



2021

RUOMENG LI

VERTICAL GREEN HOUSE HOMES



VERTICAL GREEN HOUSE HOMES

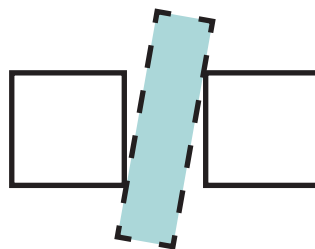
A Design for Senior Living

RUOMENG LI

Texas A&M University

***VERTICAL
GREEN HOUSE
HOMES***

A Design for Senior Living



Ruomeng Li

DEDICATION

To my family,

Thank you for always standing by me.

A special gratitude to my loving parents, your encouragement and support always give me strength.

To my friends,

Thank you for being with me on this special journey.

CONTRIBUTORS

Zhipeng Lu | Committee Chair

I would like to thank Professor Lu. Thank you for introducing me such a meaningful and interesting project. Thank you for sparing no effort to share your knowledge and pushing the whole project to become successfully.

D. Kirk Hamilton | Committee Member

I would like to thank Professor Hamilton. You are an expert in healthcare design, I really learnt a lot from you. Your professional advice pushed my project a lot, and your comments on design details are always helpful to me.

Chanam Lee | Committee Member

I would like to thank my committee member, Professor Lee from Landscape Department. Your professional advice in Landscape really help me a lot, especially for my vertical garden.

Brian Gibbs | Studio Professor

I would like to appreciate my studio professor, Brian Gibbs. Thank you for your instruction throughout the whole process. Your guidance pushed me to finish this project successfully.

08-15

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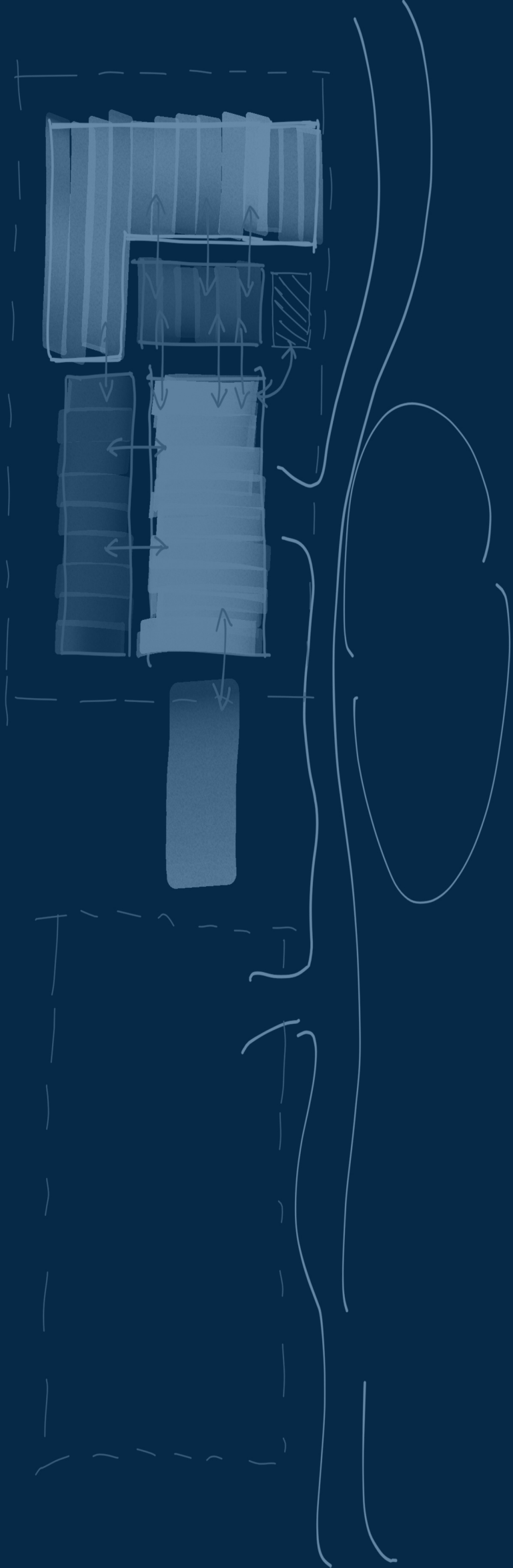
I am a Master of Architecture student at Texas A&M University. My goal is not only to be able to provide sustainable and attractive spaces for people, but also to be able to inspire and motivate others how design can create a better living condition for human.

I am hardworking and challenge orientated individual. I am eager to fulfill my lifelong desire to become a qualified architect and researcher, and I will do my best to achieve this goal.

This is my final project: VERTICAL GREEN HOUSE HOMES. From this project, I would like to explore a design for elder peoples to live comfortably and feel engaged.

-Ruomeng Li-

**This project
is intended to
propose an active,
attractive, and
innovative lifestyle
for older peoples,
and motivate the
interaction between
nature and people.**



PART 1. INTRODUCTION

Abstract

Background

History of Green House

What is Green House?

ABSTRACT

The world is facing a rapid growth of the elderly population; more and more scholars, professors, and experts are working on the research that relates to older people's activities and needs. Many researches are especially focusing on promoting older peoples' health, physically and psychologically. Therefore, healthcare infrastructures for older people are facing a great growth because of elderly population. Based on these research outcomes, this project asks the question: how can architecture design respond to the special needs that older people have in an assisted living environment? To improve the living environment of older people who live in long-term care facilities, this paper also explores innovations to an existing model for long-term care facilities – Green House model.

The innovations include two parts: firstly, changing the traditional one-story small Green House home into multi-story Green House building, from horizontal distribution to vertical distribution, to accommodate more residents. Secondly, incorporating outdoor space into previous model to create more outdoor space. In response to the first innovation, the outdoor space will be "vertical" as well.

Keywords: Green House, healthcare design, design for ageing, aging in place

VERTICAL GREEN HOUSE HOMES

BACKGROUND

The name of this project is *ONEderment Central*, that WAAO proposed to built an active, attractive, and innovative neighborhood in Mueller community in Austin, Texas. It is an interdisciplinary collaboration project. I worked with two team members to finish the whole master plan. My professional advisors are Ani Colt, Preston Tyree and Joan Huntley from WAAO team.

This project is intended to develop a green building community that can satisfy both body health and spirit health for older people. This community will be composed of Green House homes, Community Service Center, commercial space, and garden space to meet any challenges in daily life.

This community is about 3 miles from down town Austin. The general concept of this project is "we are all one", and my part in this project is to provide residential buildings for older people.

"Create, on 7.5 acres in Mueller, places that provide flexibility to adapt to changes in lifestyle, climate, transportation and employment and define a prototype for the next 50 years."

--- WAAO

DESIGN FOR AGING



"We Are All One"



A VISIONARY COMMUNITY
BUILDING PLACE IN AUSTIN

- Healthcare Space
- Residential/Affordable Space
- Community Space
- Mixed Use Retail Space
- Office Space
- Public Space
- Incubator Space
- People Space

HISTORY OF GREEN HOUSE

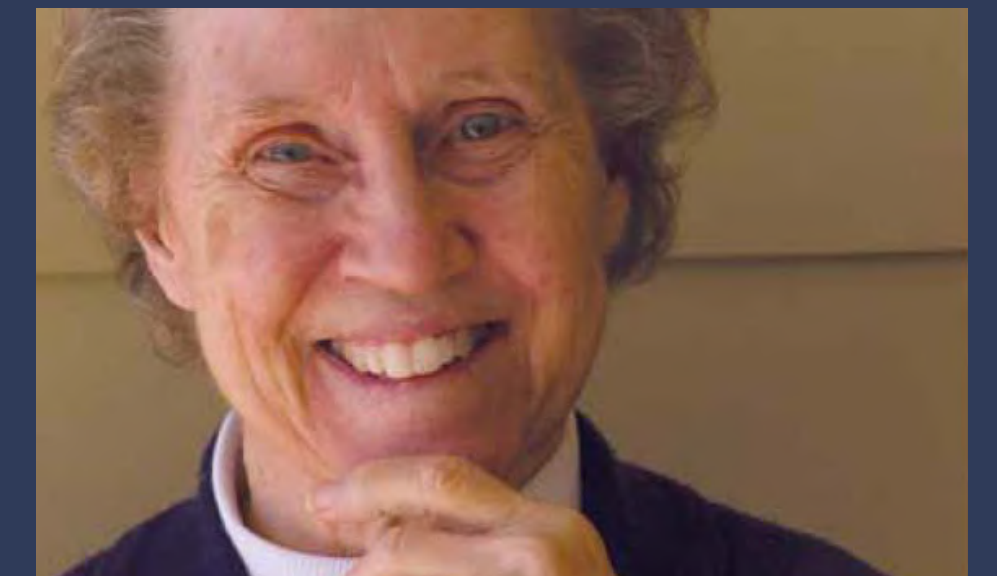
The Green House Project was founded by geriatrician William H. Thomas (physician) in 2003. The goal of this project is to provide more personalizing care by redesigning nursing homes for elders and others, grant residents more privacy and control over their lives, and spread this model to every community.

Also in 2003, the first Green House homes were built in Tupelo, Mississippi. In 2005, the Robert Wood Johnson Foundation announced a \$10 million grant, creating a catalyst for significant social change. In 2010, the first Green House homes for short-term rehabilitation were built. In 2011, financing for low-income Green House homes began. In 2012, the first community-integrated Green House homes were built. And the first Green House home for low-income Elders were built in the same year. In 2013, the Green House project celebrated its 10th year, and there were 153 homes across the county.

“We envision homes in every community where elders and others enjoy excellent quality of life and quality of care; where they, their families, and staff engage in meaningful relationship built on equality, empowerment, and mutual respect; where people want to live and work; and where all are protected, sustained, and nurtured without regard to the ability to pay.”

– The Green House Project Team

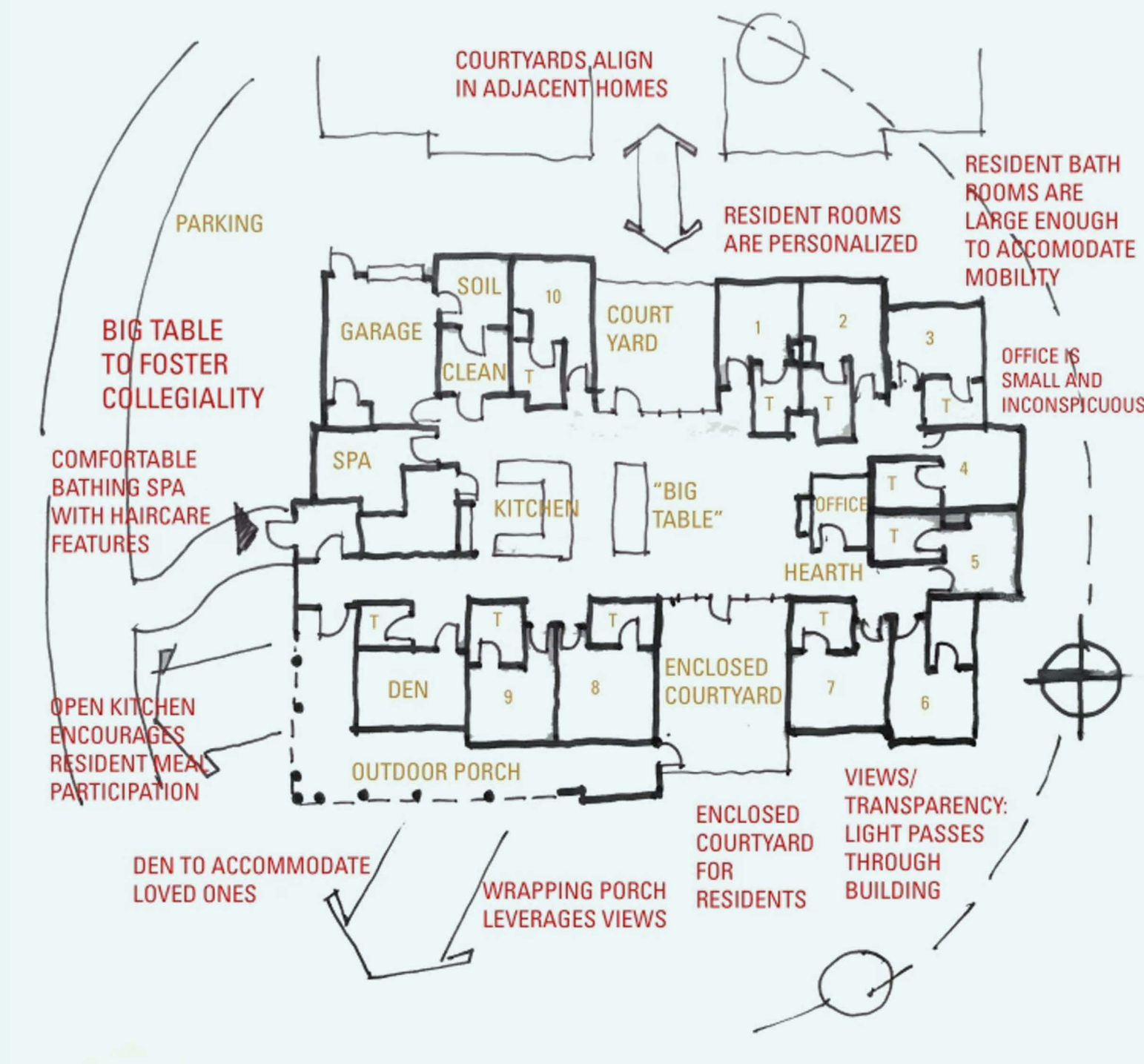
VERTICAL GREEN HOUSE HOMES



DESIGN FOR AGING

WHAT IS GREEN HOUSE?

VERTICAL GREEN HOUSE HOMES



FEATURES OF GREEN HOUSE

- 10-12 bedrooms. Total area: 6400-7000 sq.ft.
- Central part: Kitchen, Big dining table, Hearth area.
- A big dining table that seats all elders, the Shahbazim, and two guests
- Private bedrooms providing a full bathroom, locked medicine cabinet, and ample natural light
- Ceiling lifts
- Fenced outdoor space with walking paths
- Visual sight lines from the kitchen to the majority of the hearth area, bedroom, and outdoor space
- Exterior patio and garden

DESIGN FOR AGING

Caring

- **Nurtures** elders in a circle of care
- **Enables** deep relations between Elders and caregivers
- **Turns** the institutional organizational chart upside down.

Living

- **Provides** a home for 10-12 people, with private room/baths, that harmonizes with the neighboring community.
- **Creates** a real home environment with an open kitchen, great room, and easy access to the outdoors.
- **Meets** federal and state licensing requirements.

Thriving

- **Respects** flexible routines and personal preferences.
- **Nurtures** a familial experience around a common dining table.
- **Welcomes** friends and family members.
- **Encourages** personal growth and enables Elders to continue to pursue their interests and passions.



PART 2. DESIGN CONCEPT & PROPOSAL

Location

Site Analysis

Research: Case Study

Programming

Missions & Goals

Critical Questions & Primary Challenges

Mueller Community

Austin, Texas

Connection: Mueller Community is about 3 miles from downtown Austin, and 2 miles from University of Texas-Austin.

Relationship: The Site of my project belongs to Town Center District in the planning of the Whole Mueller Community.

Area: 7.5 acres



LOCATION



VERTICAL GREEN HOUSE HOMES



- It is surrounded by four streets, Aldrich Street, 51 Street, Berkman Drive and Barbara Jordan Boulevard.
- On the west and south of this site are all residential buildings, on the east is commercial space which includes HEB.
- There is a large area of green garden on the other side of 51st Street.

DESIGN FOR AGING



THE HISTORY OF MUELLER

- 1930 Robert Mueller Municipal Airport (RMMA), Austin's first airport, is dedicated on former farmland.
- 1984 A grassroots group, Citizens for Airport Relocation (CARE) calls for the airport to move and releases a vision plan for redeveloping the site.
- 1997 The City contracts with ROMA Design Group to develop a reuse and redevelopment master plan. The City Council approves ROMA's public participation plan for widespread community involvement.
- 2003 City Council adopts the RMMA Redevelopment and Reuse Plan and creates the RMMA Plan Implementation Advisory Commission to advise Council on implementation of the plan.
- 2010 Control Tower exterior preservation and restoration activities are completed.
- 2012 Wildflower Terrace, the first predominantly affordable apartment community, opens for seniors. City Council endorses the East 51st Street Vision Plan.
- 2017 Alamo Drafthouse Cinema and adjacent restaurants and shops open in the Aldrich Street District.



SITE ANALIYSIS - STREET VIEW

VERTICAL GREEN HOUSE HOMES



NORTH: Gas Station, Green Garden



EAST: Retail Stores



SOUTH: AMLI on Aldrich Apartments



WEST: Aldrich 51 Apartments

DESIGN FOR AGING

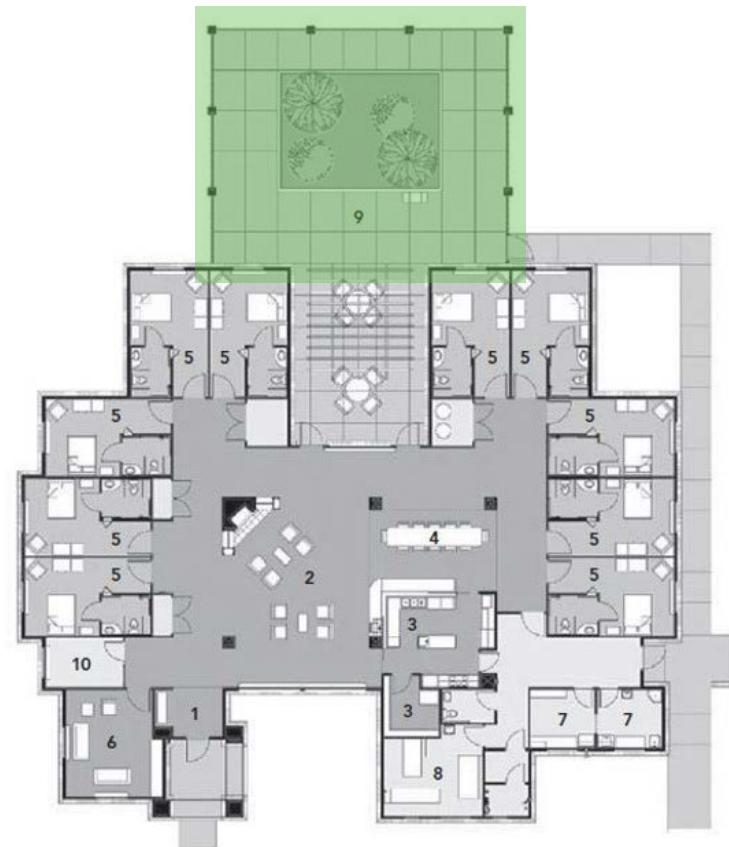


CASE STUDY

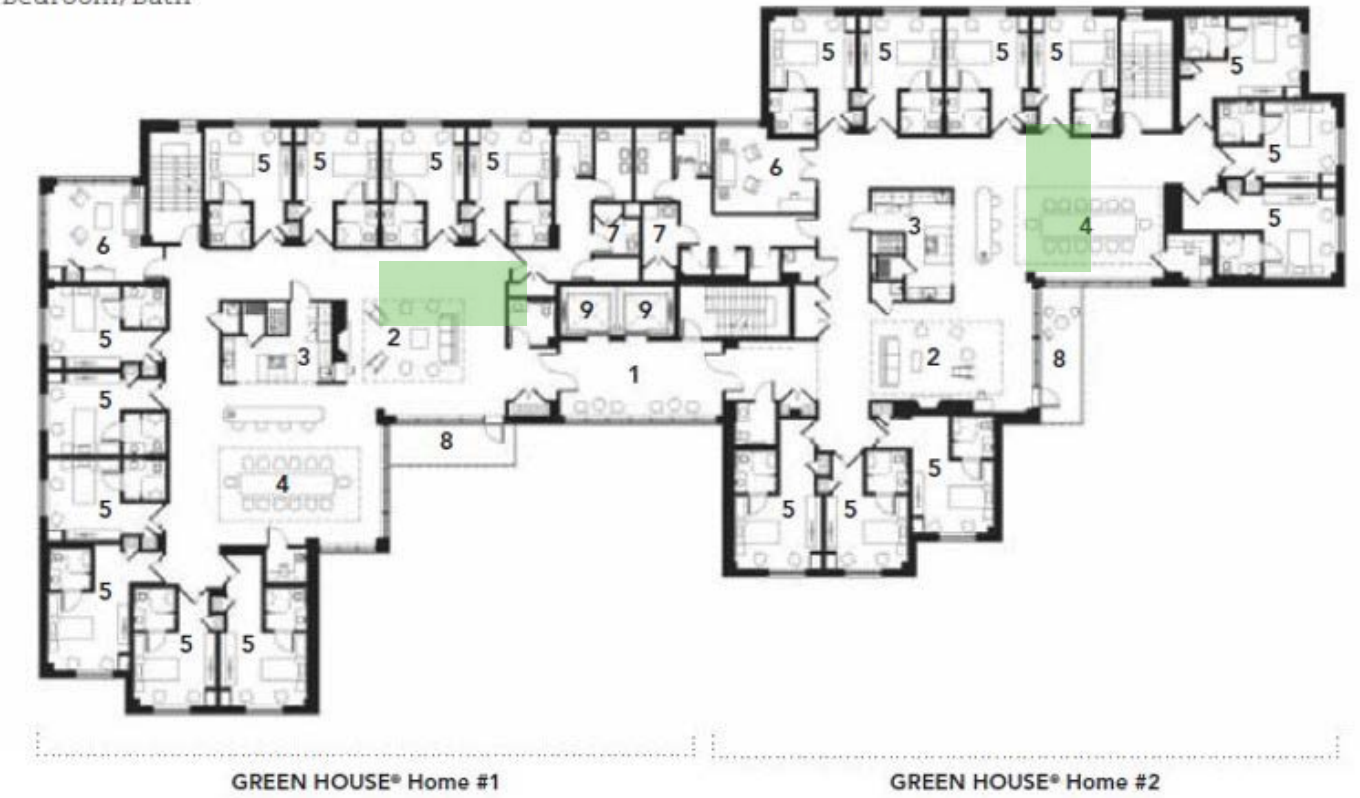
Leonard Florence Center for Living, Chelsea, MA. 2010

by DiMella Shaffer Associates, Inc.

- LEGEND**
- 1 Foyer
 - 2 Hearth Room
 - 3 Kitchen/Pantry
 - 4 Dining Room
 - 5 Bedroom/Bath
 - 6 Den
 - 7 Utility Room
 - 8 Spa/Physical Therapy
 - 9 Porch/Patio
 - 10 Office



- LEGEND**
- 1 Elevator Lobby
 - 2 Living Room
 - 3 Kitchen/Pantry
 - 4 Dining Room
 - 5 Bedroom/Bath
 - 6 Den
 - 7 Laundry
 - 8 Terrace
 - 9 Elevator



- One independent Green House home per floor, each with a separate elevator
- Shared elevator lobby on each floor
- Separate, accessible covered terraces for each home

©DiMella Shaffer

From the case study of existing the Green House Model, I found that the outdoor activity space for older people is limited, especially in the multi-story case. So, my intention is to explore the possibility of extending the outdoor space, and promoting physical activities of older people and their communication with others, also interaction with the natural environment. And also consideration of the hierarchy of space. Like how to transit from public to private, so satisfy the different requirements that older people may need.

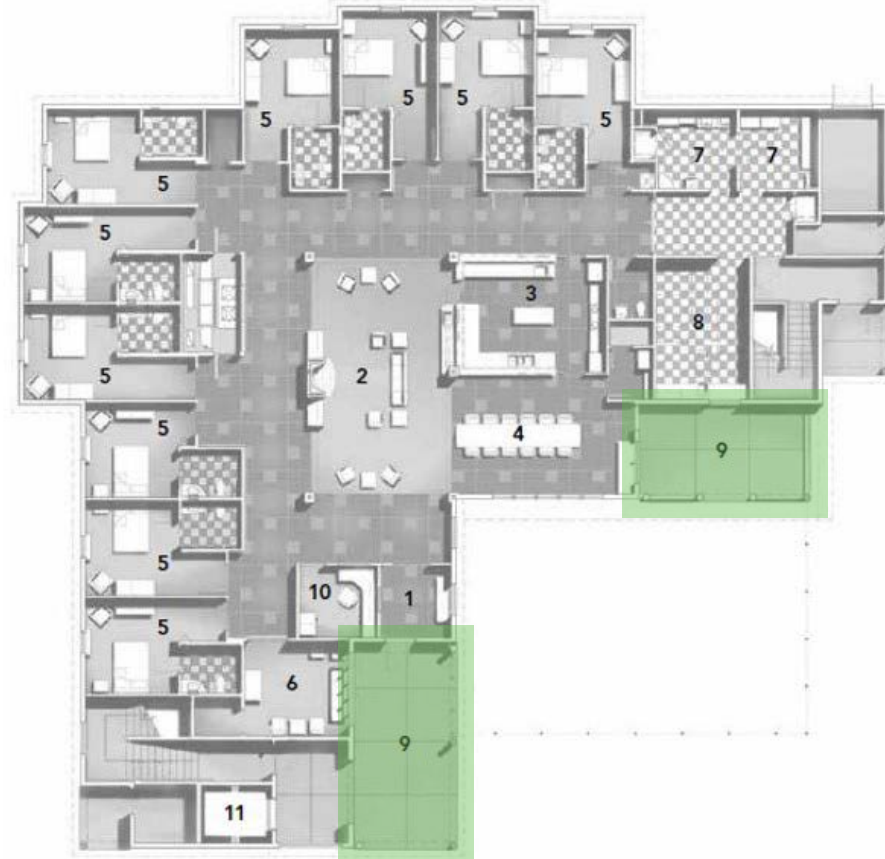
VERTICAL GREEN HOUSE HOMES

DESIGN FOR AGING

St. Martin's in the Pines. Birmingham, AL

by KPS Group

- LEGEND**
- 1 Foyer
 - 2 Hearth Room
 - 3 Kitchen
 - 4 Dining Room
 - 5 Bedroom/Bath
 - 6 Den
 - 7 Laundry
 - 8 Spa/Salon
 - 9 Porch
 - 10 Office/Library
 - 11 Elevator



- One independent Green House home per floor
- Shared elevator lobby on ground floor
- Separate, accessible covered porches for each home

©KPS Group

©McCarthy Company
 *The Green House team must review and approve architectural designs for each new project. These six examples of successful Green House home plans are provided for illustrative purposes only. Visit our Web site for additional examples of floor plans, site plans, artists' renderings, different elevations, and interior and exterior photos of the houses.

Arizona Baptist Retirement Centers, Inc.

by McCarthy Company

SPACE PROGRAMMING

VERTICAL GREEN HOUSE HOMES

	Occupants	Area per occupant	Room size / NSF	# of Rooms	Total area / Total NSF	Comments
Green House #1 Unit						Long-term housing. Shahbazim and nurses don't live in house. Only day and night shifts
Foyer				1	100	
Bedroom	1	200	200	10	2000	Resident rooms are personalized
--Bathroom	1	60	60	10	600	Large enough to accommodate mobility, (electronic ceiling lifts...)
--outdoor space	1~2	60	120	10	1200	Subsite balcony for each bedroom. locked cabinets for the storage of hazardous materials. Access to outdoor space.
Kitchen	10	40	400	1	400	Big table. Access to outdoor space.
Dining room	10	40	400	1	400	With covered exterior seating, space for wheelchairs. Serve central part.
--outdoor space	(at least) 5	80	400	1	400	Adjacent to kitchen and dining room. Access to outdoor space.
Hearth room	10	40	400	1	400	With covered exterior seating, space for wheelchairs. Serve central part.
--outdoor space	(at least) 5	80	400	1	400	Den private
Den				1	200	
Laundry	2	45	90	2	180	Comfortable bathing spa with healthcare features
Spa/Physical therapy	1			1	200	Small and inconspicuous
Office	1	120	120	1	120	
Total NSF for Green House #1 Unit					6600	
Departmental Net to Gross Factor*					*1.25	
Total DGSF for Green House #1 Unit					8250	

MISSIONS & GOALS

DESIGN FOR AGING

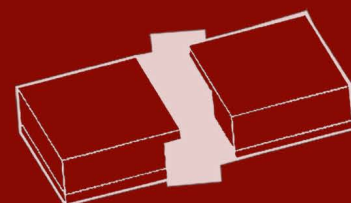
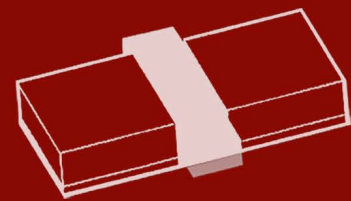
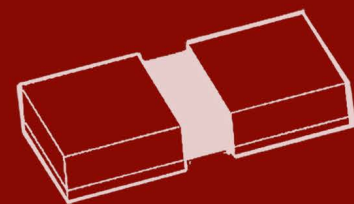
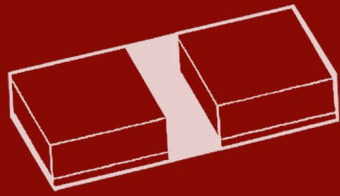
- Provide the seniors a home which is safe and comfortable.
- Grant older people feel engaged in daily activities.
- Three key things for older people: health care, transportation and affordable houses.
- Provide garden space, which is aging-friendly, it will provide older people and their family members opportunities to spend leisure time together.
- The most important thing of this project is about how can this project contribute to the whole community and make the community better.

CRITICAL QUESTIONS / CHALLENGES

- Explore the innovations to the existing Green House model.
- Design the connection between inside and outside.
- Find a design solution for the space arrangement, because this project will be partially public and partially private.
- Visual Design: make use of nature and create outdoor space on each level.
- Think of how Green House will contribute to the whole community, what the role it plays...



MUELLER STREET VIEW



PART 3. ARCHITECTURAL DESIGN PROCESS

- Pati Generation
- Two Dimentions of Site
- Floor Plan
- Spatial Traveling
- Green House Module
- Vertical Garden
- Façade & Renderings



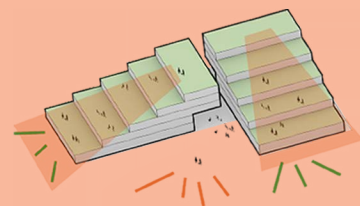
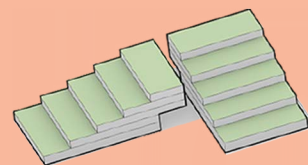
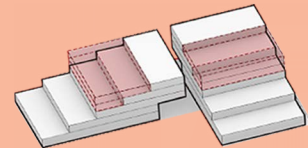
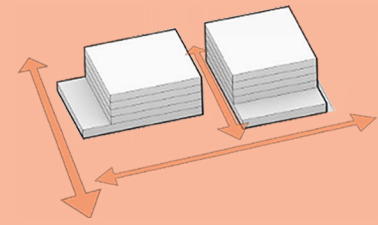
VERTICAL GREEN HOUSE HOMES

DESIGN FOR LIVING

NATURE CONNECTION & SOCIAL INTERACTION

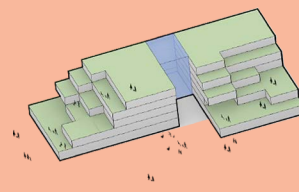
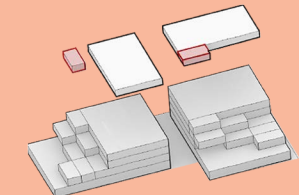
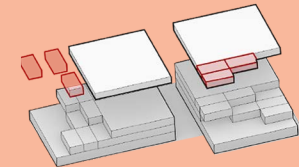
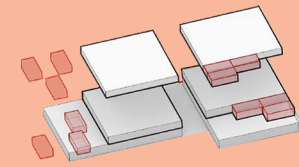
PATI GENERATION

Concept 01 - Step Back
Form 01



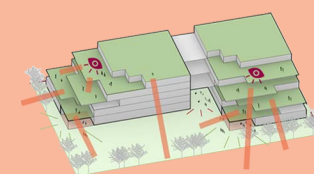
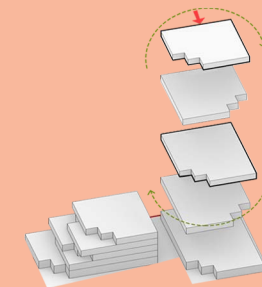
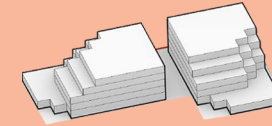
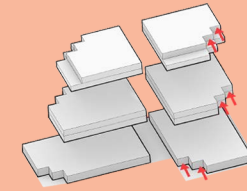
Regular Plan, Offset, Stacking

Concept 02 - Stack
Form 02



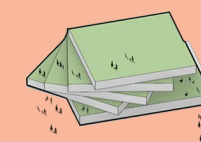
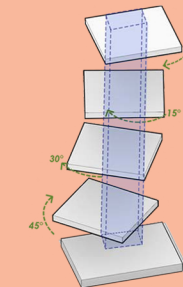
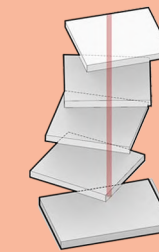
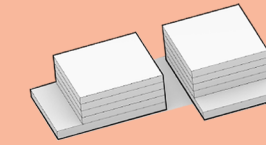
Dynamic, +/-, Maximal/ Minimal

Concept 02 - Stack
Form 03



Irregular Plan, Stacking, Mirror

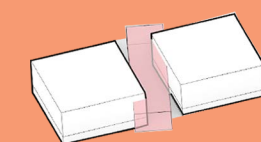
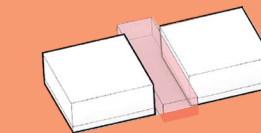
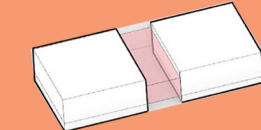
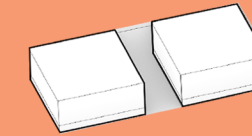
Concept 03 - Rotate
Form 04



Same Plan, Rotation, Stacking

FINAL

Concept 04 - Insert
Form 05



Same Module, Insert, Extend, Rotate

VERTICAL GREEN HOUSE HOMES



SCHEME 1. CURVE & CIRCLE

Interplay of circular forms representing a cycle of human life and a life cycle of trees.

DESIGN FOR AGING



SCHEME 2. STRAIGHT & RECTANGLE

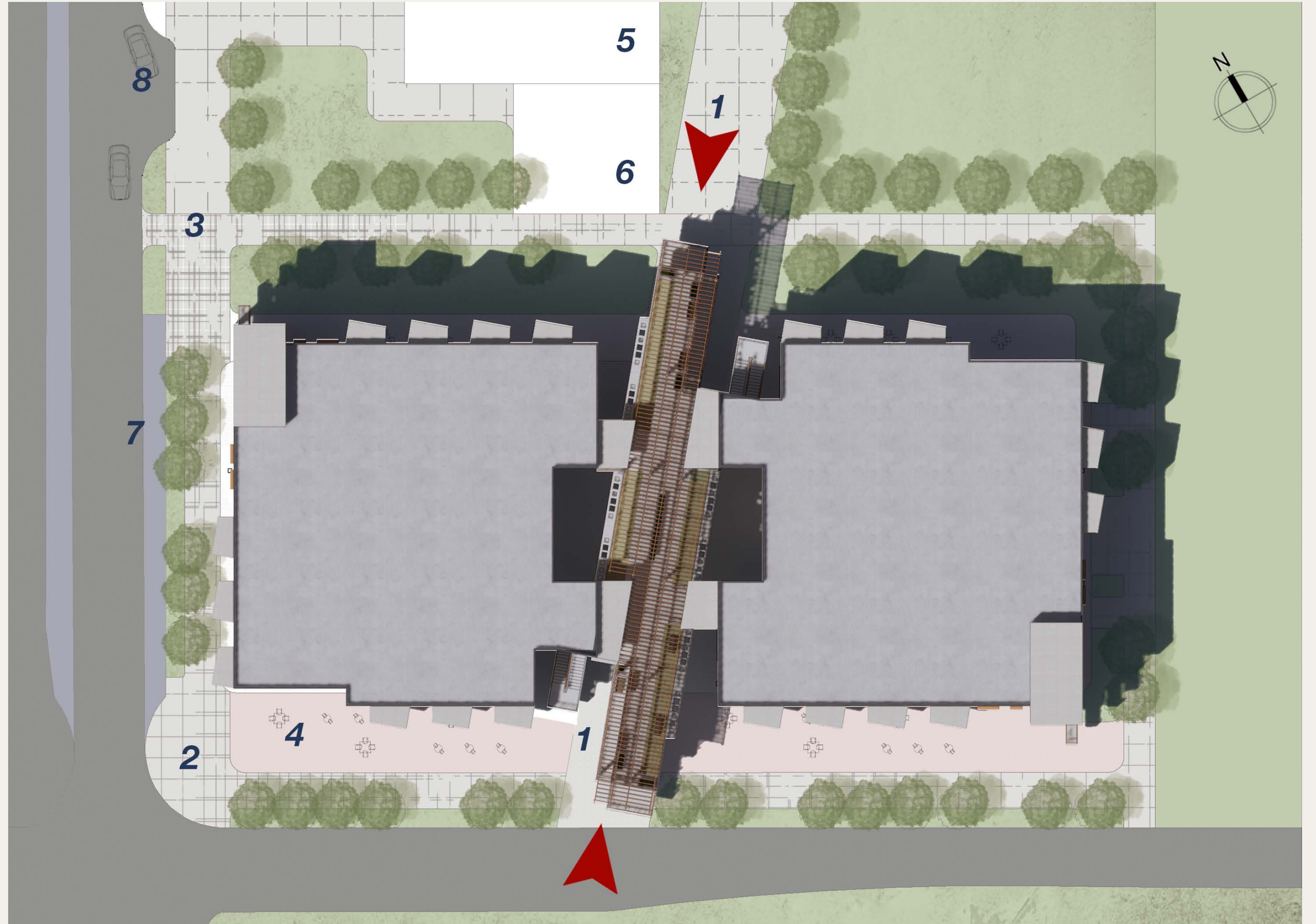
Interplay of rectilinear forms representing the interplay of different age groups.



SITE CONTEXT ▲

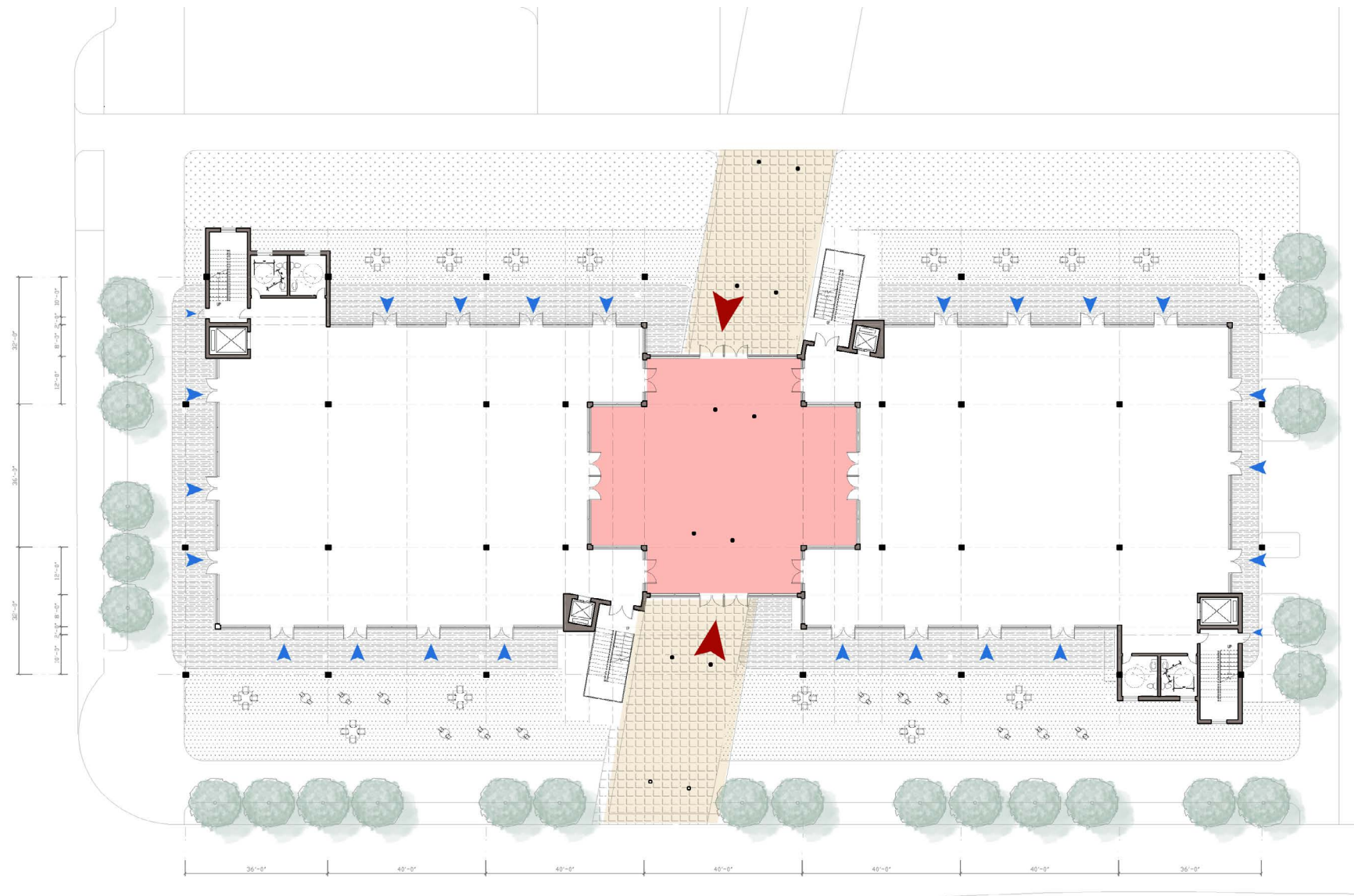
SITE PLAN ►

- 1. Main Entrance
- 2. Plaza
- 3. Pedestrian Entrance
- 4. Outdoor Plaza for Commercial
- 5. Community Service Center
- 6. Children's Playground
- 7. Street Parking
- 8. Drop Off

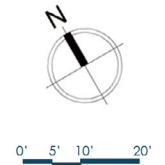


DESIGN FOR AGING

VERTICAL GREEN HOUSE HOMES

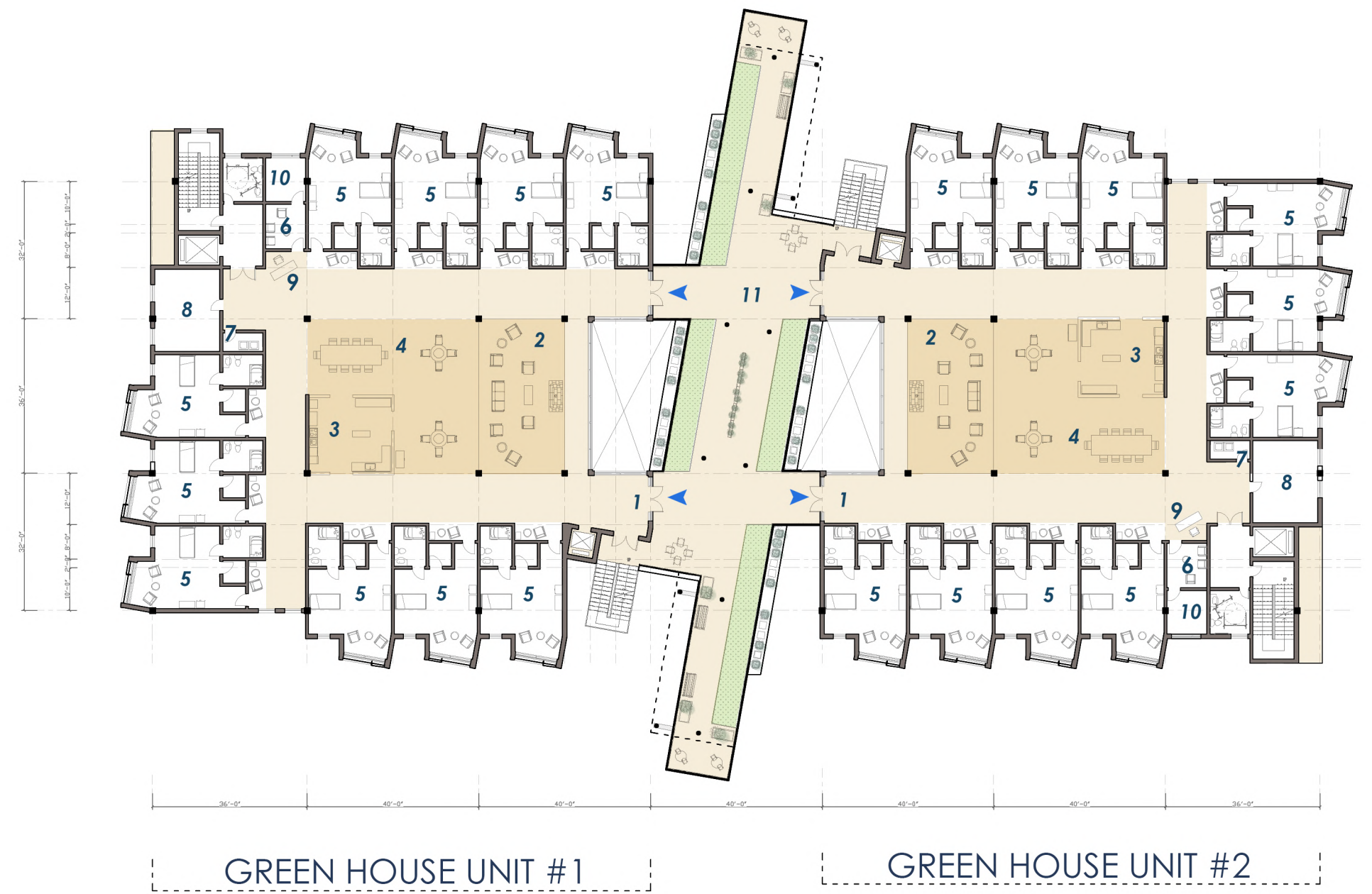


GROUND FLOOR PLAN

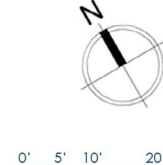


- Book Store 1200 SF
- Art Classes 1200 SF
- Senior Activities 1200 SF
- Groceries 2000 SF
- Pharmacy 2000 SF
- Shops 2*400 SF
- Restaurants 2*2000 SF
- Central part: Temporary Activity

DESIGN FOR AGING



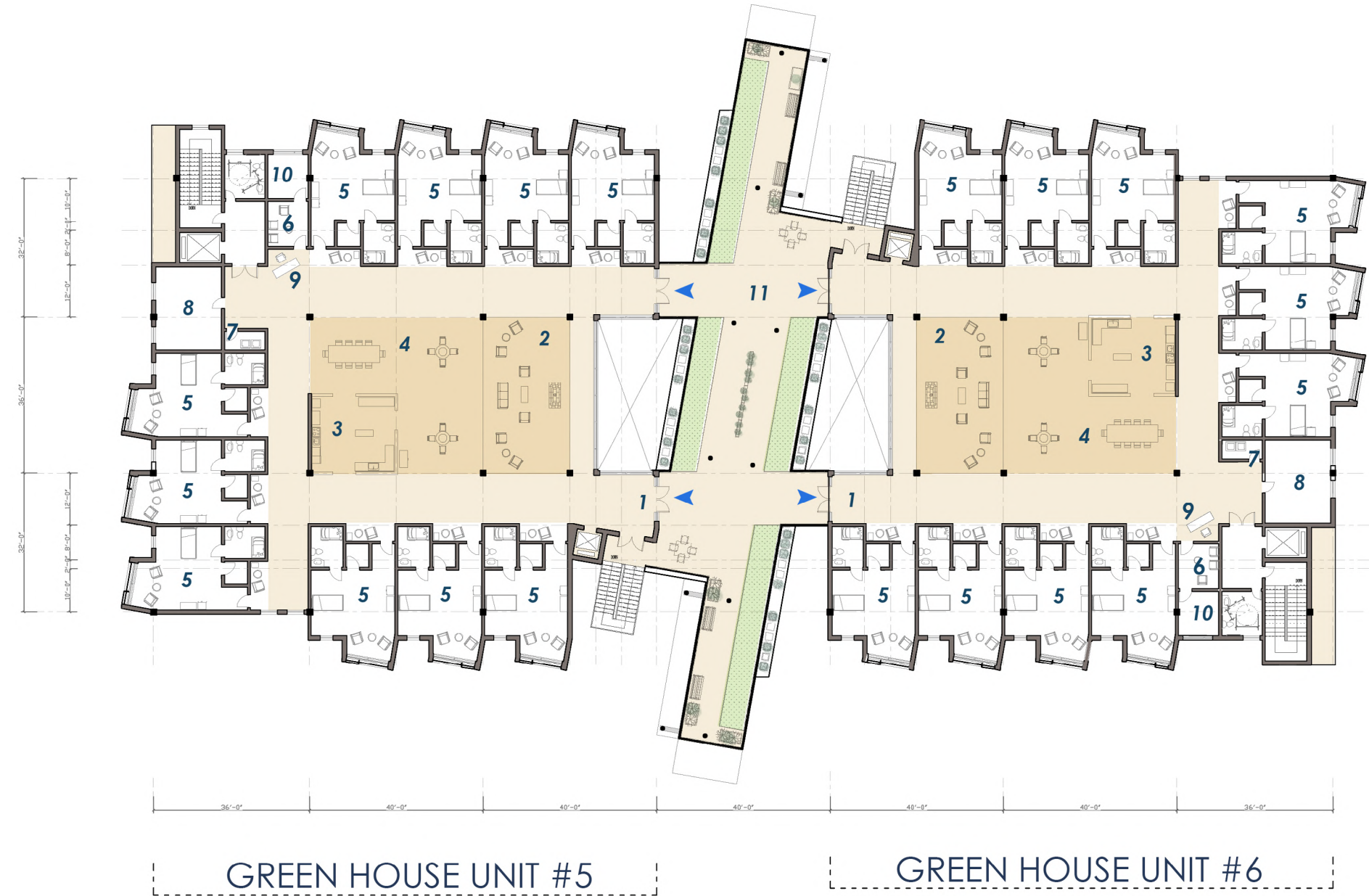
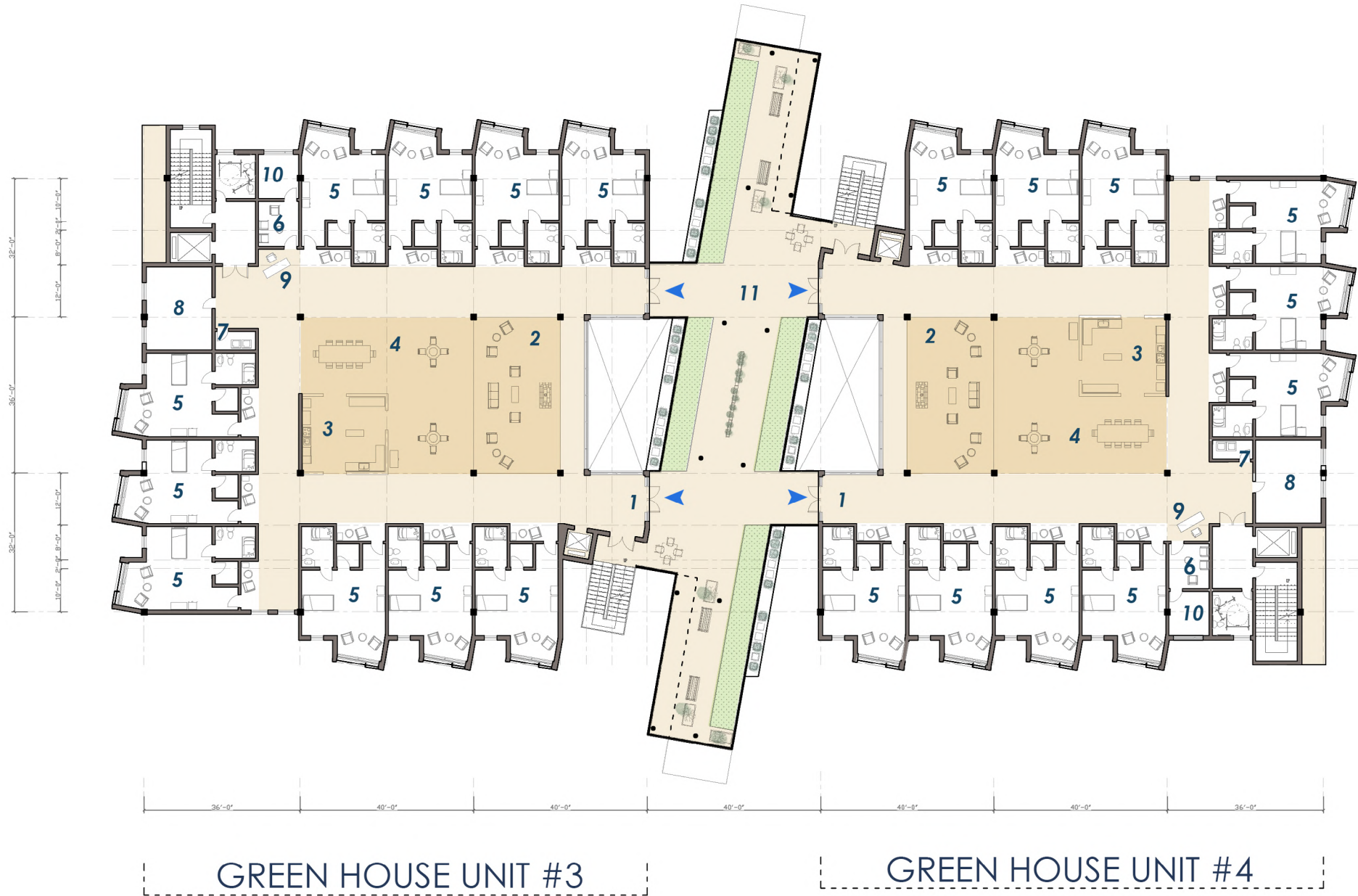
SECOND FLOOR PLAN



- 1. Foyer
- 2. Hearth Room
- 3. Kitchen
- 4. Dining Room
- 5. Bedroom (with Bath)
- 6. Den
- 7. Laundry
- 8. Spa/ Physical Therapy
- 9. Office
- 10. Storage
- 11. Outdoor Platform

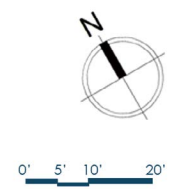
VERTICAL GREEN HOUSE HOMES

DESIGN FOR AGING

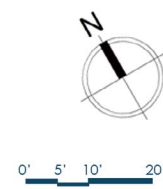


THIRD FLOOR PLAN

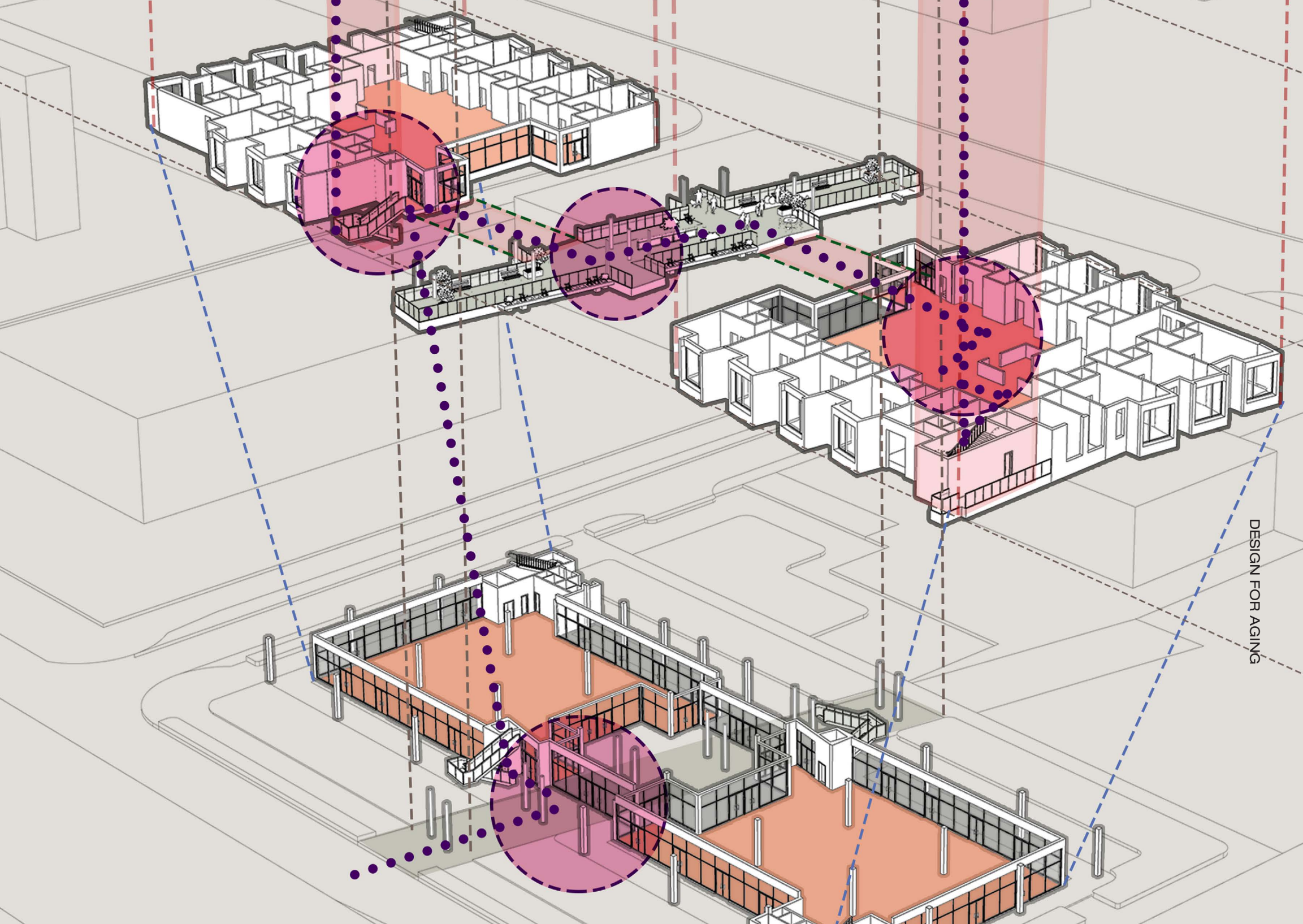
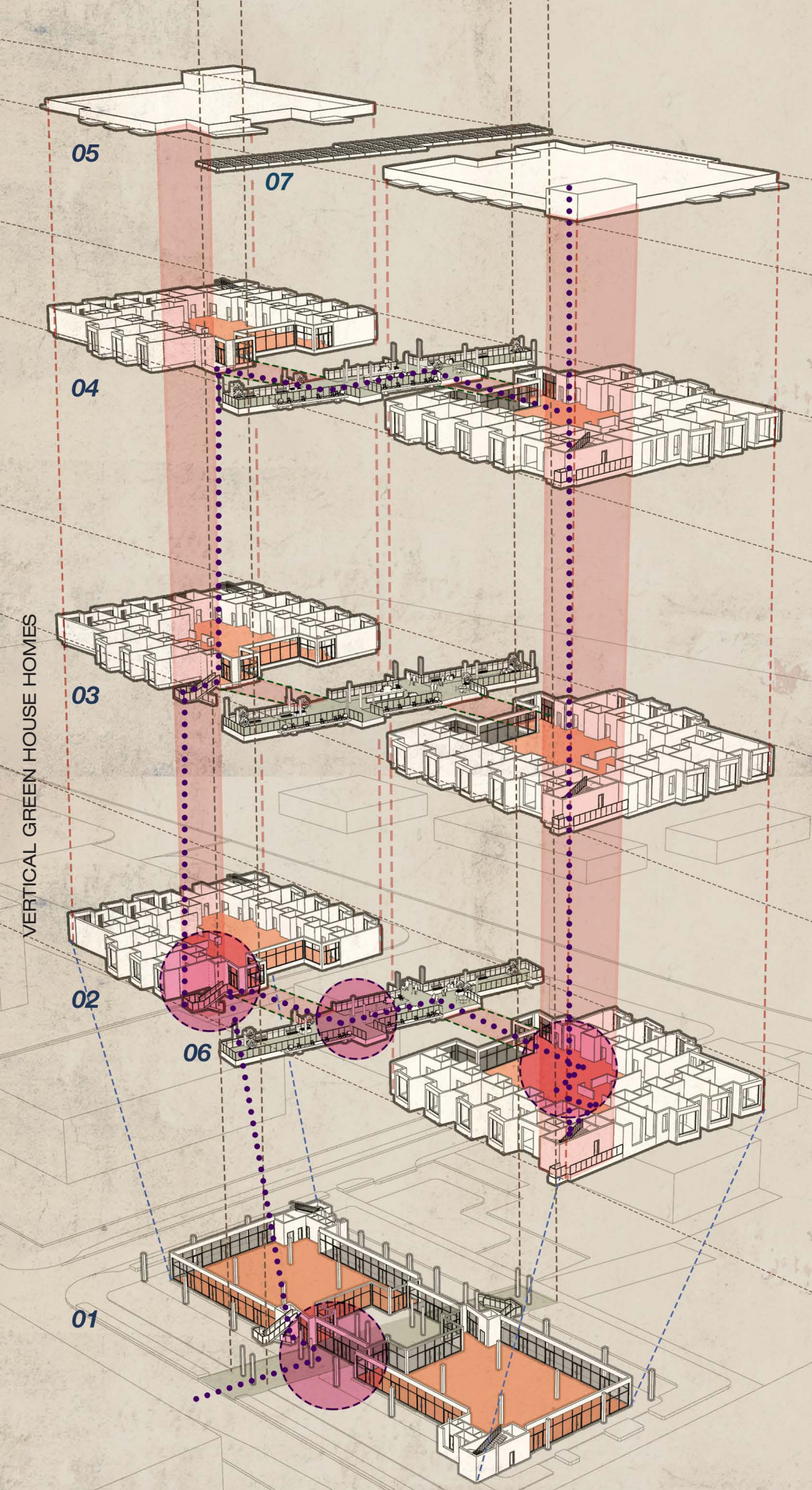
FOURTH FLOOR PLAN



- 1. Foyer
- 2. Hearth Room
- 3. Kitchen
- 4. Dining Room
- 5. Bedroom (with Bath)
- 6. Den
- 7. Laundry
- 8. Spa/ Physical Therapy
- 9. Office
- 10. Storage
- 11. Outdoor Platform



- 1. Foyer
- 2. Hearth Room
- 3. Kitchen
- 4. Dining Room
- 5. Bedroom (with Bath)
- 6. Den
- 7. Laundry
- 8. Spa/ Physical Therapy
- 9. Office
- 10. Storage
- 11. Outdoor Platform



- 01 Ground Floor - Mixed-Use
- 02 Second Floor - Green House
- 03 Third Floor - Green House
- 04 Fourth Floor - Green House
- 05 Roof
- 06 Vertical Garden
- 07 Shading

SPATIAL TRAVELING

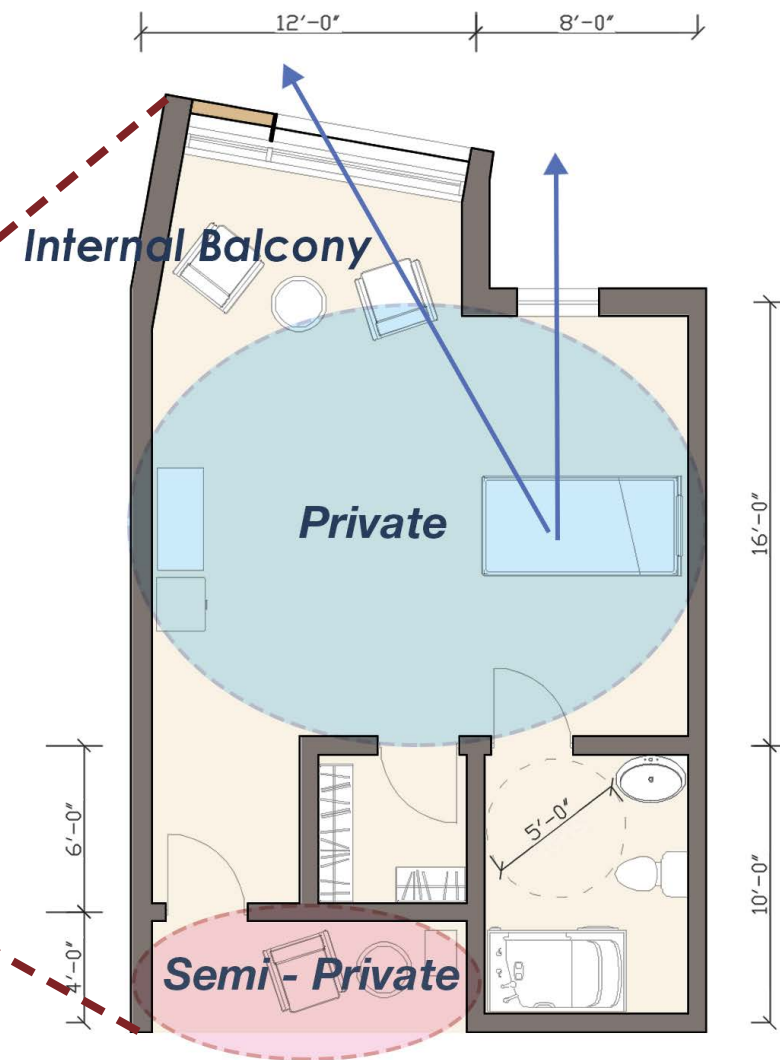
GREEN HOUSE MODULE

VERTICAL GREEN HOUSE HOMES

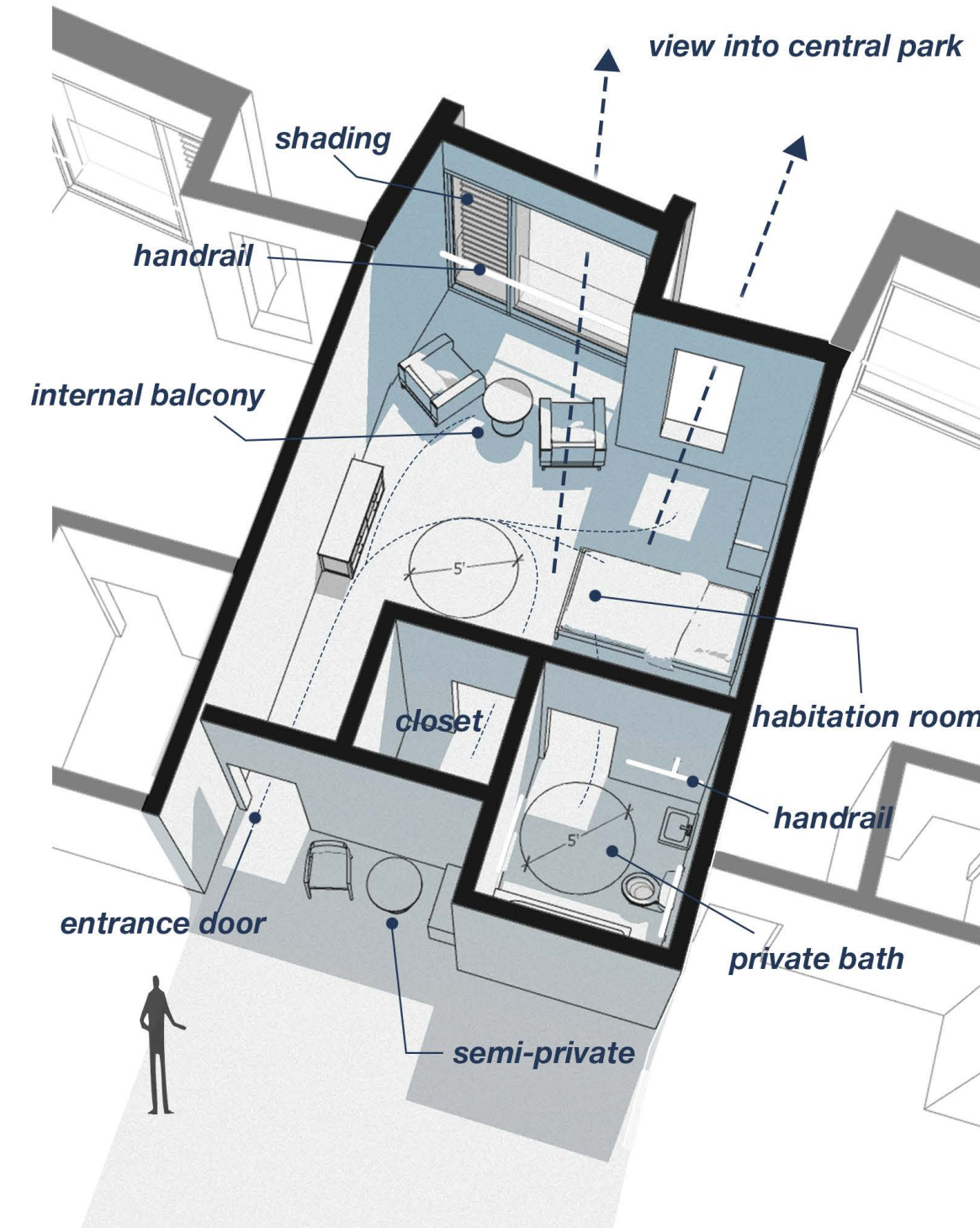


ONE UNIT MODULE (10 BEDROOMS)

- 1. Foyer
- 2. Hearth Room
- 3. Kitchen
- 4. Dining Room
- 5. Bedroom (with Bath)
- 6. Den
- 7. Laundry
- 8. Spa/ Physical Therapy
- 9. Office
- 10. Storage



SINGLE BEDROOM LAYOUT



DETAILS OF BEDROOM

DESIGN FOR AGING

VERTICAL GARDEN

SOUTH / NORTH VIEW OF VERTICAL GARDEN



VERTICAL GREEN HOUSE HOMES



VERTICAL GARDEN ON STREET VIEW

DESIGN FOR AGING

East / West View of Vertical Garden

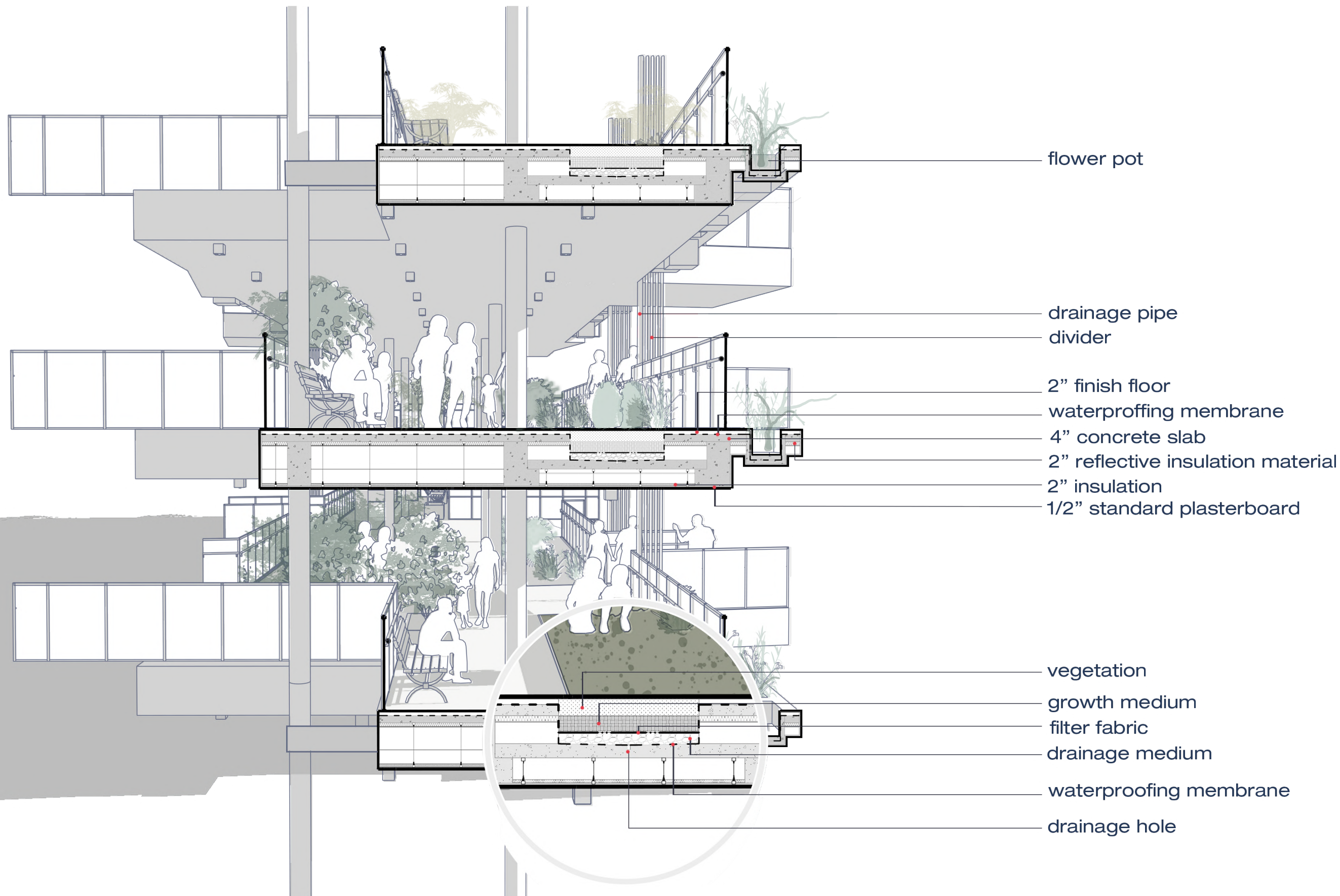


VERTICAL GREEN HOUSE HOMES

DESIGN FOR AGING

VERTICAL GARDEN

- Perspective Section & Details -



VERTICAL GREEN HOUSE HOMES

DESIGN FOR AGING

Idea of multiple-story model. In this particular project, I would like to address a multiple-story Green House building in response to the needs of the Mueller Community plan. The traditional Green House homes were usually one or two stories. In some cases, there are multiple stories building, with rehabilitation residents or short-term care in them. As I joined several webinars that hold by the Green House Team, it is a trend to build Green House that can house more older people. However, in other cases, they usually combined several units in horizontal by public or administration area. In my project, I would like to stack them in vertical and combined just two units by outdoor space, so that the gardens in middle will become a vertical garden naturally. At the same time, provide seniors a space to conduct physical activity and natural environment.

Idea of secondary outdoor space (vertical garden). The idea of “vertical garden” is to provide seniors opportunity to walking, seating, social and help them feel engaged in community, and promote their physical activity. To promote the outdoor usage, there are some features that need to consider: “high accessibility, clear indoor-outdoor connections, safe paving, good maintenance, round-trip walkways and a choice of comfortable sitting areas with appealing view.” (Rodiek & Lee, 2009).

VERTICAL GREEN HOUSE HOMES

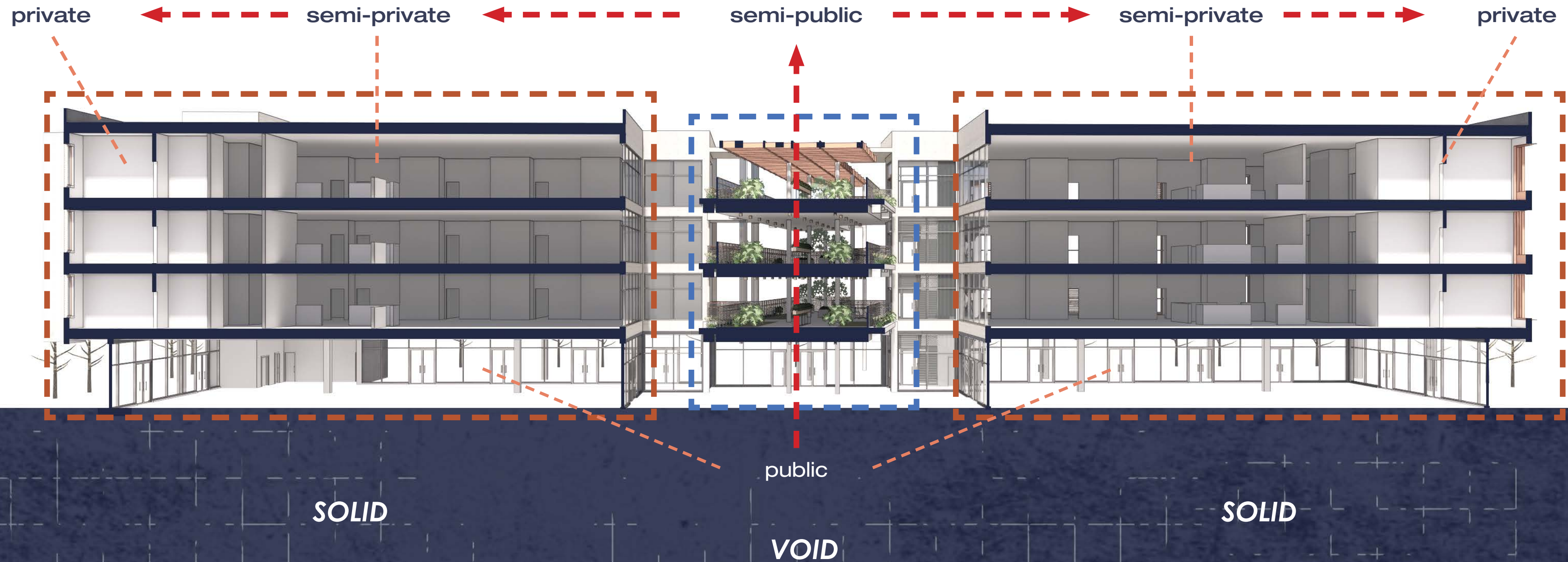
DESIGN FOR AGING



SOUTH / NORTH ELEVATION

Space Hierachy

In the public space, the primary areas are dining room, kitchen, and hearth room. These areas are open and work together to become a core room. The corridors that surround them will be a subsite area. The corridors inside are designed as a looped corridor to increase the opportunity for seniors walking inside (Lu, Rodiek, Shepley, & Tassinary, 2015).



VERTICAL GREEN HOUSE HOMES

DESIGN FOR AGING



EAST / WEST ELEVATION

VERTICAL GREEN HOUSE HOMES



MAIN Façade: Internal Balcony with Angle

OR AGING



VERTICAL GREEN HOUSE HOMES

DESIGN FOR AGING

VERTICAL CIRCULATION: *View from Outdoor Stairs*

VERTICAL GARDEN: *View of Middle Part*



SKYLIGHT: *View from Inside to Outside*



SUNSHINE & SHADING: *View of Top Floor*

PART 4. CONCLUSION

Critical Thinking
Bibliography

CRITICAL THINKING

As my concept of this project is to build Green House units in vertical, I started with exploring the strategy to stacking these units together to make a massing. After testing several types of massing, I finally chose a simplest model, which is on each floor there are two units that combined together. Considering the needs of outdoor spaces, the middle part is an open space. These spaces work as a bridge to connect the two living units, and the core space is directly access to the outdoor space. To incorporate to the “vertical Green House” idea, the outdoor space is a “vertical garden”. So, the whole massing is like a form of the connection of the void space middle with two solid spaces on two sides.

Considering the different needs from older people. There are elevators and stairs along the middle part on each side. The stairs make the space walkable, and the elevators can help people in wheelchairs and also protect

them from bad weather. Since there is a connection between two units, people from one unit can easily see and walk to another. This idea of direct view and connection from hearth room to the garden encourage older people interact and let them feel engaged.

What’s more, if there is another pandemic, the vertical garden can be a safer way to protect older people. People who come to visit can stay outside, they don’t have to go inside and walk through the whole heather room and dining room, or contact with other residents, which would decrease the risk of infection.

BIBLIOGRAPHY

Carstens, D. Y. (1993). *Site Planning and Design for the Elderly: Issues, Guidelines, and Alternatives*: Wiley.

Lu, Z., Rodiek, S., Shepley, M. M., & Tassinari, L. G. (2015). Environmental influences on indoor walking behaviours of assisted living residents. *Building Research & Information*, 43(5), 602-615. doi:10.1080/09613218.2015.1049494

Mueller Design Book: *The Master Plan for Robert Mueller Municipal Airport Redevelopment*. (2017)

Rodiek, S., & Lee, C. (2009). Rodiek, S., & Lee, C. (2009). External space: Increasing outdoor usage in residential facilities for older adults. *World Health Design*, 2(4), 49-55. *World Health Design*, 2, 49-55.

The Green House Project Team. (2010). *The Green House Project Guide Book*.

Ulrich, R. (2002). *Health Benefits of Gardens in Hospitals*.

Yen, I. H., & Anderson, L. A. (2012). Built environment and mobility of older adults: important policy and practice efforts. *Journal of the American Geriatrics Society*, 60(5), 951-956.

