Mohammadi** M.Mohammadi@tue.nl
**Dr. Irene Curulli** g.i.curulli@bwk.tue.nl

The graduation studio started by investigating the concept of home, or more precisely:
- What meaning do people assign to the concept of 'home'?
- Which are its physical components?
- Which non-physical aspects do represent what we call 'home' as opposed to 'house'?

Within disciplines studying the interplay between the individual and the environment, a considerable amount of literature is dedicated to trying to answer these questions. However, the meaning of 'home' for elderly people has been very little investigated.

Therefore:
- How can materials stimulate mental and physical health of the users?
- How does the reuse of old buildings into 'houses' can contribute to the sense of Home?
- Which are the elements of a home that stimulate social interaction?
- Thinking of housing blocks, how can open spaces promote social interaction or sense of community?

The answers to these questions will provide design principles to be applied to new designs as well as to the transformation of existing buildings into 'active and healthy homes'

# What are the effects of outdoor design on elderlies' quality of life?

-Which kind of activities could effects on elderlies' life? And what are the effects?

-How to design an environment to make feasible activities which can improve the elderlies' quality of life?

#OUTDOOR #ELDERLY #QUALITYOFLIFE

#ACTIVITIES #PASSIVE #ACTIVE

#PUBLICE #PRIVET #SEMIEXTERNAL

#NATURE #GARDENING

# Abstract

The outdoor environment plays a crucial role to improve the quality of life in the late life. It is providing opportunities to participate in outdoor physical activity, [Rodiek et al., 2008] exposure to outdoor natural elements and [Hernandez et al., 2008] social interaction with friends and neighbors [Sugiyama et al., 2008]. However, it is a difficult task to design an environment in such a way to stimulate and give access for elderlies to be involved without any problem. Interviews shows that natural and built environment have to be designed with lots of consideration in order to come up with different needs of the elderlies [Rodiek et al., 2008]. In this paper, guidelines established to overcome issues and meet requirements, in order to provide a supporting environment for elderlies to be involved more in passive and active activities. Gardening, as a comprehensive activity which comes with lots of benefits have been considered thoroughly [Hernandez et al., 2008]. Gardening will be introduced in public places and as a part of interior design inside the nursing house. In both cases different groups of elders targeted to make this activity feasible for all.

# Introduction

## What is outdoor?

Historical and environmental research have shown human is in an inextricable relation to the outdoor constantly. People normally prefer a nature environment rather than an urban environment. Additional to this strong interest, it is proved that there are lots of benefits to be in contact with nature.

Outdoor design is an inevitable and a common feature of any long-term facilities. Especially it has started to play a crucial role in the design of the nursing homes for the elderlies with dementia from early 80's.

# Making sense of home

Outdoor design for elderlies relies on many criteria. One of the issues related to nursing homes is the institutionalized feeling of the environment. So, it is very important to design in a manner to give the feeling of a home to the residents. This feeling depends on many factors such as social, mental and moral characteristics of the residence. However, generally when people feel satisfied, feeling of being at home would be transferred to them. Satisfaction can be investigated in many aspects. Criteria which evoke satisfaction and are employed in this research are control, security, contact with nature, comfort, aesthetic, physical activity and social support.

Here it is tried to delve into outdoor design and the effects of each factor on it.

## Sense of control

Particularly for the elderlies whom cognitive and physical abilities has been diminished, it is crucial to have a sense of control over the environment. It means determining and distinguishing of their own acts and influences and predicting other's acts and behavior.

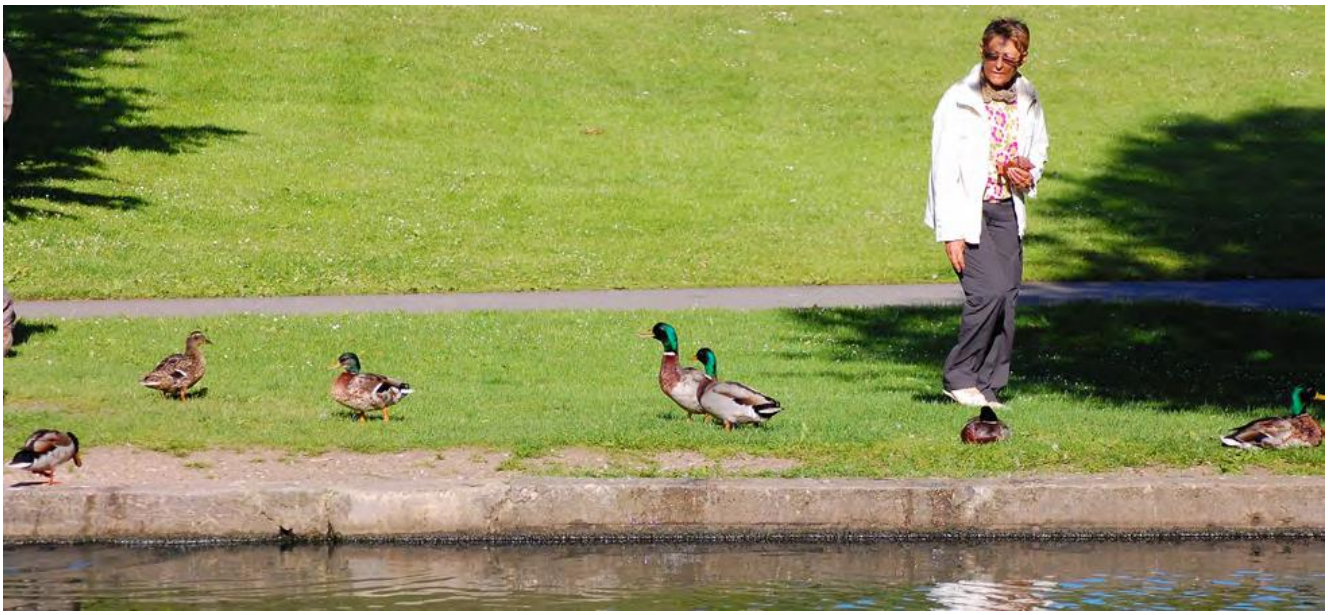
In the other word, sense of control pertaining to the power of selection, accessibilities, security and navigation of the people in the environment.

## Security and security

Security of the environment is one of the main components of the outdoor design, but it should not provoke feeling of losing the freedom. It is sophisticated to realize a secure environment and simultaneously consider the freedom.

## Contact with nature

Well-designed outdoor bring nature into the settings and can offer their visitors positive “natural distractions,” defined as “environmental features that promote an improved emotional state in the perceiver, may block worrisome thoughts, and foster beneficial changes in physiological systems”.



## Comfort

Physical comfort, is one of the features which has to be investigated thoroughly. Especially, since elderlies usually suffer from physical problems, if the outdoor design does not follow certain standards, it is not very convenient for them to participate in outdoor activities and prefer to stay inside. Comfort is included, comfort in movement, facilities, seating areas, accessibilities, wind and rain protection and so on.

## Aesthetic and sensory delight

"Providing opportunities to see and manipulate natural objects and observe seasonal changes can encourage park users to use the park as a source of positive sensory stimulation." [Mussolum et al, 2013] Such stimulation should not only be visual but also auditory, tactile, and olfactory.

## Social support

Create an opportunity to socialize with others, even younger people. It is particularly necessary for elderlies with mental disorders. Make a social network requires an appropriate mental and physical circumstances. The proper design of the outdoor is able to provide a suitable environment to gather aged people together to attend certain events and activities. Researchers have shown, it is more convenient for people to make dialogues while they are doing a same activity. Therefore, it is wise to create outdoor spaces for common activities to facilitate social networking.


## Physical activity

Providing a place for outdoor physical activity would results in many benefits for elderlies. Physical benefits include, longevity and improves older people's physical condition. In the other hand,

psychological benefits consist of, life satisfaction, depression reduction, cognitive functioning, reduction risk of developing stress-related illnesses.

If we look closer to the activity, it has to be noticed that activity has different levels. It contains a whole range from just stay out and watching and listening to the nature, to doing physical exercises. Each of these activities requires specific design for the elderlies with different abilities and health conditions.

## Privacy

It is one of the key components which makes a place to be like home. In outdoor also it should be considered to provide some personal areas for elderlies if they need to be alone. A certain level of privacy has to be taken into account in order to provide quiet and secluded areas for people who are willing to be alone according to their long life habits.

## What Is the Relation of Outdoor and Health

“The simple act of viewing a natural landscape seems to have a restorative effect on people. During commuting to and from work, blood pressures have been measured to be lower when they viewed natural landscapes than when they viewed built landscapes with concrete, buildings, and billboards [Parsons et al., 1998], and access to a view of the natural landscape was determined to reduce stress. The attention restoration theory [James et al., 1892] suggests that exposure to natural landscapes provides people with a restorative environment that benefits health and well-being.”

## Benefits

Outdoor spaces have many benefits for residents, their families, and staff. Scenic walking paths and gardens add residential character and are features demanded by consumers [Geller, J., 2006]. Interviews with people in the early stages of dementia revealed that they value the outdoor spaces for reasons that include exercise, fresh air, emotional well-being, and the opportunity for social interaction [Duggan et al., 2008].

Actually, outdoor environment improves physical and mental condition and increase social interactions. In this paper, it is tried to focus on the benefits of the outdoor in the health condition of the elderlies by considering possible activities in outdoor.

Indeed, being in the open spaces passively, may not apparently makes any advantageous directly. However, it gives a good mental mood which leads to amend aging diseases.

The benefits of passive engagement with outdoor nature spaces include increased socialization, environmental stimulation, increased exposure to sunlight, and improvement in older adults' coping strategies [Pachana et al., 2003]. Benefits such as decreased agitation and aggressive behavior, and improved hormone balance have been observed in association with contact with nature and the outdoors [Chalfont et al., 2005].

If outdoor design intended to intensify eagerness of the elderlies to be out and doing the exercises, it causes a better health condition and particularly hinders following problems:

Falling accidents: Stronger bones, which is coming from enough absorption of sun exposure, beside stronger muscles by doing proper exercises lead to be less prone to the falling accidents.

Low appetite: doing exercises, eating together in the green spaces and gardening modify the elderly's diet.

Insomnia (Sleeping abnormalities): Natural light adjusts sleeping rhythm overnight.

Nervousness and stress: Nature placidity gains control over the stress and alleviate nervousness.

Hyperten: Being in contact with nature helps to regulate blood pressure and brings down the risk of hypertension which is very common among the elderlies. [Robson et al, 2015]

Social isolation: Outdoor activities like gardening, table based games, eating food together, barbeque, reading…., increase social interaction and prevent social seclusion.

Dementia: Residents with dementia benefit from both active and passive engagement with outdoor spaces. Active engagement offers feelings of usefulness and productivity, opportunities for self-expression and personalization, and physical activity [Pachana et al., 2003]

Alzheimer: as a most common case of dementia, Alzheimer is possible to heal or at least stop growing with holding family parties, events and celebrations which happened once in the past. Moreover, repeating old habits in the outdoor can be helpful for the Alzheimer treatment.

Generally, being in outdoor environment not only intensify health rhythm for the elderlies, it is also helpful for the employees and nurses in the nursing homes.

# Activity

Activity is a critical means by which we express ourselves and interact with the world around us. [COT, 2007]

Lack of activity and lack of pleasure gain from that, associated with the higher vulnerability to mortality, depression, reduction in social functioning, physical wellbeing, increased isolation and loss of quality of life. [Mozley et al. 2004, Alessi et al. 1999]

There are different types of activity. Generally, we can divide them in eight different categories listed below:

1. Activities that encourage social interaction

   We exist in a social world and in general experience of the directly contributes to our sense of wellbeing and emotions such as satisfaction, belonging, pleasure or, conversely, anxiety, fear and oppression. [Kelly,2007]

   There are some examples of this kind of activity which will be listed below. These are just demonstrative examples and there are more of this kind.

   - Table-based activities
   - Caring for animals
   - Growing plants

2. Activities that enable a person to achieve their creative potential and self-expression.

   Residents who are not attracted to horticultural activities may be attracted to other activities. For example, people who love art may enjoy painting, drawing or sewing art and so on.

3. Activities that assist with physical health and exercises.

   Scientists have found that stayin physically active and excercising regularly can help prevent or delay many diseases and disabilities. In some cases exercise is an effective treatment for many chronic conditions.

   A proper exercise has to include different health parameters which will be listed below:

- Endurance
- Strength
- Stretching and flexibility
- Balance

All of the above mentioned parameters have to be considered and an appropriate training exercises have to be developed for aged people with considering their limitations.

4. Activities that engage the brain.

Familiar hobbies are often easier in the garden. For example, reading books, doing crosswords and so on in open spaces is an activity which exercises the brain. [ Pollock et al. 2012]

5. Activities that restore and reinforce long-held skills, abilities and knowledge

The person with dementia may well know much about growing fruit and vegetables and flowers, or have had a life-long interest in birds and wildlife. In this way, being outside and maintaining those interests and reinforcing known skills and abilities are an important aspect of reinforcing the sense of self as well as promoting orientation to time and to the seasons. [ Pollock et al. 2012]

6. Activities that provide multi-sensory stimulation.

Sensory stimulation needs to be addressed on a daily basis and year-round to support all five sensory realms. This work can help to compensate for sensory changes and losses, to maintain function and to provide a high level of resident engagement in meaningful activities. The garden and its production can help with this. Following is a list of the stimulations which can be provided by an open space:

- Visual stimulation
- Tactile stimulation
- Gustatory stimulation
- Auditory stimulation
- Olfactory stimulation

7. Activities that are less physical such as sitting, watching, reflecting.

Some people want or need to sit and just watch the wind in the trees or the sun on the flowerbeds.

8. Outdoor activities that can be undertaken in the evening when the light is fading.

Many cultures (in particular in parts of the world with very hot summers) regularly use the coll of the evening to take a walk with family or friends is rewarding. It might also be helpful for the people with dementia or generally elderlies to take a gentle walk, listening to the night sounds, looking at the stars and so on. [ Pollock et al. 2012]

Therefore, different activities can be defined to stimulate elderlies to increase their activity and be more in contact with nature. A comprehensive activity is the one which can involve elderlies both in the indoor and the outdoor environments. As one of the best examples of both outdoor and indoor activities, gardening considered as a case study.

## Gardening

Gardens enable residents to continue engaging in enjoyable activities, which helps to create familiar, non-institutional surroundings [Lovering et al., 2002]. Gardening activities encourage positive affect among persons with dementia and an outdoor garden space may result in less agitation. [Gigliotti et al., 2005]. Gigliotti and Jarrot found that compared to traditional adult day center activities, such as exercise and crafts, horticulture therapy activities resulted in higher levels of active engagement among participants with dementia [Gigliotti et al., 2005].

The presence of a garden is important not only for residents, but also for families and staff. Families visit gardens to sit, walk, and connect with nature, which may help to relieve the stress of having an ailing family member [Heath et al., 2001]. Gardens have a positive impact on staff morale and the pleasantness of the work environment [Pachana et al., 2003]. Other benefits for staff include using nature spaces for walking or other exercise [Kearney et al., 2005].

Active participation suggest that working in a garden can be particularly rewarding because: (1) human existence is based on and dependent on plants, (2) observing the beauty of plants and animals distracts us from our problems, (3) by cultivating we develop attachment and (4) horticultural activities facilitate integration into society [Relf et al, 1999, Stigsdotter et al.,2011].

Gardening is actually acting as a prevention measure for elderlies. [Robson et al, 2015]

There are different approaches which we can analyze influences of the gardening on aged people:

Positive impact on resident quality of life

- meaningful daily activities
- enjoyment of daily life
- relationships with others
- functioning as independent

Effectiveness of gardening

- Increase fruit and vegetable consumption to improve dietary habits.

- Socialize with one another, and pass on cross-generational knowledge to younger community members if applicable.

Health benefits of gardening

- Control hypertension and Hyperlipidemia by increase in consumption of fruits and vegetables
- Protection against coronary heart disease, Diabetes and Kidney Disease.
- The physical activity involved in gardening is a form of exercise beneficial for older adults with arthritis.

# Problems Concerned With Outdoor Usage

There are several problems in outdoor usage for aged people which have to be addressed. Outdoor design has to rely on certain criteria to remove these problems for ease of use for elderlies.

## Weather

Unfavorable weather condition is one of the most important problems associated with participation of elderlies in the open areas, especially in the cold climates. Elderlies are vulnerable and more sensitive to the weather conditions and it is required to protect them against it.

## Falling

Falling is one of the common issues in aged people, which causes losing their confidence. Stress and worrisome about falling on the rough outdoor surfaces could lead to unwillingness of the elderlies to use outdoor environment.

## Accessibility

Because of limitations in accessibility, sometimes it is unfamiliar for the elderlies to use outdoor. Some elderlies even consider balcony or parking as open spaces, though their actual need and desire is to be in the nature.

Issues regarding walking paths are one of the major problems in outdoor usage for elderlies. Inappropriate sidewalks, lack of passages for the wheelchairs, lack of automatic doors, distance and obstacles are the main concerns for the elderly's use of the outdoor environment.

## Security

Insecurity is the other issues related to the association of the elderlies in the outdoor environment. This feeling roots in presence of the homeless people, addicts, robbers, smoking and dirty areas in the public spaces.

Generally, elderlies always try to avoid danger and unpredicted situations, so, they do not want to attend in the crowded spaces or parks where there are younger who are playing with bicycles and skating or children who are running. They afraid to lose their control and balance or unintentionally hit by someone. Nevertheless, they do love to watch children playing and their grandsons. [Loukaitou et al, 2014]

# Background

## Quality of Life

One of the concepts which have been used and will be used later in the context, is quality of life (QOL). So, it is necessary to have a closer look on this concept and present a descriptive definition for it.

Everyone has an opinion about their quality of life, but no one knows precisely what it means in general. Thus, quality of life is highly individualistic.

QOL subscales were influenced by different factors including age, gender, and financial status and more importantly by health, education, financial and marital status. [Farzianpour et al., 2012] Elderly people's health and QOL, when compared with other age groups, are influenced by several factors such as physical, psychological, social and cultural rights [Farzianpour et al., 2012].

In the other word, QOL is multi-dimensional with objective and subjective constructs, although the latter is often given greater priority. As such, QOL often refers to individuals' life satisfaction, happiness, and morale. For example, a World Health Organization workgroup defined QOL as "individuals' perceptions of their positions in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" [ Orley et al.,1996]. Previous studies on QOL of a nursing home residents have shown that dignity, spiritual well-being, food enjoyment, leisure activities, and independence are amongst the most important aspects of QOL [Orah et al., 2010, Hall et al., 2011].

Although there are lots of statements about quality of life, they tend to be descriptive rather than definitive. Most of the energy in this field is spent on measuring quality of life; therefore, the definition of quality of life, by necessity, has to be considered together with its measurement. There are three approaches to measuring quality of life: normative—the norms being dictated by beliefs, principles and philosophies about a good life; preference satisfaction—quality of life depending on availability of goods to choose from and ability to acquire them; and subjective evaluation—a good life being one that is experienced as such. The last two approaches are commonly used in developing measures of quality of life. This process of measurement has replaced the individuality. [Gopalakrishnan et al., 2008]

# Evolution of Outdoor Perception

Being outside is an intrinsic part of being human-mankind started out as 'hunter gatherers', learning how to cultivate crops, farm animals, and support themselves by working the countryside, and thereby spent the majority of waking hours outside.

the concept of having gardens within healthcare setting dates back at least to Greek and Roman times and was seen as part of a patient's therapy. In Roman military hospital, a courtyard was the main feature and fresh air and exercise were central to recovery. Hospices in the Middle-Ages had gardens and/or vineyards. In the Renaissance, public hospitals with central courtyards were standard. In the 19th century, hospitals experienced a loss of garden and open space. Today landscape in the modern health care setting is all too often relegated to small courtyards at the entrance or within the building to provide light to surrounding rooms and corridors but to which there may be no public access. Today's generation of people with dementia grew up in an era when there was a general belief that fresh air was health-giving and, indeed, it is true that sunlight kills some types of bacteria and colds and flu-like viruses. These are also spread less easily outdoors than in internal spaces because of the superior airflow.

Post war era: balcony at the Elsie Ingles Memorial Pavilion, Edinburgh, 1935

# Culture

Our cultural outlook affects many aspects of our lives and the design of outdoor space is no exception. Outdoor spaces can include built elements that are overtly related to a person's cultural background. Such as the interface between outdoors and indoors, which are perhaps less obvious but are also strongly influenced by culture. There are questions which will need to be asked in every design of outdoor spaces. How do the people who will live there relate to outdoors? What do these people want to do? What is meaningful to them? How do they want to live?

# Dutch Garden

Was the description given to a particular type of rectangular garden space, often enclosed within hedges or walls, even if part of a larger garden or parkland. This space would be laid out in a highly cultivated and geometrical, often symmetrical, fashion, shaped by dense plantings of highly colored flowers, and edged with box or other dense and clipped shrubs, or low walls (sometimes in geometrical patterns), and sometimes, also, with areas of artificial water, with fountains and water butts, which were also laid out in symmetrical arrangements.

## Perspectives of People with Dementia and Their Relatives about Outdoor

People with dementia and their relatives have their own reasoning of how important is outdoor for people with dementia. Also, the things that they want from their outside spaces is different too. So, we have to design in accordance to various needs. Following are simply set of perspectives of people with dementia and their relatives:

Alec Lindsay (from Scottish Dementia Working Group)

Based on my own experience I find that it is essential to have space outside. Sitting indoors make me vegetate and offers no stimulus.TV and the media makes people housebound and we need that time-out from four walls. I am fortunate to have a back and front garden. I spend a lot of time buying ornaments

for them. The front has Grecian statues and a sundial and to lighten things up I have a few funny and quirky ornaments. These make people laugh and encourage conversation. My back garden is mostly to my wife's taste. We have an agreement of sorts:

1. She decides on the plants etc.

2. Then I go out with a career and buy them.

3. We get family members to do the planting.

Space is necessary to stop people like me with dementia from becoming too introverted. Although Martin, the coordinator of the Scottish Dementia Working Group, and others who meet me, see me as a bit extrovert, I feel the need for space to think without interruption. These moments out in the garden give me strength to keep going and also lift my spirits. As an agnostic, I don't talk to any gods or clerics but I have great faith in Mother Nature who can be both predictable and unpredictable. This stimulates me. I go out in all weather for a few minutes to clear my mind. It also takes me away from the mind-numbing and boring and boring TV soaps and a certain Fountain of useless knowledge who appears each weekday morning with his usual gallery of social misfits. I remarked to my good wife that I was quite partial to "Loose Woman", and I dare not to print her reply. That was cleared up when she discovered it was a TV show. I have just spend 40 minutes in my garden and now I feel able to discuss gardens and spaces. Having had my space and fresh air I am now composing a letter to the media. There are so many things to complain about that I am spoiled for choice. Space outside four walls stops me developing mental space or vacuum. I am off to the garden now with a ciggie and to consult my muses:Victor Meldrew,Alf Garnet

Members of the gardening group at the Alzheimer Scotland service in Falkirk
Fay Godfrey is the service manager for the Alzheimer Scotland service in Falkirk where Julie Shankland is the gardener/group leader for the gardening group.Fay says: "the group has been a great way to gently introduce people to services in an informal way as three of the men who attended refused all support prior to this, all three went on to accept support in terms of day care or outreach.one of the gentleman still refuses traditional support,however, he loves coming along to the garden and we have managed to get funding on an individual basis to continue this.they've done lots of jobs in the garden ranging from weeding, planting seeds,tending the veg patch, cutting the hedge and painting the fence as well as

building a bug house and sorting out the compost heap.It has saved me a lot of times I used to come over at the weekends and potter but am less able to do so now”

A daughter-in-law

My father-in-law is 62 years old and approximately three years ago he was diagnosed with Alzhemer’s disease. Following diagnosis, his condition quickly deteriorated and he is now resident in a specialist facility in a hospital.

My mother-in-law loved being outdoors and spend vast amount of time gardening, which was one of his hobbies.in fact, following his retirement from a senior position in the police force,he took up a small part-time role as a gardener at a local stately home, which he loved. Unfortunately, as his condition worsened he was unable to continue with this job.

Caring for an individual with alzheimer’s disease is very difficult.Unfortunately, after several month of looking after my gather-in-law, hs condition rapidly worsening, my mother-in-law placed him in a care home on the outskirts of the town.this was an extremely difficult time for all tha family, but even more difficult(as you can imagine) for my father-in-law.He missed his home, his family and his freedom.he was no longer able to come and go as he pleased. The facility, whilst having a small grass area, was not secure and therefore my father-in-law had to be accompanied at all times whilst outdoors it was not,therefore,possible for my father-in-law to spend the time in the outside that he wanted, and often complained about being ‘trapped’ in what he called ‘the jail’.
after a few months of his arrival,it was apparent that my father-in-law was extremely unhappy with the facility within which he’d been placed.whilst his symptoms were such that he would forget what he ate for lunch and struggled to engage in verbal conversation,he still knew his own mind and was extremely frustrated both by his condition and his surroundings.
eventually my father-in-law was placed in hospital, which, whilst it was a secure ward,had a garden that he could ‘potter’, sit in a fresh air,and help the staff with som gardening etc.He was much happier in this facility but unfortunately this was a short-term facility was required to be found.
after a few weeks my father-in-law was placed again in a short-term facility,but this time it was at another hospital.this placement was principally aimed at assessment and trying to trat his condition as well as possible under the circumstances.The facility in this hospital again had a large secure garden and he could access it at will. He spent hours in the garden and when we went to visit, this was our first port of call. Nine times out of ten we would find him there. When he was in the garden it brought back memories of

his past life and for the hours that he was out there,he seemed happier. after a month or so my father-in-law was placed in a longer-term ward in the same hospital.whilst the staff are terrific and extremely caring, the ward is two floors up with no access to a garden.the only fresh air that he gets is when the staff take him for an occasional walk around the grounds of the hospital.his condition has significantly worsened since being placed in this ward.whilst I am sure, from frome a medical diagnosis point of view, this is consequent to his illness with which he has been diagnosed, I believe that if this facility allowed him access to a garden, his quality of life would be improved .at least for the short time he was in a garden he might be allowed a small amount of happiness and to engage in the hobby he enjoyed for so many years,escaping the feeling of being 'trapped' and imprisoned. watching a relative disappear before your eyes as a result of a condition such as alzheimer's disease is absolutely heart-breaking.I believe that anything we can do to make this awful condition more bearable and provide the best quality of life possible should be pursued.

A daughter

I asked her how important she felt it was to be able to go out to the garden when you want?this is what she said:
"oh, very important. I like to go out and sit down and get the fresh air.I would really miss it if I wasn't able to do this… It's nice to be able to go out and sit down when the sun is out but I like to sit in the shade and enjoy the sunshine. I would say it is very important for old people to have a garden to sit in and It's very good for our health… there are usually two or three other people sitting in the same part of the garden but I don't really chat to them because I mainly like to enjoy the peace and quiet."
My own opinion is that having access to a nice, spacious and well-tended garden has really improved my mother's quality of life as her physical health and memory have deteriorated.
Refrences:Killick, J.(2009). The elephant in the room: Poems by people with memory loss in Cambridgeshire.Cambridge:Cambridgeshire county council

# Methods

There are several research methods which have been considered in this paper in order to gather information. Here, with the aid of different methods and combining them, it is tried to dig into the problems and solve them. The following will be a short description of the implemented research methods.

## Literature review

There are quite a few resources for the outdoor design of the nursing home. In these resources, different approaches and emphasize points have been considered. Researchers tried to shine a light on different aspects of the outdoor design for elderly's care homes. They have established different design rules and tried to acquire a safe, stimulating and attractive outdoor environment for their residents. However, it is still necessary to explore more to realize a comprehensive and perfect model for outdoor design.

## Interview

In this method cards with different elements of the outdoor environment have been generated. The cards were representing different design configurations. Then, elderly's have been asked to tell their opinion about their desired configuration. This is performed in order to get some information about preferences and wishes of the care home residents.

## Case Study

There are ample case studies which can be accounted as design references. Case study is one of the research strategies that explores individual events or cases in their own context. In this regard, it is possible to extract information from similar cases. Additionally, case studies are one of the best sources to investigate problems and obstacle which might be faced in a real application of a design strategy. In this research, this method is used to find out the current status of the outdoor designs for care homes for elderlies in different cases and get the advantage of the interesting ideas.

## Behavioral mapping

The target group of this research is aged people. Therefore, it is not easy for them to recognize their actual need, besides, there are elderlies who have mental disorders and it is hard to get their willing to the interview. So, it is wise to perform some observation and monitor their reaction in contact with different situations. Here in this study, this technique was utilized to get to know the actual needs of the elderlies.

# Case Studies

## Case 1

**Water Feature Idea**

### Ira Keller Fountain Park

Architect

Angela Danadjieva Lawrence Halprin

Built in

1968 - 1970

Location

Portland, Oregon, United States

**Introduction**

Originally called Forecourt Fountain or Auditorium Forecourt, the park opened in 1970 in an area that was part of the Municipal Auditorium. In 1978 he was named Ira Keller, in honor of the head of the Portland Development Commission in the period 1958-1972.

The main feature of the park is its large water fountain, made of concrete, which in 1999 earned him the award of the American Society of Landscape Architects. While the park is called Keller Fountain Park, the source itself is called Ira Keller Fountain.

**Situation**

The Keller Fountain Park is an urban park in downtown Portland, Oregon, United States. Occupies 0.37 acres between 2nd and 3rd Avenue, Clay and Market place at the time of its construction belonged to the Civic Auditorium in the city.

**Concept**

Angela Danadjieva, designer, then, to study the landscape architect Lawrence Halprin was who did the design of the park and fountain, although the project is usually attributed to the famous architect. His inspiration came in the Cascades of the Columbia River Gorge, Columbia River Gorge, located east of Portland.

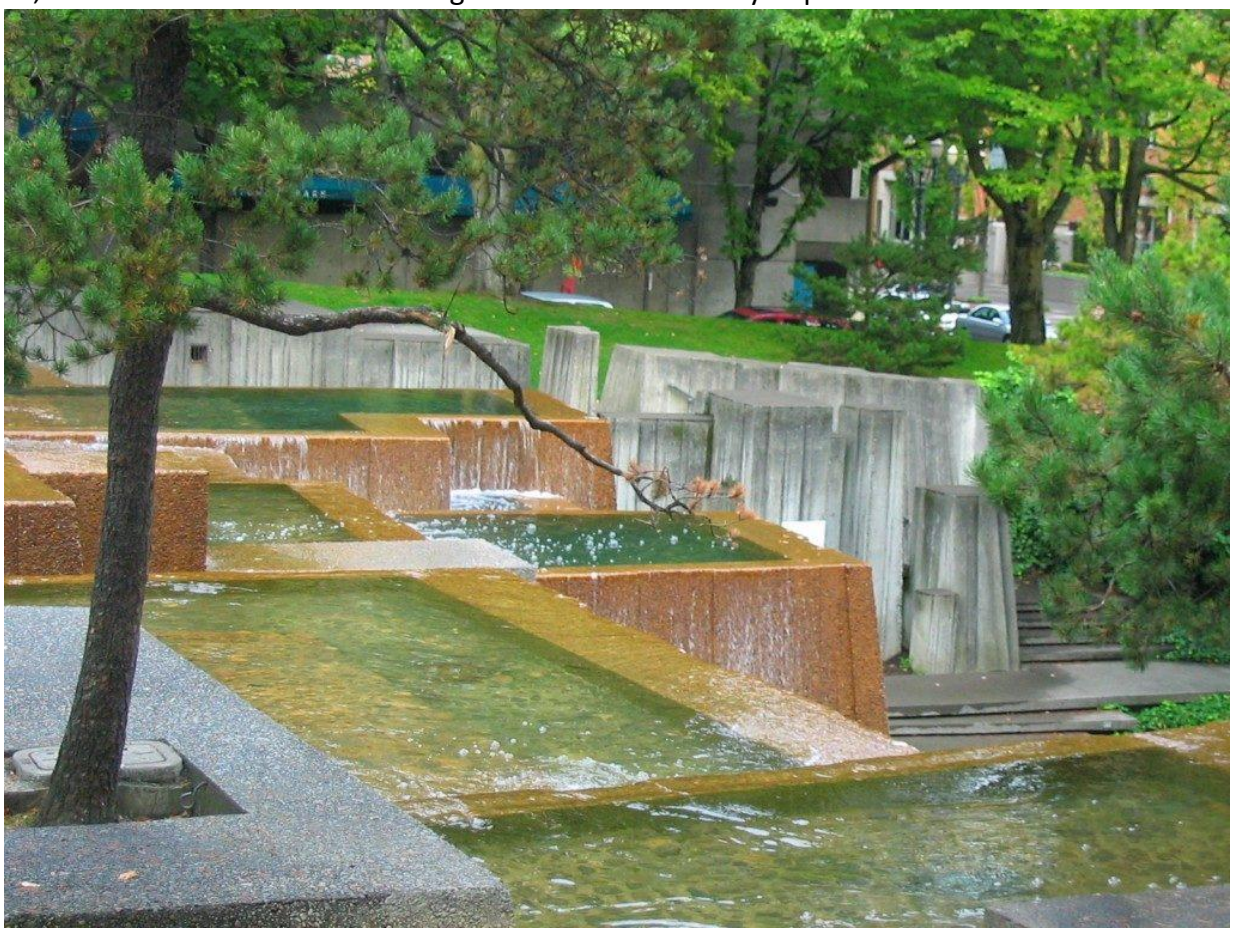
Halprim work was always marked by attention to the human scale, the user experience, to humanistic values and the social impact of their designs. This place was meant for the use, enjoyment and benefit of the public.

In 1981, the architect wrote: “Space is the choreography for movement with the nodes of silence and contemplation, action and inaction, hard and soft, Yin and Yang.”

Danadjieva considered throughout the project as an opportunity to give park goers a refuge from the streets of the city: “… Actually, it was my response to the traffic situation and insecurity of pedestrians…”

**Spaces**

The park, whose unquestionable attraction is the great source, allows visitors arrive and stand or swim in the top of the waterfalls, so was developed following a building code to prevent and avoid falls from heights, both children and adults. Its vegetation consists mainly of pine trees.



The urban space was designed by Angela Danadjieva, collaborating with the study of Halprin. In their design work done with linear and irregular shapes seen, echoing natural phenomena. It is an excellent example of abstraction of nature from close observation of processes, shape and interaction of materials, staying true to them.

Its surface offers many places to sit and relax, without losing sight of the attractiveness of the source in full only under the shade of trees or large concrete slabs.

**Ira Keller Fountain**

The flow of water begins as a fast-paced trail that goes evenly into a series of stepped pools, overflows and falls into a broad quieter stretch. Adapting to the urban context and human interaction, all functions are simplified, seeking the essentials. The use of straight lines permutations absorbs micro desert, but the volume of the concrete slabs given the complexity and topographic integrity from the edge of the water to vegetation.

The Fountain Pools perform Ira Keller were in reinforced concrete and contain 280,000 liters of water. A pump that propels the water cascades moves 49,000 liters per minute on them.

To prevent falling over visitors by the waterfall at the top of it, where it is allowed to stand and play children and adults, have created pockets of water of 910 mm deep, which act as security walls. As described by Lawrence Halprin, the source is a complex of 8 blocks interconnected with interfaces urban corridors and in the middle of Portland.

**Sections**

Following a rising level in the source there are three sections:

- The collecting, deep and shallow pool, accessible from the large flat stones of concrete, square or rectangular, irregularly overlapping, on one another, creating voids shaded and offering proximity to the water without getting wet.
- The parapets of the blocks in the waterfalls, which make up the stepped aisles, the most dramatic and photogenic, sunny, bright and strong attractive, with deep, secret passages pedestrian on each side of the waterfall to allow the rise of visitors.
- You upstairs cascades leads to the third section, a higher plane before the falls where swift currents pass under the foot, between the cracks and irregularities in the pavement, to fall by the waterfall.

**Consumption**

In 1988, the Portland Water Bureau objected to the cost involved maintaining the source, both water consumption and electricity. Then water consumed $ 34,000 and $ 13,000 per year in electricity.

In 1993, all government departments of the city asked the Mayor Vera Katz conduct a study to determine which areas could reduce budgets and Portland Water Bureau suggested suspend the activity of sources, including Keller Fountain. The governor of Oregon, Mike Rosenberger, acknowledged that the sources were not an essential service, but also to the entire public opinion and might have to be removed if you cut the water necessary for the operation of sources would turn against From that moment he did not turn to discuss the closure of the Keller Fountain.

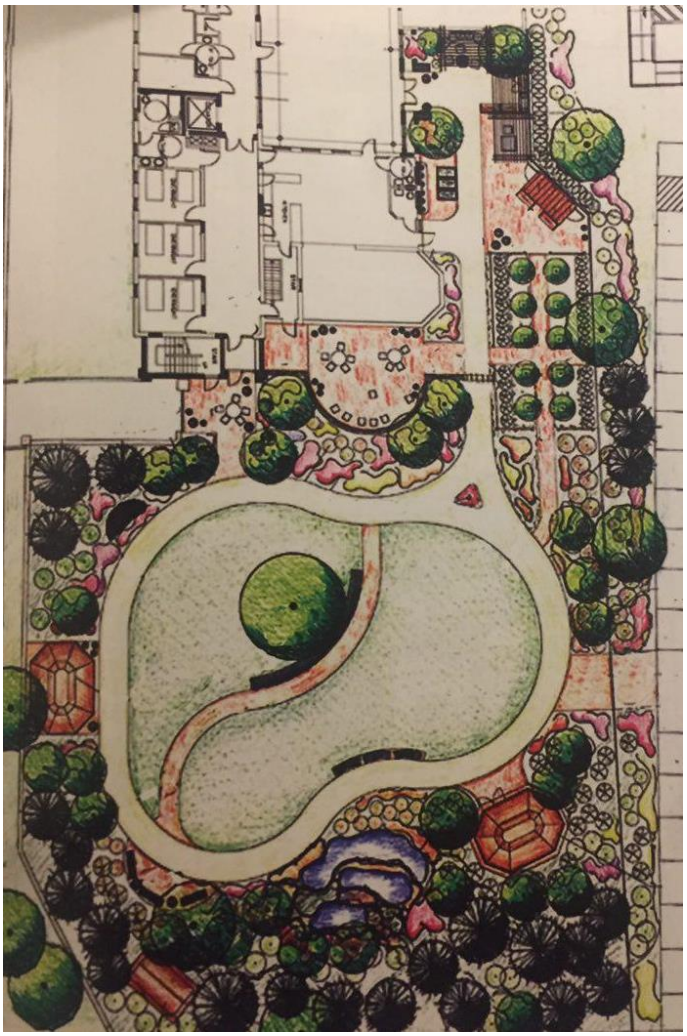
## Case 2

**Idea for:**

- **Introduction of Focal points to attract attention**
- **Spaces for active and passive activities**

**LOCATION: Family life center in Grand Rapids Michigan, USA**

The garden was designed by Martha Tyson of Douglas Hills Associates in Evanston, Illinois.



There are two main components to the half-acre site: the main strolling and viewing garden and the working garden. The working garden is a rectangular area, east of the building with raised beds and trellises for horticultural therapy, a potting area with shade and a sink, a garden shade, a small orchard, a butterfly garden, and an umbrella-shaded area for seating near the atrium entry door.

The larger component, the main garden is entered via an arbor from the working garden and consist of lawns, paths, perennial beds, gazebos, a waterfall and pond, and various places to sit.

Passages guiding to a focal point

Allocation of different areas for active and passive activities

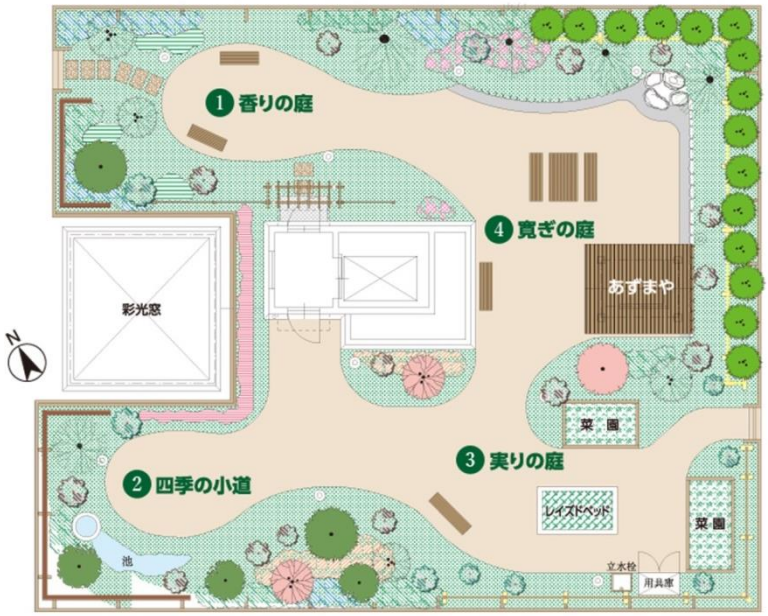
Case 3

## Idea for Stimulating Outdoor Design

**LOCATION : Japanese garden at Plaisir, Villa Ichikawa**

Stimulation in different ways in garden

Architect: Yuji Okubo




1 Scented garden" that you can enjoy scented plants such as sinking flower, jasmine, rosemary

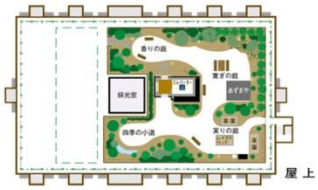
The home is a three-story reinforced concrete structure, which houses 60 residents of which around 20 residents currently require care for dementia.

One of the wonderful aspects of the institution is that it is home to a garden and rooftop garden created by Hirokazu Kaku of the Japan Branch of the Royal Hortical Society. Once through the entrance way, the lobby opens out before you leads through to a combined restaurant and multipurpose hall. The hall overlooks a beautiful Japanese-style garden that makes use of green slopes.

2 Path of the Four Seasons
"Flow of the Four Seasons" that you can enjoy flowers by season

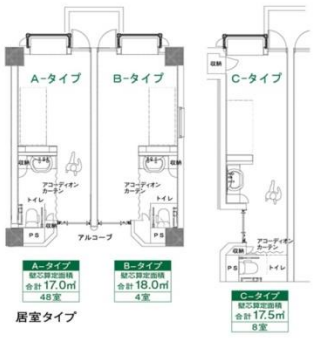
3 A fruitful garden (raised bed) that can plant, grow, and harvest flowers and crops

4 Relaxing garden
to spend with family and friends










Falls falling on the surface of the Infernal Fountain
The taste of ink painting

Foot bath in the Japanese garden. Relax and relax, effective to maintain health by
improving blood circulation.

In the Japanese garden facing the bathroom, flowers of the seasons bloom, trees such as pine and maple arranged around the waterfall make the hearts of people seeing it.

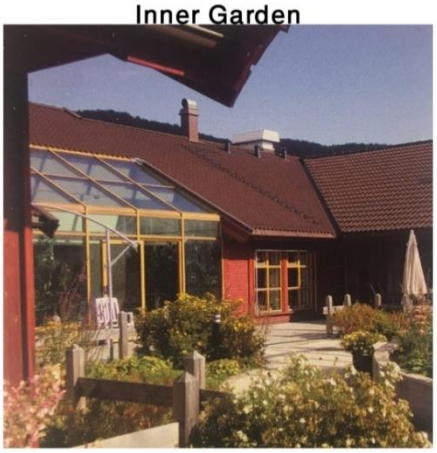
Case 4

## Idea for Separation of private and public gardens

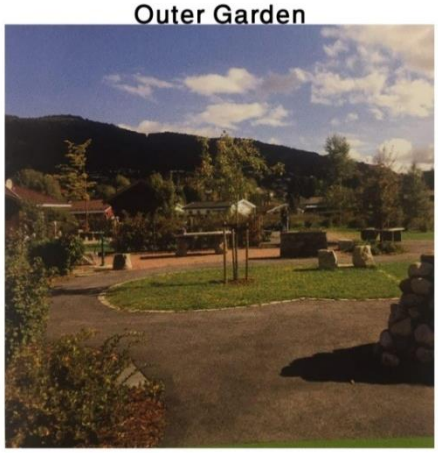
**Haugmotun Sensory Garden, A therapeutic garden for people with dementia**

**LOCATION: Telemark County, Norway**


Inner Garden



Outer Garden



Growing season in this part of Norway is just over three months, yet the two-part garden is treasured both as a place to be in and a place to be viewed through the many windows of the facility during the

long, cold winter. The inner garden, faced for privacy and safety, is designed for 16 patients with dementia who need a serene and predictable space. The second outer garden is designed for 12 assisted living residents in flats next door. These residents are not diagnosed with dementia, but are elderly and can access nursing care as needed. This outer garden is designed for activity and is open to the public.

## Case 5

# Greenhouse design Idea

A great Idea to integrate green house to the indoor spaces.

Following we delve into features of this project, which later we use some of these features in our gesign.

Danish studio EFFEKT has designed a self-sustaining, off-grid village of greenhouse properties, which it will present inside the Danish Pavilion during the Venice Biennale.

Called ReGen Villages, the project imagines a community of buildings that produce all their own food and energy – a model that aims to tackle a wide spectrum of global issues, from the food and water crises to the rise of CO2 emissions.

Each village would comprise a series of buildings with attached greenhouses, creating spaces where families can grow fruit and vegetables, farm aquaponics or recycle waste products.

They would also integrate sustainable energy technologies, producing all their own electricity.

"Our modern lifestyle is utterly unsustainable and this calls for more resilient solutions for the future," explained EFFEKT partner Sinus Lynge.

"The technology already exists, it is just a matter of applying science into the architecture of everyday life."

The project was born out of a research paper at Stanford University. One of its authors, entrepreneur James Ehrlich, further developed the idea to launch a tech-integrated real estate development company, and brought in EFFEKT to imagine what its buildings might look like.

The aim is to start building the first community of homes this summer in Almere, the Netherlands.

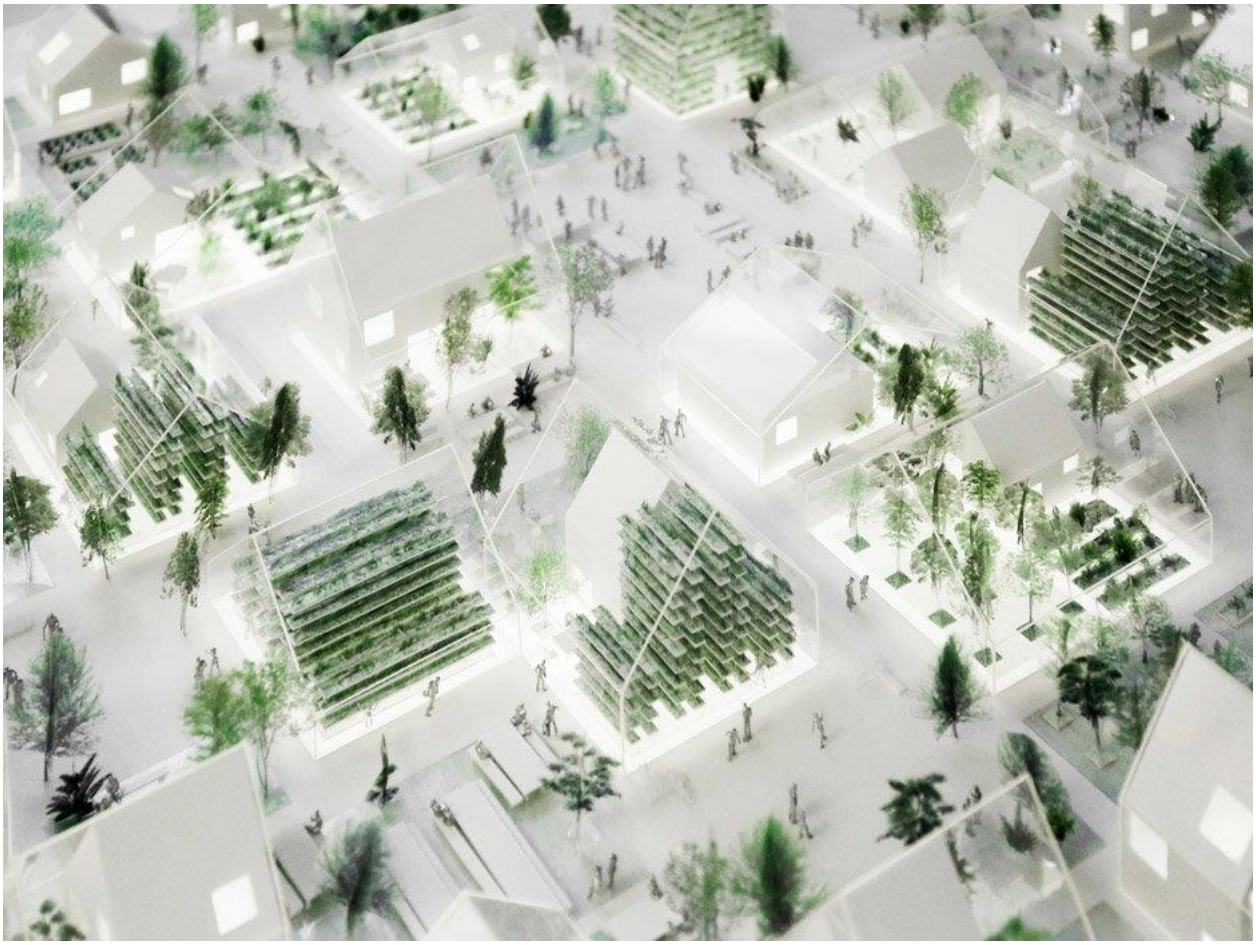
Other pilot projects are in the works for Sweden, Norway, Denmark and Germany, and there are also plans in development for the UAE, China and Africa.

"ReGen Villages is engineering and facilitating the development of off-grid, integrated and resilient neighborhoods that power and feed self-reliant families around the world," said Ehrlich.

"The time has come to redefine residential real-estate development for the next three billion people coming to the planet."

The concept is similar to the idea of a cooperative community – a model that is proving increasingly popular, with similar recent examples in Belgium, the UK and Germany. But here the concept is slightly different.

With ReGen Villages, residents become part of a shared local eco-system, so different families can take on different roles in the community. As well as fostering a sense of camaraderie, this also helps to lift burdens on struggling municipal governments.

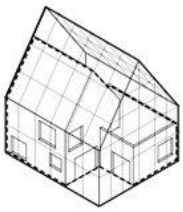


Each village would include a series of public squares, integrated with technologies like electric car charging points.

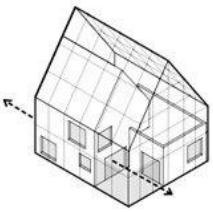
Individual homes would integrate photovoltaic solar panels to generate power and heat water. They would also feature passive heating and cooling systems, as well as natural ventilation, helping to keep electrical demand low.

There would also be closed-loop organic food and waste systems.

# HOUSING FEATURES

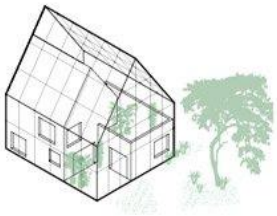


PREFABRICATED AND DEMOUNTABLE LIVING BOX

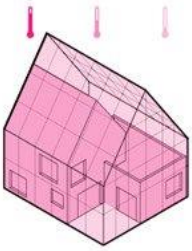


OPENABLE

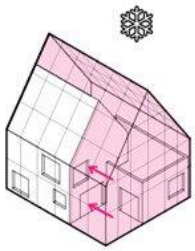
EXTENDED LIVING ZONE



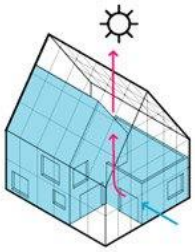
INSIDE & OUTSIDE BLENDS



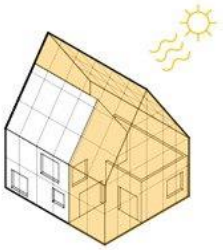
PASSIVE HEAT + HEATED SPACE



PREHEATED AIR IN WINTER

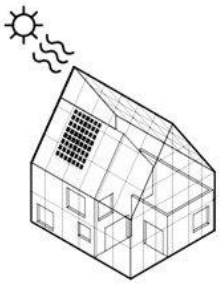


NATURAL VENTILATION



EXTENDING SUMMER SEASON

BUILT IN WATER COLLECTION



BUILT-IN SOLAR ENERGY

# Target

## Target Place

Here, an assisted living center has been considered as a target place to work on. This center is named “Saint Joseph Oord”.

Foundation Saint Joseph Oord has been founded in 1950 in a wooded area of Nuland for elderly and / or sick nuns. St. Joseph Oord offers not only care in the nursing home, but also, care in elderly’s own home and day care.  St.Jozefoord was a chapel central and currently still live approximately 75 sisters. The main building houses is included a recreation room, restaurant and library.

It is located in the leafy area on the east side of s-Hertogenbosch, Netherlands. The building complex, the 6-hectare park and the surrounding forest (over 20 hectares) have been developed over 60 years ago.

| General information | |
|---|---|
| Name | Jozefoord |
| Town/City | Nuland |
| Number of locations | |
| Number of organisational units | 1 |
| Number of members of Board of Directors | 1 |
| Number of members of Supervisory Board | 7 |

| Information for institutions for nursing and residential care | 2011 | 2012 | 2013 |
|---|---|---|---|
| Number of clients at the institution on the basis of a care intensity | 128 | 123 | 124 |
| Number of residential clients on the basis of a full package (VPT) | 0 | 0 | 0 |
| Number of extramural clients | 0 | 0 | 0 |
| Number of available beds/places with residential care | 117 | 121 | 121 |
| Number of days of residential care | 43,633 | 45,058 | 46,531 |
| Number of days of care on the basis of a full package (VPT) | 0 | 0 | 0 |
| Number of permanent employees | 198 | 212 | 224 |
| Number of FTEs of permanent staff | 100.8 | 108.0 | 118.6 |
| Number of half-day sessions of daytime activities | 0 | 0 | 0 |
| Number of hours of extramural production | 66 | 0 | 0 |

## Target group

Elderlies in St. Jozefoord are aged between 60-100 years old. They have different physical and mental health conditions.

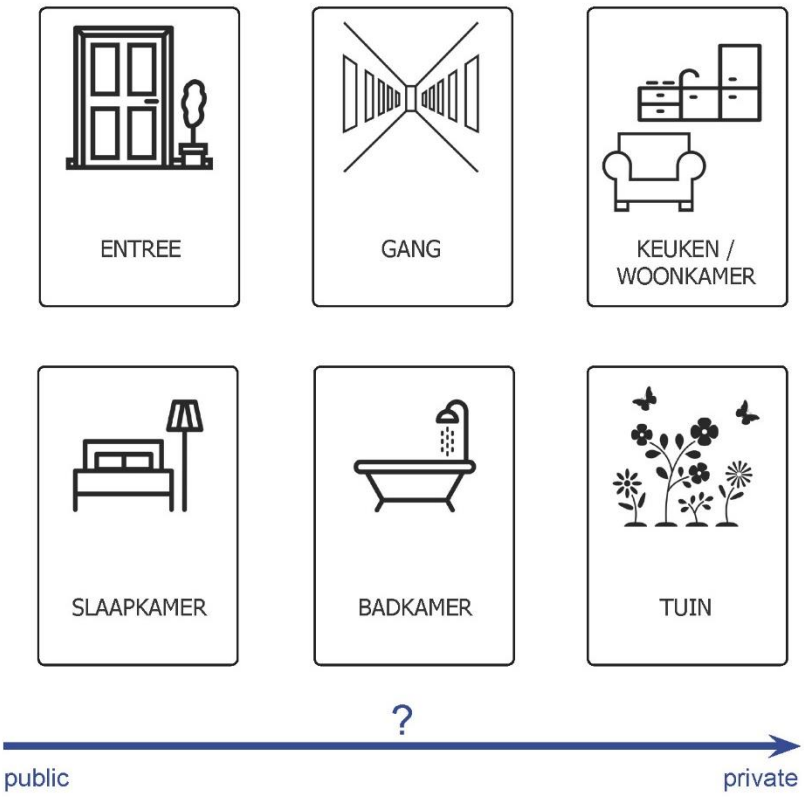
With considering all data gathered from the study methods mentioned earlier, it is decided to perform some modifications in this facility in order to let residence to take advantages of the outdoor spaces more. In the coming chapter, first, guidelines of the design will be developed, then a design based on the observations and criteria will be presented.

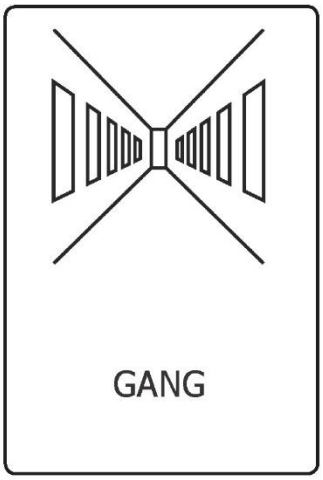
## Interviews from Residents

In this method cards with different elements of the outdoor environment have been generated. The cards were representing different design configurations. Then, elderly's have been asked to tell their opinion about their desired configuration. This is performed in order to get some information about preferences and wishes of the care home residents.

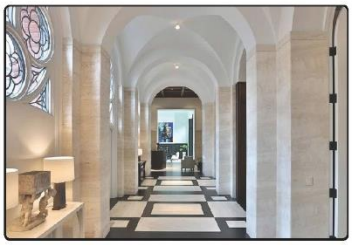
The main features of the nursing house which can make this public place to inspire feeling of the home and make it private like environment have been chosen. Cards for these spaces have been proposed with different configuration to give freedom to the residences to choose one which give better feeling to them and make the nursing home more home like.

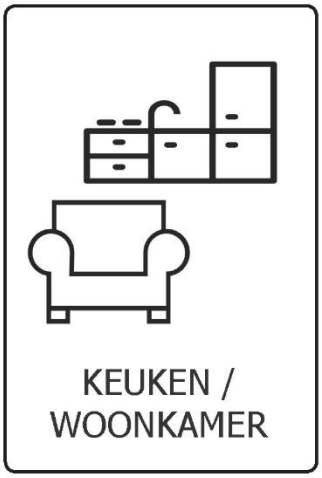
Following is the main categories:





GANG

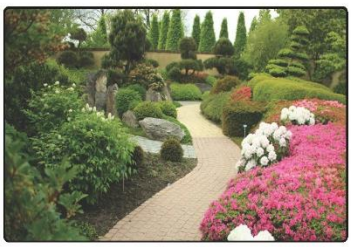




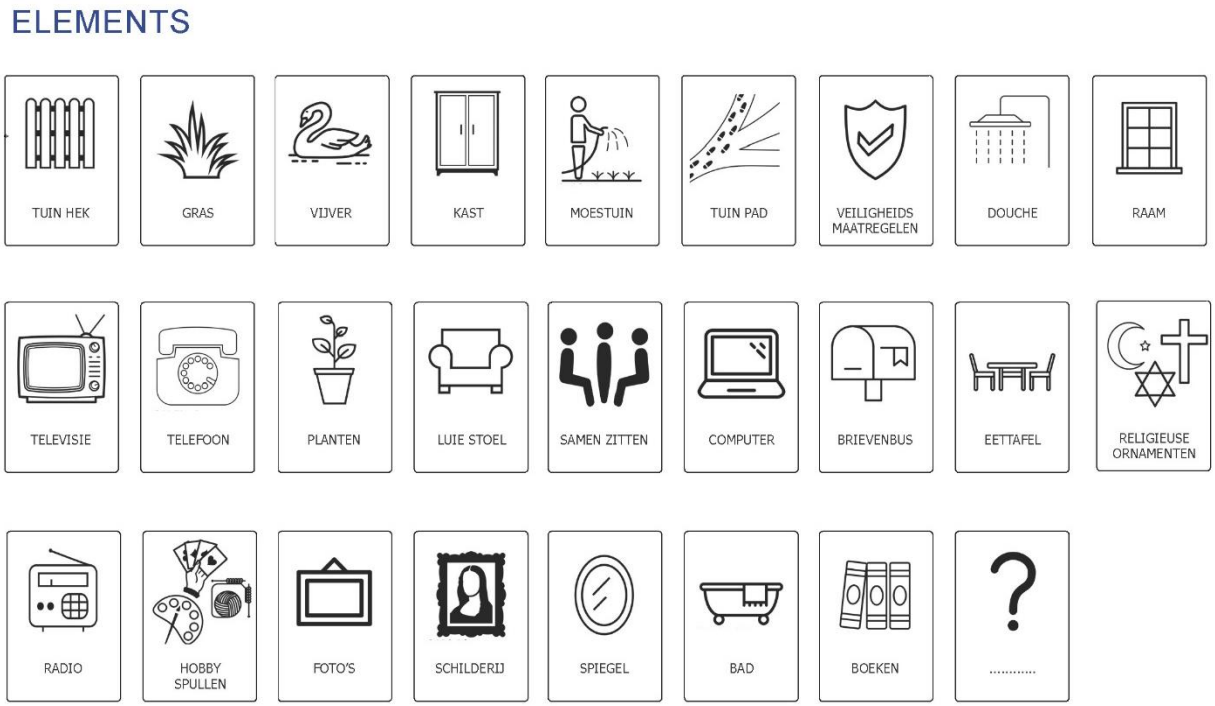
KEUKEN /
WOONKAMER

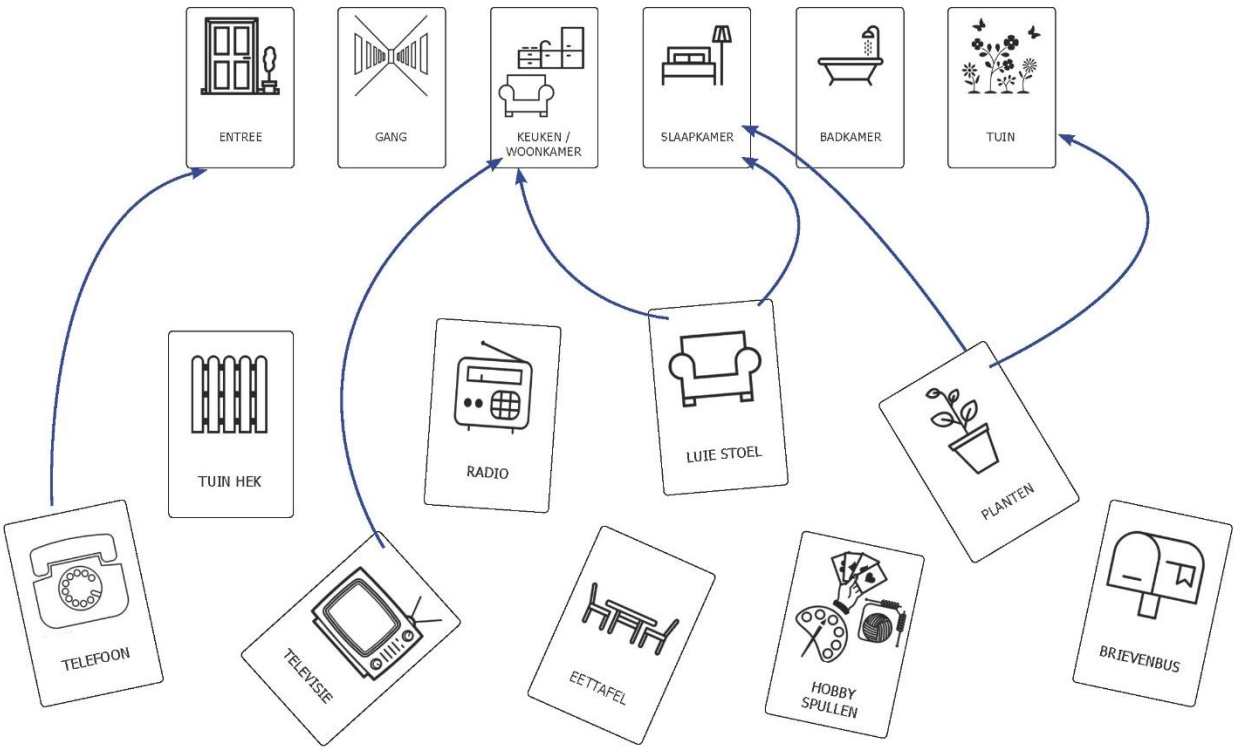
BADKAMER

TUIN



Then we asked them to determine which elements they would prefer to add to the spaces. Cards for this part are listed below.




ENTREE
GANG
KEUKEN / WOONKAMER
SLAAPKAMER
BADKAMER
TUIN
TUIN HEK
RADIO
LUIE STOEL
PLANTEN
TELEFOON
TELEVISIE
EETTAFEL
HOBBY SPULLEN
BRIEVENBUS

Thanks to this interview, we could figure out which are the required elements and preferred design for the appropriate nursing home in the residence prospective.

## Interviews from literature

Following some of the results generated form interviews from elderlies in nursing homes, are reported.

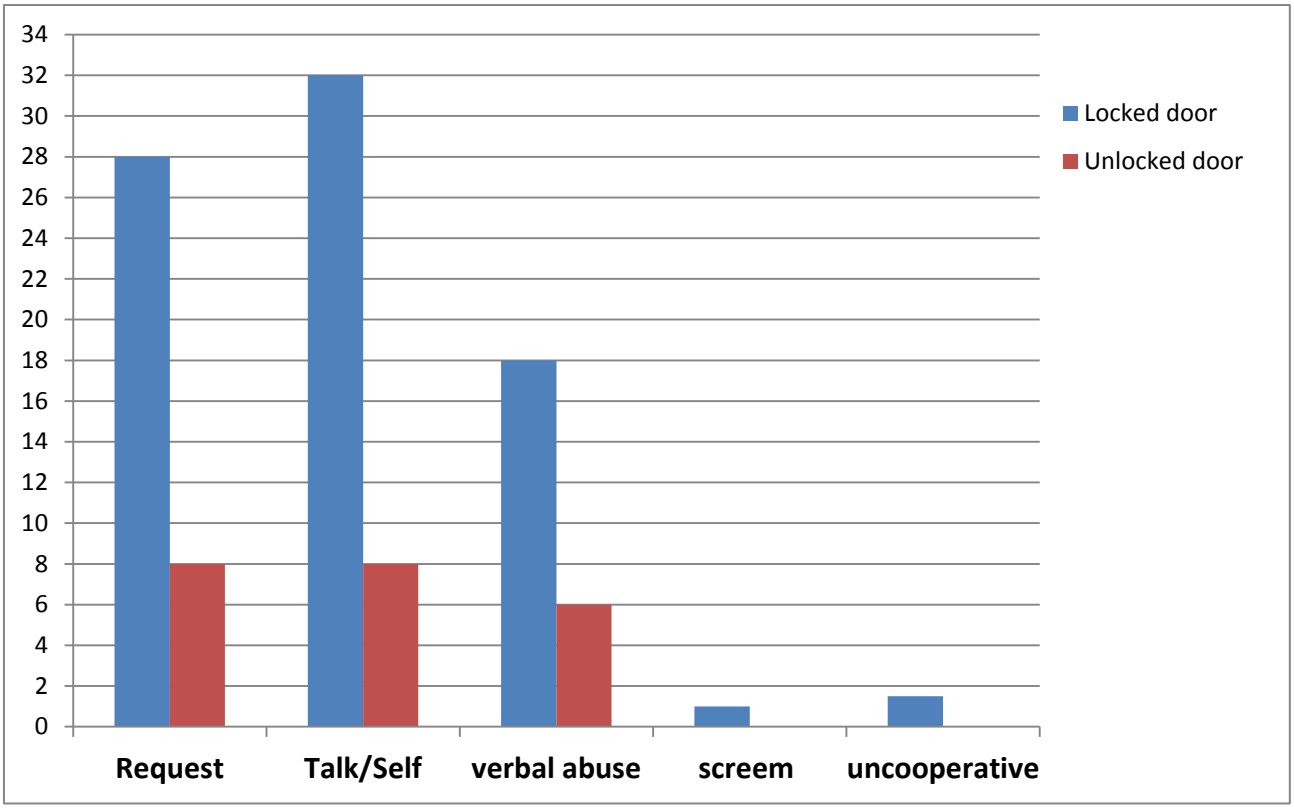
Average time and number of residents engaged in a particular activity across all observations.

| Facility Garden | Total Observation Minutes in Each Garden | Number of Residents Sitting Alone | Number of Residents Sitting & Socializing | Number of Residents Sitting & Sunning |
|---|---|---|---|---|
| Parkview | 375 | 4 for avg. of 25 min | 18 for avg. of 43min (10 residents in 1-hr seated group activity) | 3 for avg. of 41 min |
| Creekview Woods Assisted/Independent Living | 260 | 3 for avg. of 15 min | 7 for avg. of 29 min | 2 for avg. of 40 min |
| Creekview Woods Skilled/Personal Care | 200 | 0 residents | 2 for avg. of 45 min | 0 residents |

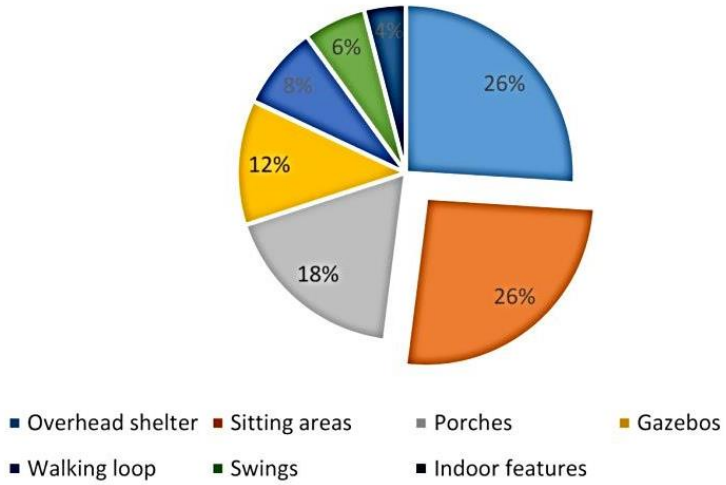
Weekly frequency of participants (N =32) enjoying facility gardens.

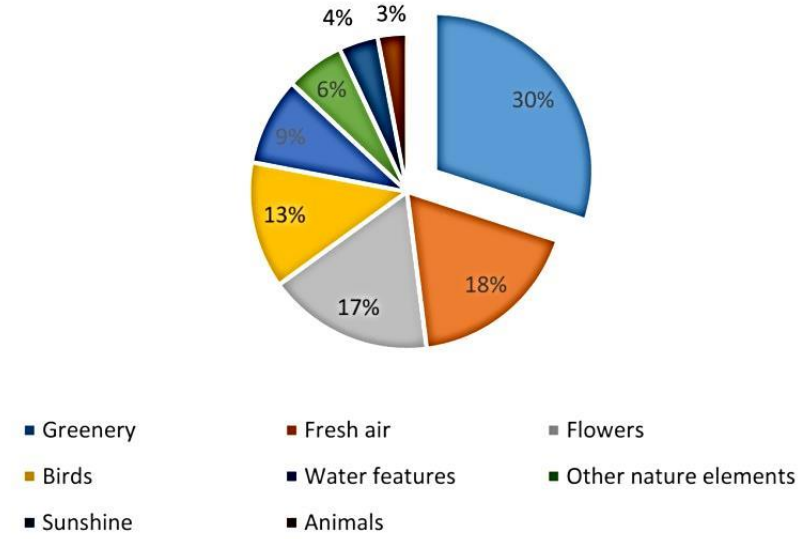
| Frequency of going outdoors | Daily | 3-4 times a week | 2-3 times a week | 1-2 times a week | Less than once a week |
|---|---|---|---|---|---|
| Number of people | 12 | 5 | 3 | 2 | 10 |
| Living environment | 10 = IL 2 = AL | 5= AL | 3= AL | 2= AL | 5 = AL 5 = NC |
| Preferred method of enjoyment | 11 = Active 1= Passive | 5= Active | 3= Active | 2 = Passive | 5 = Active 5 = Passive |

Note. IL = Independent living; AL = assisted living; NC = Skilled/Personal Care; Passive = passive relationship; Active= active relationship.


34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Request
Talk/Self
verbal abuse
screem
uncooperative
Locked door
Unlocked door


Preferred Situation


26%
26%
18%
12%
8%
6%
4%
Overhead shelter
Sitting areas
Porches
Gazebos
Walking loop
Swings
Indoor features


30%
18%
17%
13%
9%
6%
4%
3%
Greenery
Fresh air
Flowers
Birds
Water features
Other nature elements
Sunshine
Animals

# Results

In outdoor design for the elderlies it is very paramount to consider the fact that most of them are struggling with physical and mental disabilities and social isolation. So, it is crucial to think about revitalization and rehabilitation features of the design.

As it is discussed earlier, outdoor design has to follow certain guidelines and standards. These standards have to satisfy certain criteria such as Control, Safety, Accessibility and orientation. Observing these guidelines helps elderlies to be more confident to go out and use the natural environment. In the other word, it is possible to remove physical obstacles with proper design. Interviews reveal that proper seating areas and ample green spaces had been requested most among others such as sidewalks with appropriate slope and length, little garden and so on.

## Design guidelines

We can divide the guidelines to eleven main categories. [Loukaitou et al, 2014]

- Control
- Choice
- Safety and security
    - enclosure
- Accessibility
- Social support
    - Interaction with children
- Physical Activity
    - gardening
- Privacy
- Contact with nature
- Comfort
- Aesthetic and sensory delight
- Culture and connection to the past

## Control

Control refers to persons' real or perceived ability to determine what they do, to affect their situation, and to determine what others do to them. [Aspinall, 2010]

Elderlies should feel that they have full control over the environment. There should not be anything unpredictable happen to them. In order to provide that, there should be good visibility of the whole view and different signs to show clearly the walking path.

*Prospect*

*Orientation and way finding. A number of seats and varying plantings a long distinctly shaped paths*

## Choice

There should be always different choices in different weather conditions and different moods. This should be considered in design of different components of outdoor environment. For instance, different configuration for seating have to be designed to give this freedom to choose the appropriate one in different moods or physical conditions.

*Different options in different kinds of weather. Possibilities for taking a walk in all kinds of weather*

*Different seating settings.*

## Safety and security

The outdoor environment is safe and secure to use without risking any physical hazards. It includes risk of falling to the ground, water or plants. Therefore, there should be careful consideration in designing the pathways regarding the materials of the pavement, slope, proper handling and obstacles. Additionally, plants beside the pathways have to be soft enough to prevent probable injuries in case of falling. Moreover, in case using water features, prevention of falling into water has to be taken into account.

*Safety and security. Plantings with soft shapes*

*Safety and security. Handrails along walking paths.*

## Enclosure

This is a subdivision of safety and security and meaning that, the outdoor environment is safe and secure to use without risking any psychological unpleasantness [Bengtsson and Carlsson, 2006, 2013, Cooper Marcus, 2007, Rodiek, 2008]. In other word, the risk of intrusion or of unwillingly being viewed by outsiders.

*Enclosure and entrance. Hedges and plantings in stages create enclosure without confining.*

*Enclosure and entrance. Several hedge gates accentuate the entrance to the welcome garden.*

## Accessibility

The outdoor environment should be close, visible and easy accessible from the inside spaces where elderlies spent most of their time there. [Bengtsson and Carlsson , 2006, 2013; Rodiek, 2008].

*Closeness and easy access. Outdoor environment close at hand and clearly visible from inside the building.*

*Closeness and easy access*

## Social support

Some places with seating settings have to be provided for gathering of the occupants and provide different opportunities to socialize. It can be coffee tables, amusement facilities and group activities.

*Social opportunities. A flexible environment offering everyone an outdoor treat.*

*Benches can facilitate interaction*

## Interaction with children

As a subdivision of social support, we can mention places where children as visitors, can interact with elderlies. In this settings children can learn things from elderlies and provide a joyful environment for both groups. However, it has to be noticed proper care have to be taken to hinder probable hazards to elderlies like dangerous physical accidents. This interaction should take place in areas where is separated from other parts of the outdoor to prevent bothering the elderlies who need just a calm and relaxing environment.

*Playful features bring pleasure to children visiting the health care and elderlies simultaneously.*

## Physical activity

Open spaces can encourage physical activity by providing appropriate settings for active recreation. Elders are more likely than other groups to live sedentary life styles and become intimidated by the prospect of exercise. [Loukaitou et al., 2014] Therefore, some areas should be prepared for physical activities. This can be group activities like physical exercise classes or individual ones. However, because physical capacities are limited among elderlies, activity can be constrained to the simple ones like walking.

*Joyful and meaningful activities. This bridge blends into the environment and gives opportunities for walking training.*

## Gardening

Gardening as one of the best and most beneficial and meaningful physical activity for elderlies has gained lots of attention among researchers. As mentioned previously, gardens has lots of benefits for elderlies, so it is very helpful to provide opportunity of doing some simple tasks of gardening for elderlies. These gardens have to be designed in a way to be appropriate for elderlies with physical limitation. Stages of the gardens should be movable and could be reachable in different levels, doors should be automatic, and irritation system have to be simple and easily possible to be used. Furthermore, it is possible to bring gardens inside the building for elderlies who prefer to stay inside and still take advantage of this activity.

*Gardening*

## Privacy

There should be some enclosed and secluded, verdant places where elderlies can be alone, have private discussions or just seat and watch people from a distance(Bengtsson and Carlsson, 2006, 2013; Grahnetal, 2010; TenngartIvarsson, 2011).

*Secluded places.*

## Contact with nature

Plants should be near the pathways to allow users to feel, hear, smell and taste the beauty of the nature.

*Sensual pleasures of nature. Bushes along the walking path make it possible to touch and smell the lilacs*

Additionally, it is important for the health cares to have a view of the surrounding life of other people, in order to not give feeling of being isolated to the occupants. Nevertheless, there should be reasonable distance from the healthcare settings to the surrounding environment to not have unpleasant intervene of outside world.

*Contact with surrounding. View of city life from inside nursing home garden*

*Serene.  An undisturbed place for relaxation*

## Comfort

In designing and using materials, always, comfort of the elderlies have to be taken into account.

- Provide rest stops and opportunities for seating every few meter along main paths. [Marcus et al, 2014]
- Provide comfortable seating with ergonomic designs and with backs and arms.
- Prefer natural seating materials such as wood or stone that are more resistant to high temperatures.
- Protection from Sun, Wind, Rain, and Glare.

*Wooden bench with proper design.*

## Aesthetic and sensory delight

Outdoor should feature attractive view both from inside and outside.

*Use of water to make the view alive and attractive.*

*A bridge from the inside building straight into a verdant garden oasis.*

## Culture and connection to the past

There are elements that stimulate memory, such as a clothesline, a hand pump or a barbecue. These element can be used to make outdoor spaces familiar place for the users.

*Culture and connection to past times. Finnish hospital garden enclosed by a traditional Scandinavian "gärdsgård" fence.*

# Green house design criteria

Because there are some areas which have to be designed to have green plant all over the year, use of the green house is inevitable. Following, some guidelines for the green house design will be discussed briefly. [Von Elsner et al., 2000]

## General design criteria

The local climate, the general structural design and load characteristics, and the locally available materials comprise the general design criteria for greenhouses.

In Netherlands, the climate is characterized by cold winters and moderate summers (temperate climate). The main problems for greenhouses in a temperate climate are

(1) Low outside temperature in winter;

(2) Significant wind and snow loads, and hail;

(3) Insufficient light in winter; and

(4) Occasionally hot summers.

Therefore, greenhouses for temperate climates should have the following characteristics:

(1) Sufficient stability against wind and snow loads, taking into account relevant national or European standards;

(2) An efficient heating system;

(3) High light transparency;

(4) Efficient insulation against heat losses at low outside temperatures; and

(5) Sufficient ventilation and shading in summer.

## Greenhouse Design and Functional Characteristics

Greenhouses have to provide optimal climate conditions for healthy plant growth and high production. The design strongly influences not only the mechanical behavior of the greenhouse structure, but also internal climate factors such as temperature, air humidity and light transmittance. The physical properties of the covering material also influence the quality of the indoor microclimate, while its mechanical properties influence the structural design and the mechanical behavior of the greenhouse.

## Height of the greenhouse

The average height of a greenhouse characterizes its volume. A large greenhouse volume results in a slow response of the indoor environment to changes of the external weather conditions. Therefore, higher greenhouses exhibit smaller fluctuations in their indoor microclimate.

On the other hand, higher greenhouses have increased energy consumption and are more demanding in terms of structural stability due to larger wind loads.

The height of a greenhouse is optimized with respect to above mentioned competing factors.

## Light transmittance of greenhouses

The intensity of the incoming solar radiation is an important parameter influencing the indoor climate as well as the photosynthetic activity of the plants. The greenhouse structure and the covering material are responsible for solar radiation losses. Specifically, the transmitted global radiation is reduced by

(1) Absorption and reflection at the covering material;

(2) Shading by greenhouse structural components;

(3) Dirt on the covering material; and

(4) Condensation on the covering material.

## Condensation on the greenhouse cover

Water condensation on the inner surface of the covering material influences the light transmission and the heat transfer through the cover. The structure of the patterns created by the condensed water vapor on the cover depends on the wetting tension of the covering material.

## Ventilation

The ventilation openings are essential functional elements of a greenhouse. Their location and design can strongly influence the quality of the indoor microclimate and the energy efficiency of the greenhouse. Since in most greenhouses the renewal of internal air is exclusively obtained by passive ventilation, the design of the ventilation openings should allow strategies for enhancing the ventilation rate under various weather conditions.

## Roof and side ventilators

The ventilation openings are usually distinguished into roof and side ones. This distinction is based on the differences with respect to design and functionality.

The term ‘roof ventilators' is used to characterize the openings located at a height above the working space in the greenhouse (i.e. 2 m height). It has been shown that the roof ventilators generally induce higher ventilation rates when wind driven ventilation is considered.

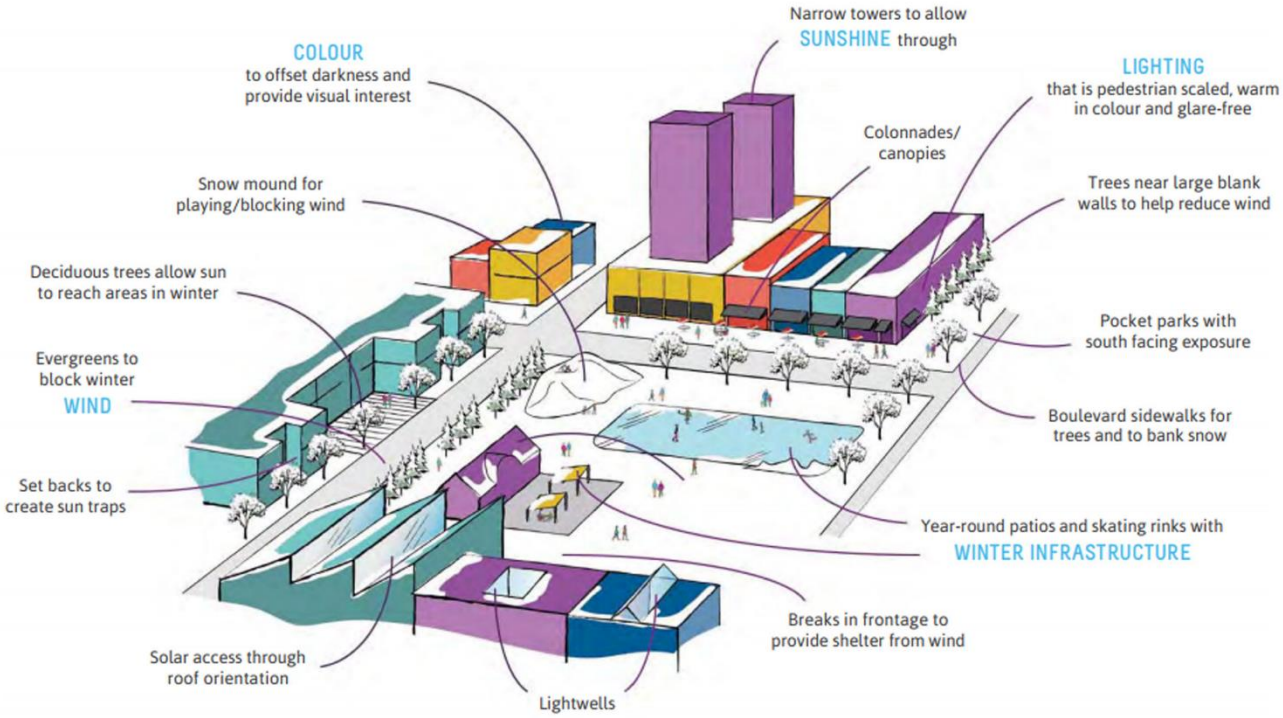
# Winter Design

The Winter Design Guidelines are comprehensive. For the sake of simplicity, however, the five main principles of winter city design are:

1. Incorporate design strategies to block wind, particularly prevailing winds and downdrafts.
2. Maximize exposure to sunshine through orientation and design.
3. Use color to enliven the winter space.
4. Create visual interest with light, while being mindful of intensity, spread, contrast and color.
5. Design and provide infrastructure that supports desired winter life and improves comfort and access in cold weather.

The five main principles are applied in all contexts throughout these guidelines. Multiple examples are provided for how to apply the principles in all scales, from building to site to neighborhood. The following image demonstrates how all five principles can be used in one space.

# PRINCIPLES OF WINTER DESIGN



## Design

Considering all above mentioned rules and with focus in the gardening, it is decided to integrate buildings with greenhouses. This designed inspired from EFFEKT designs project for regenerative villages. Here, we tried to get all the benefits of gardening for the elderlies with bringing gardens inside the buildings.

*Mixing building and a greenhouse together to bring gardens inside the buildings.*

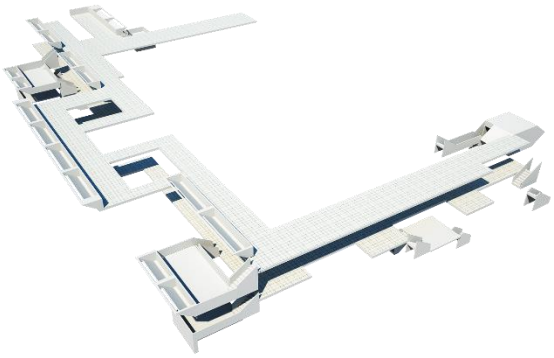
The house care would comprise a series of buildings with attached greenhouses, creating spaces where elderlies can grow fruit and vegetables.

This greenhouses can provide fresh fruits, fresh air, nice view, physical exercise, stress reduction, relief from physical symptoms, socialize with one another, meaningful daily activities, and giving feeling of usefulness.

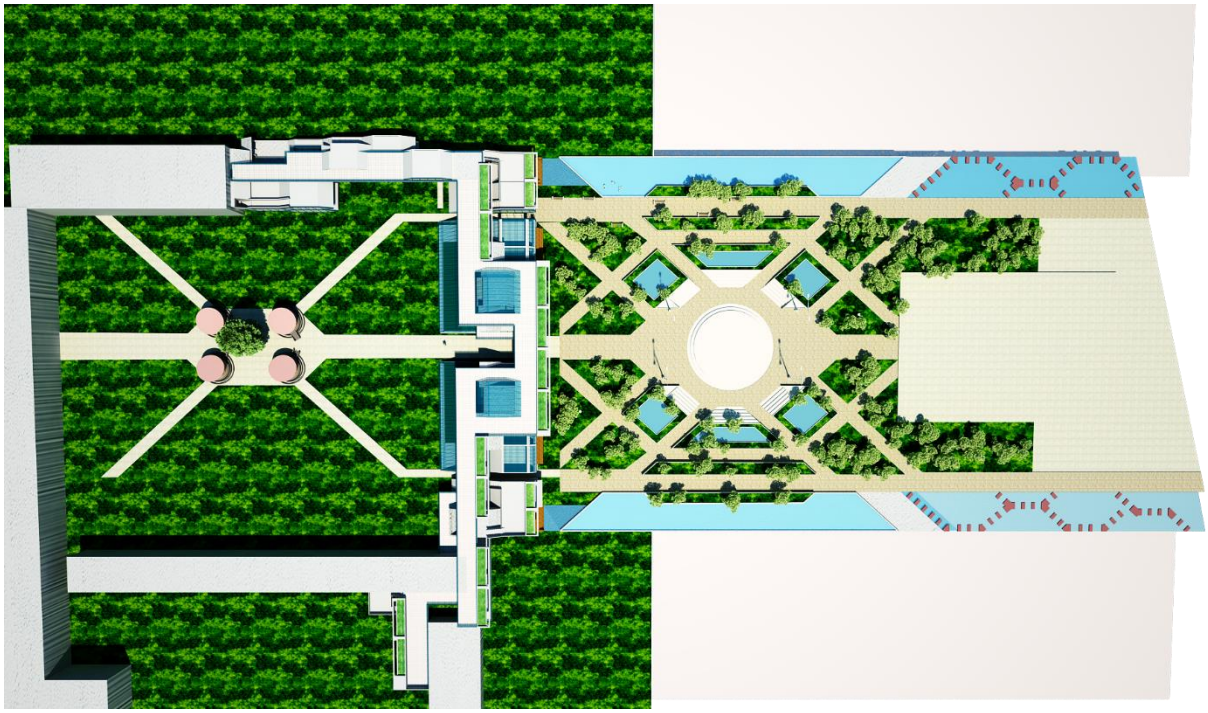
From air conditioning point of view, a wise deign of theses building can make warm winters and cool summers with low cost and mostly benefiting from natural air circulation.

The other modification is to create a circular path over and inside the buildings and in different levels to make an appropriate path for walking exercise in outstanding view. This modification also leads to

providing a private open space in the center of the buildings which is necessary for some of the elderlies who prefer to get a rest and watch the beauty of nature without any disturbance.



*Part of the circular outdoor path which is going through the buildings and it has different levels to provide elderlies enjoy of a good walk and an exercise simultaneously.*



*top viwes of the whole setting with design path for outdoor walk.*

Additionally, water features introduced into design to give a lively sense and stimulate elderlies to be active.

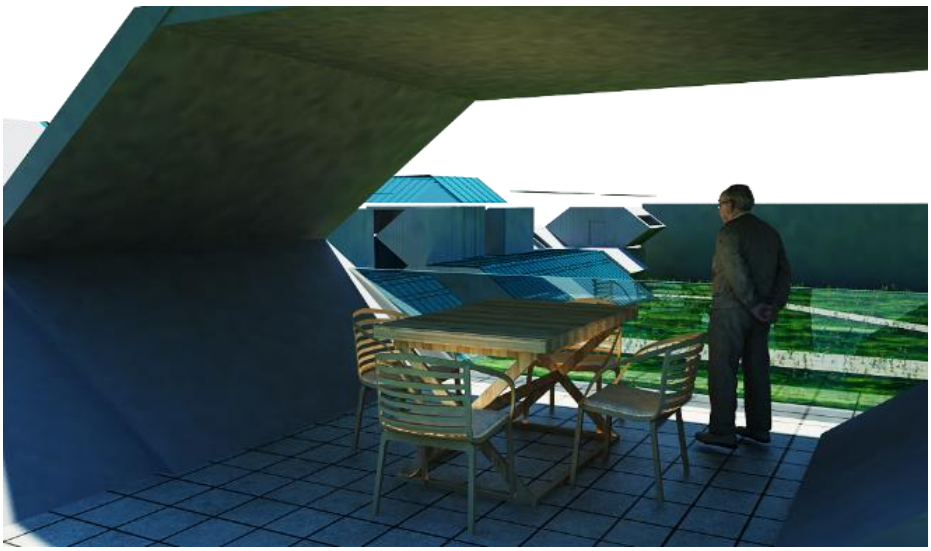
*Water features with animals inside them.*

There are some parts where there are animals to induce feeling of the past years and reminds good memories to the residences.

*Sensory delight view of the garden.*

Moreover, shaded areas are provided to protect residence from sun and rain.

Also there are places for having a cup of coffee and socialize with each other.



*Protected areas for socializing in outdoor.*

There are some isolated part which can provide opportunity for the elderlies to enjoy silence and privacy for enjoying nature and reading a book.

*Secluded areas for elderlies who prefer to stay alone and enjoy the nature.*

Inside the facility we have plants which are green all over the year and can produce fruits. Gardening and taking care of the plants can be shared with elderlies who are eager to do gardening, staffs and visitors especially children. This interaction with children is beneficial for both elderlies and children.

# Introduction of the Unit of the Modular Design

Here we introduce the main structure unit which used for as a structure unit to add some extra spaces to the existing facility. This building block have been chosen for several reasons which it is able to provide. Later, it is explained in details.

## History

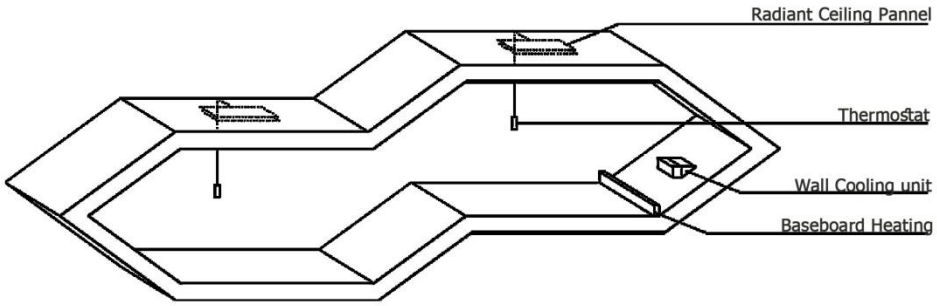
Funded by the Federal Housing Authority (FHA), Habitat Puerto Rico was commissioned as a prototype for providing low-cost housing to moderate-income families in Puerto Rico and the Virgin Islands. Though unbuilt, the project was developed in two phases and for two different sites between 1968 and the time of the project's termination in 1973. Both sites shared similar topographical features in underdeveloped neighborhoods of San Juan. Phase one of the project, designed for the neighborhood of Hato Rey, evolved in planning stage only between 1968 and February 1969. This mountainous site was ultimately rejected by the FHA in favor of a second site, known as Berwin Farm, on which some preliminary construction did occur between March 1969 and 1973.

## Well Suited For Greenhouse Design

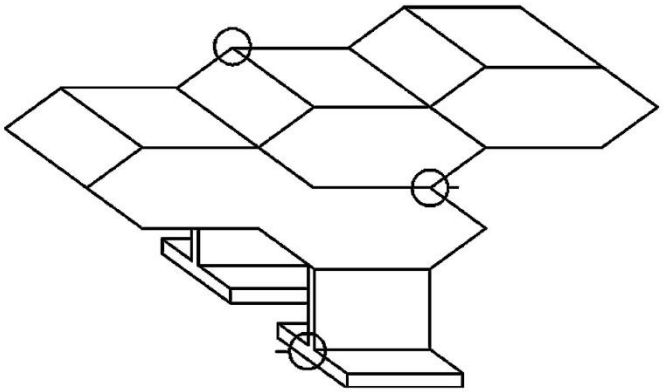
Earlier, it has been mentioned that, it is needed to add green spaces into interior design and it is done with introducing greenhouses inside the building. The building block is very suitable for making greenhouse integrated into buildings in two major ways.

- light absorption ability
- Natural ventilation
- Efficient heating system
- Structure stability

(3) An efficient heating system;




(4) Sufficient stability

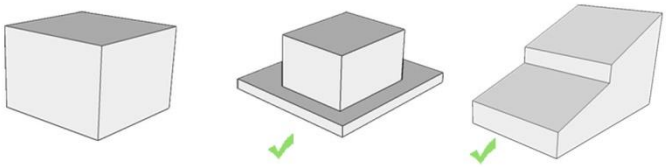


# Winter Design Capabilities

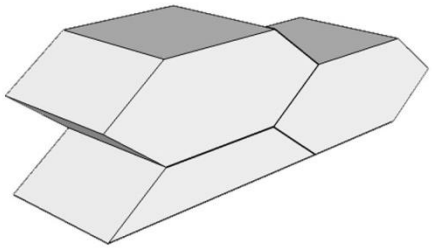
## PRINCIPLES OF WINTER DESIGN

**1)BLOCK WIND** deflect wind flow to provide shelter
dissipate wind energy by frictional processes
to reduce wind velocity

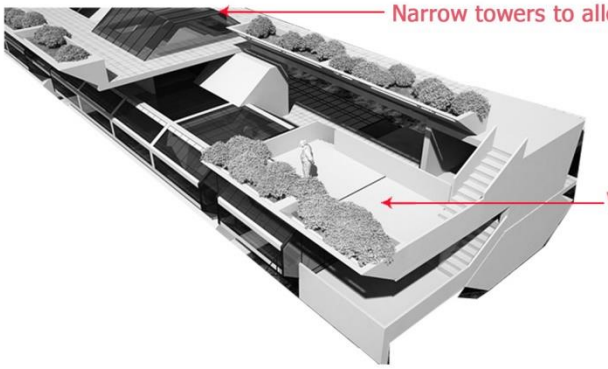
### Shape of Building



avoid creatinglarge cube-shaped-flat-rooofed building.
Apodium or raised base at ground level or a stepped,pyramidal,or pitched-roofedbuilding will help



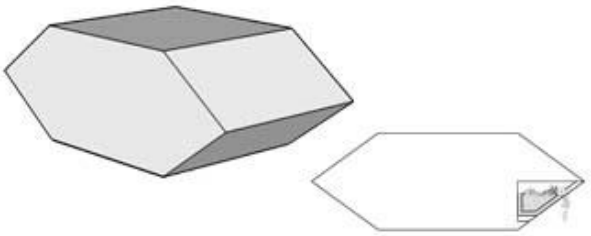
Maximize exposure to **SUNSHINE**
through orientation and design



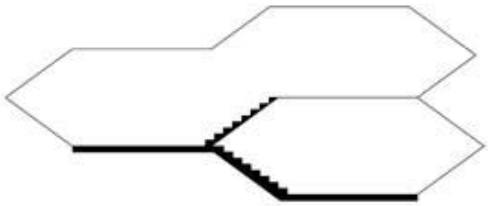

Design and provide **INFRASTRUCTURE** that supports desired winter life and improves comfort and access in cold weather

## Different Features of the Unit

Plantation capability

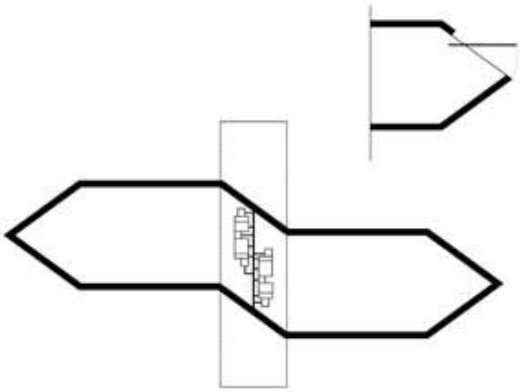


Simple Stair case implementation

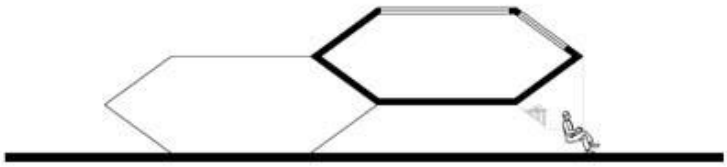


Proper ventilation system with shaded window

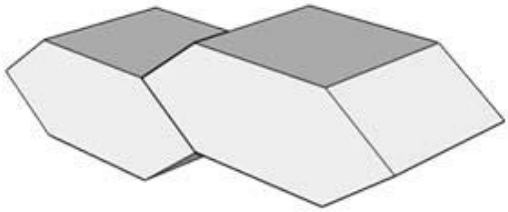
Facile Duct introduction

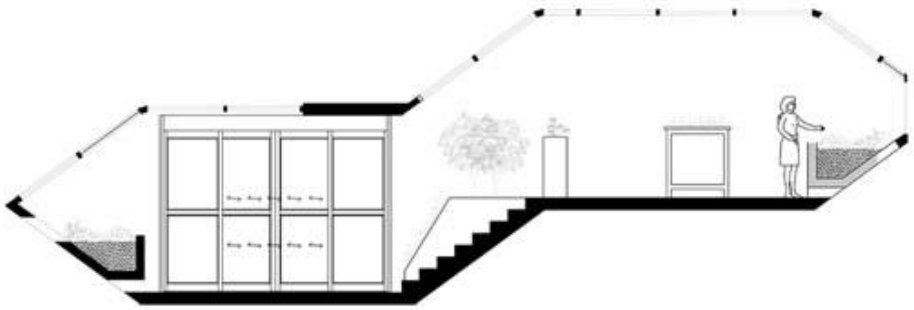


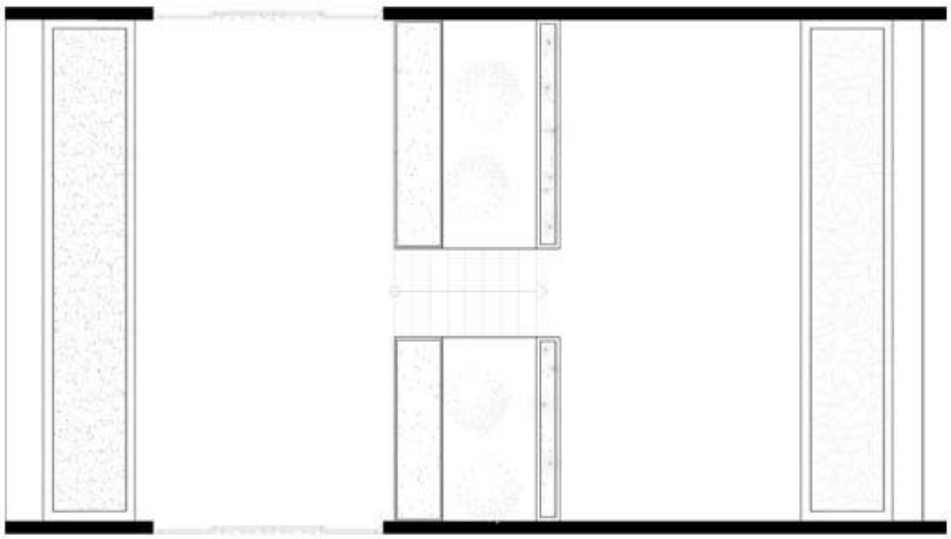
Providing shaded spaces



## Extendibility

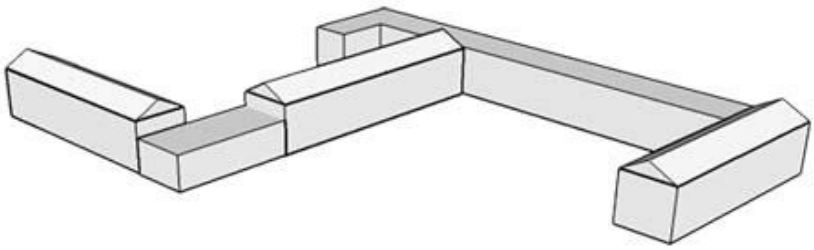


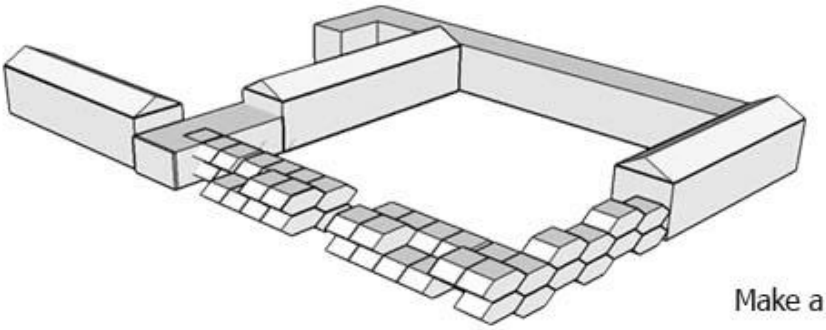




## Implementation of the Modular Units

The existing state of the buildings in the facility, is shown in the figure. To create a loop, our modular unit added to the existing building.



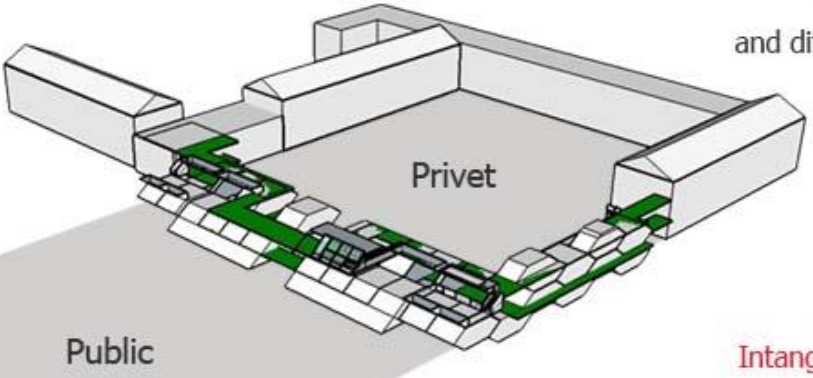


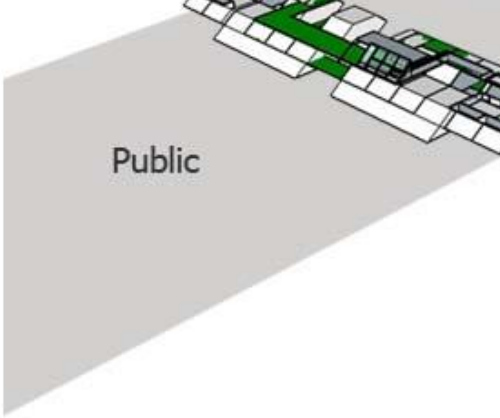
Make a connection between

buildings in order to create a loop

to move people around each floor

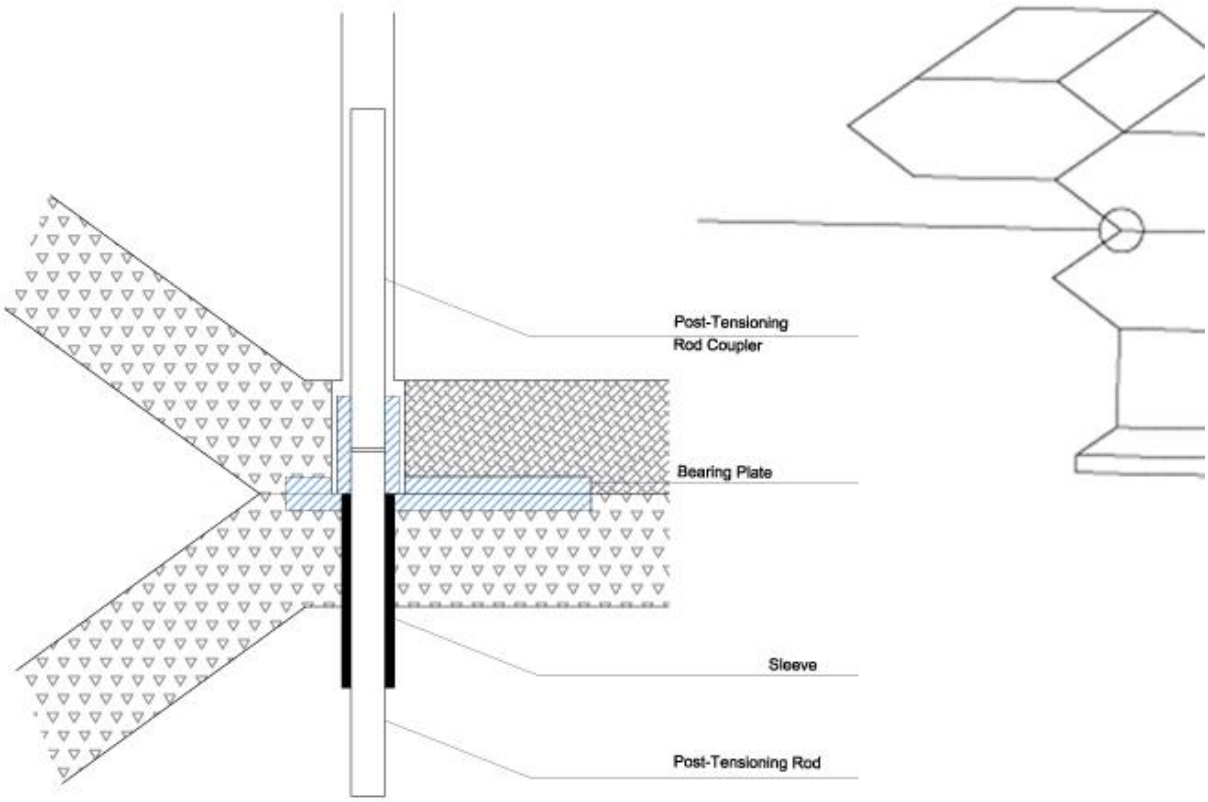
and different Level

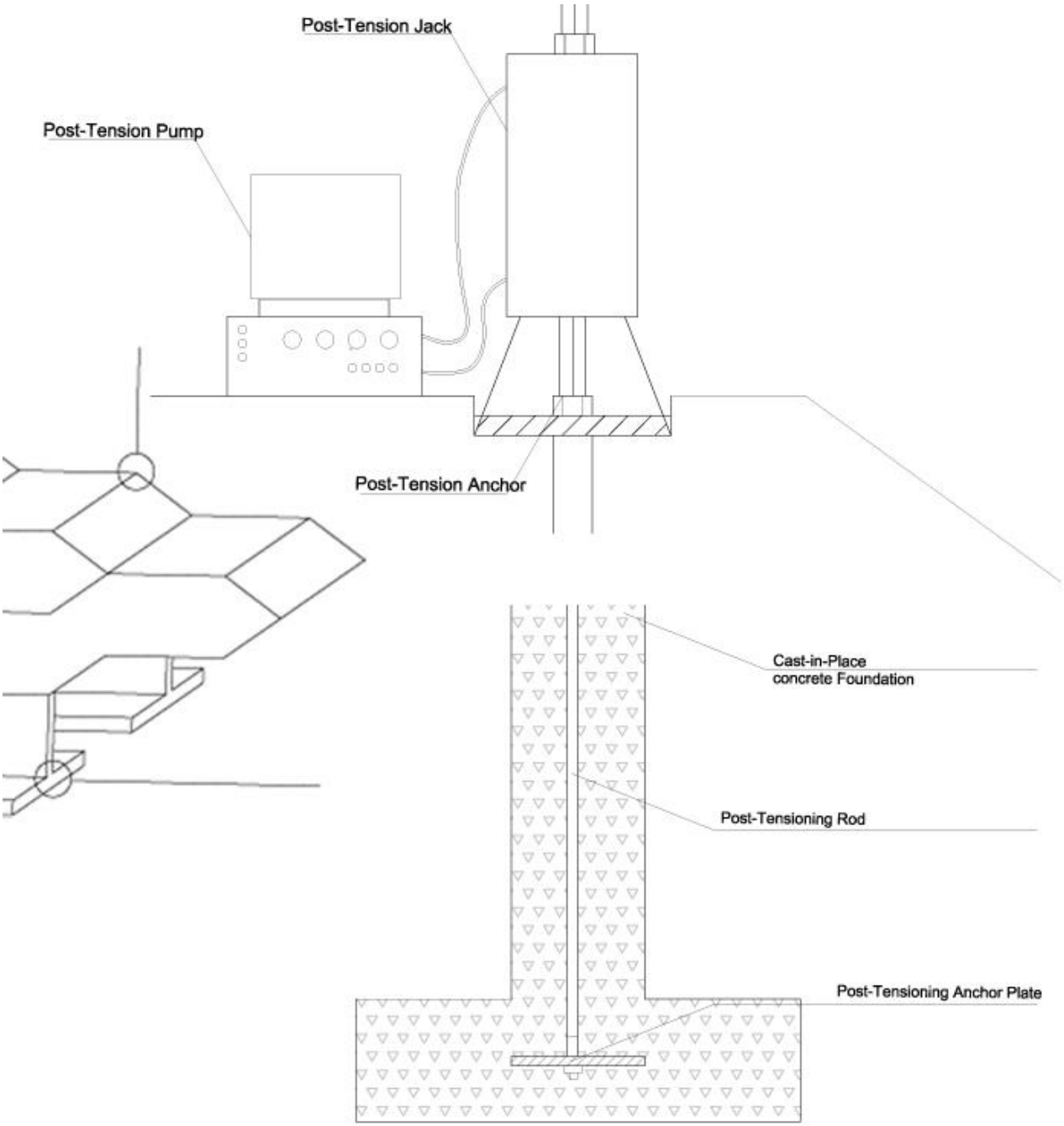



Intangible control to keep the seurity

# TECHNICAL DETAILS




Post-Tension Jack
Post-Tension Pump
Post-Tension Anchor
Cast-in-Place
concrete Foundation
Post-Tensioning Rod
Post-Tensioning Anchor Plate

## Assembly Line of the Modular Unit

| STATION1 | STATION2 | STATION3 | STATION4 |
|---|---|---|---|
| Strip casting<br>Prepare from<br>install reinforcing | Pour concrete<br>Cure concrete<br>Test concrete | Finish Concrete<br>Paint<br>Sheet Metal<br>Rough Plumbing<br>Rough Electrical | Install Doors<br>Install Windows<br>Install Planters<br>Install cabinets |

## STATION5

Finish Electrical
Finish Plumbing
Finish Paint
Install Flooring
Install Base

## STATION6

Install Appliances
Final Check-out
Final Clean

## STATION7

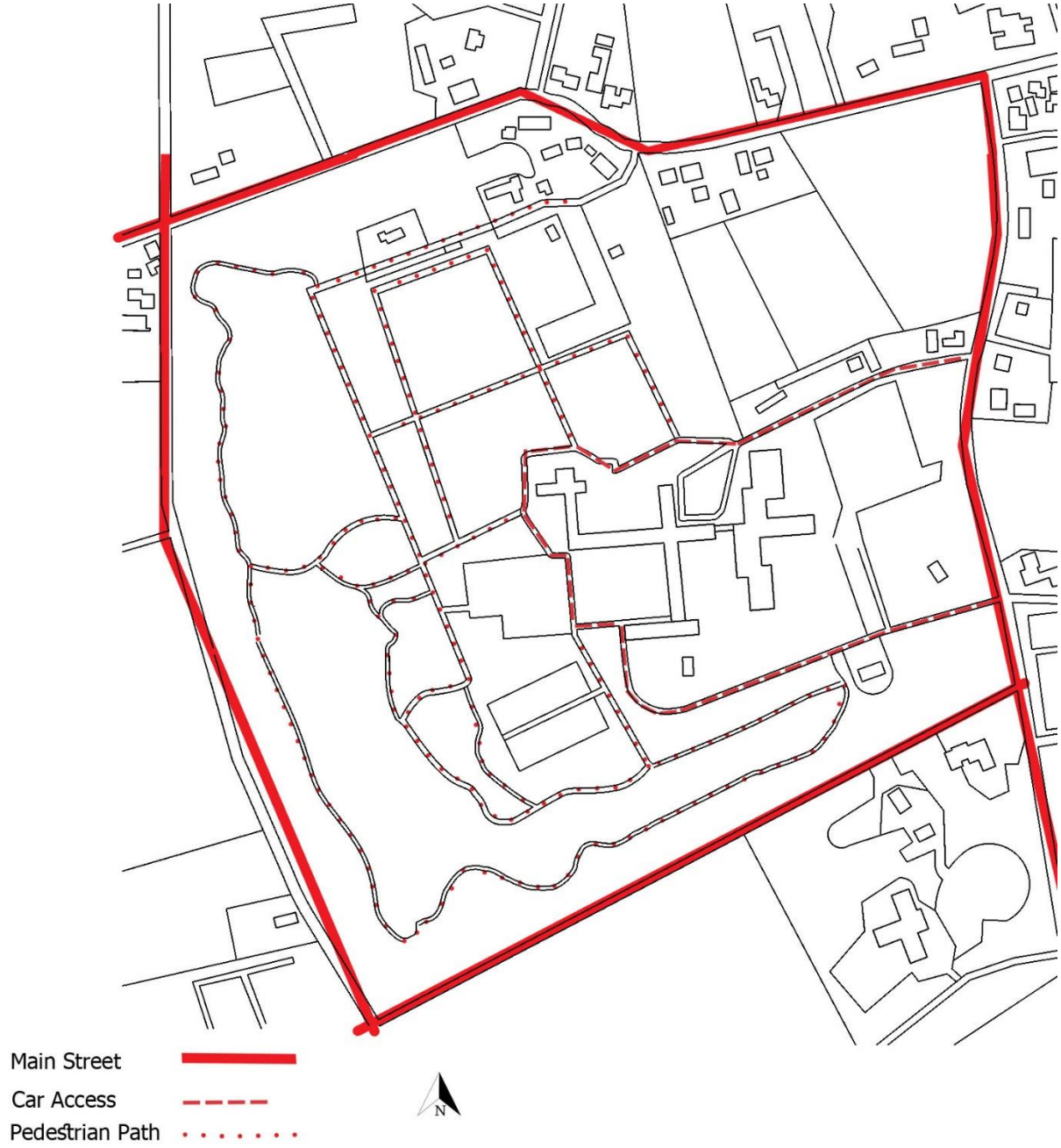
Loading &
Transportation

## ERECTION ON SITE

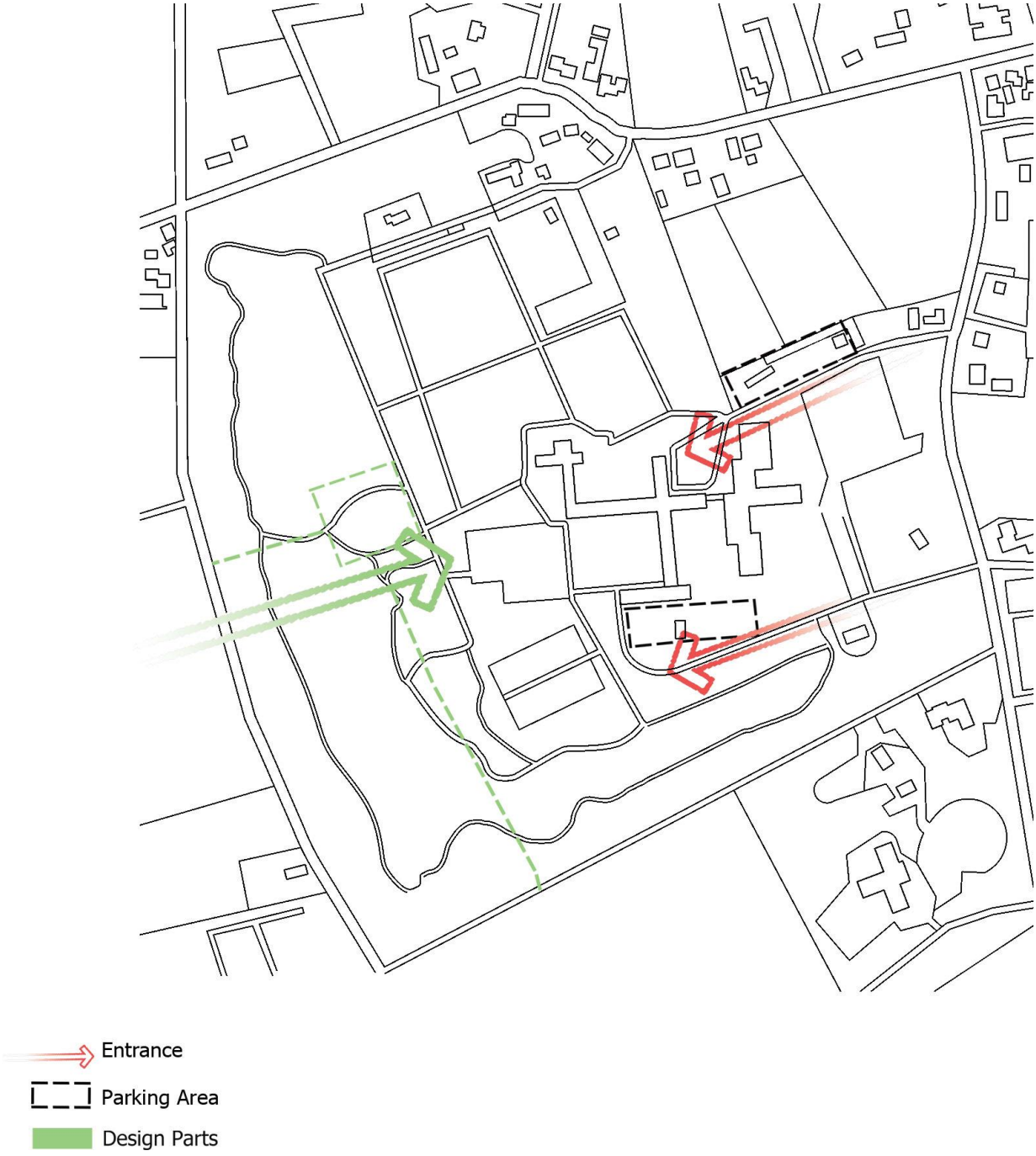
# Site Plan

# Analysis

## Circulation



## Entrances and Parking Points



# Project Area

# Existing Ground Floor

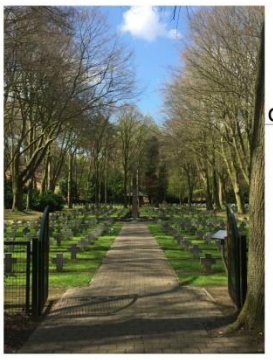
**GROUND FLOOR**

- CIRCULATION
- VERTICAL CONNECTION
- STOP POINTS
- COUTYARDS

COUTYARD1

COUTYARD2

MAIN COURTYARD



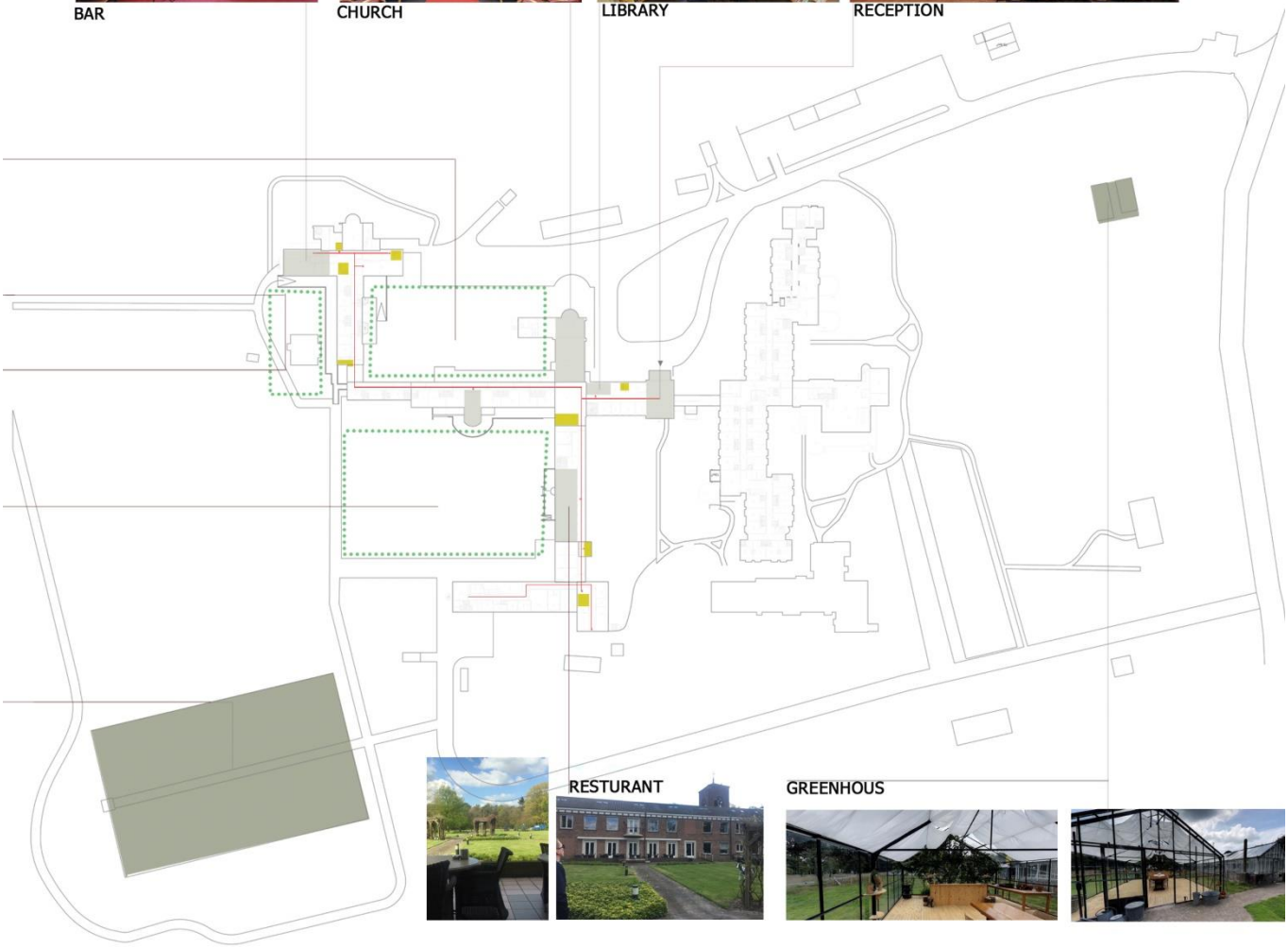
CEMETERY

BAR

CHURCH

LIBRARY

RECEPTION



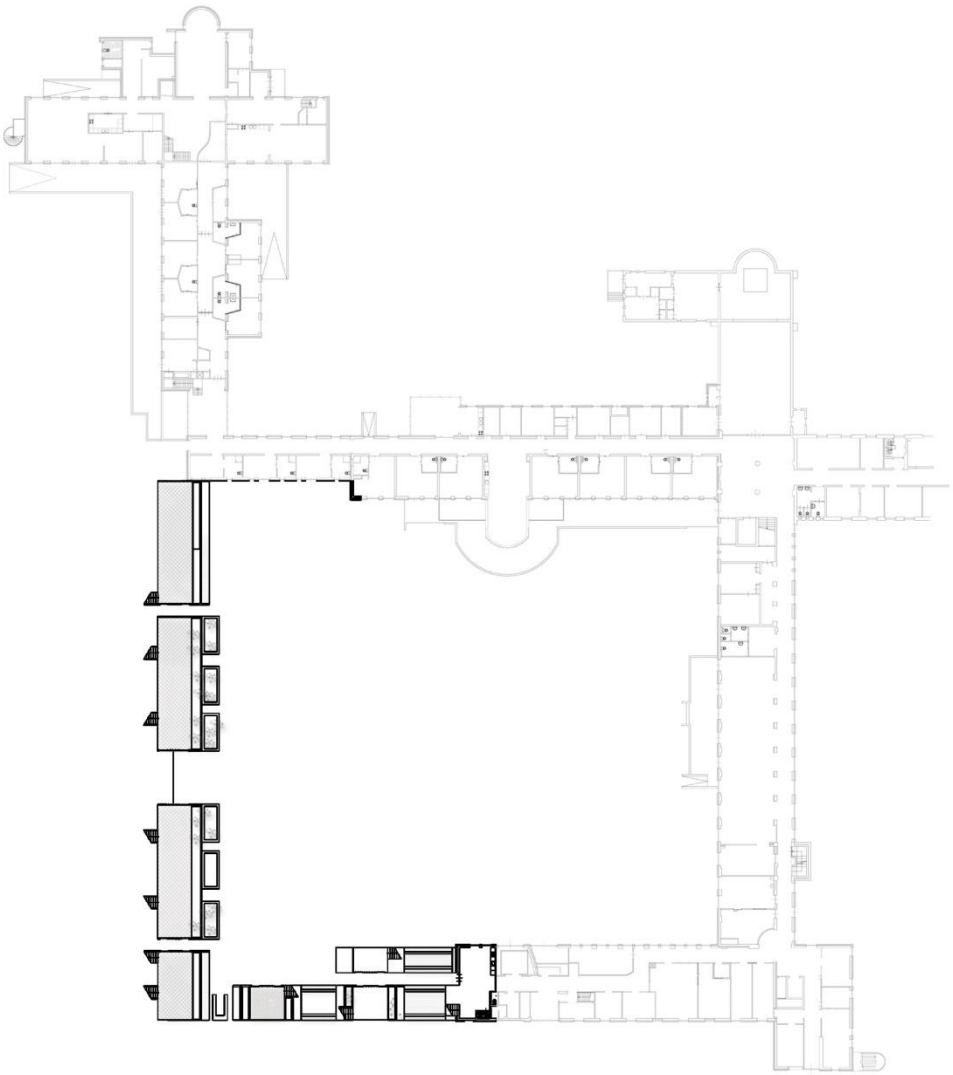




RESTURANT

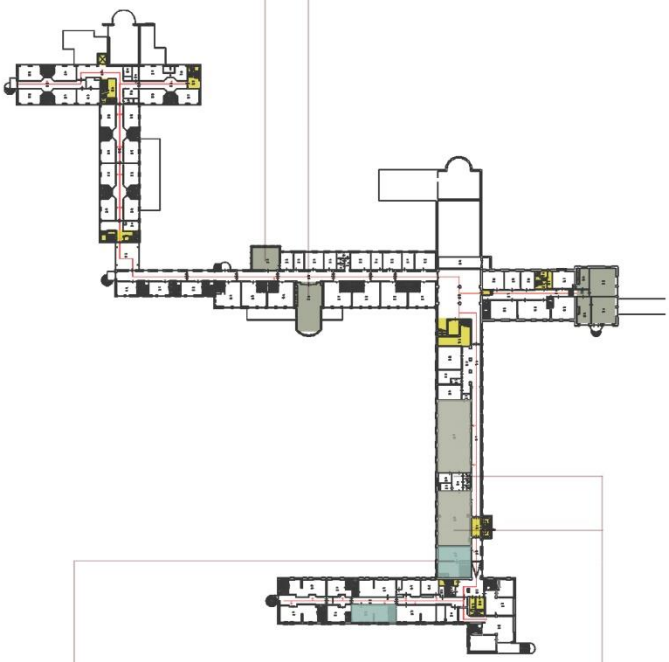
GREENHOUS

# Proposal for Ground Floor Addition



# Existing First Floor

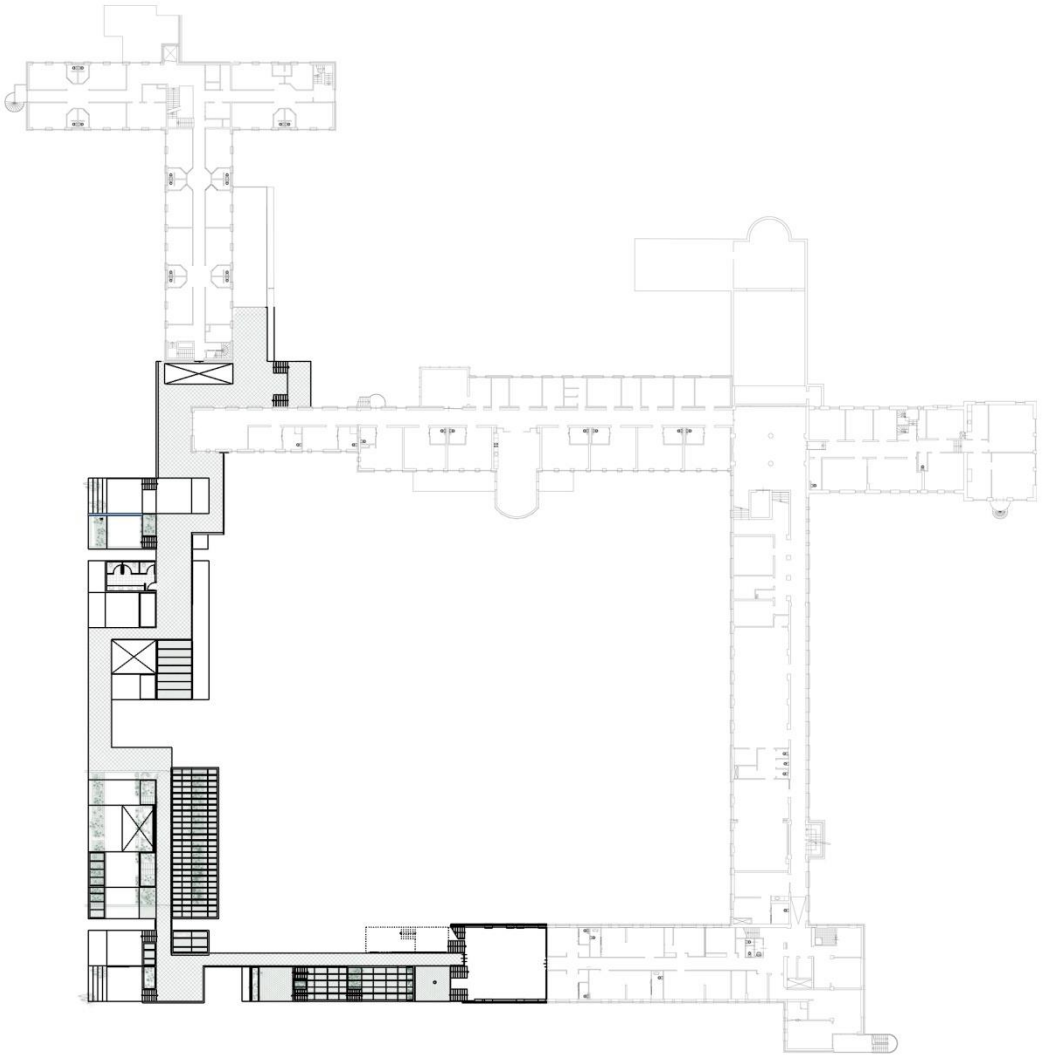
LIVING ROOMS



TYPYCAL ROOMS

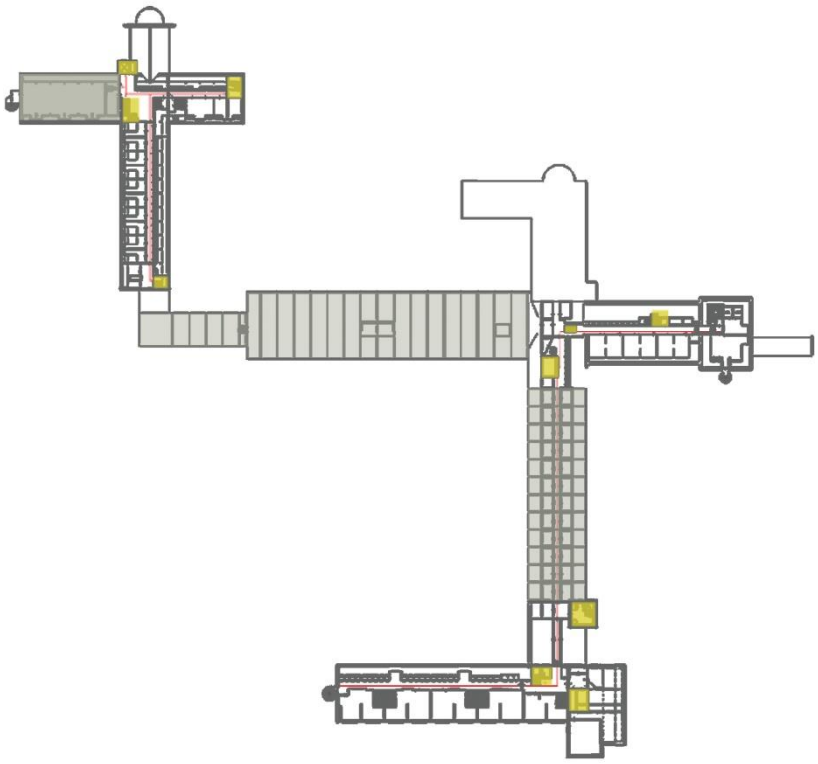
THERAPY ROOMS

## Proposal for the First Floor

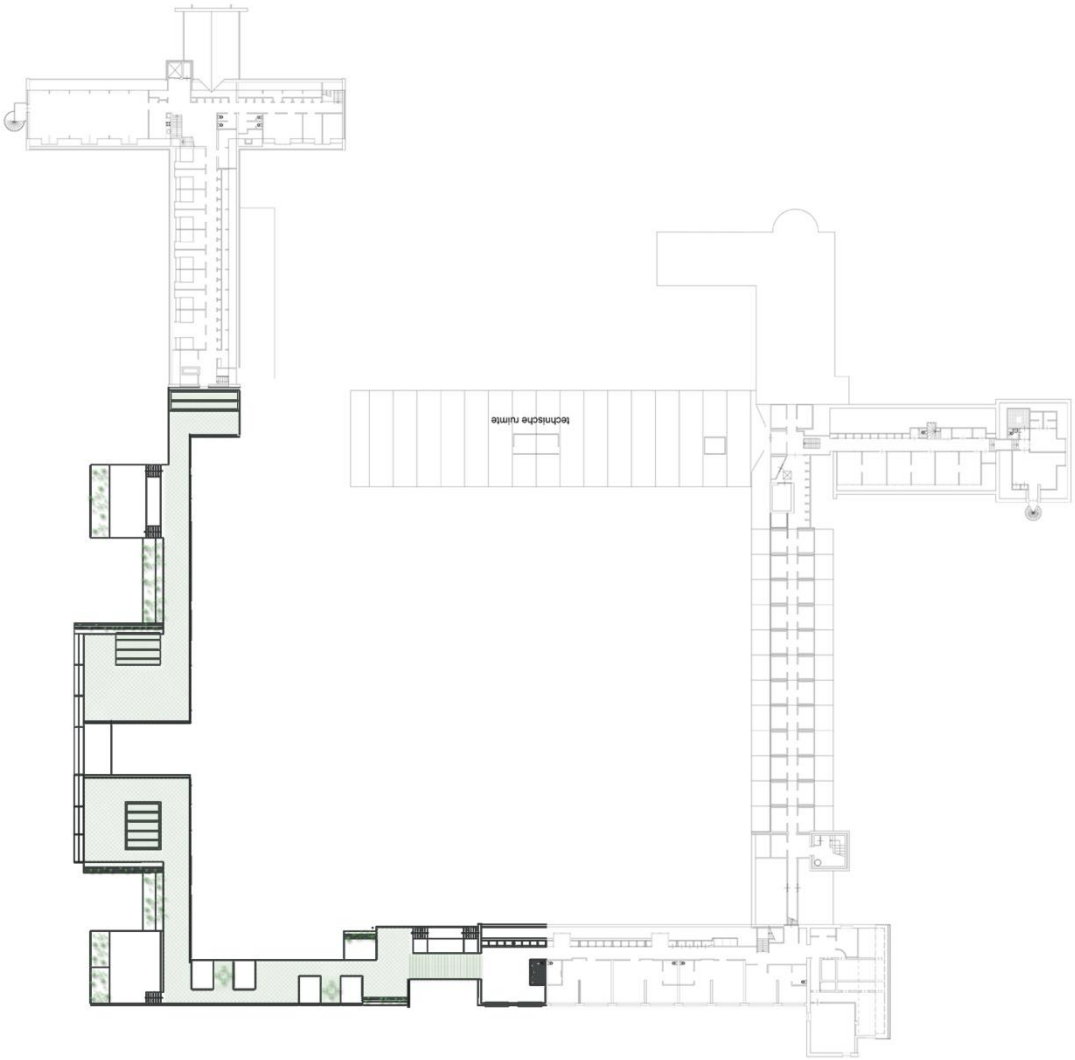


# 3D View of the First Floor Proposal

## Existing Second Floor



# Proposal for the Second Floor Addition



# References


*Friedman & Tappen, "**The effect of Planned walking on communication in Alzheimer's disease**". Journal of the American Geriatrics society, 1991.*

*Galbraith and Westphal, "**Therapeutic garden design: Martin Luther Alzheimer Garden**". Charleston, SC: proceedings of the council of educators in landscape architecture, 2003.*

*Age UK. (2010).Falls in the over 65s cost NH 4.6 million pond a day. Retrieved from www.ageuk.org.uk/latest-news/archive/cost-of-falls*

*Lori Reynolds, "**A Valued Relationship with Nature and Its Influence on the Use of Gardens by Older Adults Living in Residential Care**", Journal of Housing for the Elderly. 2016.*

*Takemi Sugiyama & Catharine Ward Thompson, "**Environmental Support for Outdoor Activities and Older People's Quality of Life**", 2008.*

*Susan Rodiek, "**Resident Perceptions of Physical Environment Features that Influence Outdoor Usage at Assisted Living Facilities**", 2008.*

*Margaret Calkins, Joseph G. Szmerekovsky & Stacey Biddle, "**Effect of Increased Time Spent Outdoors on Individuals with Dementia Residing in Nursing Homes**", 2008*

*Martha Raske , "**Nursing Home Quality of Life: Study of an Enabling Garden**", 2010.*

*Egil W. Martinsen M.D, "**Physical activity in the prevention and treatment of anxiety and depression**", 2009*

*Donna Wang & Thalia MacMillan, "**The Benefits of Gardening for Older Adults: A Systematic Review of the Literature**", 2013*

*Rodiek, "**A New Tool for Evaluating Senior Living Environments**." Seniors Housing & Care Journal, 2008*

*T Sugiyama, E Leslie, B Giles-Corti, N Owen , "**Associations of neighbourhood greenness with physical and mental health: do walking, social coherence and local social interaction explain the relationships?**", 2008*

*Russ Parsons, Louis G. Tassinary, Roger S. Ulrich, Michelle R. Hebl, Michele Grossman-Alexander , "**the view from the road: implications for stress recovery and immunization**", 1998*

*James, "**attention restoration theory**", 1892*

*Sandra Duggan, Tim Blackman, Anthony Martyr, Paul Van Schaik "**The impact of early dementia on outdoor life**", 2008.*

*Nancy A Pachana, J Lindsay McWha, Maureen Arathoon, **"Passive Therapeutic Gardens: A Study on an Inpatient Geriatric Ward**", 2003.*

*CHALFONT, GARUTH ELIOT, RODIEK, SUSAN,"**Building Edge: An Ecological Approach to Research and Design of Environments for People With Dementia**"", 2005*

*James P. Robson, Meredith L. Troutman-Jordan, "**Back to Basics: Health and Wellness Benefits of Gardening in Older Adults**", 2015.*

*C. G. Mozley , J. Schneider , L. Cordingley , M. Molineux , S. Duggan , C. Hart , B. Stoker , R. Williamson , R. Lovegrove & A. Cruickshank,"**The Care Home Activity Project: Does introducing an occupational therapy programme reduce depression in care homes?**", 2007.*

*Joseph G. Ouslander, William G. Buxton, Nahla R. Al-Samarrai, Patrice A. Cruise, Cathy Alessi, John F. Schnelle, "**Nighttime Urinary Incontinence and Sleep Disruption Among Nursing Home Residents**", 1998.*

*D Grosset, L Taurah, D J Burn, D MacMahon, A Forbes, K Turner, A Bowron, R Walker, L Findley, O Foster, K Patel, C Clough, B Castleton, S Smith, G Carey, T Murphy, J Hill, U Brechany, P McGee, S Reading, G Brand, L Kelly, K Breen, S Ford, M Baker, A Williams, J Hearne, N Qizilbash, K Ray Chaudhuri, "**A multicentre longitudinal observational study of changes in self-reported health status in people with Parkinson's disease left untreated at diagnosis**", 2007.*

*Jill G. Zwickera, Cheryl Missiunab, Susan R.Harrisc, Lara A. Boyd, "**Developmental coordination disorder: A review and update**", 2012.*

*Lea T.Drye, Zahinoor Ismail, Anton P.Porsteinsson, Paul B. Rosenberg, Daniel Weintraub, Christopher Marano, Gregory Pelton, Constantine Frangakis, Peter V. Rabins, Cynthia A. Munro, Curtis L. Meinert, D.*

*P. Devanand, Jerome Yesavage, Jacobo E. Mintzer, Lon S. Schneider, Bruce G. Pollock, Constantine G. Lyketsos,* ***"Citalopram for agitation in Alzheimer's disease: Design and methods****", 2012.*

*M.J. Lovering, C.A. Cott, D.L. Wells, J. Schleifer Taylor and L.M. Wells, "****A Study of a Secure Garden in the Care of People with Alzheimer's Disease****", 2002.*

*Christina M. Gigliotti and Shannon E. Jarrott, "****Effects of Horticulture Therapy on Engagement and Affect****", 2005.*

*Yuko Heath & Robert Gifford,* ***"Post-Occupancy Evaluation of Therapeutic Gardens in a Multi-Level Care Facility for the Aged****", 2001.*

*Laurie W. DeMarco, Diane Relf and Alan McDaniel, "****Integrating Gardening into the Elementary School Curriculum****", 1999.*

*Ulrika K. Stigsdotter, Anna Maria Palsdottir, Ambra Burls, Alessandra Chermaz, Francesco Ferrini, Patrik Grahn, "****Nature-Based Therapeutic Interventions****", 2011.*

*Anastasia Loukaitou-Sideris, "****Fear and safety in transit environments from the women's perspective****", 2014.*

*Fereshteh Farzianpour, Mohammad Arab, Seyyed Mustafa Hosseini, Bakhtiar Pirozi and Shadi Hosseini "****Evaluation of Quality of Life of the Elderly Population Covered by Healthcare Centers of Marivan and the Influencing Demographic and Background Factors in 2010****", 2012.*

*Power, M. Bullinger, M. Harper, A. "****The World Health Organization WHOQOL-100: Tests of the universality of quality of life in 15 different cultural groups worldwide****", 1996.*

*Pamela Y. Collins, Vikram Patel, Sarah S. Joestl, Dana March, Thomas R. Insel, Abdallah S. Daar, Isabel A. Bordin, E. Jane Costello, Maureen Durkin, Christopher Fairburn, Roger I. Glass, Wayne Hall, Yueqin Huang, Steven E. Hyman, Kay Jamison, Sylvia Kaaya, Shitij Kapur, Arthur Kleinman, Adesola Ogunniyi, Angel Otero-Ojeda, Mu-Ming Poo, Vijayalakshmi Ravindranath, Barbara J. Sahakian, Shekhar Saxena, Peter A. Singer, Dan J. Stein, Warwick Anderson, Muhammad A. Dhansay, Wendy Ewart, Anthony Phillips, Susan Shurin, Mark Walport, "****Grand challenges in global mental health****", 2011.*

*N Gopalakrishnan, D Blane, "****Quality of life in older ages****", British Medical Bulletin, 2008.*

*R Aspinall, JJ Goronzy, "**Immune senescence**", 2010.*

*Bengtsson, A., Carlsson, G., 2006. "**Outdoor environments at three nursing homes: focus group interviews with staff"**. J. Hous. Elder.*

*Bengtsson, A., Carlsson, G., 2013. "**Outdoor environments at three nursing homes: qualitative interviews with residents and next of kin"**. Urban For. Urban Green.*

*Bengtsson, A., Hagerhall, C., Englund, J.E.,Grahn, P., "**Outdoor environments at three nursing homes: semantic environmental descriptions.**" J.Hous.Elder. 2015.*

*Björk, J., Albin, M.,Grahn, P., Jacobsson,H., Ardö,J., Wadbro,J., Östergren,P.-O., Skärbäck, E., "**Recreational values of the natural environment in relation to neighbourhood satisfaction, physical activity, obesity and wellbeing**", 2008.*

*Chalfont, G.E., "**The living edge: connection to nature for people with dementia in residential care.**" 2008.*

*Chalfont, G.E., Rodiek, S., "**Building edge: an ecological approach to research and design of environments for people with dementia."**2005.*

*Cohen-Mansfield, J., Werner, P., "**Visits to an outdoor garden: impact on behavior and mood of nursing home residents who pace.**" 1998.*

*Cooper Marcus, C., **"Healing gardens in hospitals."** 2007.*

*Cooper Marcus, C., Barnes, M.,"**Therapeutic Benefits and Design Recommendations**". 1999.*

*Cooper Marcus, C., Barnes, M., "**Introduction: historical and cultural perspective on healing gardens**." 1999.*

AFTER