GENTRIFYING GERIATRICS: CHALLENGING DESIGN PARADIGMS FOR THE AGED AND AGING

by

Gerhard J. van der Linde

M.Soc.Sc (Psych)
University of the Free State, Bloemfontein, South Africa, 2005

B.Psych
University of the Free State, Bloemfontein, South Africa, 2004

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARCHITECTURE
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FEBRUARY 2011

Signature of Author:.....
Department of Architecture
January 13, 2011

Certified by:.....
Andrew Scott, BArch
Associate Professor of Architecture
Thesis Supervisor

Accepted by:.....
Takehiko Nagakura, MArch, PhD
Associate Professor of Design and Computation
Chair of the Department Committee on Graduate Students

THESIS COMMITTEE

Andrew Scott, BArch
Associate Professor of Architecture
Thesis Supervisor

Adèle Naudé Santos, MAUD, MArch, MCP
Professor of Architecture and Urban Planning
Dean, School of Architecture and Planning
Thesis Reader

Kent Larson, BArch
Principal Research Scientist
Thesis Reader

GENTRIFYING GERIATRICS: CHALLENGING DESIGN PARADIGMS FOR THE AGED AND AGING

by

Gerhard J. van der Linde

Submitted to the Department of Architecture on January 14, 2011 in partial fulfillment of the requirements for the degree of Master of Architecture

ABSTRACT

Internationally the world is undergoing a grey revolution, with the average age of the human population being higher than it has ever been before. Within the U.S. context this trend is driven by the Baby Boomers, the 80 million Americans born between 1946 and 1964. As more Boomers enter into late adulthood they will require an increased degree of support as age related needs increase.

Historically three approaches have been followed in order to address the needs of the aged: aging in place or in-home care, assisted living and nursing homes. Continuing care communities have attempted to provide an integrated model to assist through all the stages of late adulthood. With the exception of in home care, all architectural models for elderly care have been driven by a paradigm of 'aging as disease' which, through isolation and differentiation, sets up homogenous 'enclaves' for the elderly. This has attributed to the stigmatization associated with the aged and architecture for the aged.

This thesis attempts to challenge the paradigms informing architecture for the elderly by proposing a diverse, urban, mixed-use residential development supporting the needs of the aged and the aging. Essential to this is a reconsideration of the contemporary nature of late adulthood which requires an emphasis on lifestyle rather than illness and a manifestation of an architecture that is urban, programmatically mixed, age integrated, specific and flexible.

Thesis Supervisor: Andrew Scott

Title: Associate Professor of Architecture

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

I would like to acknowledge and thank the following individuals and organizations whose contributions made this project a reality:

The Oppenheimer Memorial Trust in South Africa for their support during my studies at MIT,

Megan Wright for her critique, advice, understanding and loving support,

My father and mother, Theuns and Cecilia van der Linde, and brothers, Theuns and Frans for their continued support throughout my time at MIT,

Professor Andrew Scott for his excellent guidance and support, and Professor Adèle Naudé Santos and Mr. Kent Larson for their valuable comments and guidance,

Emily Lo, Kevin Lee, May Hwang, Richard Ong, Travis Williams, James Manto, Asli Arpak and Maryam Eskandari for their sacrificial help in rendering, drawing and model building,

Professor Suzanne Corkin and Nancy Reed for assisting me in visiting the Memory Support Program at Newbridge in Dedham,

Cynthia Stewart for her interest and support. Everybody at architecture HQ without whose coordination and contributions none of this would have been possible. Also Duncan Kincaid and the staff at CRON, and Chris Dewart at the woodshop.

My focus and foundation: For all have sinned and fall short of the glory of God, and are justified by his grace as a gift, through the redemption that is in Christ Jesus. Rom 3:22-24.

Thank you to the numerous other individuals and classmates that supported me during this project. While your name is unnoted, your help is not. Thank you.

1. INTRODUCTION

Disruptive demographics

The most significant change in our world is the shift in population demographics. Of the various demographic shifts, the shift in the average age of the human population is the most important. In 2000 there were 600 million people aged 60 and over. By 2025 there will be 1.2 billion and by 2050 this number is expected to rise to 2 billion. By 2050 the number of older persons in the world will exceed the number of young for the first time in history [i].

In the USA this development is driven by the Baby boomers, the generation born between 1946 and 1964. With a longer life expectancy than any of the previous generations this generation will create a demand for age-specific housing that has never been seen before. Due to the changes in sensory, cognitive and physical health, mobility and dexterity associated with the aging process, individuals require an increasing measure of support from the physical environment as they age. There is therefore no greater and more urgent task than to find suitable solutions to address the challenges brought on by this coming 'age wave' [ii].

Architecture and the aged

Architecture is set to play a key role in addressing the needs of the aged and aging. One of the single most important variables determining the quality of life of the aged is the degree to which the home environment addresses the individual's changing needs. The project of finding new and better ways of living is an architectural project and urgently requires architects and designers to take on this as a serious theoretical and design project.

i Feddersen & Ludtke (2009)

ii Tauke (2009)

2. HISTORY

Historically three types of housing arrangements addressed the needs of the elderly. These were ageing in place, co-habitation and institutionalization.

Ageing in place

Aging in place has been a common residential arrangement for centuries. In this model individuals will remain in their homes for as long as possible. With a decrease in mobility or an increase in age-related symptoms some individuals arranged for in-home care from either a family member or a professional care provider. In the United States in-home care commonly occurs in co-habitation arrangements where the elderly will co-habitate with a family member.

Co-habitation

Further co-habitation arrangements includes the co-habitation of unrelated individuals, and in many cases, individuals of roughly the same age. Co-habitation differs from institutionalization due to the fact that no formal, in some cases, contractual relationship exist between the care-givers and the residents.

Institutionalization

Institutionalization has emerged as a common approach in coping with the challenges of age related conditions. The word ‘institutionalization’ is used with caution since it has many meanings depending on the context, but for the purposes of this discussion institutionalization will refer to a living arrangement where there is a formal and contractual agreement between care-giver and resident.

A number of institutional models exist. Assisted living homes and nursing homes are the best known examples. Continuing care communities is another model aimed at providing support for all stages of late adulthood. This model typically provides independent living units, assisted living units and nursing units. These developments tend to be age differentiated and only provide services associated with middle and late adulthood.

Architectural responses to aging

As a discipline Architecture's response to the question of human aging has been varied. During the mid and late 1900's a number of designers, most notably individuals like Herman Hertzberger and designers associated with Team X, addressed the social aspect of architecture which lead to the completion of a number of revolutionary housing projects for the elderly. Architecture as a social project had a limited lifetime and as more contemporary research interests emerged, projects associated with the elderly were moved to the background. This was particularly the case in the United States where arguably the best known elderly project is Robert Venturi's Guild House which is well-known, not for its usability or revolutionary approach to elderly housing, but more for the discourse on representation and communication in architecture.

Some of the most notable examples of architecture for the aged can be found in Western Europe and the United Kingdom where interest in the project continued. It has only been in the last two decades that some ideas from Europe are making its way back into the North American discussion on elderly housing. One well-known example of this is David Hogulnd's Woodside Place for Alzheimer residents based on the Woodside development in England.

While architects in practice are developing senior housing projects, issues regarding aging has not been addressed within the academic or theoretical spheres of architectural discourse. In order to develop new ways of thinking about these issues, architects and designers within practice and academia should develop the discourse needed to address the challenge.

For a detailed discussion on various living arrangements for the elderly please refer to the "Disruptive Demographics" Appendix in the back of this publication.

3. THE AGING-AS-DISEASE PARADIGM

Late adulthood is associated with an increase in age-related health conditions. In many cases these conditions require continued medical support and treatment, and access to medical care is therefore a primary concern for aging individuals. This has lead to the development of a situation where architecture for the elderly became directly associated with architecture for the ill. This aging-as-disease association has lead to the development of an aging-as-disease paradigm that has informed architecture for the aged for the last few decades. There are five general characteristics or concepts of the aging-as-disease paradigm. Each of these concepts can be associated with an architectural scale, and as such, can directly inform architectural projects for the aged.

5 concepts of a disease paradigm

The first concept refer to the sub-urban or rural nature of the aging-as-disease paradigm. Architectural history has many examples of the countryside or picturesque landscape as setting for buildings associated with disease or illness, whether it be physical- or mental illness. This trend can be seen to continue with architecture for the aged where much emphasis is placed on the natural surroundings of contemporary developments. The reality, however, is that apart from the occasional walk, very few individuals experience or even make use of the natural setting, and in many cases the 'natural' or unprogrammed environment contribute little towards the improvement of any physical or emotional conditions even though much resources are

committed to it. While there are definite advantages associated with a low-stress environment, unprogrammed natural environments can in certain instances lead to more stress due to issues related to mobility and access.

The second concept of the aging-as-disease paradigm is single use programming. Historically housing for the aged offered limited programmatic options for residents. Most housing developments include some form of recreational program but these programs are usually related to the needs of the residents as it develops in late adulthood. Very little accommodation is made to facilitate activities that are not necessarily associated with late adulthood. Few housing developments for the elderly allow for, for example, work-live arrangements or provide opportunities for residents to be actively involved with individuals in different life stages.

The third concept of the aging-as-disease paradigm addresses age-differentiation. Historically architecture for the aged focused on the creation of environments that are primarily concerned with the aged and their needs with little regard for individuals from other age groups. This differentiation of ages can be closely matched to an illness-paradigm where a certain group of individuals is isolated from the general population. While this isolation can have practical benefits, it also leads to differentiation and in some cases alienation of a segment of the population. Regarding architecture for the aged, this isolation has lead to the stigmatization of the elderly and architecture associated with the elderly.

The fourth concept of the aging-as-disease paradigm deals with the generic. This kind of architecture is predominantly informed by the services provided by the institution. It allows for the needs of the institution rather than for the needs of the residents. A generic model, however, can contribute to the stigma associated with architecture for the elderly due to the institutionalized image it represents.

The fifth concept of this paradigm deals with the static nature of age-specific developments. Due to an increase in life-expectancy residents can easily live in an age-specific development for up to 15 - 20 years. A resident's needs and desires, as it relates to the physical environment can however change significantly over this period. Unfortunately most age-related developments do not allow for much change architecturally. This can lead to a person-environment mismatch. A more flexible architectural approach may provide a better person-environment match and can be more supportive on the long term by adapting to the individual's needs.

4. TOWARDS A NEW PARADIGM: AGING AS DEVELOPMENT

The aging-as-disease paradigm that has informed elderly housing for the last few decades will be insufficient to address the specific needs of the baby-boomer generation. Through isolation, differentiation and separation this model sets up a situation that does not allow for a systematic and gradual change of lifestyle. What is required is an approach that allows for gradual change - an approach that can facilitate a supportive environment to address changing needs while allowing for the aged and aging to be engaged in an integrated lifestyle.

Essentially a new model should consider aging not as a disease, but as a life stage that requires support where needed while allowing individuals to make the best use of their current abilities. This requires a consideration for aging as a normal part of human development that requires support and not an abnormal condition that requires treatment. Architecturally and urbanistically this requires an environment that integrates the aged and aging into a diverse neighborhood through programmatic adjacencies and proximities, access to public transport and opportunities for shared activities. It requires an architecture that challenges the stigma of the institutional model and instead provides a realistic and approachable alternative.

5 concepts of a lifestyle paradigm

After considering the 5 concepts of the disease paradigm, this chapter proposes a new paradigm, the aging as development paradigm. Similar to the disease paradigm, this paradigm can be described by means of 5 concepts. These are urbanity, mixed use, age integration, specificity and flexibility. This chapter will discuss these 5 concepts and provide an example of how these concepts can be applied architecturally through the development of a mixed use, age integrated, flexible, urban housing development addressing the specific needs of all the residents, both aged and aging.

4.1. Urbanity

Urbanity, as the first concept of the development paradigm, does not necessarily refer to an urban location, but more importantly to an urban condition. Urban conditions can be characterized by three aspects: Increased density, access to public transport and programmatic diversity.

Increased density

Increased density allows for a larger amount of people to occupy a given site. While this deals primarily with zoning and FAR guidelines, practically this refers to the number of individuals that can be housed on a site. Density is important since it allows for the feasibility of a larger number of services. This is essential since the development model requires mixed program use. A higher population density can also support a greater amount of public amenities on a site.

Access to public transport

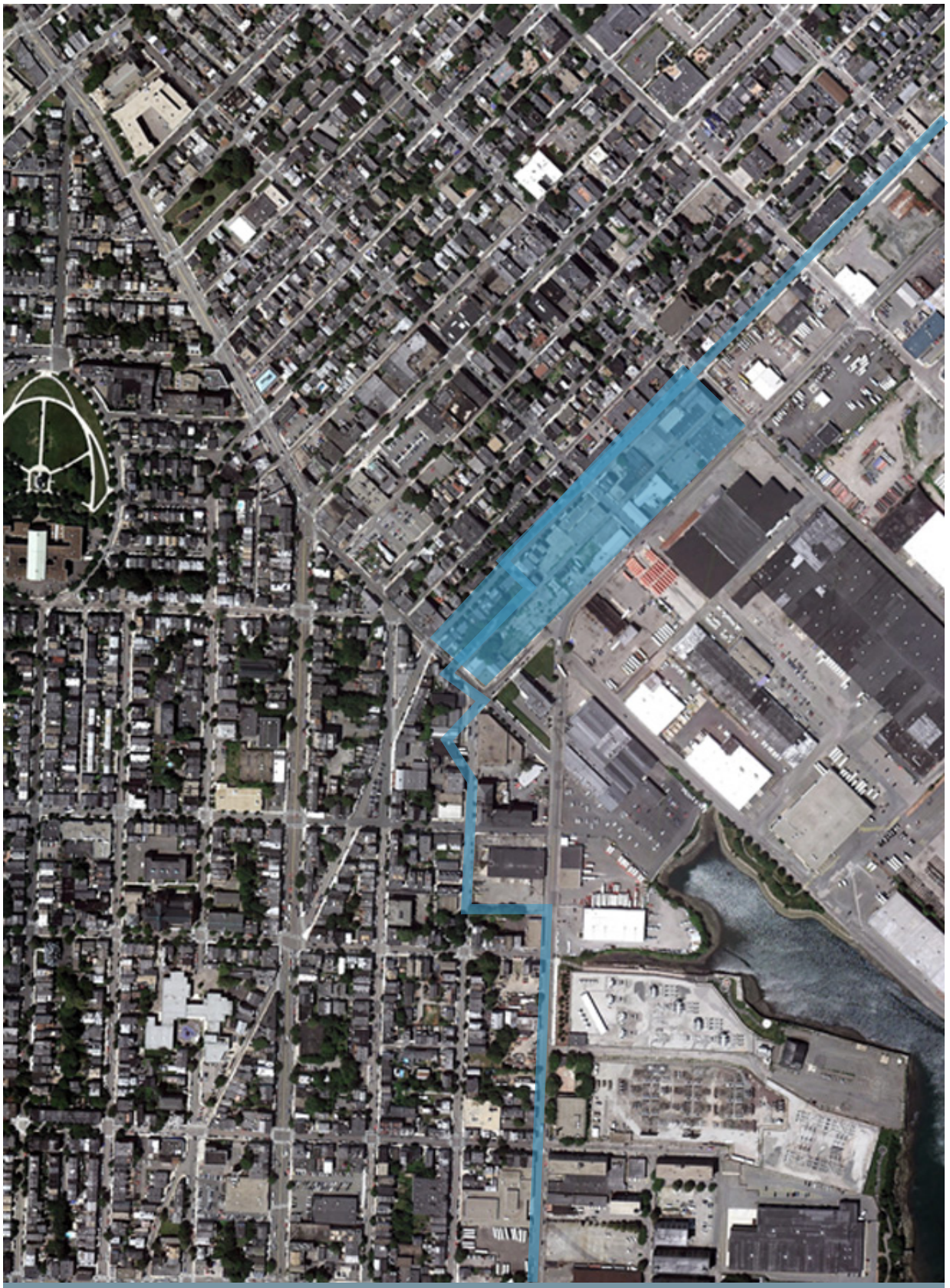
As individuals age the importance of access to public transport increases. Not only does it provide access to essential or secondary services for the elderly, it also allows those visiting, or caring for the elderly to have a convenient method of transport. Access to public transport further enable caretakers to have a wider variety of potential recreational activities for those they care for. In age-integrated communities public transport is essential since it allows for a greater degree of freedom regarding employment and educational opportunities for those in early or middle adulthood.

Programmatic diversity

Programmatic diversity refers to the diversity of the programs within the immediate urban context. Urban conditions can be characterized by the presence of programs and services supporting different age groups and various needs. These include, but are not limited to, retail, commercial, educational, civic, and service related programs. Developments informed by a development paradigm do not only improve the client basis of the existing programs in the neighborhood, but it also aims at addressing the programmatic need of an existing neighborhood.

PROJECT: URBANITY

The location for the proposed project is in South Boston, between the Fort Point Channel and City Point. It is north of Dorchester and south east from downtown Boston. The site lies on the border between an active industrial zone and an established residential neighborhood.



PROJECT: URBANITY

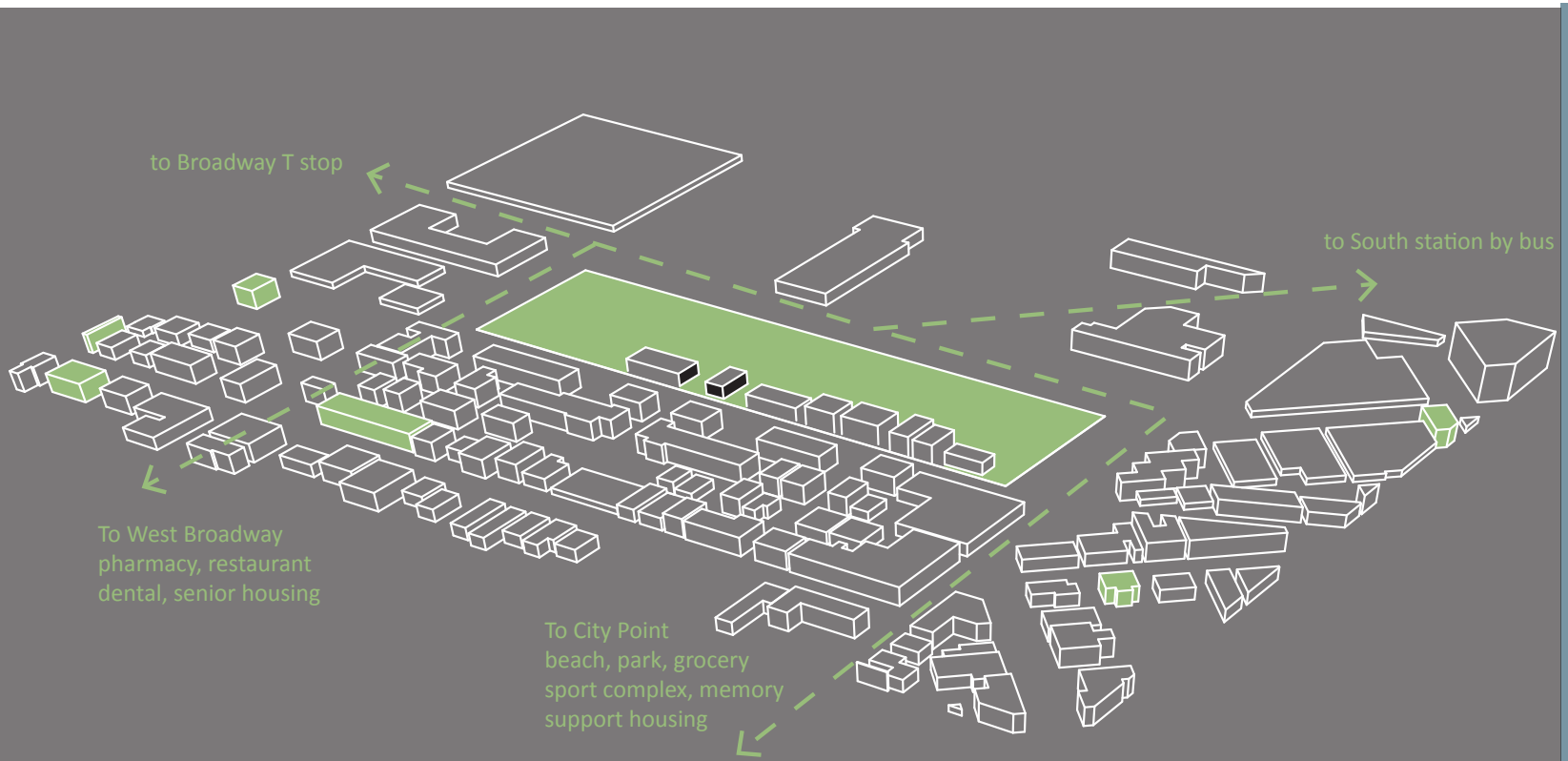
PROJECT: URBANITY

The urban design opportunities for the site include the possibility of locating a public entrance on the southern edge of the site to make utilise the existing neighborhood street. In contrast with the street on the north the southern street is tree-lined and serves a number of multi-family dwellings and is domestic in nature. The street to the north will require activation through locating programs that can be served directly from street level.

Urbanistically it will be necessary to create a porous edge towards the north, firstly to create a barrier towards the industrial zone but secondly not to cut off potential future developments since this industrial area is experiencing redevelopment and gentrification.

Due to the lower density of the industrial zone a good view towards Boston can be experienced. This, together with the solar angles will inform the formal aspects of the projects.

It will be necessary to create shared public space on the site in order to bring residents from the neighborhood to the development. Supported by appropriate public programs it should be possible to create an integrated community and connect to existing neighborhood resources.

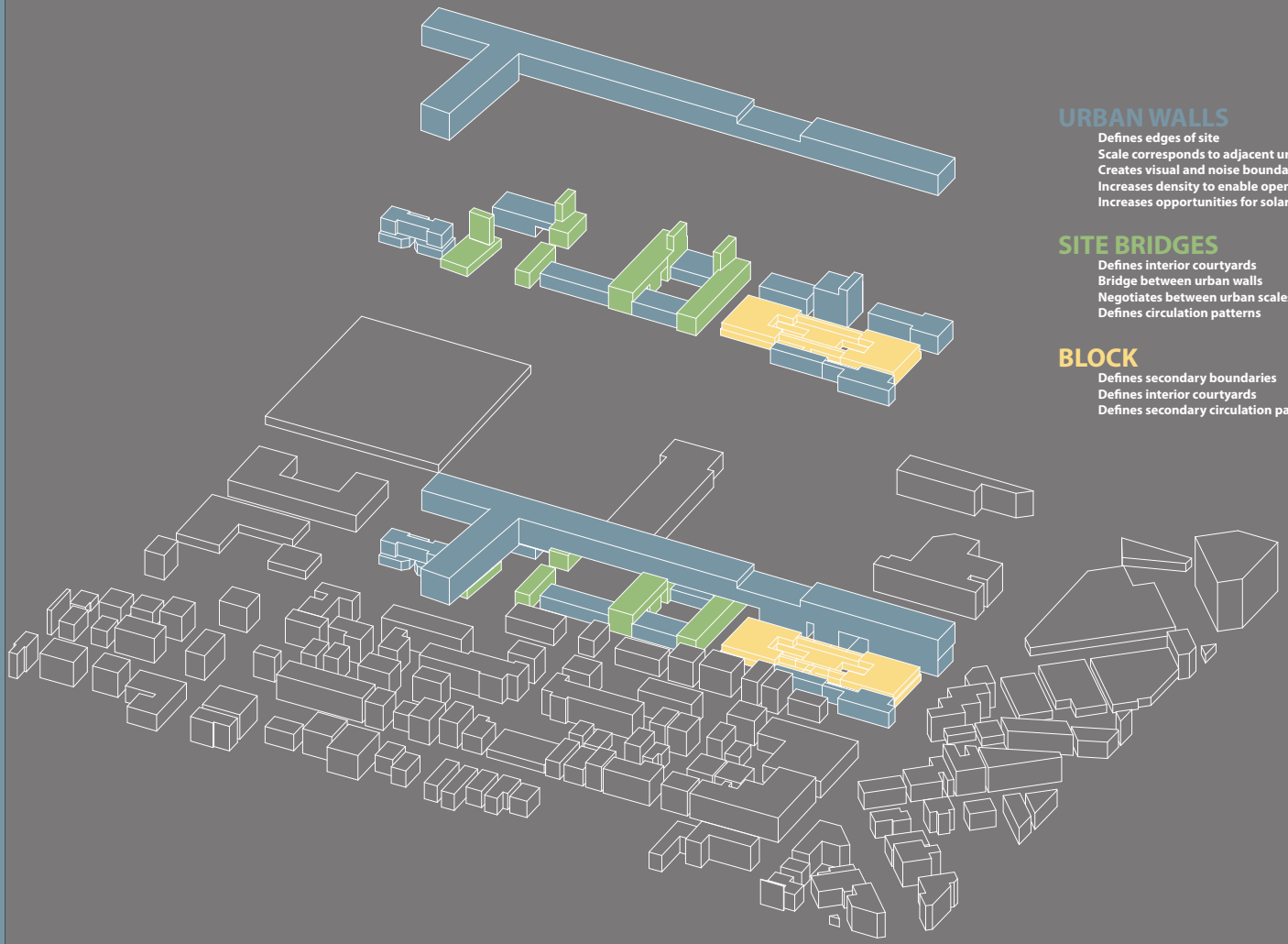


PROJECT: URBANITY

Essential to an urban condition is a higher density, connections to public transport and programmatic diversity. This site satisfies all three of these requirements. The density varies from 1-4 level buildings with allowance for higher density residential developments. Two bus routes run adjacent to the site and connects the Dorchester beach area to South Station (red line) and the Broadway stop (red line). The Broadway stop is a 15 minute walk from the site.

A number of commercial, civic and service related programs exist in the immediate are and due to the presence of a well established community, potential programs on the site should be well supported.

PROJECT: URBANITY



URBAN WALLS

Defines edges of site
Scale corresponds to adjacent urban fabric
Creates visual and noise boundary towards industrial zone
Increases density to enable open spaces
Increases opportunities for solar exposure

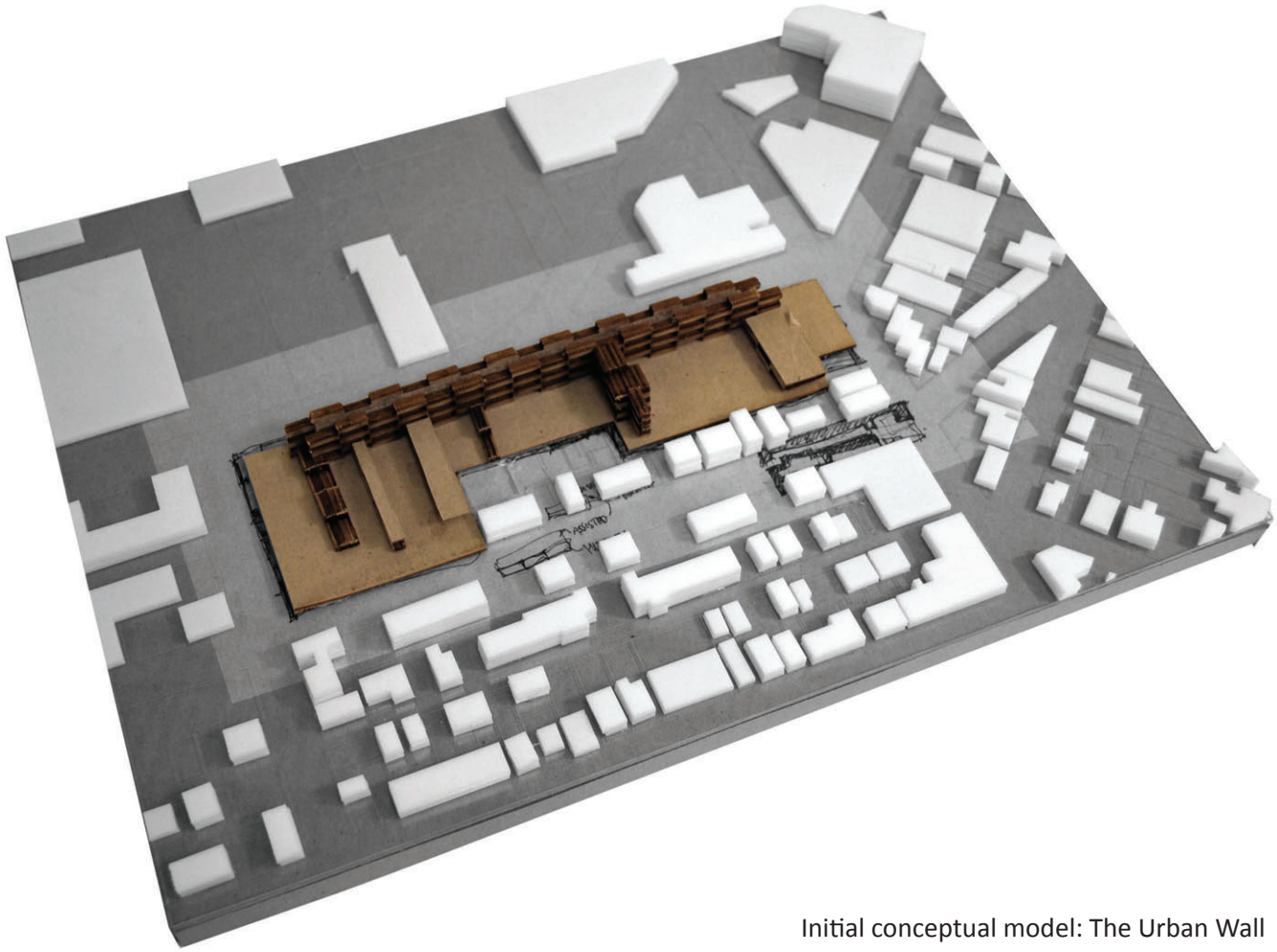
SITE BRIDGES

Defines interior courtyards
Bridge between urban walls
Negotiates between urban scales
Defines circulation patterns

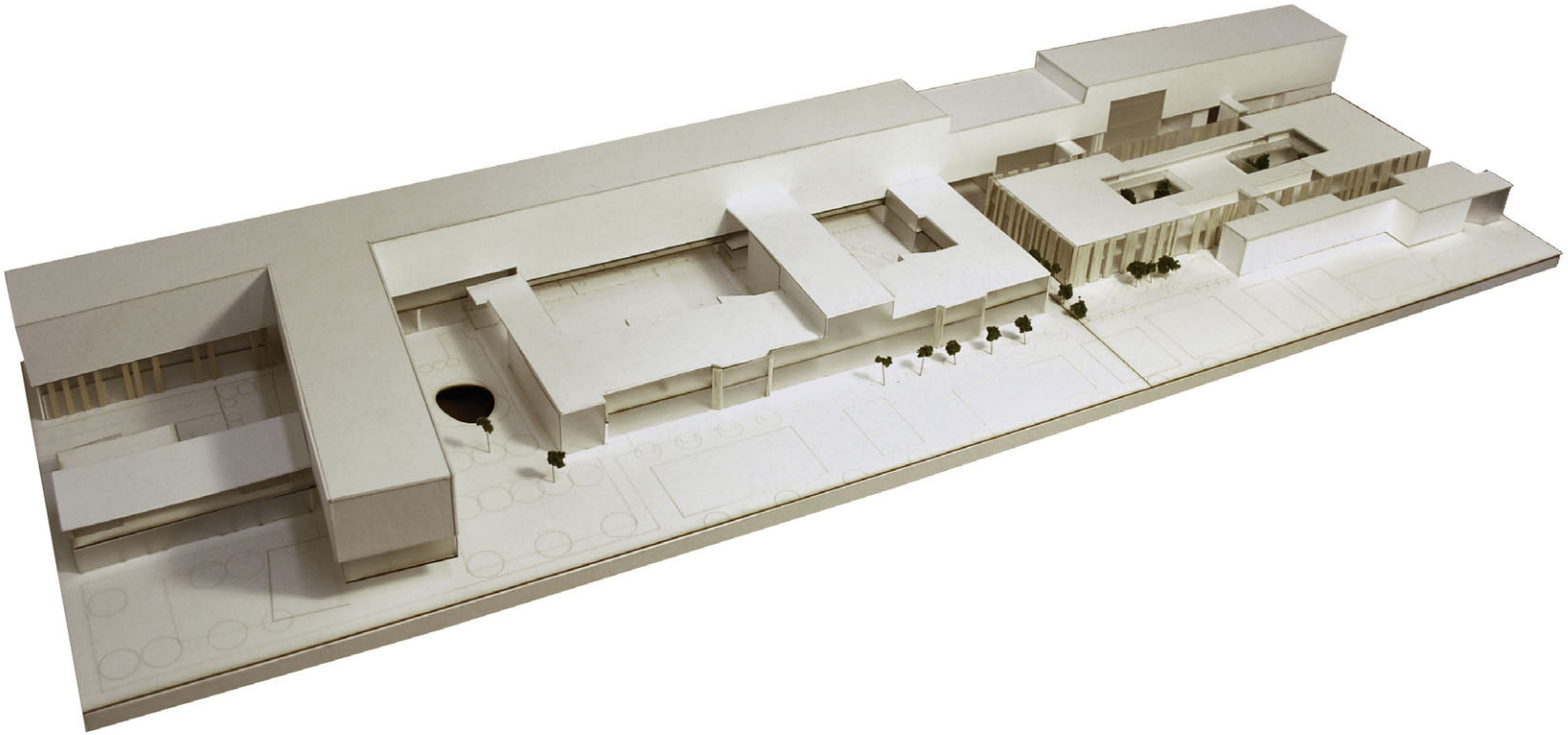
BLOCK

Defines secondary boundaries
Defines interior courtyards
Defines secondary circulation patterns

Formally the project consists of urban walls, site bridges and a block. The urban walls define the boundaries of the site while the bridges define circulation and courtyards. On the ground level the forms are fragmented in order to allow for pedestrian access and flow in various directions. From the second level onwards the form is continuous and unites the development into one form.

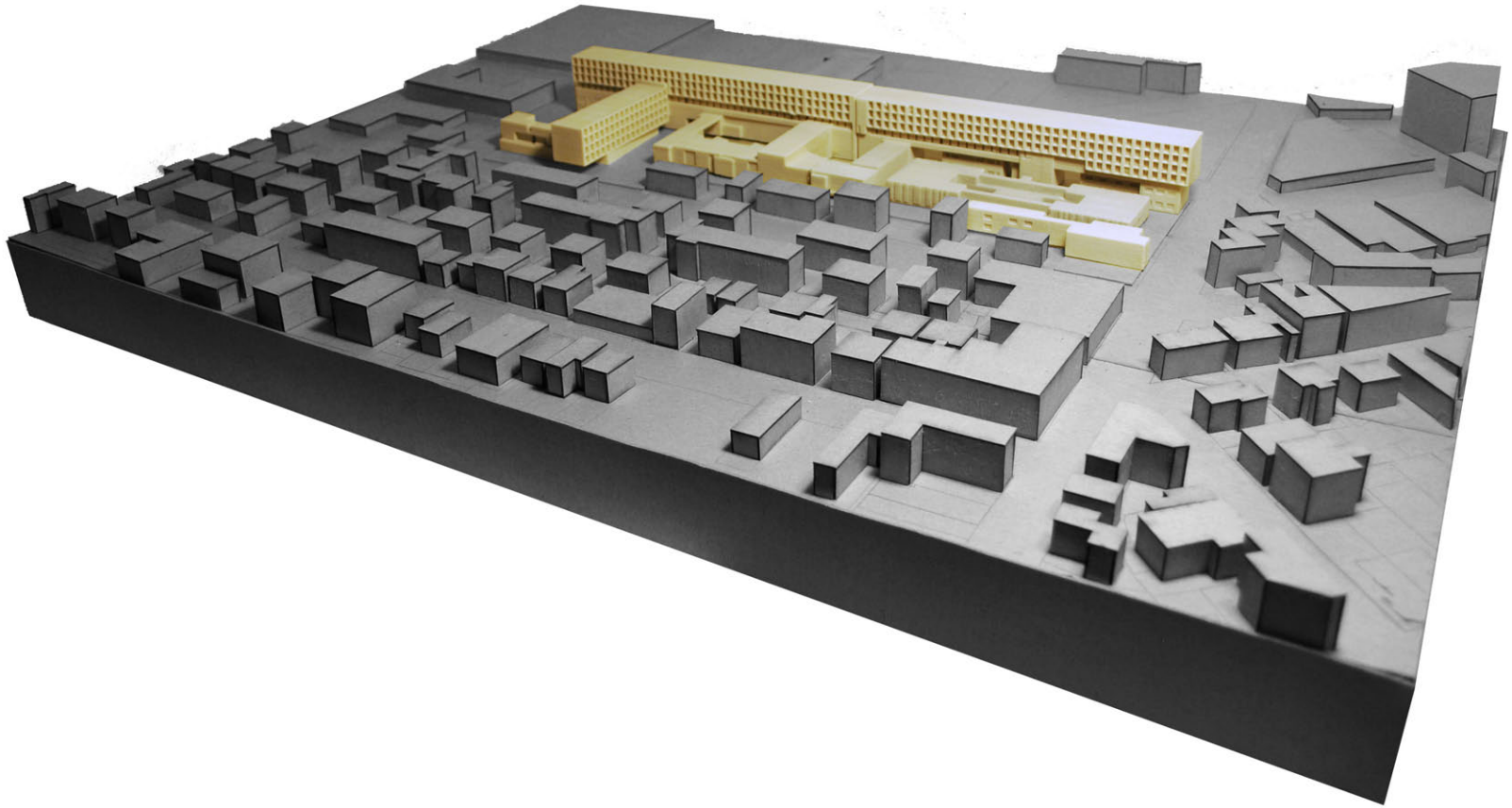


Initial conceptual model: The Urban Wall



Solids, voids and skin model

PROJECT: URBANITY



Final form in urban context

4.2. Mixed use

The mixed-use concept of the developmental approach is not new and has been discussed by various urban theorists and researchers. What distinguishes mixed-use within the developmental approach is the fact that the programmatic diversity is intended to achieve two goals; firstly to support an age integrated community and secondly to address the unique and changing needs of the aged and aging.

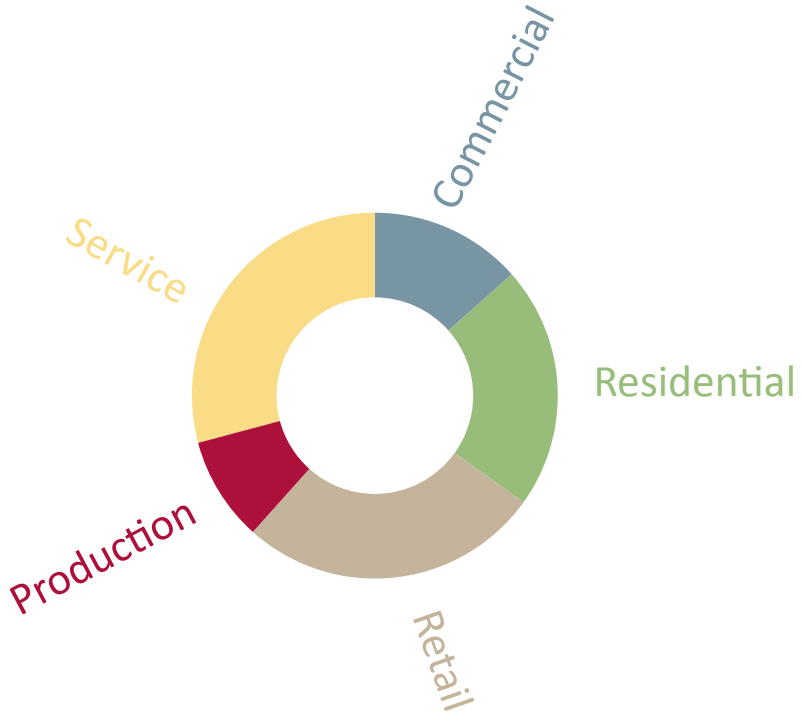
Age-integration through mixed use

In order for younger individuals to become part of an age-integrated community desirable amenities need to be associated with such a community. Beyond the typical programs found in the neighborhood, secondary programs ranging from gymnasiums and day care facilities to on-site parking and easy access to a laundromat has proven to be desirable for most households, especially those with younger children. Cost, location and access to services (or amenities) are often the three primary factors determining the suitability of an urban residence. Age-integration can be facilitated by providing programs that address the needs of a wider portion of the population.

Mixed use and the aged and aging

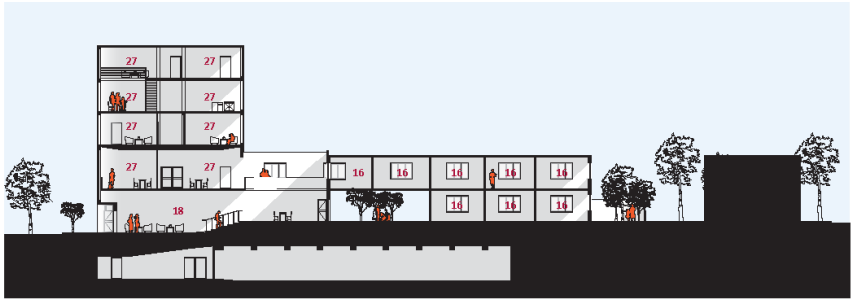
The needs of today's aged and aging is in many cases different from those of previous generations. One example is the tendency for individuals to remain economically active long

after the traditional age of retirement. This is primarily due to an increase in life expectancy and due to the fact that some individuals cannot afford retirement. Projects developed from the aging-as-disease paradigm does not allow spaces for home-offices or even venues for shared office space. The absence of workshop spaces is one reason why many aged individuals are unable to continue their occupation or in many cases more intensive hobbies after retirement. Providing for non-traditional programs will not only enable for a wider variety of activities and the continuation of occupations, it can also facilitate various therapeutic goals as well as provide a basis for age-integration. This can also contribute to challenging the assumptions regarding retirement as well as the stigma associated with architecture for the aged.

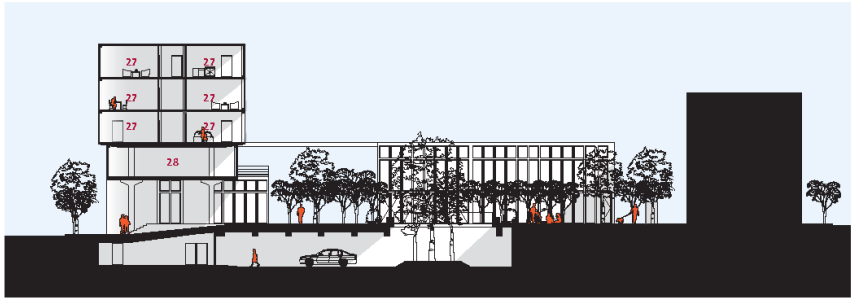


5 components of mixed use programming

SECTION C-C



SECTION B-B



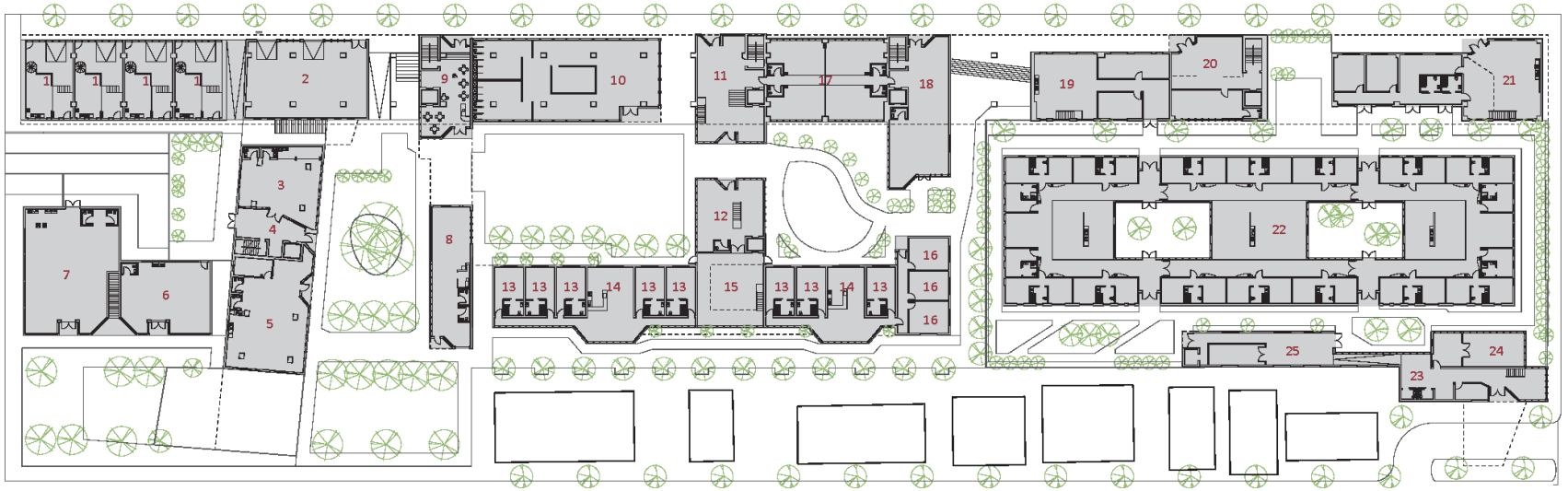
SECTION A-A

1. Work-live unit
2. Workshop
3. Community hall
4. Lobby
5. Childcare
6. Laundromat
7. Diner
8. Coffeeshop
9. Cafe | Busstop
10. Health center
11. Business center
12. Library
13. Assisted living unit
14. Shared space
15. Recreation
16. Assisted living office
17. Flex office space
18. Assisted living reception
19. Dementia support
20. Lobby
21. Dementia daycare
22. Dementia household
23. Dementia reception
24. Dementia meeting
25. Dementia recreation
26. Assisted living unit
27. Residential flex
28. Gallery
29. Family units

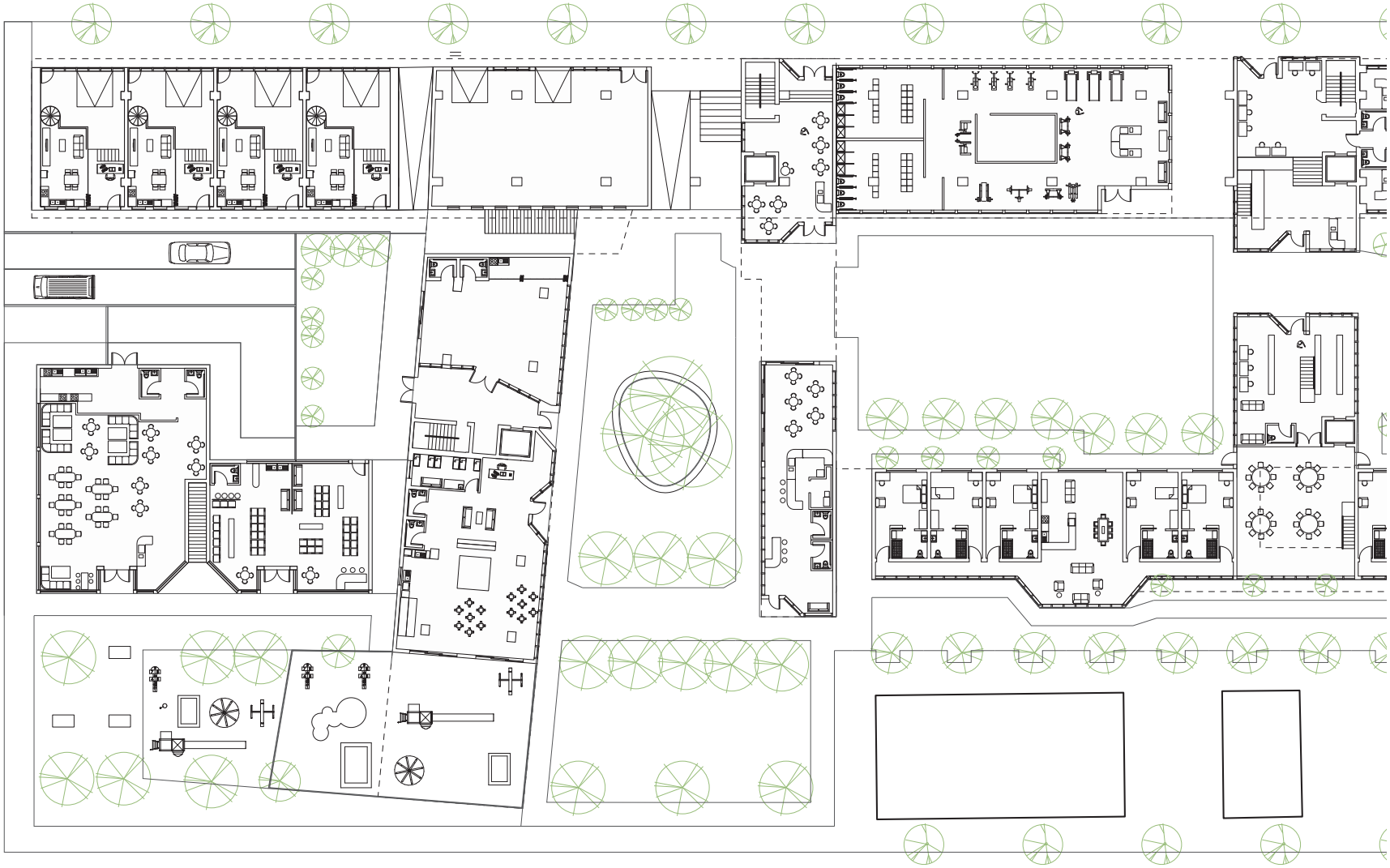
PROJECT: MIXED USE

Residential:	5 housing typologies	Commercial:	Cafe / Coffeeshop	Service:	Laundromat	Production:	Workshop
	Family housing		Business center		Child day care		Gallery
	Work-live		Flex office space		Adult day care		
	Assisted Living				Health center		
	Dementia care	Retail:	Shop		Library		
	Residential Flex units				Dementia support		

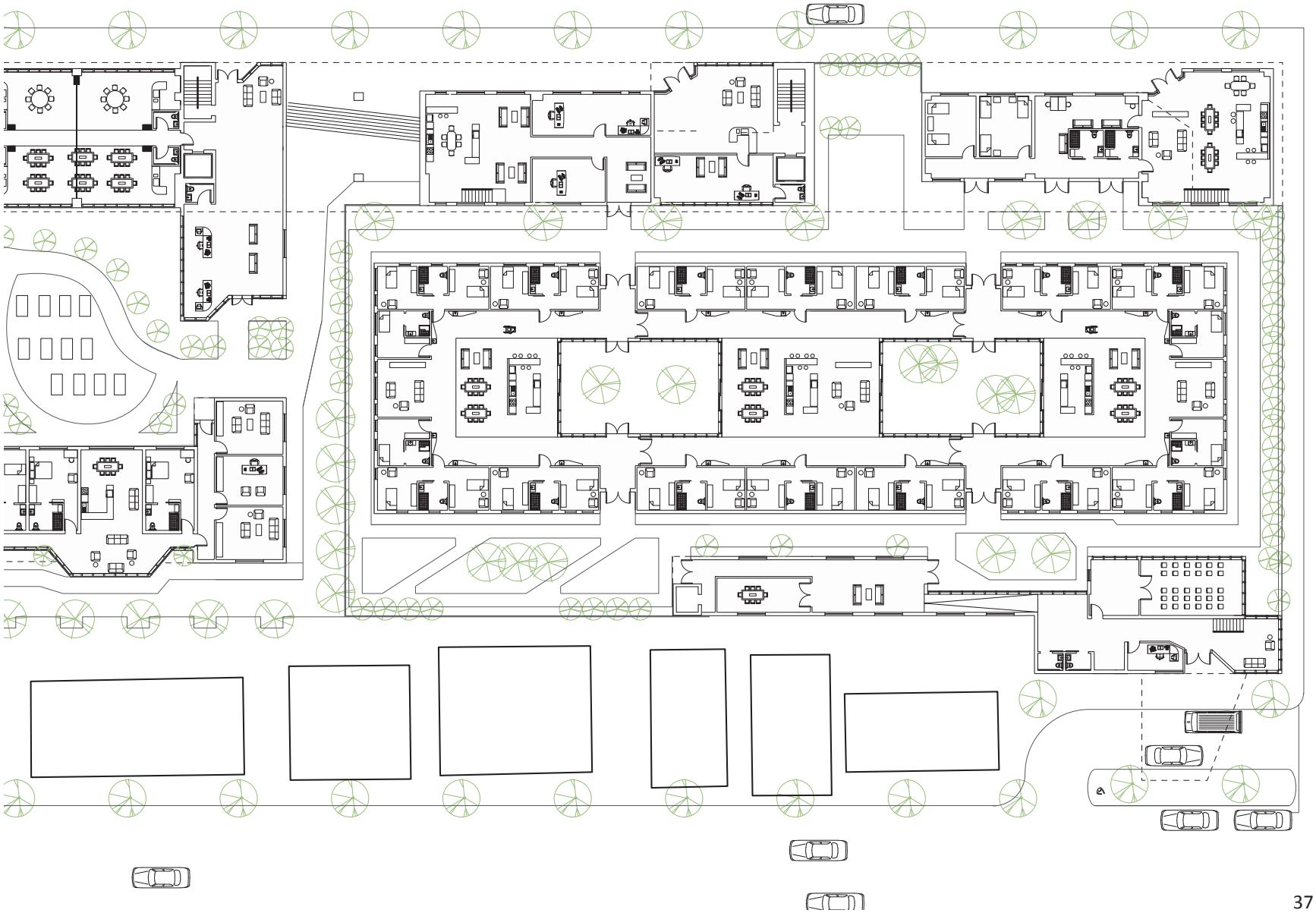
SECOND FLOOR

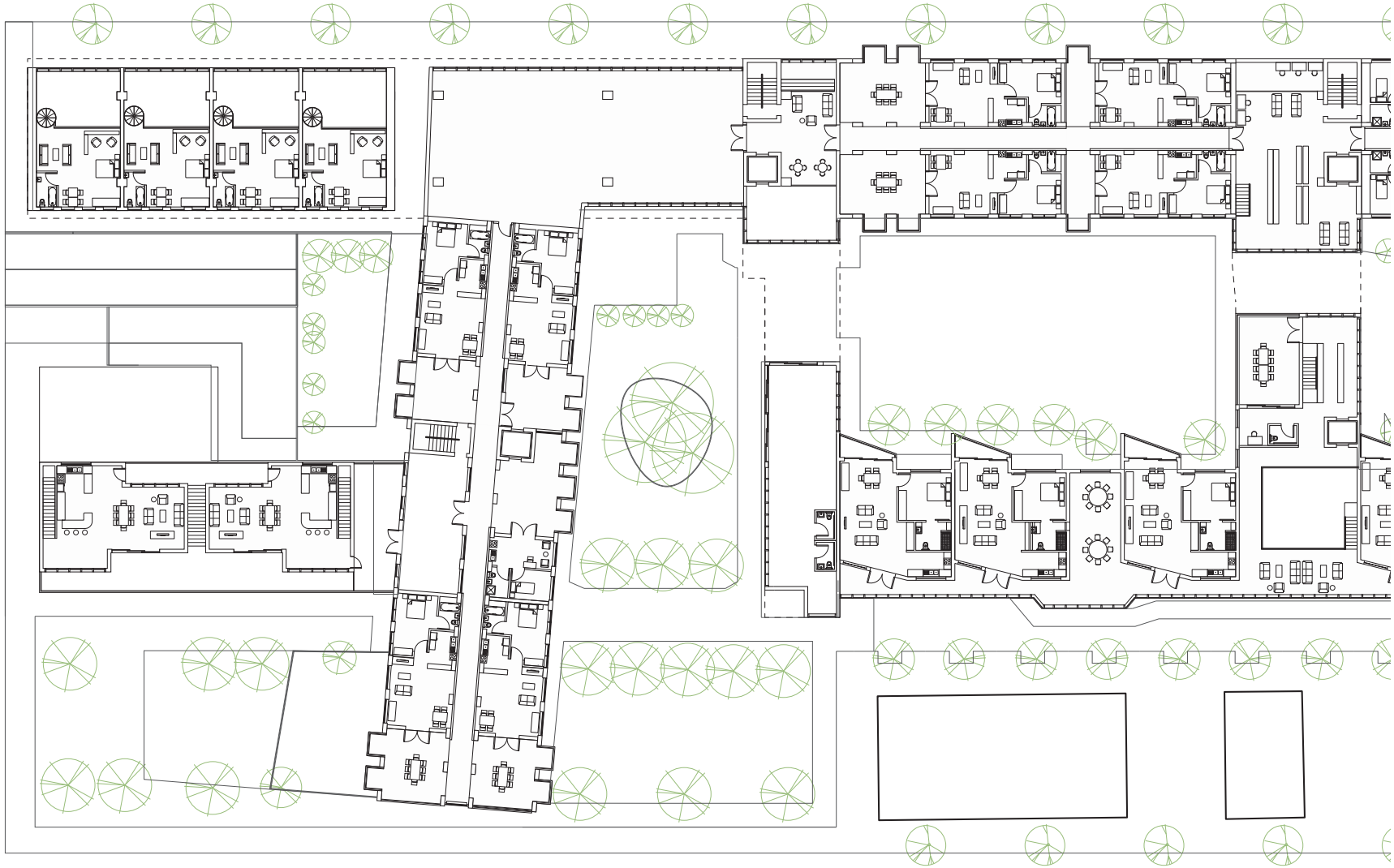


GROUND FLOOR

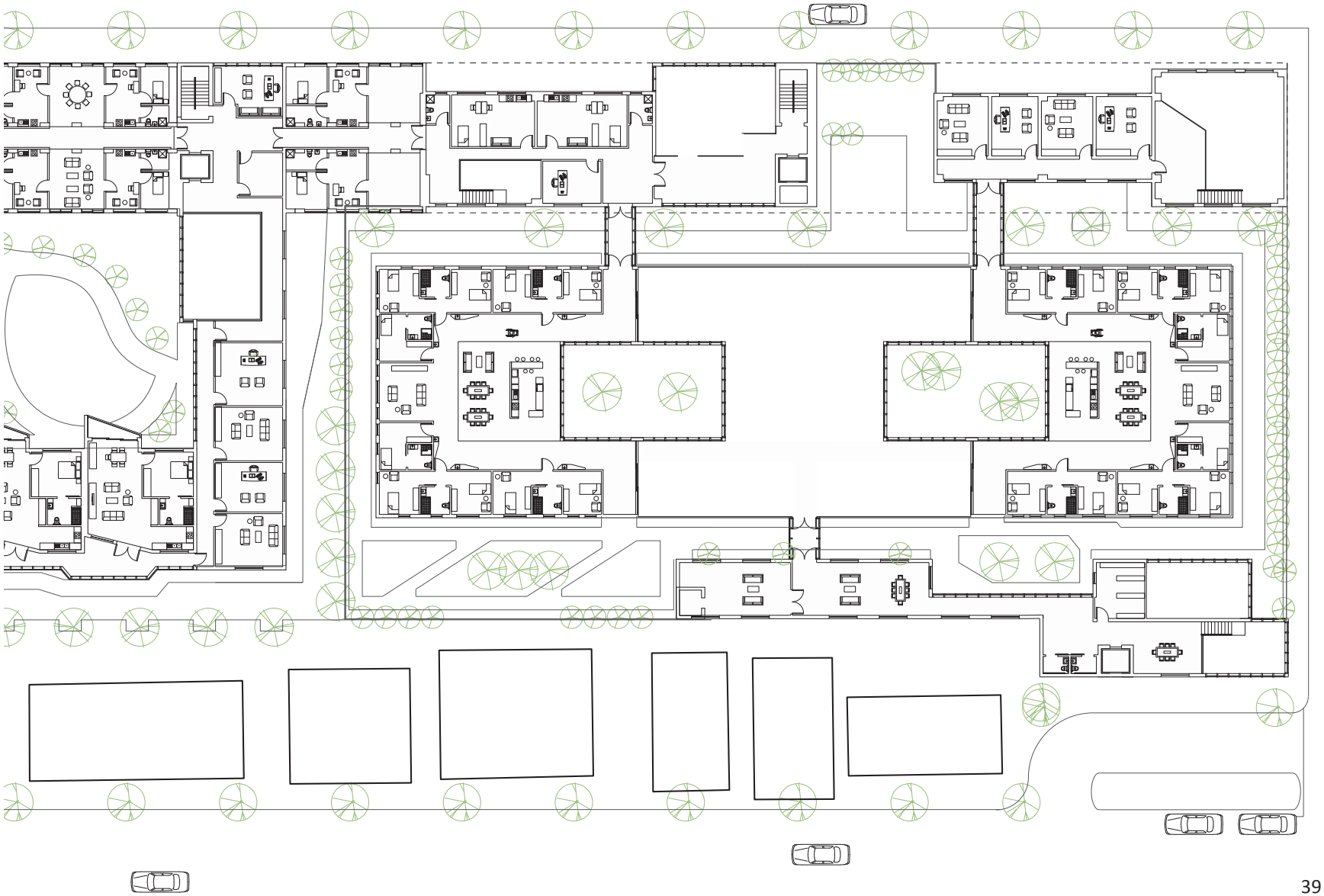


Ground floor plan



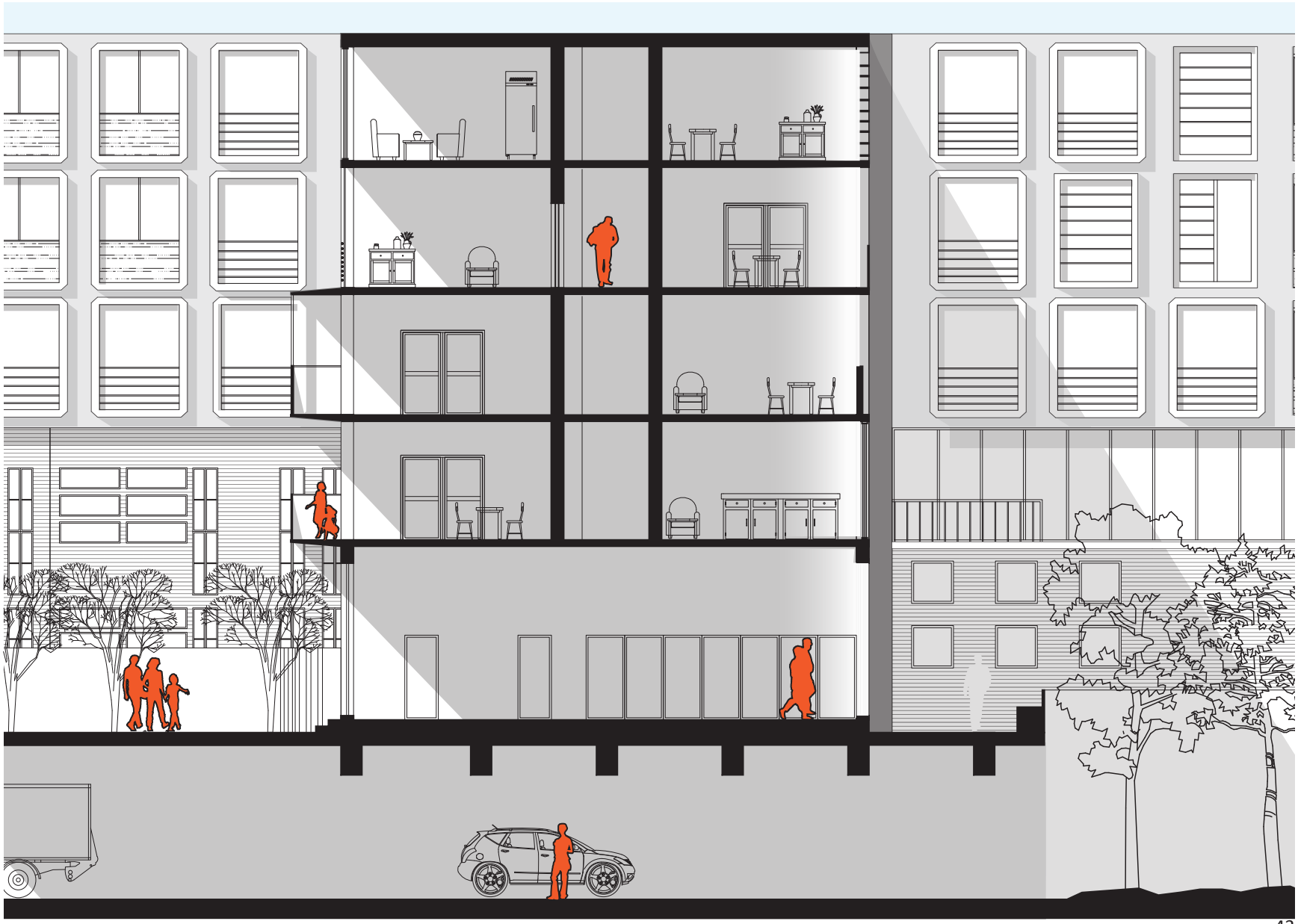


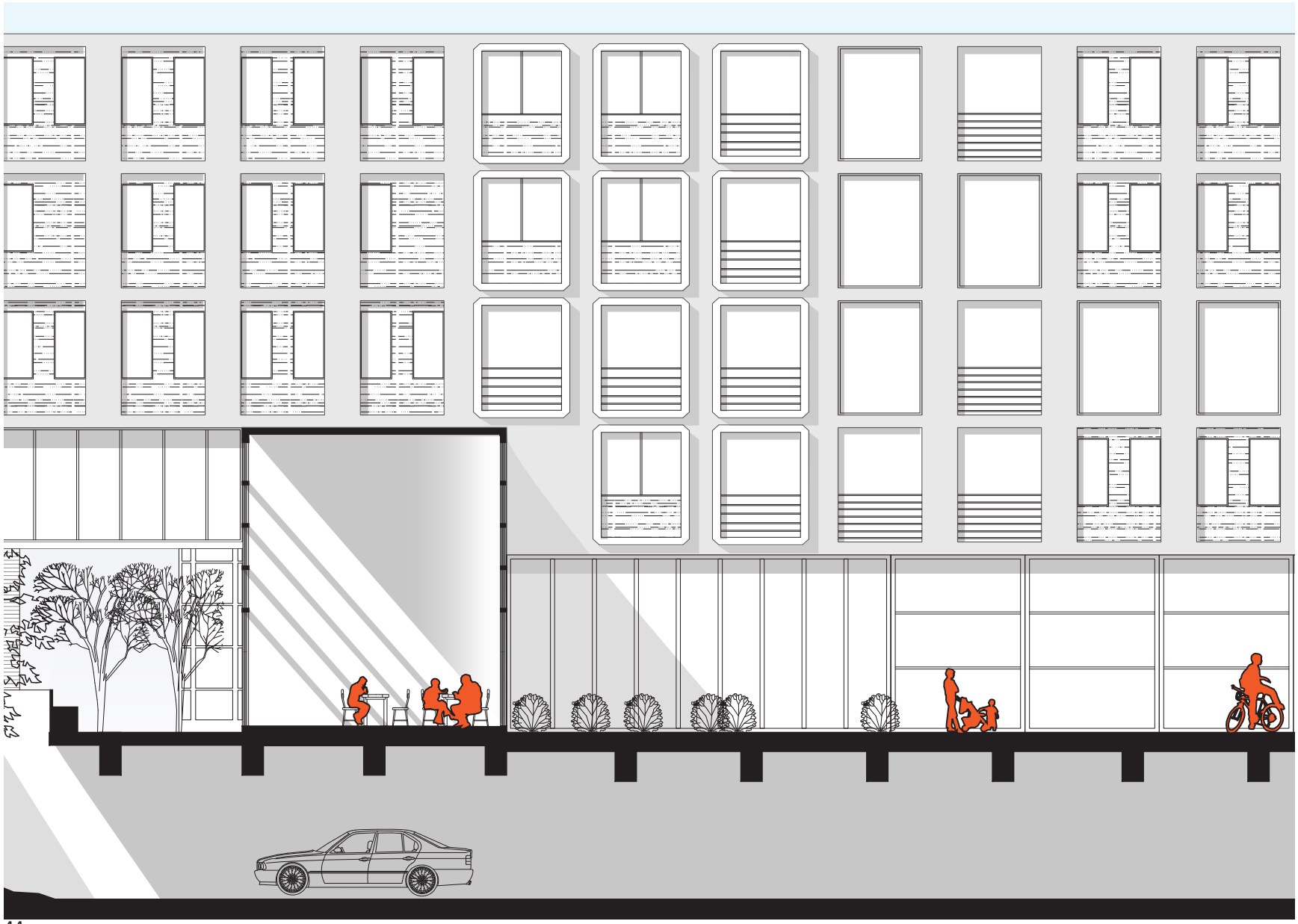
Second floor plan

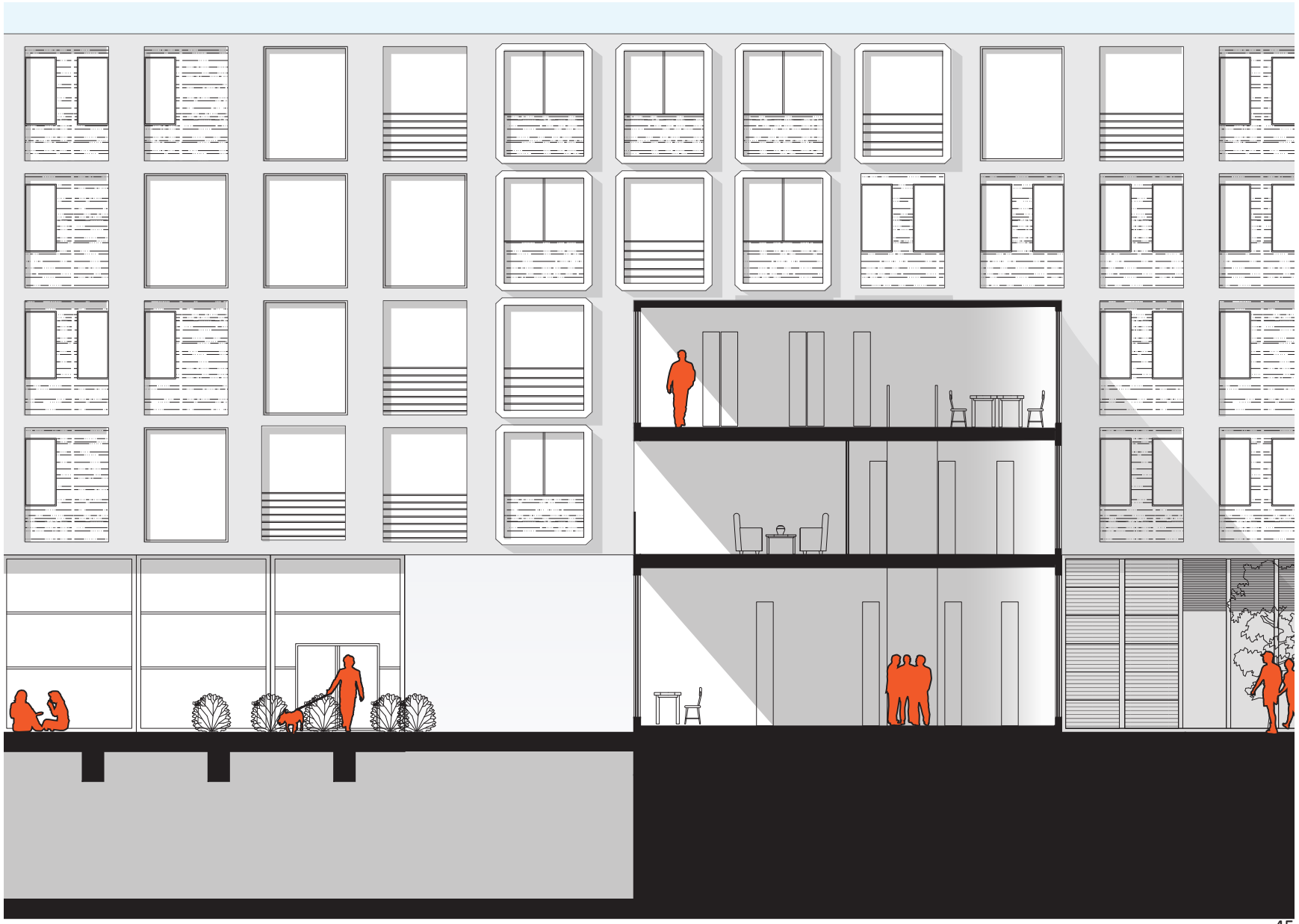


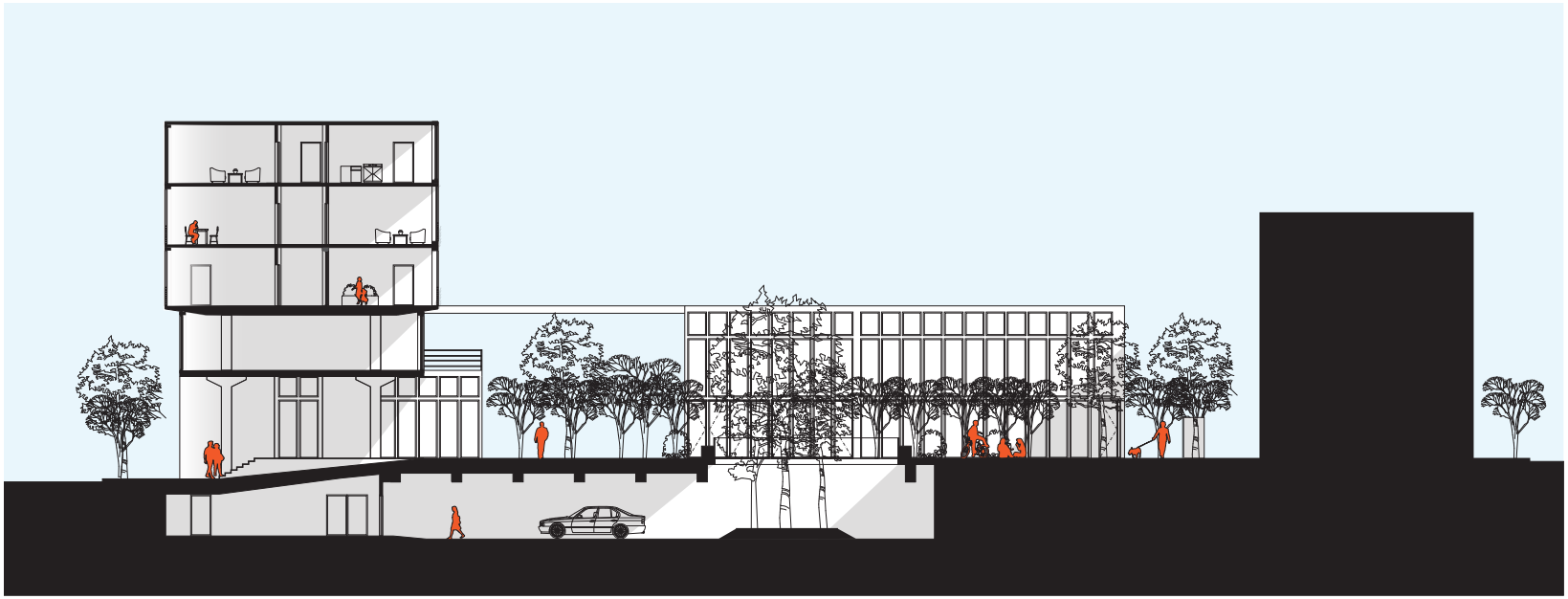
Longitudinal section

SECTION D-D
Scale 1:100

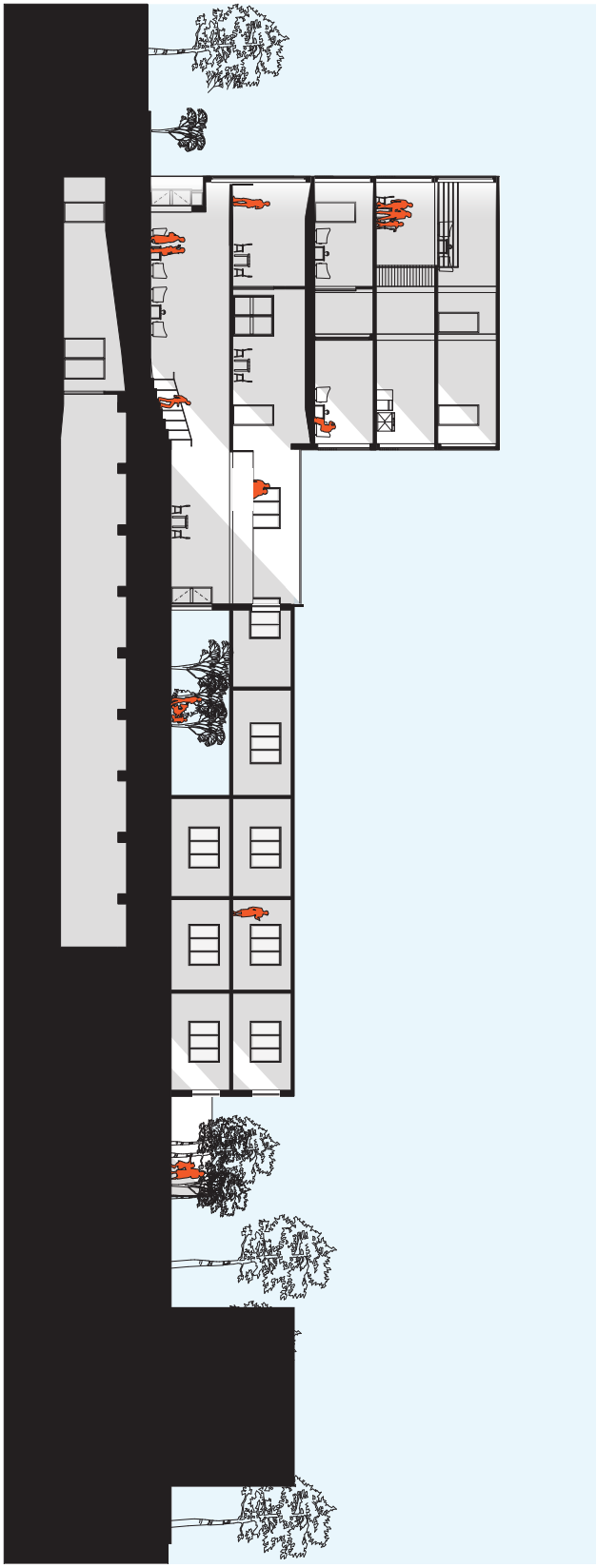








Sections 1, 2, 3.



PROJECT: MIXED USE

4.3. Age integrated

The most significant aspect of the lifestyle paradigm is age-integration. Instead of the isolation and differentiation of the disease paradigm the development paradigm proposes age integration on various levels. Two strategies are the creation of various housing typologies on a single site, and programmatic integration through the creation of programmatic adjacencies and proximities.

Integration of housing typologies

The most basic method of age-integration is the combination of various housing typologies on a single site. Essential to this approach is the creation of common spaces, which in most cases are programmed or unprogrammed green spaces. While this is a valuable strategy its application is limited since the aged and aging tend to spend a significant amount of time in their homes and therefore the opportunities for integration are limited.

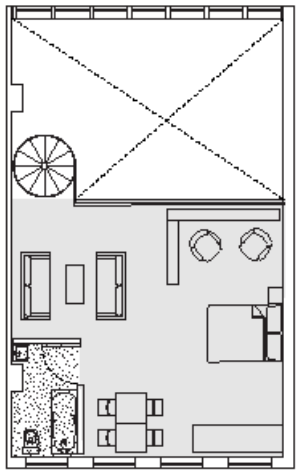
Adjacencies and proximities

A better strategy is the creation of programmatic adjacencies and proximities. A number of programs can be used to achieve a higher degree of age integration. One example deals with day care. The programmatic requirements of day care for children is similar to day care for adults and can lead to a adjacent relationship. Similarly the desire of many aging individuals to provide a service in their community allow for residents to serve at an integrated day care.

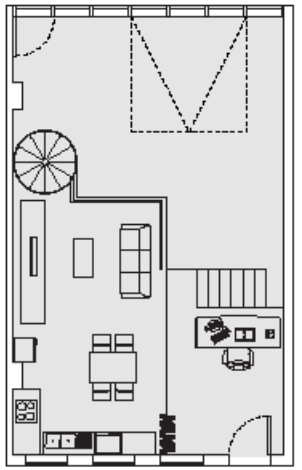
Another example, already referred to, is that of the communal workshop where activities are not age-specific and can lead to integration. Various other programs can be utilized in a similar fashion. These include the library, community store, greenhouse, flex-offices and health center. Essential and supportive to these programs are the proximities and adjacencies shared with the housing typologies.

Housing typologies as foundation of age integration

PROJECT: AGE INTEGRATED

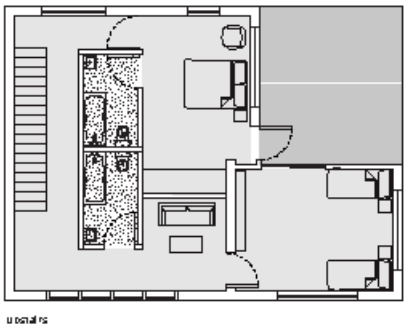


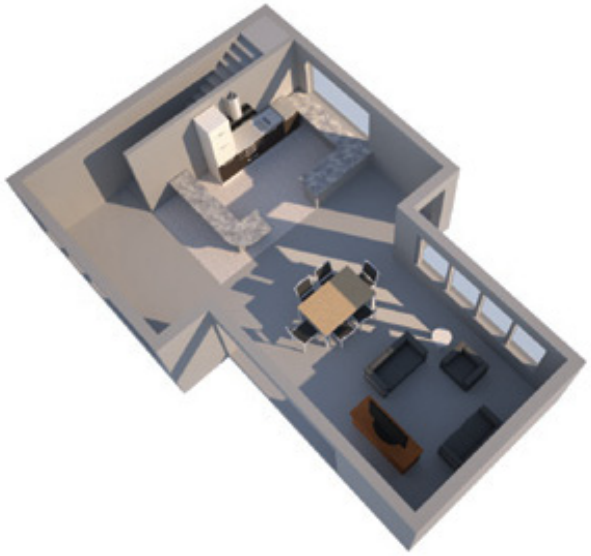
Upstairs

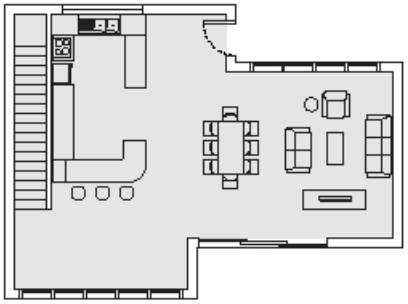


Downstairs

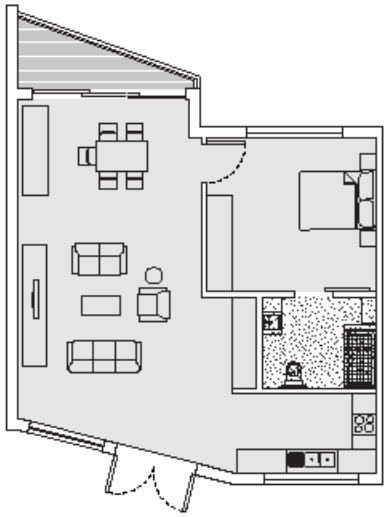
Live/Work Unit

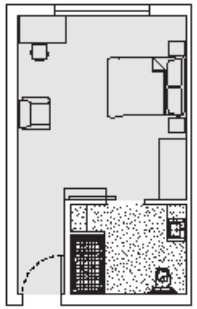




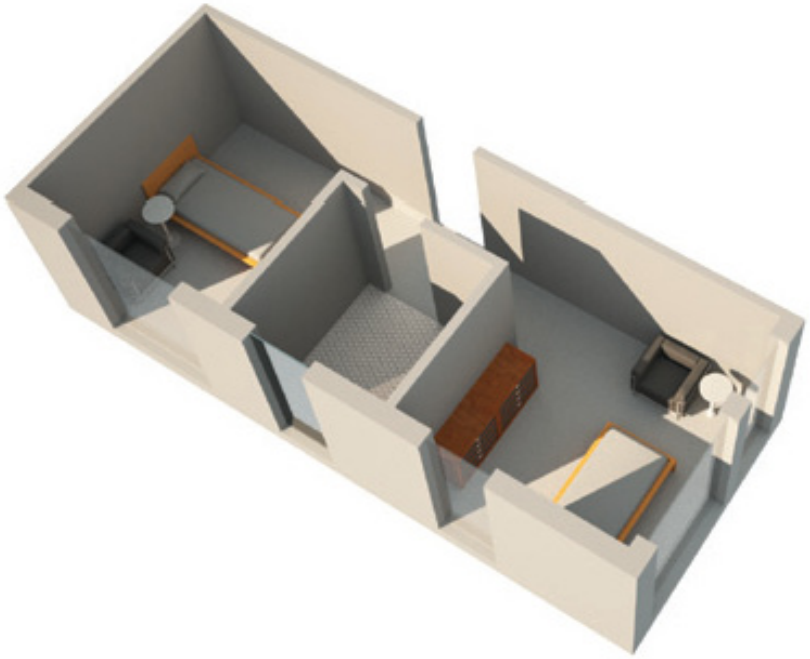


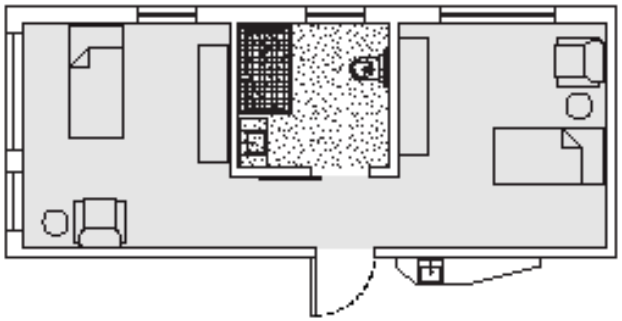
Family Unit





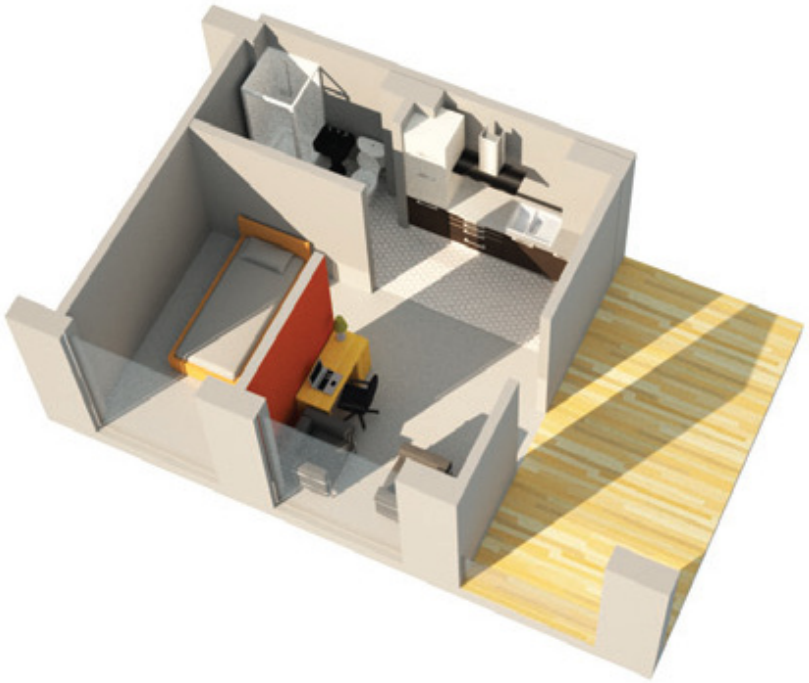
Assisted Living Units

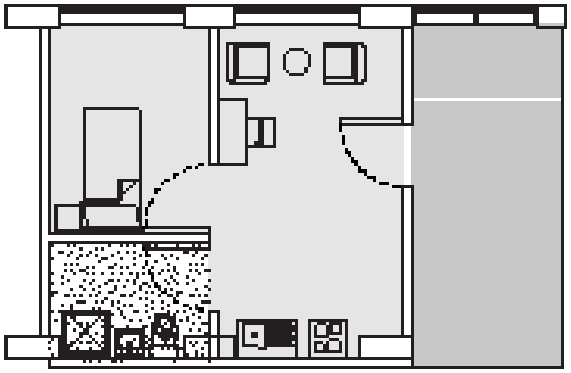




Dementia Units

PROJECT: AGE INTEGRATED

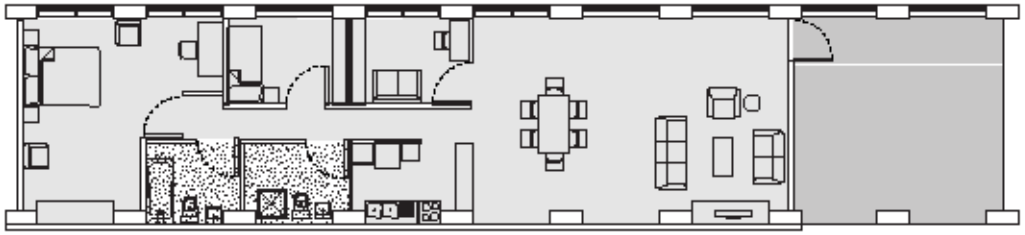


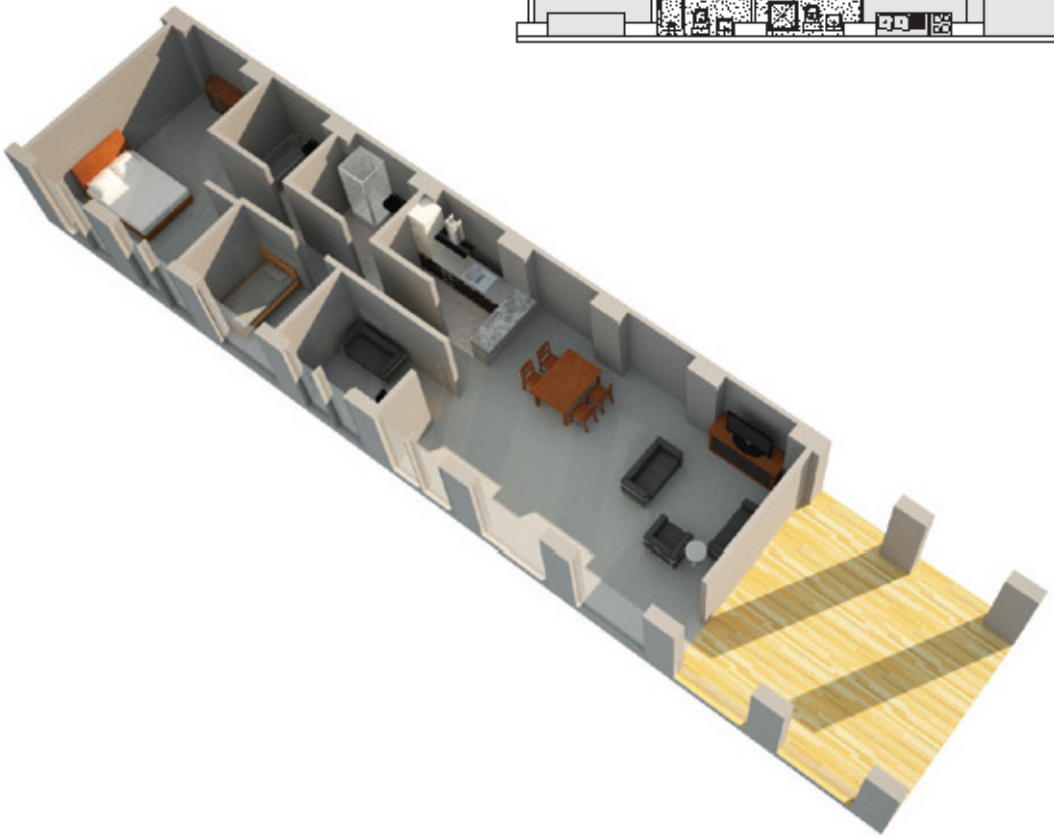


One Bedroom Communal Unit

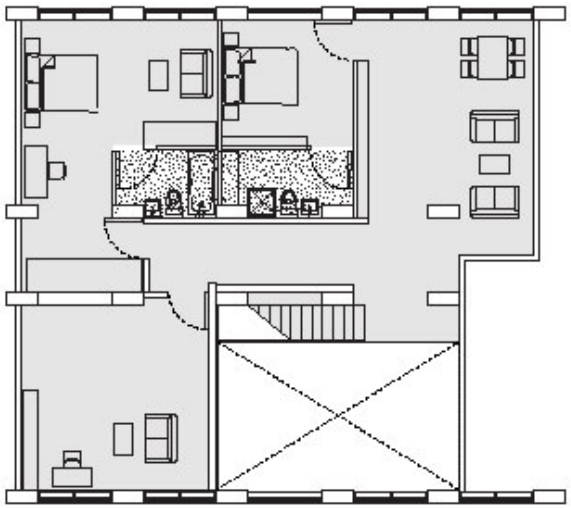
One Bedroom Flex Unit

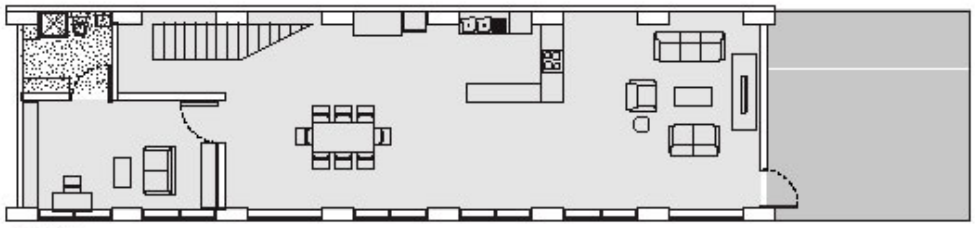
PROJECT: AGE INTEGRATED

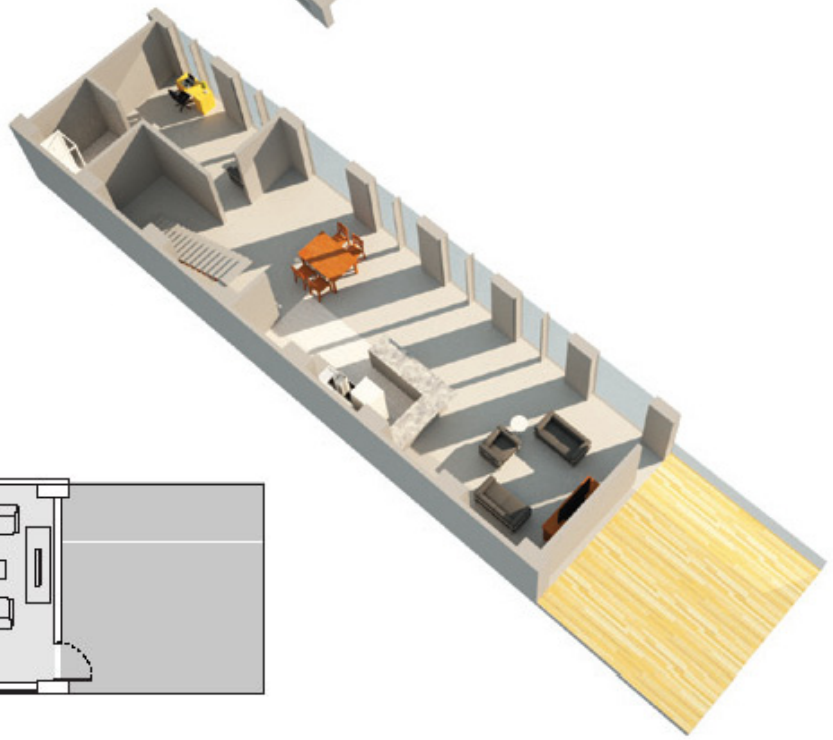




Two Bedroom Communal Unit

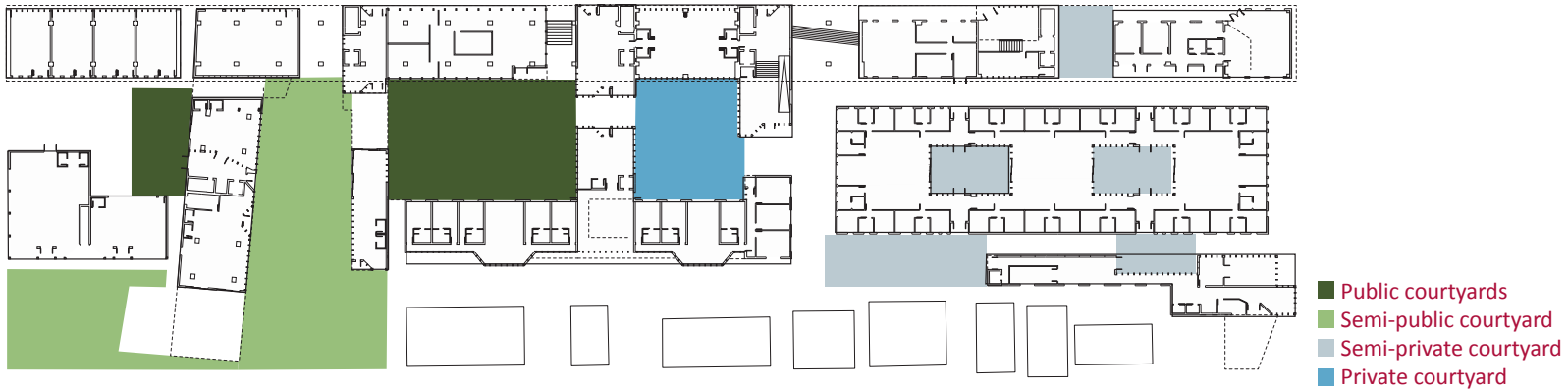






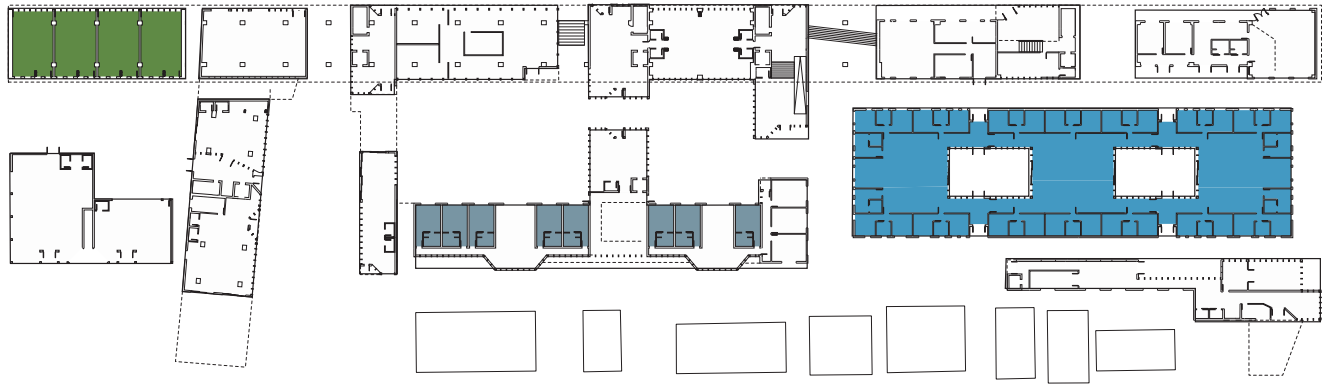
Two Bedroom Flex Unit

PROJECT: AGE INTEGRATED



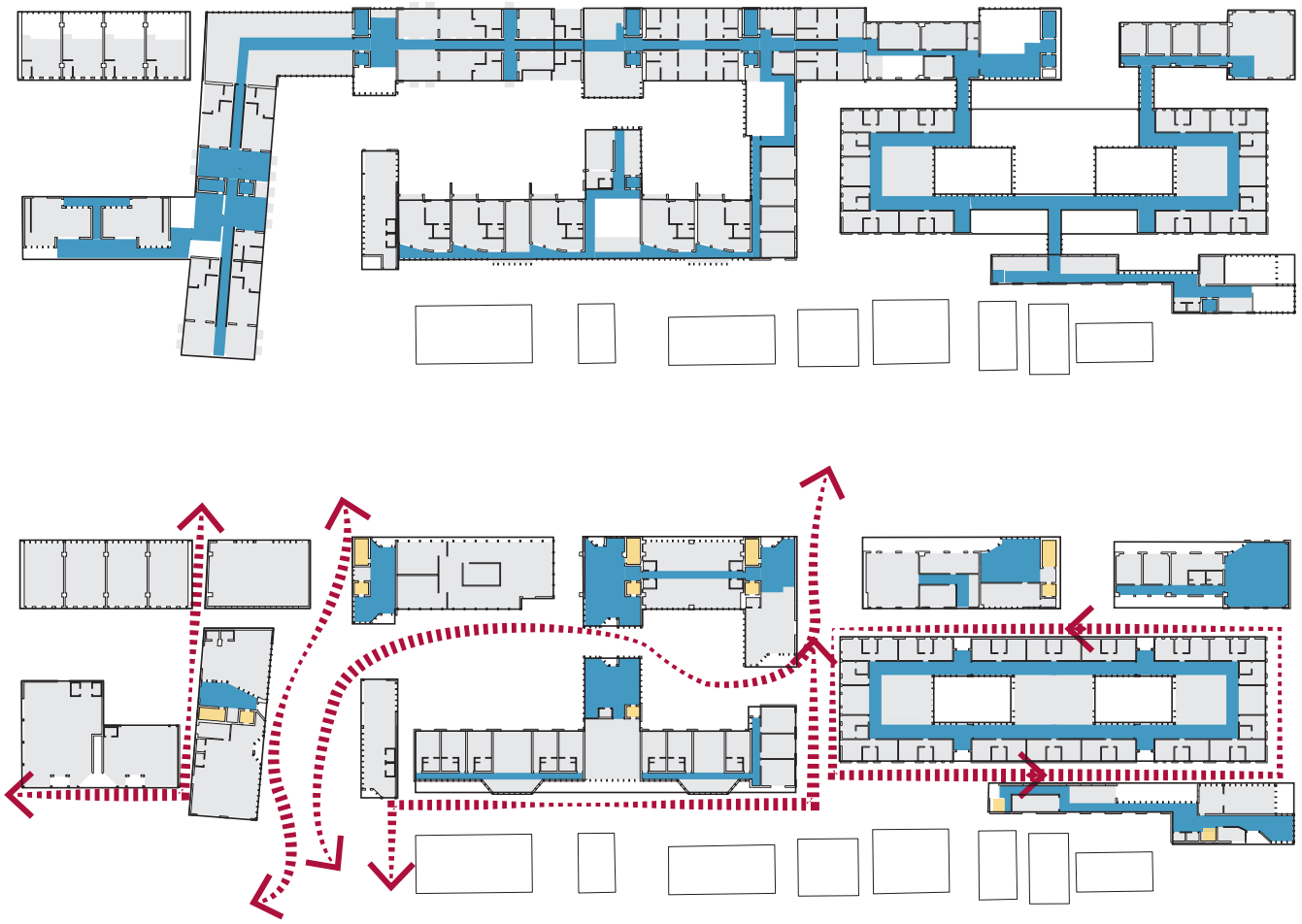
Courtyards

The courtyard spaces are defined as crossovers between various programs and age groups and differ in their qualities. The public courtyard is considered to be a neighborhood park with a playground adjacent to the street. The two semi-public courtyards respectively serve the community room and the library, cafe and assisted living programs and might be used for activities that range from individual reading to structured group activities. The semi-private courtyard has the library and assisted living programs as adjacencies and can be used for reading, gardening or walking. The private courtyards are access controlled and only serve the dementia units and adult day care.



Housing typologies

Public | Private zones



Circulation routes and entrance lobbies

4.4. Specificity

The concept of specificity is contrasted with the tendency of contemporary age-related architecture to be generic and institutional in nature, that is, deny the possibility of a more residential approach to care.

In recent years a number of movements, among others the Green House movement, has proposed a residential approach to elderly care. While this is not only a reconsideration of the architecture associated with aging, it also requires a redevelopment of the programs and service models associated with the aged. While this model can be applied in various settings, it has been successful in providing an alternative living environment for individuals requiring a high level of care, e.g. those dealing with dementia or severe health related symptoms.

This concept, has as its basis to assumption that individuals tend to perform better in familiar, residential environments than in unfamiliar clinical environments. The increase of individuals preferring aging-in-place or co-habitation over institutionalisation is a manifestation of this tendency. There are three characteristics that are essential to a residential approach. These can be categorized as the physical, the service and the social characteristics.

Physical characteristics

The physical characteristics of this approach deals with the non-institutional image and experience of facilities for the aged. Two important aspects are the personalization of shared and individual spaces and the creation of a residential environment.

Personalization

On the most basic level, personalization of the living environment starts with allowing residents to bring their own furniture when setting up their new homes. This serves two functions, firstly this helps in creating a comfortable and familiar environment where individuals can recognize their belongings and conceptualise their new living arrangements as 'home'. Secondly this contributes to the creation of a domestic image for the whole community. Personal furniture or decorations can further serve as a topic of conversation. In contrast, the absence of personal belongings and furniture often leads to a feeling of temporal or spatial disorientation and can also increase feelings of distrust and skepticism towards others since the absence of personal belongings is often considered the result of theft by caretakers or fellow residents.
The creation of window boxes at the entrance of resident rooms is also a useful strategy to improve way finding. Placing personal objects or photographs of individuals in the boxes can help individuals recognize their own rooms.

Residential vs institutional

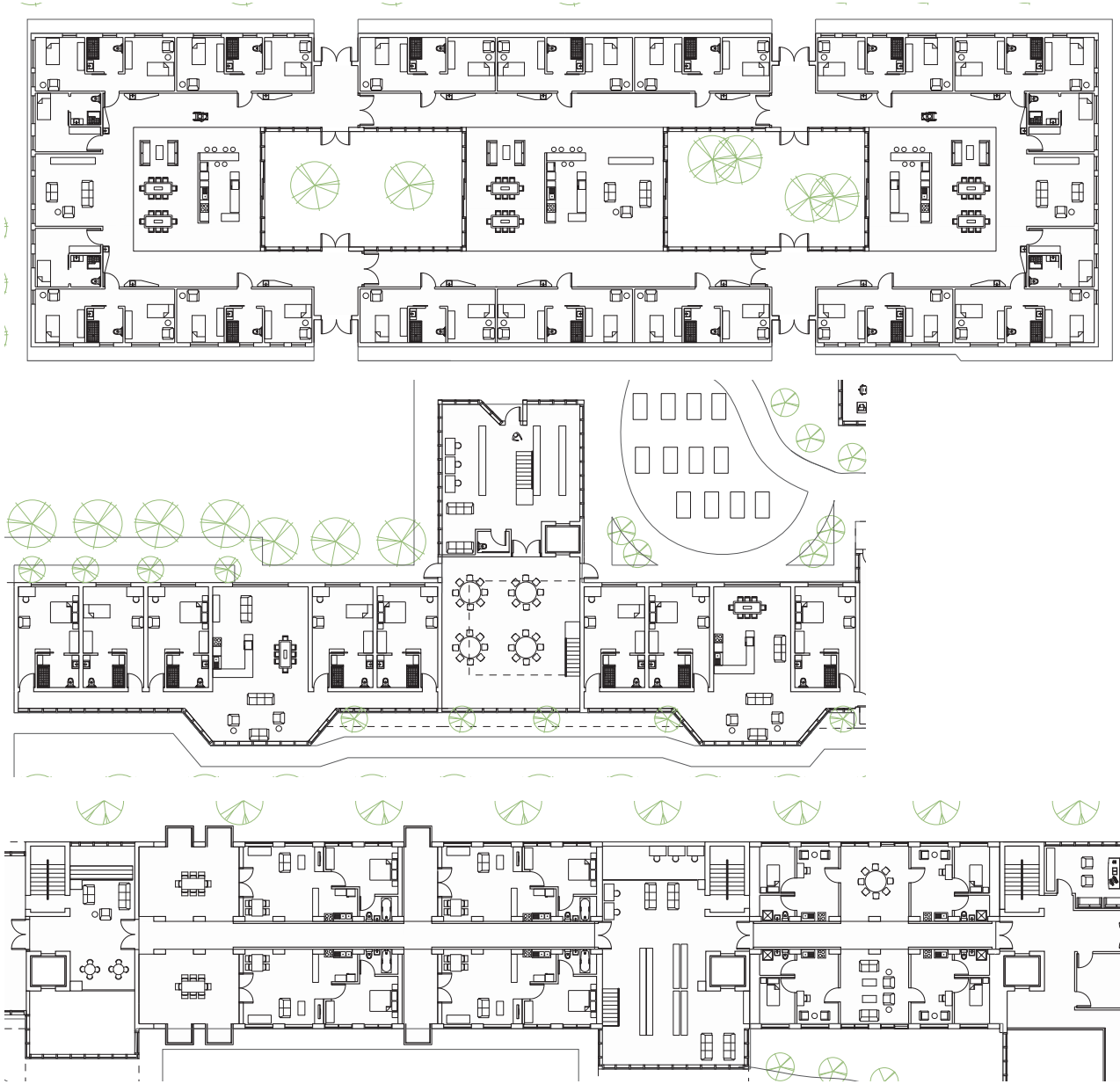
The creation of a residential environment in the common spaces has been a trend in recent years. One common strategy is to design a centralised plan arrangement with a open kitchen in the center with two to three shared living spaces surrounding the kitchen. The kitchen fulfills the role traditionally fulfilled but the nurses station but in a more domestic manner. With views towards the common spaces, typically a living and dining room, staff can have a full view of all residents while engaged in other activities. This setup also facilitates the non-traditional service model which will be discussed next.

Service characteristics

Traditional service models associated with the aged were generally of a strict hierarchical and standard nature with little allowance for individual preferences. This is especially true in the case of an individual experiencing dementia related symptoms where the typical day-night schedule does not correspond to the needs of residents. It is not uncommon to find Alzheimer patients wide awake and wondering at night, and in many cases in need of a drink or snack.
A more appropriate model provides a set schedule which most residents will follow, but in case a resident is not willing or able to follow this schedule exceptions can be made. The residential model, with the kitchen in the center allows for exception since there is always snacks available and caretakers can help a resident to eat while remaining in visual contact with other residents.

Social characteristics

The social aspect of the lifestyle approach is essential to the success of this model. Residents are typically grouped into households consisting of between 10 - 15 individuals with 2 - 3 caretakers per household. In many cases caretakers are expected to remain with a specific household thereby allowing them to get to know residents better. This also helps residents to build relationships with caretakers and contributes to creating a 'family' environment.
Another social aspect of this model involves family members visiting residents. Within the residential setup family visits often involve all residents an therefore serve as an opportunity for social interaction. Its not uncommon for family members to initiate activities the whole household can take part in.
Depending on the length of stay, some residents can remain in a single household for as long as 5-7 years. This model therefore essentially allows for aging-in-place.



PROJECT: SPECIFICITY

The residential nature of the various unit aggregations can be seen in these three examples. The plan at the top represents 3 of the 5 dementia care households with the central kitchen and living spaces. Essential to this arrangement is the allowance made for wondering wether it be inside or outside.

The second plan represents the assisted living units which consists of individual rooms and apartments with shared dining and living spaces.

The third plan represents a potential arrangement of the flex units which are communal but age independent.

Dementia care: Geometry and skin

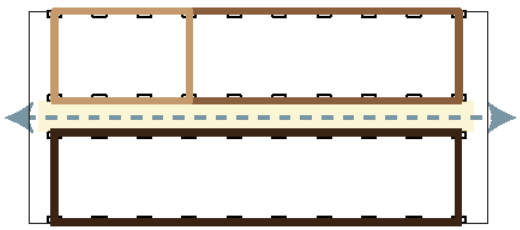
View into private courtyard from dementia units on second floor

4.5. Flexibility

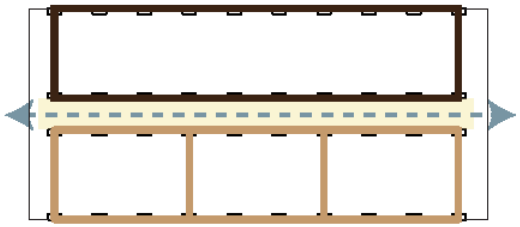
The disease paradigm considers aging as a static process and as an architectural approach allows for little to no flexibility. Aging is however not a static process and therefore an individual's needs - and how these relate to the physical environment - can change dramatically during the process.

One of the biggest challenges to aging in place is the inability of architecture to adjust to an individual's changing needs. Most individuals prefer to remain in their homes until their age-related needs force them to move. A contemporary trend is for the aged to move in with their children. This can require something as simple as refurnishing an existing bedroom, or as complex as adding an apartment to the house.

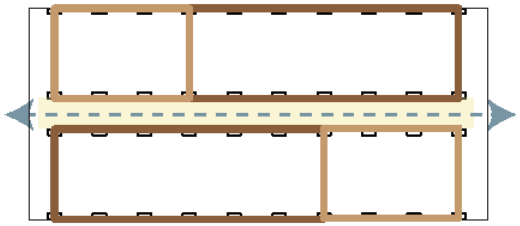
For the last few decades, issues of mass-customization and flexibility in architecture have been active, though controversial research topics. The issues related to an aging society will. in the future, require of architects and designers to consider these options more seriously. The scenario where individuals move into a condominium with the goal of adapting it as their needs change should be considered. The growing demand for more suitable living arrangements will outgrow our ability to build new homes before it will outgrow the ability to customize existing homes.



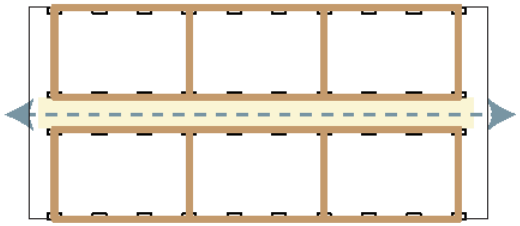
OPTION 1
1 x 2 br
1 x 1 br flex
1 x 1 br communal



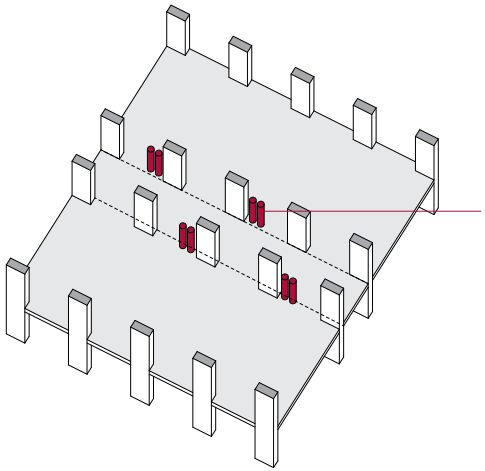
OPTION 2
1 x 2 br
3 x 1 br communal



OPTION 3
2 x 2 br
2 x 1 br communal



OPTION 4
3 x 1 br communal



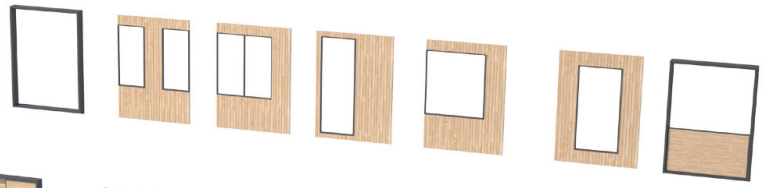
PROJECT: FLEXIBILITY

The residential flex units are based on a simple column and slab structure with the services located on the interior edge of the units. The various units are proportionate in size to each other and, together with the location of the services, should enable unit owners to, over the lifetime of their units change the configuration if needed. Larger units can be subdivided to allow for changes in lifestyle or needs.

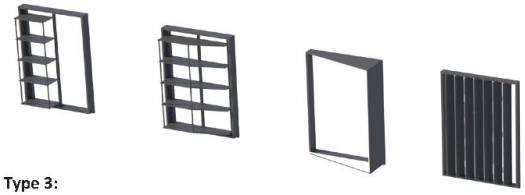
PROJECT: FLEXIBILITY

Flexibility extends beyond the floor plan and units can be customized by replacing window units. While providing various options for the interior of a unit the changing facades also provide a reflection on the exterior of the building, of the changes on the inside. For practical reasons it is estimated that the facades will only be changed every 5 - 15 years, depending on the change in occupancy.

Type 1:
- Adjust window openings
- Improves sense of enclosure
- Influences thermal gains and losses
- Creates diversity on interior

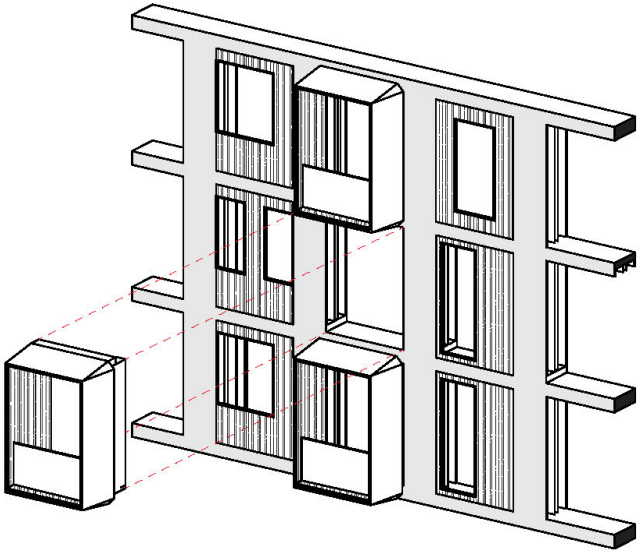


Type 2:
- Allows for blackout of daylight
- Facilitates airflow through unit
- Creates opening to outside



Type 3:
- Functional components
- Creates full or partial greenhouse in window
- Units useful for increasing or decreasing solar gains

Type 4:
- Balcony units
- Creates 1 - 2 m balconies for porch units
- Either open or enclosed
- Can serve as greenhouse or social space



Facade model

View towards public courtyard


View towards northern facade
W. 1st Street

5. BIBLIOGRAPHY

Cohen, U. et al. (1988). Environments for people with dementia: Design Guide. Center for Architecture and Urban Planning Research, University of Wisconsin-Milwaukee

Cohen, U. et al. (1988). Environments for people with dementia: Case studies. Center for Architecture and Urban Planning Research, University of Wisconsin-Milwaukee

ETH Wohnforum. 2008. New approaches to housing for the second half of life. Swiss Federak Institute of Technology Zurich.

Feddersen, E., & Ludtke, I. (2009). Preface. In E. Feddersen, & I. Ludtke, A design manual: Living for the Elderly (p. 8). Basel: Birkhauser.

Herwig, O. (2008). Universal Design. Birkhauser. Basel.

Tauke, B. (2009). Universal Design: A declaration of independence. In E. Feddersen, & I. Ludtke, A design manual: Living for the Elderly (p. 9). Basel: Birkhauser.

6. APPENDIX: Disruptive Demographics: Thesis Preparation Document

Architectural Imperatives for Disruptive Demographics

Designing for the aged and aging

Gerhard van der Linde
gvdlinde@mit.edu
March 7, 2010

INTRODUCTION

Internationally the developed world is undergoing an unprecedented increase in the proportion of elderly people among their populations. Over the next 25 years some 70 million workers will retire, and be replaced by 5 million new workers. This contrasts strongly with the past 25-years during which 45 million new pensioners were replaced by 120 million baby boomers[1].

While this development has been discussed extensively in the literature of the social sciences, architectural discourse has, to date, been silent on this topic. A possible reason for this is that design for the elderly has never been considered a 'glamorous' task by the profession[2] with museums, commercial towers and cultural showpieces eclipsing the mundane architectures related to the phenomenon of aging. The social and economic consequences of this demographic shift, however mundane it might seem now, will arguably be the most significant trend of the coming 50 years and will require innovative responses due to its effect on labor markets, education, pensions, long-term care, housing and urban design.

The emerging demands[3] by the aging population and its influence on architecture can no longer be ignored if the discipline expects to be relevant in the future. It is the timely definition of architectural imperatives for this disruptive demographic that this thesis hopes to address.

Sun City, AZ Google Earth

AGE AS DISRUPTIVE DEMOGRAPHIC

Within the North American context the 'Baby boomer' generation refers to the 80 million Americans born between 1946 and 1964. Both locally and internationally this generation has been the focus of public and private industry and design for more than half a century. For the last 60 years businesses have responded to the seemingly endless supply of young consumers. From the 1950 Levittowns to contemporary suburbs, from open plaza and strip shopping to enclosed malls and big boxes, from the 1950 wood paneled wagons to the 1980's minivans and contemporary hybrids, the baby boomer generation has shaped what is now considered the cultural norm with their preferences[4]. Known as the 'me-generation' they also shaped the advertising and branding industries, contributing significantly to both the commercialization of American culture and historical levels of economic growth.

While the cultural influence of this generation is especially evident within the North American context, the demographic phenomenon of the 'boomers' cannot be confined to a single country. The disruptive demographics boomers bring to a population can, for example also be seen in China that is currently undergoing a 'grey revolution'[5]. With a sudden increase in life expectancy from 41 years in 1951 to 79 in 2008 the number of people older than 60 have surpassed 167 million, greater than the total population of Germany and France combined. This number is estimated to reach 248 million by 2020 and 437 million by 2050, more than the projected total population of the United States in 2050[6], completely outgrowing the current capacity for elderly care in China. With the median age on the planet in 2000 at 26 and this number rising to 36 by 2050 the number of people over 60 will by mid-century be nearly 2 billion.

While this is not the first generation to age, the sheer number of individuals and given the fact that this is the first generation with record high levels of health, wealth and education and a strong desire to remain independent, healthy and productive

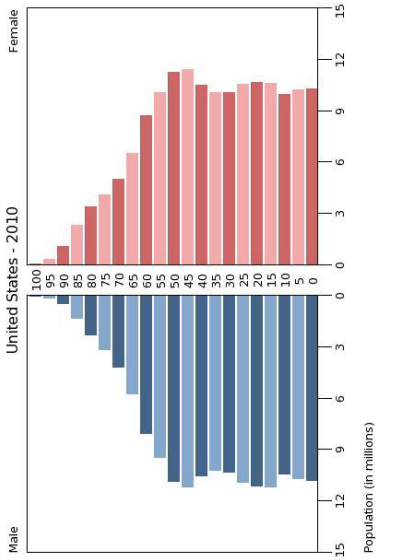


Figure 1: US Population Pyramid 2010


Figure 2: Levit town, NY.

the implications for this statistic are significant. With a decrease in the birthrate after the late 1960's, and therefore a decrease in new and younger customers, it is apparent that the needs of the boomer generation will continue to influence business and society for the next few decades. These needs, going beyond the simple ergonomics of universal design, is set to influence every aspect of our daily lives, from the home to the office, from community organization to the design of the retail environment with the primary demands being focused on wellness, simplicity, personalized service and connected convenience.

The biggest and most significant need will be associated with the residential environment. Current models will not, however, for reasons that will be discussed later, be sufficient to satisfy this growing demand. One of the reasons is that a paradigm shift needs to occur from designing houses to designing total environments. Instead of designers asking: "How do we provide the required housing?" the question should be: "How do we provide the desired environment?"

INSTEAD OF DESIGNERS ASKING: "HOW DO WE PROVIDE THE REQUIRED HOUSING?" THE QUESTION SHOULD BE: "HOW DO WE PROVIDE THE DESIRED ENVIRONMENT?"

3 DIMENSIONS OF THE REQUIRED ENVIRONMENT

Supportive housing vs. Supportive environments

Traditionally architecture is involved with the design and construction of individual buildings. In certain instances the architect accounts for urban and systemic considerations but regularly only to the degree it relates directly to the architectural design. In a vast number of projects for the aged and aging, this is the case. In order to create a supportive environment for the aging, it is necessary to, not only consider the architectural design, e.g. the house, but also the larger environment, physical and non-physical. A supportive house within an unsupportive environment may be less helpful than an unsupportive house within a very supportive environment.

Any discussion regarding the determining and creation of non-architectural environments within an architectural discourse is risky, but for the aim of this discussion it is necessary in order to effectively frame a potential architectural

project. Supportive environments within this discussion will be defined as consisting of physical, social and service components.

Physical component: The primary and most important requirement in creating an environment for the elderly relate to the physical environment, i.e. physical safety, security and comfort. Especially within the context of the aged and aging, where physiological responses are heightened and tolerances to changes in temperature are decreased, adequate environmental control is extremely important. This is however the simplest aspect of the environment to solve and can be achieved with standard HVAC design. Similarly, issues regarding access and usability can easily be addressed by following the ADA guidelines, building codes, and consulting the numerous best use practices available. In most cases physical environmental requirements can be addressed effectively, largely independently of building type or location.

Social component: Secondary factors important in creating a suitable environment for the aged and aging involves social factors such as access to a supportive community network, proximity to friends and family, and an environment that facilitates social interaction and allows for a range of recreational activities. This requirement can be satisfied by either an increase in mobility of a community or proximity to programs allowing for social interaction. Most retirement villages or assisted living institutions address this requirement through social programs or organized outings. Individual activities independent of the group may be an exception.

Serivce component: A third aspect defining a suitable environment involves access to services. While access to medical services is considered the most important, access to financial, commercial, and governmental services are equally important. While assisted living complexes attempt to integrate these services into the facility, most generally medical services, access to secondary services is achieved through weekly communal rides.

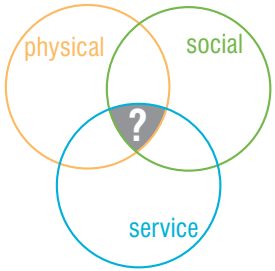


Figure 3: Environmental components

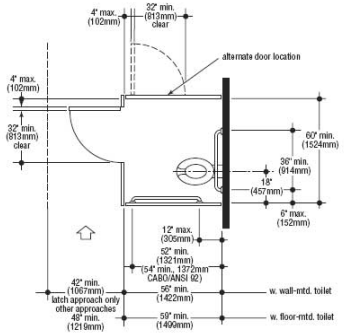


Figure 5: ADA Guidelines
Assuring usability through perscriptive design

In order to create a supportive environment it is important for the physical, social and service component to be present. These components will be used as a guideline when discussing the various environments associated with the elderly.

ENVIRONMENTS FOR AGING

Existing typologies and arrangements[7]

Historically a number of housing typologies and living arrangements for specifically the elderly can be identified. By considering these it is not only possible to identify the social and cultural factors that lead to the establishment of these, but it may also help identify significant architectural precedents that might inform future design.

For the most part of human history the elderly of a society were taken care of by close family members. While this is still the case in most non-western countries, this tendency is changing. Even before the Industrial revolution it was uncommon for certain western households to house and take care of their elderly, with the most prominent reason being a lack of resources. In many cases these individuals became the responsibility of either the church or state. In cases where family members did take care of their elderly it was primarily in the form of co-habitation within the residential environment. In rural communities where the house was located within the village context, the elderly became part of an arrangement contemporarily known as *'living communities[8]'* which involves the communal ownership of land with individual families owning their own homes, but sharing a large community house for social gatherings. These arrangements usually consist of an intergenerational population.

This form of living is similar to intentional communities[9] where individuals live together because they share common values or a common purpose. Land, housing and resources may be shared or owned individually. This reminds of the historical and contemporary religious communities.

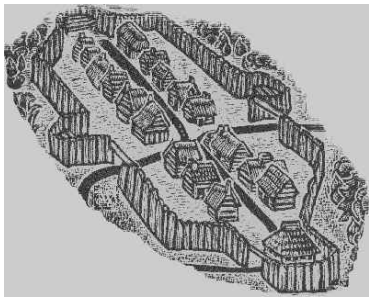


Figure 6: Puritan village 1627
Elderly care integrated and multi-generational

Co-habitation during the Industrial Revolution became more common as an aging member of the household could take care of the children while both parents of a household were working. Since co-habitation occurs within the residential environment this tendency did not give rise to any new typologies.

With a dramatic increase of life expectancy after the Industrial revolution a number of living arrangements for the elderly developed. Another form of co-housing is *ECHO housing*[10]. Elderly Cottage Housing Opportunities involve the installation of temporary living units, with all the amenities of a regular house on the property of a family member. The term 'Granny flat' best describes this arrangement and is considered a cheap alternative for housing the elderly. ECHO housing became very popular during the 1980's. Similarly to ECHO housing but more integrative are *accessory apartments*[11]. This refers to the installation of a complete new living unit in an existing house or apartment.

Home sharing and *small group living*[12] refers to situations where unrelated individuals enter into a rent or purchasing agreement, sharing dwelling space, home life, household expenses and responsibilities and sometimes social activities.

Cooperative housing[13] is owned by the residents who also act as share holders through a co-op and consists of housing units and shared facilities. This can be either intergenerational or not. *Collaborative housing*[14] consists of private, self contained housing units with extensive common areas and facilities. These are developed and managed by residents and may be intergenerational in nature.

A less formalized living arrangement is the commune in which individuals live together in an unstructured living group on communal or 3rd party property.
One of the most overlooked living arrangement is the mobile home or recreational vehicle. Many retirees prefer living in their RV's since this provides the highest potential for modility. While some stay in RV resorts for a longer periods, ranging from a few months and even to years, others prefer to move between resorts and national parks on a weekly basis.

Figure 7: Low cost ECHO house

Figure 8 a & b: Medium to high cost ECHO house

Figure 9: RV resort
An alternative and mobile solution for retirement

While the above mentioned living arrangements are primarily driven by the individual or community of individuals the following arrangements are driven by private developers.

For individuals preferring a relatively independent retirement *condominiums*[15] are an attractive option. Living units are individually owned with joint ownership of common areas. *Cluster housing*[16] consists of houses clustered around a communal open space and contains shared facilities.

Retirement communities[17] are usually found in suburban or rural areas and consists of individual homes purchased by the residents. Common spaces such as a clubhouse, health club are shared while outdoor spaces are maintained by a management board. *Congregate housing*[18] are housing built and managed by private or public agencies and consists of small private living units sharing a central dining area where meals are served. These developments usually provide support services for the elderly in need. With *continuing care communities*[19] residents purchase life time contracts ensuring housing, support services and medical care. This may include meals, housekeeping, transportation, recreation, health and nursing services. The developer can either be private or non-profit.

Figure 10: TheCypress of Raleigh Retirement community

Figure 11: Home for Senior Citizens
Graubünden, Switzerland
Peter Zumthor 1993
An example of congregate housing

Figure 12: Guild house retirement home
Philadelphia, Pennsylvania
Robert Venturi 1960-1962
An example of congregate housing

The 5 environmental dimensions of retirement

While the various examples differ from one another on various levels they can all be categorized based on 5 dimensions[20]:

Stay vs. Move: Development allows individuals to remain in their current community or requires them to move to a new area
Independence vs. Dependence: Development fosters independence or dependence on a 3rd party
Heterogeneous vs. Homogenous: Development leads to heterogeneous or homogenous community
Integration vs. Differentiation: Development is urbanistically integrated or differentiated (isolated)
Existent vs. New: Development is existent or development requires new construction

Using this classification individual developments can either be considered community based or institution based. Community based developments are characterized by the stay, independence, heterogeneous, integration and the existent dimensions while institution based developments are associated with the move, dependence, homogenous, differentiation and the new dimensions.
The advantage of the community based developments are that individuals remain in a natural social environment, no new construction is required, they can maintain higher levels of independence and remain more involvement with community affairs since they are better integrated within an existing, intergenerational community.
The advantages of institutional developments are that individuals have greater access to specialized services and can access age specific recreational opportunities more easily. Institutional developments offer better controlled environments and environments especially designed for the residents' unique needs and interests.

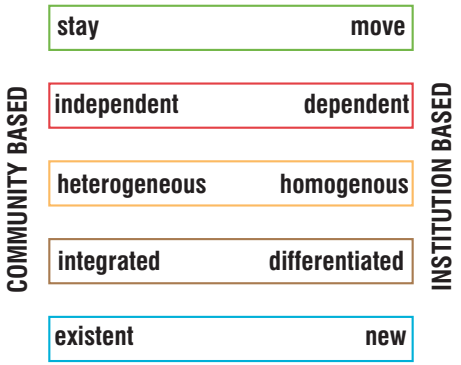


Figure 13: 5 environmental dimensions of retirement

The role of life stage in selecting a suitable environment.

Human life can basically be divided into 5 stages: pre-birth, childhood, adolescence, adulthood, and aged. For the purposes of this discussion the aged stage can be divided into two primary stages: Life stage 5A and 5B. Stage 5A is typically is characterized by relatively good health, independence and high levels of activity. Stage 5B is characterized by higher incidence of health issues, higher levels of dependence, and lower levels of activity. The required environments for these stages will differ significantly. While stage 5A will require less institutional care, stage 5B will in most cases require institutional care.
Historically housing for the aged primarily centered on the design and construction of institutional environments for stage 5B. Only during the last few decades have housing for stage 5A been considered seriously, and in many cases in the form of suburban retirement villages. Advances in healthcare have extended the length of 5A to historic lengths. This means that as the baby boomer cohort is entering stage 5A a significant demand for appropriate housing will be created and since stage 5A is extended the turnover for these properties will not be similar to what it has been historically.

Unique nature of the baby boomer cohort

Apart from the size of the baby boomer generation this cohort also differs in other ways from the preceding generations. These differences will have a definite influence on what they will consider 'supportive environments' in the future. These differences are:

Unique experience: The baby boomer generation will be the first generation retiring with significant knowledge and experience of digital technology which will make the integration of digital technology into the home environment a possibility. The potential for digital health assessment, communication and entertainment is more likely than ever before.

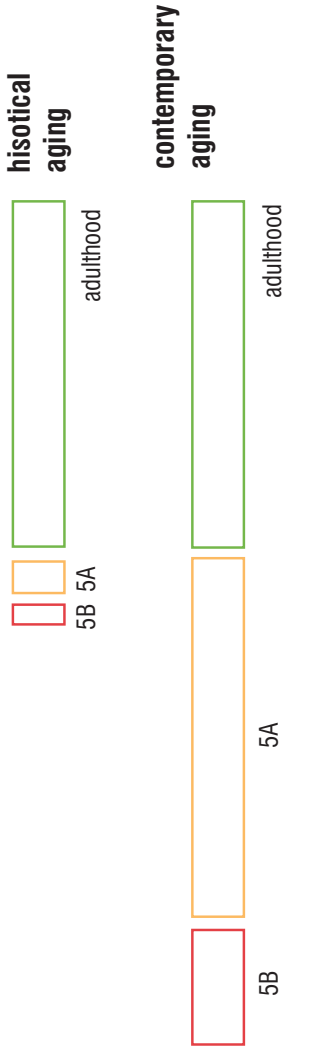


Figure 14: Life stages during retirement

Expert knowledge and business experience: These individuals retire with the highest level of education in history. With an extended life expectancy remaining active professionally after retirement will be a definite need. With a shrinking workforce and brain drain due to the destructive demographic of these individuals leaving the workplace, working from home as consultants will be a real possibility. AARP determined that 1 in 5 people past 50 are already self employed. Barclays Bank identified a new entrepreneurial class – people over 50 starting their own businesses for the first time and therefore requires special financial services. Future homes may need extra office space, something traditional retirement facilities never planned for.

Changing definitions of marriage and households: With higher divorce rates, and an increase of adult children returning home[21] ('boomerang generation') alternative family structures are a reality. With an increase in life expectancy, aging baby boomers are in many cases taking care of their own aged parents. For the first time in decades three-generation households are reoccurring. Contemporary design for old age cannot be based on traditional family structures anymore.

Transportation and mobility: Currently 70 percent of the baby boomers in the US live in areas where transport alternatives do not exist or are in short supply[22]. For a generation that brought the automobile industry into existence the inability to drive independently can lead to numerous issues.

Lifestyle[23], empowered communities and values purchasing: With lifestyles that has been built upon an "on demand" society supported by continuous technological innovation and 'Me-generation" consumer demands, it is unlikely that this generation will settle for an environment without the recreational and commercial possibilities they've had access to. Through social media and values purchasing they will continue to shape industry long into their retirement years, and because of their resources and buying power commercial industries will allow the shaping.

CONTEMPORARY DEVLOPMENTS AND POTENTIAL FUTURES

With the abovementioned characteristics many baby boomers are already exhibiting signs that their approach to retirement will differ from previous generations. While traditional solutions to retirement are followed by some, new trends are starting to emerge.

Due to the advantages of aging in place, meaning, remaining in ones' home for as long as possible the average age of entire neighborhoods are steadily increasing. This has lead to the occurrence of 'NORC's' or Naturally Occurring Retirement Communities. Not only does these areas develop spontaneously they also attract new residents.
Parts of Manhattan and also the South end of Boston can be characterized as such.
Recently an association called The Beacon Hill Village was created by residents in Beacon Hill who decided to age in place. Possessing 800 members, and significant buying power, the association can contract a wide range of services. These are the new communities resulting of baby boomer activism coupled with desire to age in place.[24]
These 'new' communities place a premium on the livability and quality of life. They demand a well designed community with easy navigation and connectivity, rich in activities, health services, education, fitness centers, libraries and work.

Commercially the evolution of existing neighborhoods has gained the attention of large enterprises. With CVS buying Minute clinics, the nearly round the clock convenience of retail store healthcare will soon be available, and as an aging population requires more simplicity and personal service a move from 'big box' to 'village' retail is made. Natick Mall in Natick, Massachusetts consists of a condo community integrated with the retail component. Big brands are opting out of big mega stores in favor of more boutique like stores offering greater simplicity and authenticity, offering less clutter, more education, selling solutions not products, raising the possibility of revitalizing main street.[25] Against the background of these developments issues regarding alternative transport gain greater importance[26].

BEACON HILL VILLAGE: EVERYTHING YOU NEED OR WISH YOU HAD... WHEN YOU WANT IT

Figure 15: Beacon Hill Village Association
Images from association website

DEMOGRAPHICS AND ARCHITECTURAL OPPORTUNITIES

We are facing the most significant demographic shift in the history of mankind. What is starting in the developed world will be followed in the developing world in the future. While the implications of this are significant for every societal sphere from, government, healthcare, education and industry it is especially significant for architecture and urban design.

The latest census data indicates that more than 30% of the US population is over 50. With 78 million Americans currently older than 55, and 65 million to follow within the next 15 years the reality is clear. Since old age undoubtedly bring with it new environmental needs, this might quite easily be the most significant architectural project for this generation of architects. If existing models for the aging are followed it will require the establishment of new retirement villages. The establishment of suburban retirement communities for 100 million individuals is not only impossible, but the results of even just a relatively small percentage of these individuals moving from their current neighborhoods will have a definite effect on these neighborhoods. While aging in place is an alternative, the real environmental needs arising from aging cannot be ignored – either the individual needs to move to a new supportive environment or the environment needs to become more supportive. This poses a direct question to architecture.

Bibliography

Coughlin, J. F. (2010, February 21). China's Gray Revolution: Why China May Invent the New Business of Aging. Retrieved March 3, 2010, from Disruptive Demographics: Global Aging, Technology & Innovation : http://www.disruptivedemographics.com/

Coughlin, J. F. (2007, Spring). Disruptive Demographics, Design and the Future of Everyday Environments. Design Management Review , pp. 53-44.

Coughlin, J. F. (2010, 2 1). Disruptive Demographics: Gloal Aging, Technology & Innovation. Retrieved March 2, 2010, from Blended Futures of Aging & Business Innovation: http://www.disruptivedemographics.com/2010/02/blended-futures-of-aging-business.html

Feddersen, E., & Ludtke, I. (2009). A design manual: Living for the Elderley. Basel: Birkhauser.

Frederix, E. (2009, 10 28). Click here to find out more! Retrieved 03 03, 2010, from The Huffington Post: http://www.huffingtonpost.com/

Kertzer, D. I. (1995). Towards a historical Demography of Aging. In D. I. Kertzer, Aging in the Past: Demography, Society, and Old Age. London: University of California Press.

Laslett, P. (1995). Necessary Knowledge: Age and Aging in the Societies of the Past. In D. I. Kertzer, & P. Laslett, Aging in the Past: Demography, Society and Old Age (pp. 3-77). London: University of California Press.

Organization for Economic Co-operation and Development (OECD). (2003). Ageing, Housing and Urban Development. Paris: Organization for Economic Co-operation and Development.

Porcino, J. (1991). Living Longer, living better: adventures in community housing. New York: The Continuum Publishing Company.

Wang, W., & Morin, R. (2009, November 24). Home for the Holidays... and Every Other Day. Retrieved March 3, 2010, from Social & Demographic Trends: http://pewsocialtrends.org

Works Cited

Coughlin, J. F. (2010, February 21). China's Gray Revolution: Why China May Invent the New Business of Aging. Retrieved March 3, 2010, from Disruptive Demographics: Global Aging, Technology & Innovation : http://www.disruptivedemographics.com/

Coughlin, J. F. (2007, Spring). Disruptive Demographics, Design and the Future of Everyday Environments. Design Management Review , pp. 53-44.

Coughlin, J. F. (2010, 2 1). Disruptive Demographics: Gloal Aging, Technology & Innovation. Retrieved March 2, 2010, from Blended Futures of Aging & Business Innovation: http://www.disruptivedemographics.com/2010/02/blended-futures-of-aging-business.html

Feddersen, E., & Ludtke, I. (2009). A design manual: Living for the Elderley. Basel: Birkhauser.

Frederix, E. (2009, 10 28). Click here to find out more! Retrieved 03 03, 2010, from The Huffington Post: http://www.huffingtonpost.com/

Kertzer, D. I. (1995). Towards a historical Demography of Aging. In D. I. Kertzer, Aging in the Past: Demography, Society, and Old Age. London: University of California Press.

Laslett, P. (1995). Necessary Knowledge: Age and Aging in the Societies of the Past. In D. I. Kertzer, & P. Laslett, Aging in the Past: Demography, Society and Old Age (pp. 3-77). London: University of California Press.

Organization for Economic Co-operation and Development (OECD). (2003). Ageing, Housing and Urban Development. Paris: Organization for Economic Co-operation and Development.

Porcino, J. (1991). Living Longer, living better: adventures in community housing. New York: The Continuum Publishing Company.

Wang, W., & Morin, R. (2009, November 24). Home for the Holidays... and Every Other Day. Retrieved March 3, 2010, from Social & Demographic Trends: http://pewsocialtrends.org

Endnotes

1 (Organization for Economic Co-operation and Development (OECD), 2003)
2 (Feddersen & Ludtke, 2009)
3 (Organization for Economic Co-operation and Development (OECD), 2003)
4 (Coughlin, Disruptive Demographics, Design and the Future of Everyday Environments, 2007)
5 (Coughlin, China's Gray Revolution: Why China May Invent the New Business of Aging, 2010)
6 (Coughlin, China's Gray Revolution: Why China May Invent the New Business of Aging, 2010)
7 Best examples in Scandinavian countries.
8 (Porcino, 1991)
9 (Porcino, 1991)
10 (Porcino, 1991)
11 (Porcino, 1991)
12 (Porcino, 1991)
13 (Porcino, 1991)
14 (Porcino, 1991)
15 (Porcino, 1991)
16 (Porcino, 1991)
17 (Porcino, 1991)
18 (Porcino, 1991)
19 (Porcino, 1991)
20 For a more complete description on these dimensions please consult the author.
21 (Wang & Morin, 2009)
22 (Coughlin, Disruptive Demographics, Design and the Future of Everyday Environments, 2007)
23 (Coughlin, Disruptive Demographics, Design and the Future of Everyday Environments, 2007)
24 (Coughlin, Disruptive Demographics, Design and the Future of Everyday Environments, 2007)
25 (Coughlin, Disruptive Demographics, Design and the Future of Everyday Environments, 2007)
26 (Coughlin, Disruptive Demographics, Design and the Future of Everyday Environments, 2007)

Image Credits

Figure 1: US Population Pyramid 2010 www.census.gov

Figure 2: Levit town, NY. http://obsessivejew.com/blog/wp-content/uploads/image/levittownny.jpg

Figure 5: ADA Guidelines http://www.harborcitysupply.com/ada/ada_guidelines_toilet_partitions.htm

Figure 6: Puritan village 1627 http://hermes.hrc.ntu.edu.tw/lctd/asp/periods/4/america/concept.htm

Figure 7: Low cost ECHO house http://johannesburg.gumtree.co.za/c-Business-Services-building-trades-Granny-Flats-Wendy-Houses-Garden-Sheds-Tool-Sheds-etc-W0QQAdIdZ157008959

Figure 8 a & b: Medium to high cost ECHO house http://granny--flats.com.au/

Figure 9: RV resort An alternative and mobile solution for retirement http://www.bransonparksandrecreation.com/Campground/Pictures/pix%20096.jpg

Figure 10: TheCypress of Raleigh Retirement community http://www.thecypressofraleigh.com/chapelhill-retirement-communities-chapel-hill-nc.htm

Figure 11: Home for Senior Citizens Chur, Graubünden Switzerland Peter Zumthor 1993 http://www.galinsky.com/buildings/elderly/index.htm

Figure 12: Guild house retirement home Philadelphia, Pennsylvania Robert Venturi 1960-1962 An example of congregate housing http://madrid2008-09.blogspot.com/2009/05/apuntes-miercoles-29-de-abril.html

Figure 15: Beacon Hill Village Association Images from association website http://www.beaconhillvillage.org/index.html