Spring 5-9-2023

Enabling the Intellectually Disabled Mind through Architecture

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-An Integrated Community for Independence with Down Syndrome

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An Integrated Community for Independence with Down Syndrome

Approval of Thesis Research
Project Book is presented too:

Selen Okcu

and to
Faculty of the Department of Architecture
College of Architecture and Contruction Management

by

James Voorhees

In partial fulfillment of the requirements for the Degree

Bachelor of Architecture

Kennesaw State University
Marietta, Georgia

May 9, 2023

Dedication

I dedicate this project to my younger brother Andy. Although his life was short, his time in my life provided me with a world perspective that has come to find itself in each and everything that I do. Everyone who shares a memory with Andy can only smile when it comes to mind. I really just think the world would be a better place if we had the same positive impact on those around us. Just because someone is less capable or has certain setbacks in life doesn't mean they don't have something we can learn from them. It is our duty to use our own talents and abilites so that those people can have the opportunity to teach us. This project is nothing more than my humble attempt to provide that opportunity through the utilization of skills attained in my time with the Architecture Department at Kennesaw State University synthesized with my life experiences thus far.

"We don't truly understand what innocence is until we've already lost it."

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1.Design Theorem

"The careful examination of the dynamic between the built environment- with its attributes of acoustics, visual character, spatial quality, color, texture, geometry etc- and human behavior can lead to the development of more specific and sensitive design guidelines. With these more attuned guidelines, designs become more conducive of productivity, efficiency and comfort for all users."- Magda Mastafa

1.1. Abstract

According to the World Health Organization, roughly **10% of the world population live with mental disability or impairment** (Fujira, 2005). For the intellectually disabled, finding a purpose and independence as one transitions into yound adulthood can prove troublesome given their unique shortcomings. In 2015, it was estimated **80,000 intellectually disabled adults were held on waiting lists for residential placement** in government-funded programs that could take up to 10 years to complete. Autism Speaks approximates that this number will increase by half a million in that same time span (Lutz, 2015). A greater initiative must take place to assist these individuals in finding as sense of stability in an increasingly dynamic global setting.

Some built initiatives have come to exist specifically for those with Autism, such as the Autism Treatment Center of San Antonio. However, these interventions often neglect a large subdivision of the mentally-disabled population known as Down Syndrome. **This genetic condition occurs in nearly one in 1000 live births, making it one of the most common birth defects** (Rodrigues, 2019). The scope of projects with the intellectually-disabled in mind should be expanded to meet their particular needs so that they may reside alongside their autistic counterparts. With this diversification, the lack of independence in the mentally-disabled community of adults can be tackled more efficiently through the lens of the built environment.

Through manipulation of the built world an **Integrated Community** can be established to enable these individuals to live their lives within the context of the working world. The resulting project will exhibit this objective by creating a space where individuals with special needs can become become a part of a **subcommunity that is assimilated** independently into the general public, **rather than seperated**. Although, creating such a space for the intellectually impaired presents unique challenges in its own right.

Mental disabilities create internal obstacles for each individual that can prevent them from functioning properly in a given setting. The design solution to be presented will allow them to not only address, but **overcome, these obstacles**. This solution will serve to **remediate sensory overload** and similar symptoms, while also allowing for incremental exposure to them so that they can better handle their presence in everyday life. This creates a functional paradox requiring careful compositional considerations in order to create a **controlled, but flexible, environmental setting**.

The aforementioned paradox in turn is the driving force behind the resulting architectural work. This controlled environment will be attained through the **implementation of architectural tools and techniques**, such as light manipulation, acoustic control, materiality, spatial sequencing, and overall understanding of form and space.

1.2. Defintion and Focus Questions

Integrated Community

Noun

1. A community within the boundary of a larger, autonomous community that utilizes the surrounding community through methods that prove advantageous to all parties involved; including but not limited to occupational involvement, learning advancement, contribution of production and supply, and volunteer work.
   Also see: Subcommunity

Noun

2. A community in which all aspects of the design are formulated to meet the individual needs of its intended inhabitants, including but not limited to programmatic intention, spatial accommodation, systems selection, and manipulation of enviromental factors.
   Also see: Integrated Design

- In what ways can architectural design tools (form, space, materiality, etc.) be used to solve the lack of adaptive living for those with mental disabilities?
- What are the limitations undertaken in the built environment as a result of special needs care?
- Institutions in the past, such as the Willowbrook State School (1972), have shown the negative effects of improper facility design and usage can have on its disabled inhabitants. How will this project differentiate itself to provide an effective design solution? (Community vs. Institution)
- Segregation between the disabled an unimpaired often creates limiting boundaries for both groups. How can this project provide safety and privacy without enforcing seperation between them?
- Given an ideal design solution, how will this project impact the community n which it resides?

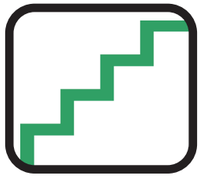
1.3. Interview

Hello Karen, could you provide a brief introduction of yourself and your son, Andy?

*My name is Karen Givens, and my son was born with **Down Syndrome** in 1996. He was considered to be **lower functioning** and had **sensory issues** as well. Along with his diagnosis of Down Syndrome, his birth was difficult and may have also caused further setbacks.*

Do you feel that Andy could have lived with some form of independence in the future with the proper effort and surroundings?

*Many people with Down Syndrome are **higher functioning and can certainly live independently** or, at the very least, enjoy independence in several ways while living in the family's home. However, I **do not feel Andy could have lived independently at full scale**. I do believe if he was afforded the same applied behavior analysis that those with Autism receive, had **concerted efforts with occupational skills** along with the tools he needed, and greater sensitivity to his disability and physical limitations, he would have had **a better outcome with his independence** in our home and while he was out with us in public.*



Given your understanding of my proposed project, what are some physical aspects you would like to see incorporated?

*The physical aspects that I would like to see incorporated would have to do with **lighting and sound** especially. For instance, when it is understood that a poorly functioning sensory system is actually painful and overwhelming to a person, these things become very important. In taking Andy to a normal family restaurant, if chairs were being scooted up and screeching across a hard floor and conversations were loud and overwhelming, rather than **acoustics being at a more muted level**, it would possibly mean that it was not even doable for Andy to function in such an environment. Also, if a **physical setting is not spread out properly with walkways**, etc., it makes it difficulty for someone with an intellectual disability to move, as such a person may **tend to be less agile in maneuvering around people**. Maybe certain areas of public places could be set up to accomodate someone with and intellectual disability when they are having diffculty as well.*

What were some of the biggest challenges for Andy when it came to functioning in a public environment?

*Andy's biggest challenges when it came to functioning in the public environment were sensory matters involving **too much simulation** and, also, **physical limitations** like stairs and walking long distances. **Proprioception was challenging**, and expressive communication was lacking, though receptive communication was understood according to his cognitive level.*

In these environments, what were some of the primary 'triggers' or causes of those challenges and resulting behaviors?

*Some of the **primary triggers** or causes of those challenges and resulting behaviors in the public environment were due to **stairs**, **lighting**, **noise**, **and social stresses**, such as people approaching Andy he did not know and getting into what he considered to be his **personal space** or which involved **disrupting his routine**.*

What are some aspects you think should be blatantly avoided?

*Some aspects that should be blatantly avoided are those causing **safety concerns**, such as **walkways** that are steep and narrow without rails or without a landing for rest and that do not have the **proper lighting**, so that one step to the next can be easily distinguished. Maybe another aspect that should be avoided is **transitions that are abrupt** in moving from one area to another as far as lighting and sound and for things to flow more easily. For example, aquarium visits where you go from one bright lighting to darkness without a slow transitions should be avoided and include a smooth and slower modification to the surroundings. **Not having alternatives** to certain walkways or environments that **overstimulate** or are difficult to adjust to should certainly be avoided. Some places like this have done well in this area, but others are troublesome. I see this as being inclusive and not exclusive. **Inclusivity is so important**, but not at the cost of not allowing a person's unique challenges.*

1.4. Down Syndrome: An Overview

Down Syndrome (DS) was first formally identified in 1866 by John Hayden Down. It wasn't until 1958 however, that the origin of the disease was associated to be genetic in nature (*Campana, 2012*).

In 1929, the average life expectency of those with DS was as low as 9 years old (*Penrose, 1929*). This figure rose to roughly 40 years of age in the early 80s (*Carter, 1983*) and continued to rise to reach an expectency of 60-64 years in 1996 (*Strauss, 1996*).

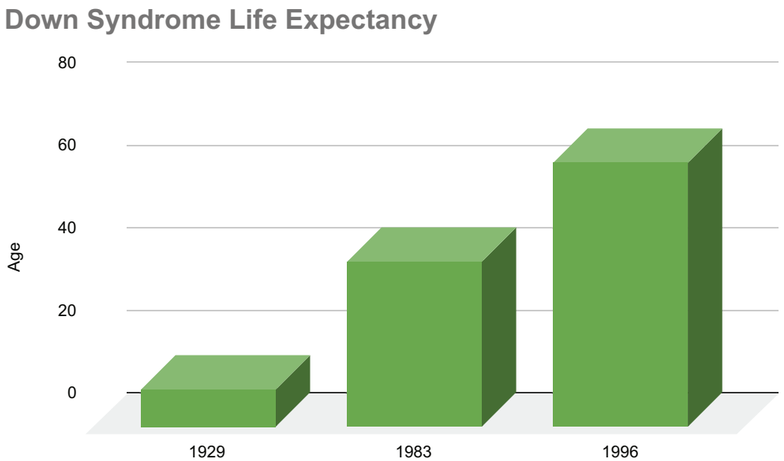


Figure 1.4a. Trisomy 21 Down Syndrome Life Expectancy

In the past, this **shortened life expectency had created an absence of need for care for the Intellectually Disabled (ID)**. Since ID adults were once considered more of a rarity, any focus toward **disabled living was initially for the younger generation**. Even with the gradual abandonment of institutionalism, there exists a **lagging progress for adults living with mental disabilites**. This project aims to bridge the gap in research to the field of architecture so that the older generations may find acceptance within the built environment.

The **phenotype of trisomy 21** still exhibts 2 clinically significant observations that can be observed in almost all cases (Campana, 2012):

1. **Cognitive Development Delays**

2. **Muscular Hypotonia**

The cognitive development problems, which show similar attributes to those with progressed Alzheimer's disease, come to affect the individual's **mental processing of information**. More specifically, they affect how the person creates a **mental representation of the physical world** around them.

Musular hypotonia, on the other hand, refers to the **lack of muscle definition** in the body. While not directly related to muscular weakness, this condition does come to **negatively affect the physical capabilites** of those with DS.

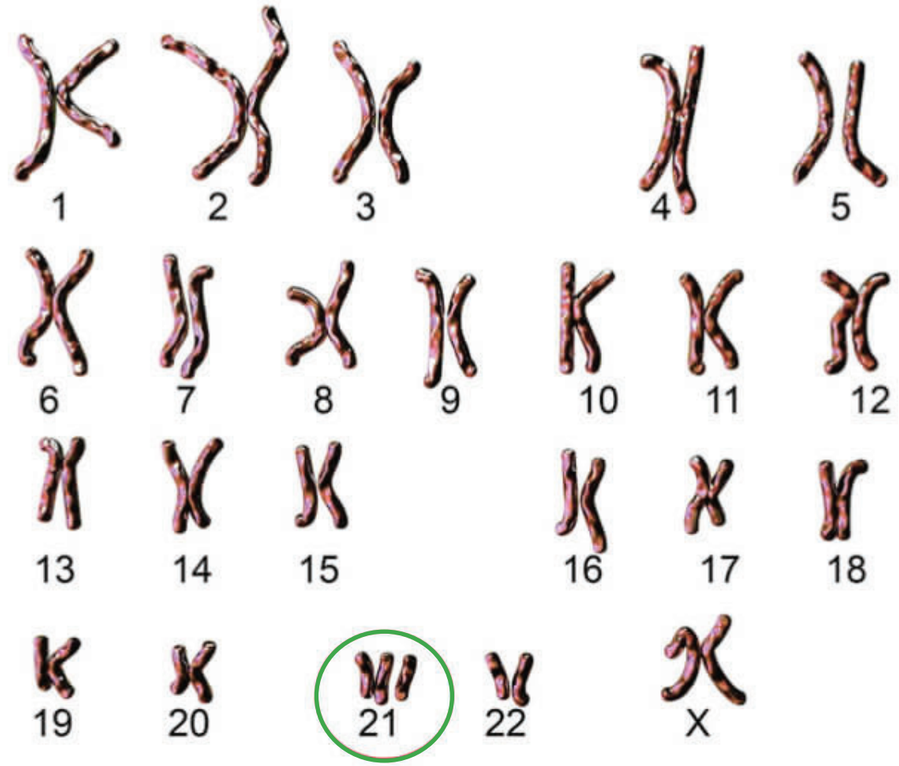


Figure 1.4b. Trisomy 21

1.5. Down Syndrome and the Brain

The brain serves as the extremely efficient, yet often mysterious, **system in which our body retrieves and processes information** (Bruer, 1999). This system constitutes the relationship between our **internal and external environments** at any given moment, allowing us to utilize that correlation however we see fit.

For those with DS and other mental disabilities, this **system operates at a less efficient rate due** to the physical differences in the structure of the brain (below).

Within the **greater areas of the brain are smaller functional parts**, such as the hippocampus, which can be more **directly connected to cognitive behaviors**. How these behaviors differ in those with DS can be summarized by the research conducted by Florez (1999) in following table (Figure 1.5a):

Down Syndrome Brain Pathology and Cognitive Behaviors

Cognitive Behavior	Associated Brain Structure	Cognitive Behavior	Associated Brain Structure
Short-term Memory Easily distracted Unable to differentiate between stimuli Minimal attention span Difficulty in maintaining tasks Lack of self-inhibition Low initiative to interact with others	Midbrain Thalamus Frontal Lobe Parietal Lobe	*Long-term Memory* Increased difficulty synthesizing and retrieving memory Reduced capacity for declarative memory types (names, places, facts, etc.)	Hippocampus Cerebral Cortex
Immediate Memory and Information Processing Inability to process sensory information Difficulty utilizing sensory input and formulating the correct ouput	Pariatel Lobe Temporal Lobe Prefrontal Cortex	*Association and Analysis* Difficulty: integrating new information, producing internal conceptualizations, developing sequential cognitive operations, formulating abstract thoughts, conducting numerical operations	Prefrontal Cortex Cerebral Cortex Hippocampus

Figure 1.5a. Down Syndrome Cognitive Behaviors

Cerebellum

Hypoplasia and reduced number of granule cells

Brain Stem

Altered serotoninergic, noradrenergic, and cholinergic systems

Temporal Lobe

Reduced volume, reduced number of granule cells, and altered microarchitecture of pyramidal cells

Frontal Lobe

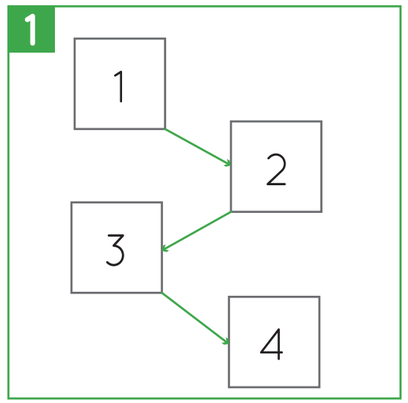
Reduced volume and larger minicolumns with fewer cells

Parietal Lobe

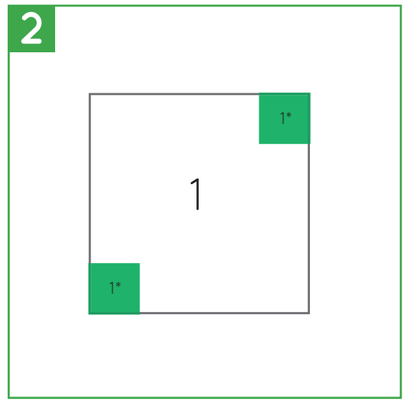
Normal volume and altered microarchitecture of pyramidal cells

Figure 1.5b. Areas of the Brain Affected

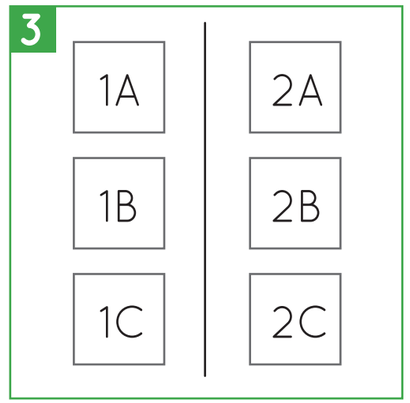
1.6. Sensory Design Theory



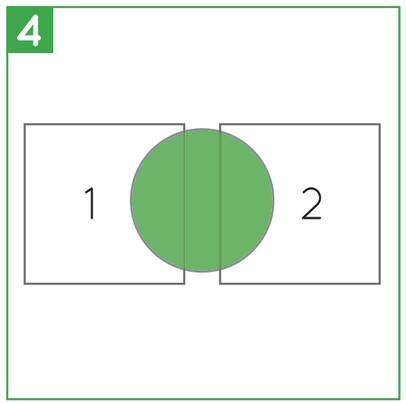
1. Spatial Sequencing
Areas should be organzied in a logical order. This order should be based off use in programmatic spaces and should flow seamlessly.



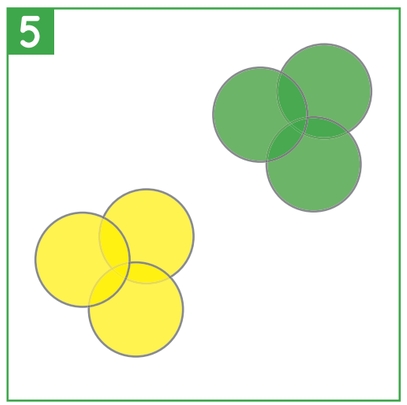
2. Escape Spaces
These areas represent a refuge from the overstimulation that may occur in the high-activity environments.



3. Compartmentalization
This concept refers to the delineation of spaces according to activity, where each 'compartment' has a clearly defined function.



4. Transition Zones
These 'zones' serve as spatial intermediaries between spaces so that individuals may recalibrate according to stimuli.



5. Senory Zoning
This type of zoning refers to organization according to their level of stimulus, rather than the typical architectural approach of organizing to function.

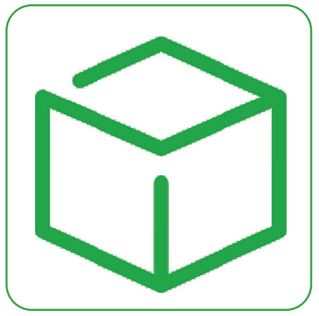
6. Safety
Surroundings should be heavily considered for safety in navigatation, such as avoiding sharp edges or corners.

Design Applications for the Disabled Mind

Sight

Sound

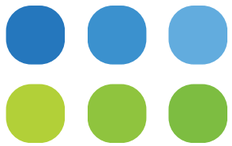
Geometry



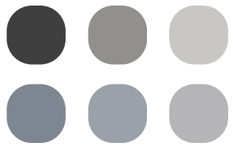
Perception

1.7.1. Sight

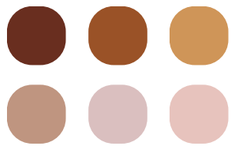
Low-Stimulus



Cool Colors

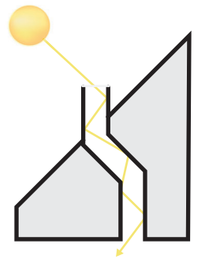


Neutral Colors



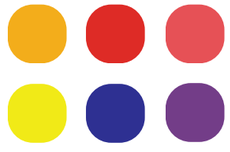
Earth Tones

Pastels



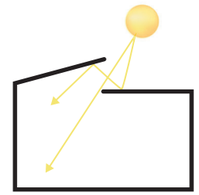
Solar Tube

High-Stimulus

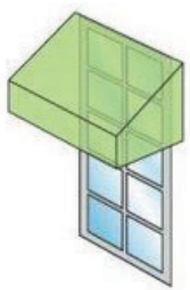


Bright Colors

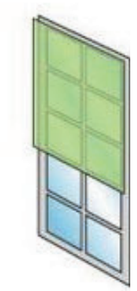
For the DS individual, their visual memory skills far outweigh that of their verbal skills (Greenspan and Weider, 1998). With this reasononing, visual stimulus can be used as the primary means of spatial sequencing and enviromental recognition.



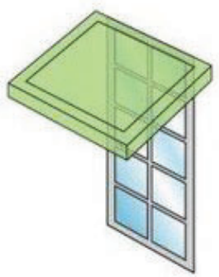
Clerestory



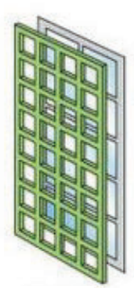
Awning



Exterior Operable Shade



Bahama Shutter



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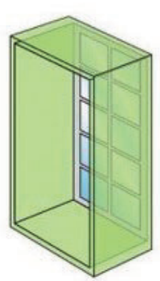
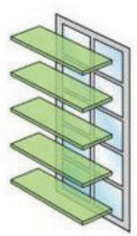
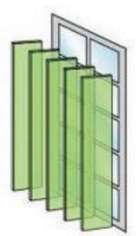


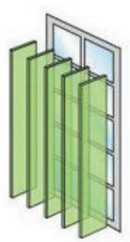
Recessed Window



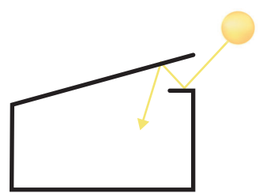
Horizontal Fixed Shade



Vertival Movable Shade



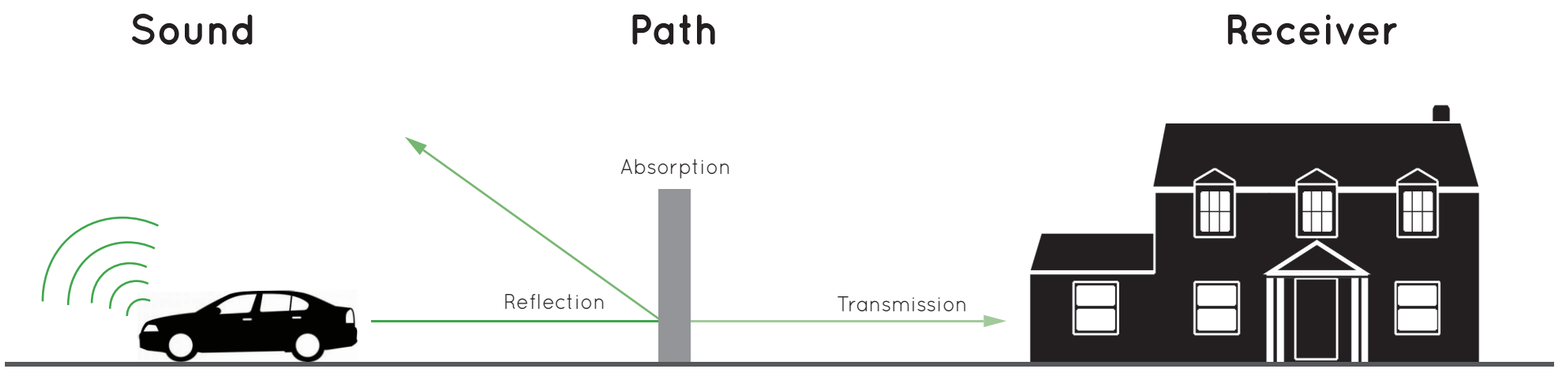
Bahama Shutter

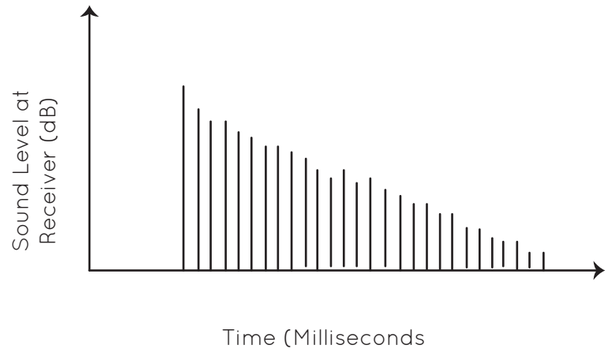


Light Shelf

Figure 1.7.1. Visual Applications in Architecture

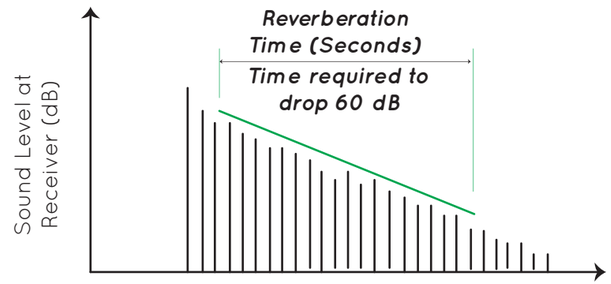
1.7.2. Sound





Wall Type	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	Sound Transmission Class (STC)
Typical stud wall	15	24	32	40	35	40	34
Double-stud wall with two layer gypsum each side and glass fiber cavity	44	53	62	65	63	65	62

Transmission Loss (TL)



More rapid decay: smaller rooms, more surfaces, fuzzier surfaces, shorter reverberation times

More gradual decay: larger rooms, fewer surfaces, smoother surfaces, longer reverberation times

Rubber Flooring

Flooring is the most difficult facet of enclosure to control in terms of acoustics. Rubber material can prove useful in this regard, especially in active communal spaces where there may be louder footsteps or speech. It also provides underfoot comfort and improved safety in the case of slip prevention or fall impact.

Acoustic Tiles

Acoustic ceiling tiles can be used to not only absorb sound, but reflect sound to the intended receiver when necessary. In the case the former, the suspended tiles typically consist of a perforated surface backed by a porous material. By hiding the mechanical systems within the ceiling, these tiles simplify the appearance of the room, while also providing an effective form acoustical control.

Figure 1.7.2. Acoustic Applications in Architecture

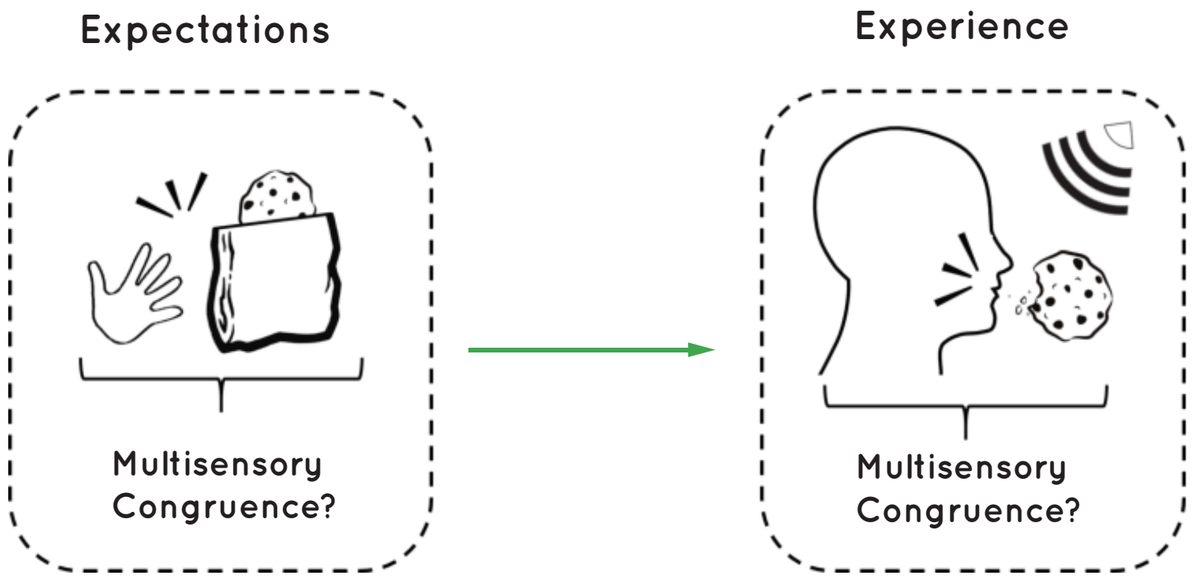
Approach-Avoidance Motivation Response

"We typically rate curvilinear forms as being more approachable than rectiliniear ones. Angular forms, especially when pointing downward/toward us, may well be perceived as threatening, and hence are somewhat more likely to trigger an avoidance response" (Salgado, 2017)

Figure 1.7.3. Approach-Avoidance Response Theory

1.7.4. Perception

Sensorial Congruency



"A principle rule that governs our response to multisensory combinations of environmental cues is that those combinations of stimuli that are "congruent" (complimentary) will tend to be processed more fluently, and hence be liked more, than those combinations are deemed incongruent, and hence will often prove more difficult and effortful, to process" (Reber, 2012)

Figure 1.7.4. Multi-Sensory Congruency

1.8. Universal Design Principles

When it comes to creating an architectural solution aimed toward those with any intellectual disability, each design decision should be made with the entire spectrum in mind. Fortunately, a refrence standarad for these decisions is already in place.

According to the National Disability Authority (2020), the Disability Act of 2005 defines **Universal Design** as the design and composition of an environment so that it may be accessed, understood and used:

i. To the greates possible extent

ii. In the most independent and natural manner possible

iii. In the widest possible range of situations

iv. Without the need for adaptation, modification, assistive devices or specialised solutions, by by any persons of any age or size or having any particular physical, sensory, mental health or intellectual ability or disability

Universal Design is guided by **seven key principles** that were developed in 1997 to guide compostion of any building or product so that it meets the needs of all types of people (Figure 1.8). These principles will serve as the underlying criteria to ensure the architetural solution effectively addresses the needs of the subject as we apply the spatial attributes noted previously.

In addition to these seven principles the NDA (2020) also outlines a **two-level approach** to be incorporated into any Universal Design:

1. **User-Aware Design:** pushing the boundaires of 'mainstream' products, services and environments to include as many people as possible
2. **Customizable Design:** design to minimize the difficulties of adaptation to particular users.

Given that this project is meant to apply to a set group of people, the second level of approach, **Customizable Design**, will be more heavily applied moving forward.

	Principle	Definition	Guidelines
1	Equitable Use	This design is useful and marketable to people with diverse abilities.	**1a.** Provide the same means of use for all users: identical whenever possbile; equivalent when not. **1b.** Avoid segregating or stigmatizing any users. **1c.** Provisions for privacy, security, and safety should be equally available to all users **1d.** Make the design appealing to all users.
2	Flexibility in Use	This design accommodates a wide range of individual preferences and abilities.	**2a.** Provide choice in methods of use. **2b.** Accommodate right/left handed access and use. **2c.** Facilitate the user's accuracy an precision **2d.** Provide adaptability to the user's pace.
3	Simple and Intuitive Use	Use of the design is easy to understand regardless of the user's exeperience, knowledge, language skills, or current consideration level.	**3a.** Provide choice in methods of use. **3b.** Accommodate right/left handed access and use. **3c.** Facilitate the user's accuracy an precision **3d.** Provide adaptability to the user's pace.
4	Perceptible Information	The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.	**4a.** Use different modes (pictorial, verbal, tactile) for reduntant presentation of information **4b.** Provide adequate contrast between essential information and its surroundings **4c.** Maximize "legibility" of essential information **4d.** Differentiate elements in ways that can be described. **4e.** Provide compatibility with a variety of techniques or devices used by people with sensory limitations.
5	Tolerance for Error	The design minimizes hazards and the adverse consequences of accidental or unitended actions.	**5a.** Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded. **5b.** Provide warnings of hazards and errors. **5c.** Provide fail safe feature. **5d.** Discourage unconscious action in tasks
6	Low Physical Effort	The design can be used efficiently and comfortably and with a minmum of fatigue	**6a.** Allow user to maintain a neutral body position. **6b.** Use reasonable operating forces. **6c.** Minimize reptitive actions. **6d.** Minimize sustained physical effort.
7	Size and Space for Approach and Use	Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.	**7a.** Provide a clear line of sight to important elements for any seated or standing user. **7b.** Make reach to all components comfortable for any seated or standing user. **7c.** Accomodate variations in hand and grip size. **7d.** Provide adequate space for the use of

Figure 1.8. NDA Universal Design Principal Summary

2. Precedent Analysis

"Architecture, as a profession, is responsible for creating environments that accommodate the needs of all types of users. Special needs individuals should not be exempt from such accommodation. Despite their high incidence, there are yet to be developed architectural design guidelines catering specifically to the scope of special needs users." - Magda Mostafa

2.1. Case Study: Willowbrook State School

The Willowbrook Center was a building complex found on Staten Island that housed both children and adults with developmental disabilities. At its highest population in 1969, **6,200 residents were living in houses meant to house 4,000** (Disability Justice, 2022).

The overcrowding nurtured dehuminazation and abuse. Hepatitis was so prevalent within the institution that researchers took advantage and began **experimenting on the residents with potential vaccines**, intentionally exposing them to the virus.

Figure 2.1a. Willowbrook State School

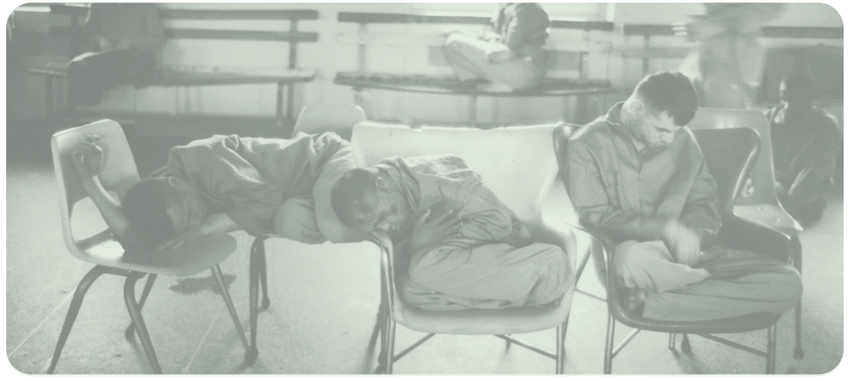


Figure 2.1b. Willowbrook Residents

Despite the shift in social perspective and introduction of lawful action to eliminate unethical segregation of the mentally disabled communities, **instances of institutionalization practices still arise**.

A watershed case in the evolution of legal rights for people with disabilites to live in dignity arose out of public awareness of the horrific living conditions set by the state developmental center. In turn, setting important **precedents for the humane treatment for people with developmental disabilities**.

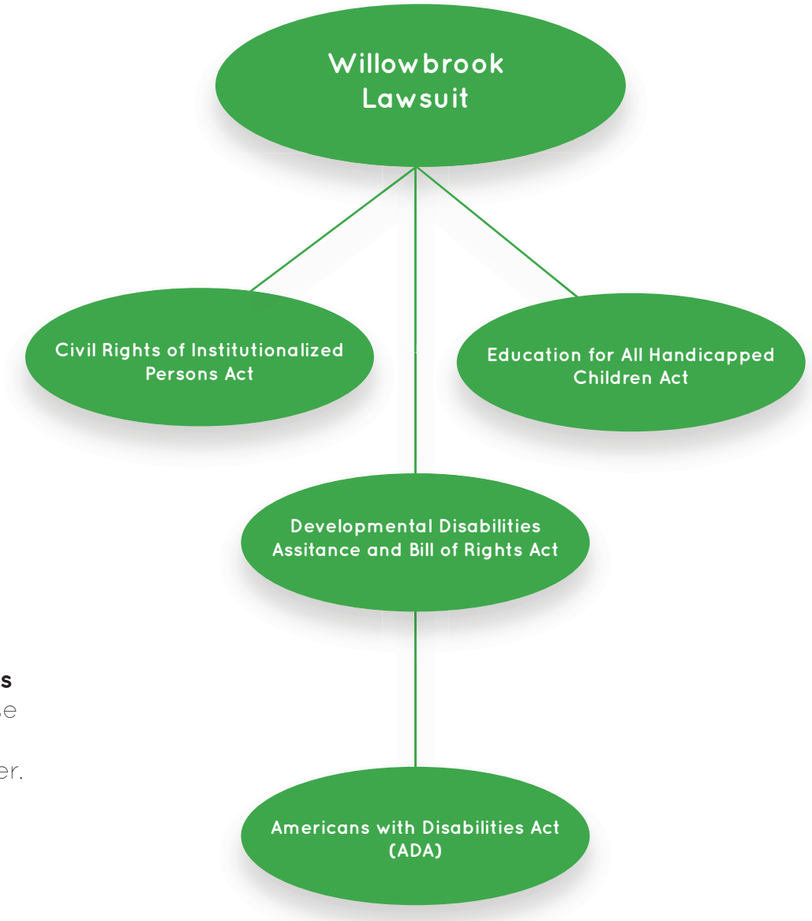
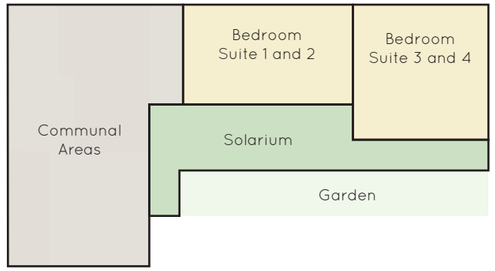


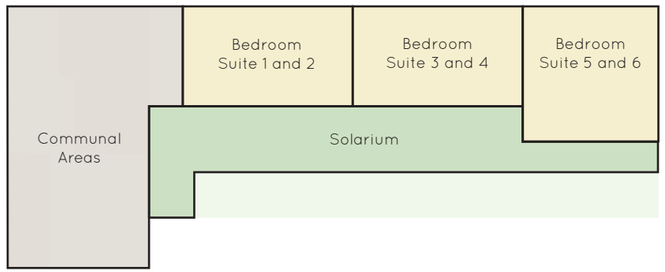
Figure 2.1c. Willowbrook Lawsuit Precedence

2.2. Michael Singer: Proposed Living Project for Living with Autism

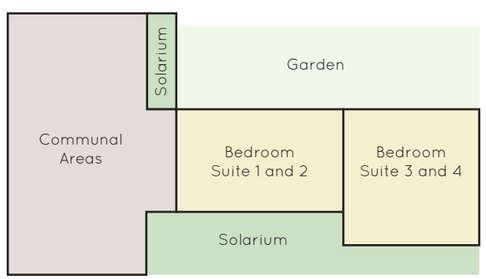
Typology Studies



South-Facing Home Design



South-Facing Home Design Expanded



North-Facing Home Design

Figure 2.2a. Michael Singer Typology Studies

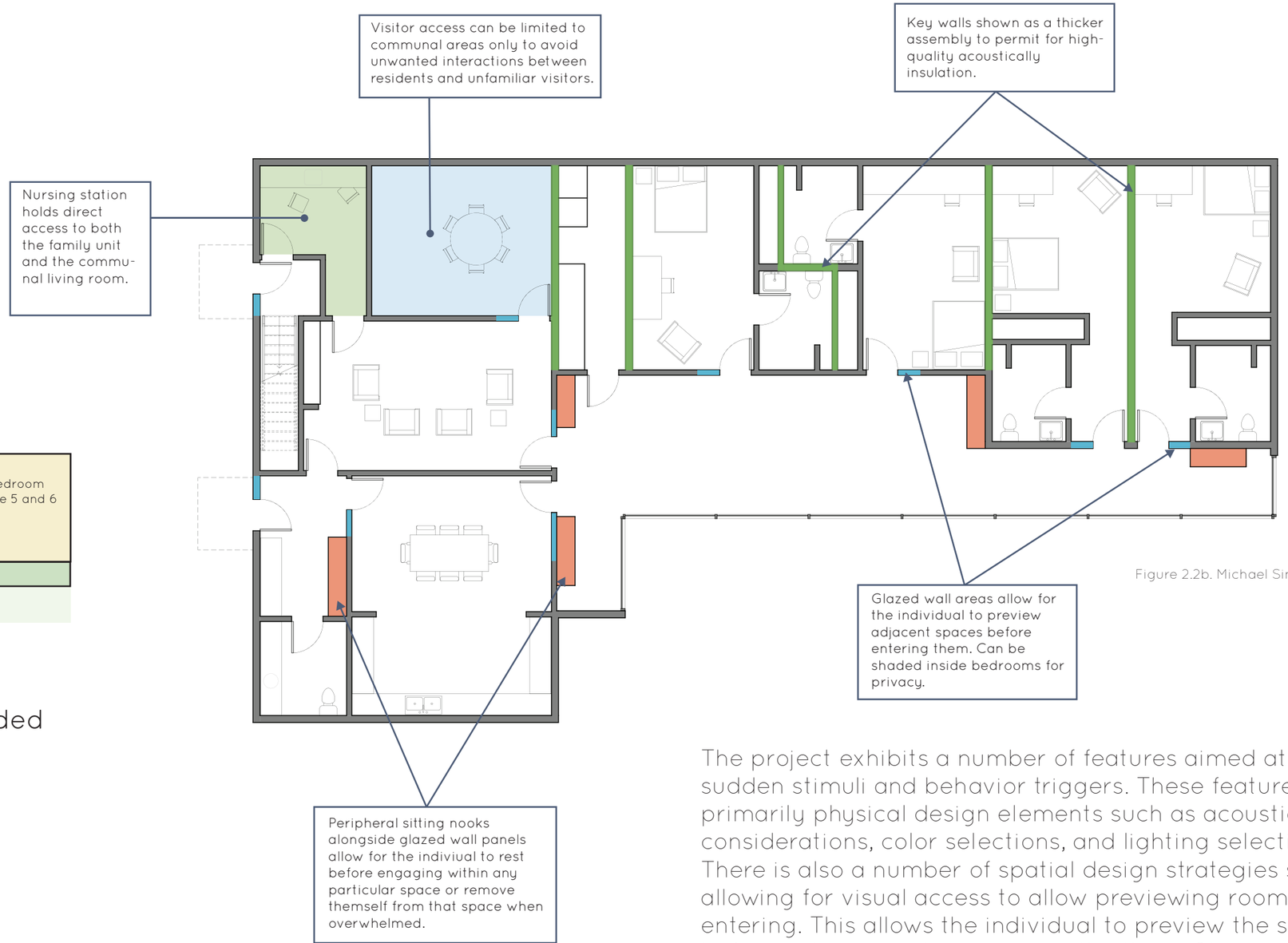


Figure 2.2b. Michael Singer Project Details

The project exhibits a number of features aimed at reducing sudden stimuli and behavior triggers. These features are primarily physical design elements such as acoustical considerations, color selections, and lighting selections. There is also a number of spatial design strategies such as allowing for visual access to allow previewing rooms before entering. This allows the individual to preview the space before entering and engaging with others. Storage is built in to the rooms, such as within seating or wall cavities to reduce overall clutter, flex activity rooms also give way to provide a space that can accomodate any reasonable activity.

2.3. Urbain Architectencollectief: Day Care Center

Figure 2.3a. Exterior Urbain Architectencollectief

Figure 2.3b. Covered Gallery Urbain Architectencollectief

Figure 2.3c. Interior Urbain Architectencollectief

While this longstanding project has been expanded on several occasions to broaden its programmatic elements, it focus remains and shines within its simplicity. A project for the disabled mind does not need to be a complex series of spaces, but should rather be straightforward and easy to comprehend. The center accomplishes this facet with it long, single-storey volume positioned against a blank wall to maximize open space and focus on the garden. The circulation was designed as a covered gallery and provides a singular, easily understood way to each space with the project.

Figure 2.3e. Linear Organization in Plan View

Figure 2.3d. Direct Path Urbain Architectencollectief

2.4. Susumy Uno: Kaze No Machi Miyabira

Figure 2.4a. Interior/Exterior Relationship Susume Uno

Figure 2.4b. Overhead Perspective View Susume Uno

This residential project located in Shobara, Japan is designed for elderly living where each unit is carefully organized to so that the exterior and interior spaces have a reciprocal relationship. Each unit consists of 3 “co-units” where a total of 10 people can reside. The smaller units consist of acommunal living space with three or four bedrooms organized around it. These bedrooms are located toward the rearside of the unit, while the living areas are appropriately arranged toward the frontal exterior spaces. A simple design feature to prioritize privacy.

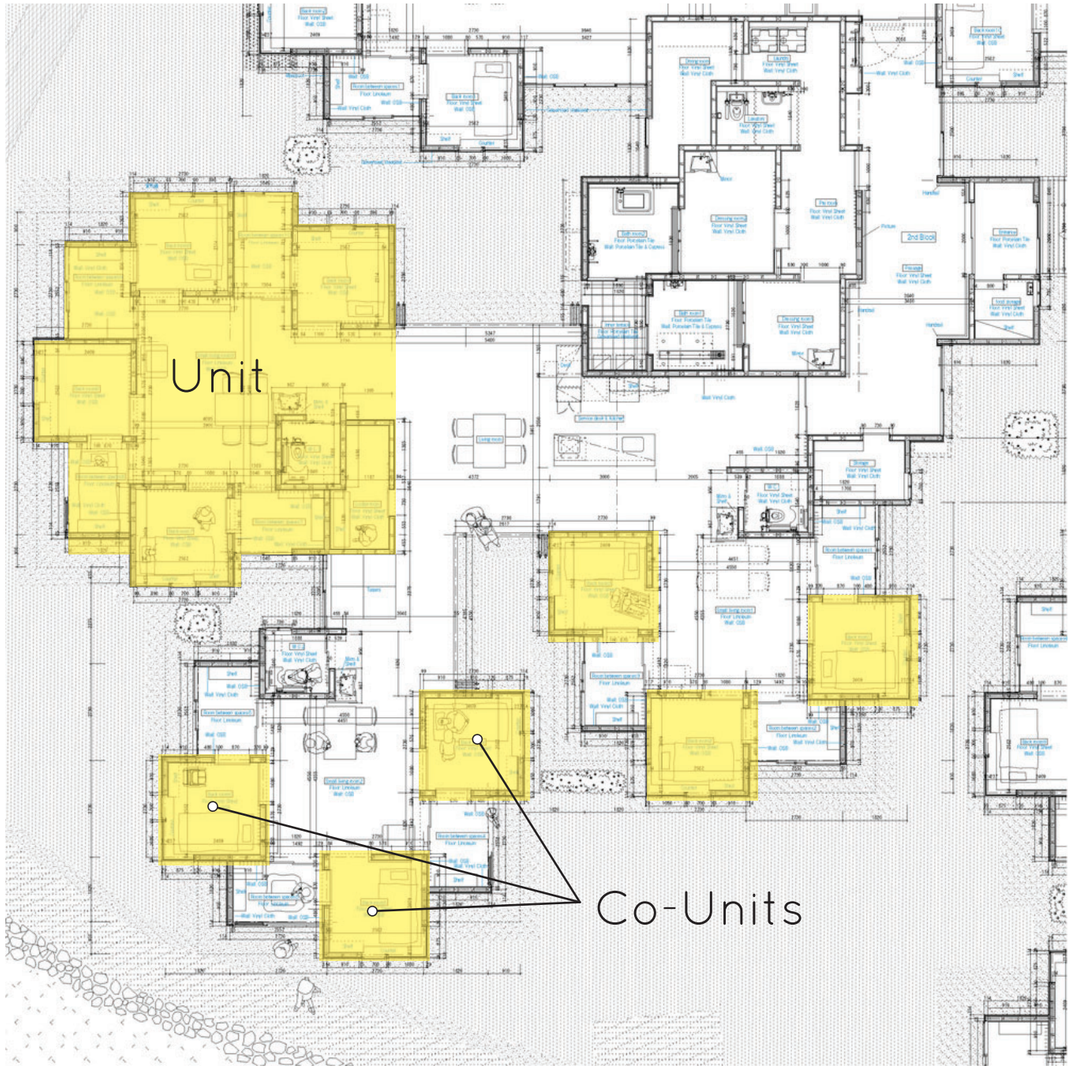


Figure 2.4c. Unit Organization

3. Site Selection and Analysis

"One of the more important problems of special needs individuals that have recently come to the forefront of research and literature is the issue of inclusion and respect in society. Through design it may be possible to assist such inclusion. The provision of community-linked services is essential to this end. Facilities such as the commercial outlets proposed create an opportunity for participant interaction with society." - Magda Mostafa

3.1. Andy's Home: Chattanooga, Tennessee

530 Manufacturers Rd, Chattanooga, TN 37405

This empty lot on the north shore of the Chattanooga River features a rather large area of roughly **333,500 square feet**. The relative size of the footprint of the site allows for **flexible design control** in terms of indoor-outdoor spatial relationships, programs, and circulation routes. The **waterfront orientation to the south** gives direct views across the river to the Chattanooga Aquarium and riverside plaza, the central area of entertainment within the city, to provide a **sense of inclusion** while also maintaining **feelings of privacy**.

Figure 3.1. Site Selection and Relevance

3.2.1. Community Linked Services

The city of Chattanooga is an ideal location for a project involving intellectual disabilites because of its array of programs that can be outsourced to nearby facilities with a relatively small proximity. The University of Tennessee-Chattanooga, for example, provides context for the residents to pursue a higher education and find a sense of belonging within the community. Outdoor areas, such as Coolidge Park and the Bluff View Art District provide easily-accessible ways to experience the culture of the city. Sports arenas like AT&T Field give way to community involvement through camaraderie and entertainment. Finally, facilities like Siskin's Learning Center allow them to find and create a legacy of their own from the ground up.

Coolidge Park

Coolidge Park is the largest park in the downtown area and sits within walking distance of the site and across the trees of the eastern side. The park is often the venue for major city events and social gatherings, allowing for easily-accessibile community involvement without full escaping the safety of the project.

Chattanooga Theatre Center

The Chattanooga Theatre Center is a local venue for plays, musicals, and educational shows located at the other edge of Coolidge Park. Not only does this provide nearby educational and education opportunities, but also the possibility of project residents finding their passion for acting in a familiar environment.

Walnut Bridge

The Walnut Bridge is a pedestrian path famous for its scenic walk across the river. Less than a half-mile in length, it serves as the connector between the North Shore area of the city and its center. It represents both a functional and recreational tool for the residents of the project.

3.2.2. Community Linked Services

Bluff View Art District

While the Bluff View Art District is the most scenic-based area of the city. Its small corner parks and collection of local restaurants and art displays is an easily accessible source of city culture for the project residents to experience and engage within the community's unique offerings.

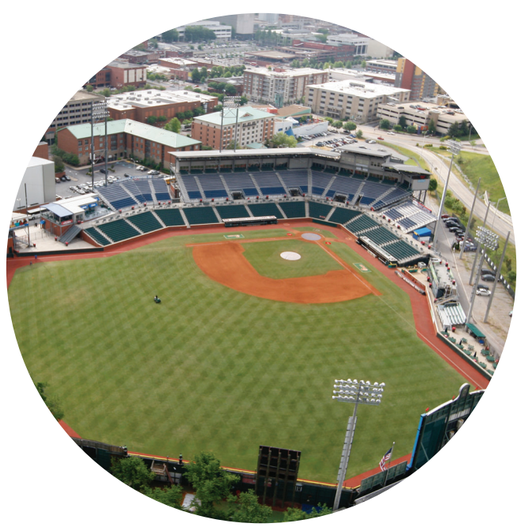
Chattanooga Aquarium

The Chattanooga Aquarium is the most famous attraction in the city and provides educational opportunities in an interactive format to engage the project residents, as well as potential in the form of occupational opportunity.

Siskin's Learning Center

The Siskin's Learning Center has provided high-quality education for children with special needs for over 70 years. Having this center in close proximity to the proposed project for young adults not only helps with the transition from the educational system if needed, but allows them to be involved in the growth of others with similar setbacks and give back to the community.

AT&T Field



AT&T Field hosts the minor-league baseball team known as the Chattanooga Lookouts. Sports can be a very strong tool for individuals to feel engaged within their community and form bonds with those around them in the form of similar interest.

3.2.3. Community Linked Services

Blue Cross/Blue Shield

The Blue Cross/Blue Shield Health Center is a multi-faceted healthcare clinic on the southeastern shore. Having the clinic nearby provides potential for health-driven research with the project resident's consent without sacrficing in-home privacy, as well as the more evident reasons in the case of emergency situations.

Chattanooga Zoo

The Chattanooga Zoo, much like the local aquarium, has the opportunity to meet educational and occupational needs of the residents. Exhibits like the petting areas allow for direct interaction with animals, a proven source of sensory relief.

Hamilton Volunteer Center

The Hamilton Volunteer Center has a dual-action benefit in that it provides an easily-accessible source of volunteers to assist project residents where applicable, as well as the opportunity for the residents to engage further into the community through volunteer work themselves.

McKenzie Arena

The McKenzie Arena hosts a number of sports events, as well as other forms of entertainment. Associated heavily with UTC, it adds another layer of potential to the community-driven idea behind sports involvement to find the same sense of inclusion with the university where they will attend classes.

3.2.4. Community Linked Services

UTC Aquatics/Recreation Center

The UTC Aquatics and Recreation Center gives a nearby facility to participate in active interests outside of the day-to-day activites on-site, such as swimming lessons and tennis. The center being fully facilitated by the university additionally allows for these activities to be intertwined with their higher education.

UTC Library

The UTC Library is also facilitated by the university and provides learning opportunities in regard to their higher education and personal interests. The sensorial environment also has high occupational potential for project residents, such as shelf organization or desk attendance.

Challenger Learning Center

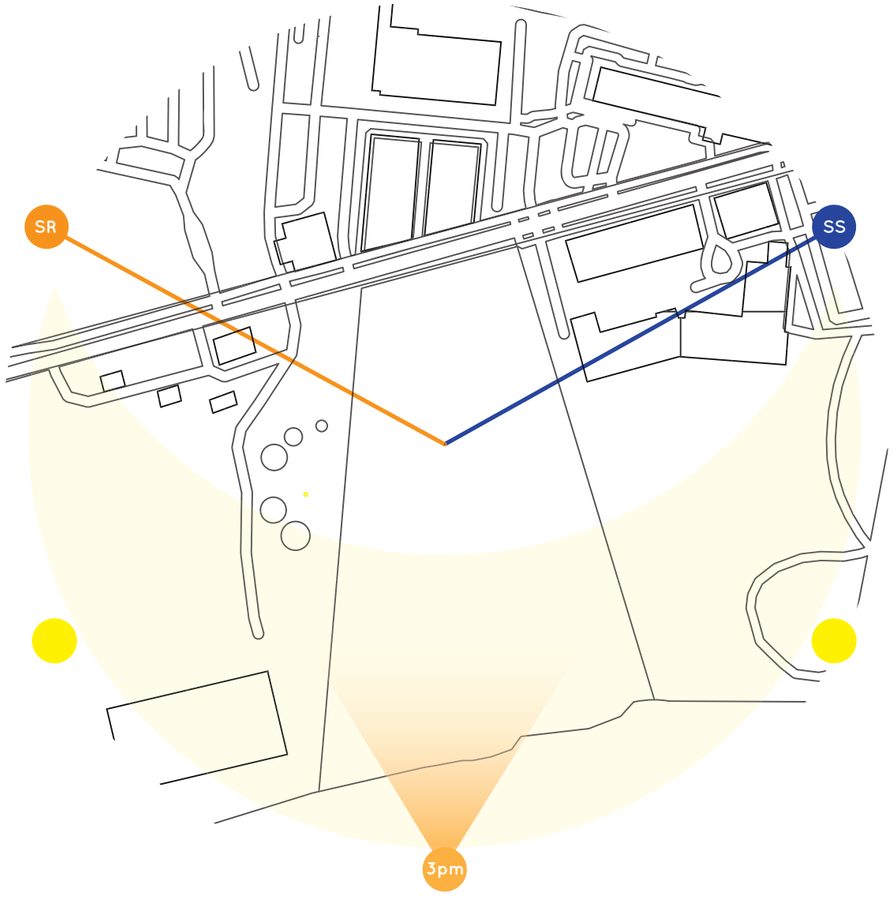
The Challenger Learning Center is a UTC STEM-based educational center with a very interactive format for understanding physics and space travel, including team building exercises and individual learning experiences.

Erlanger Children's Hospital

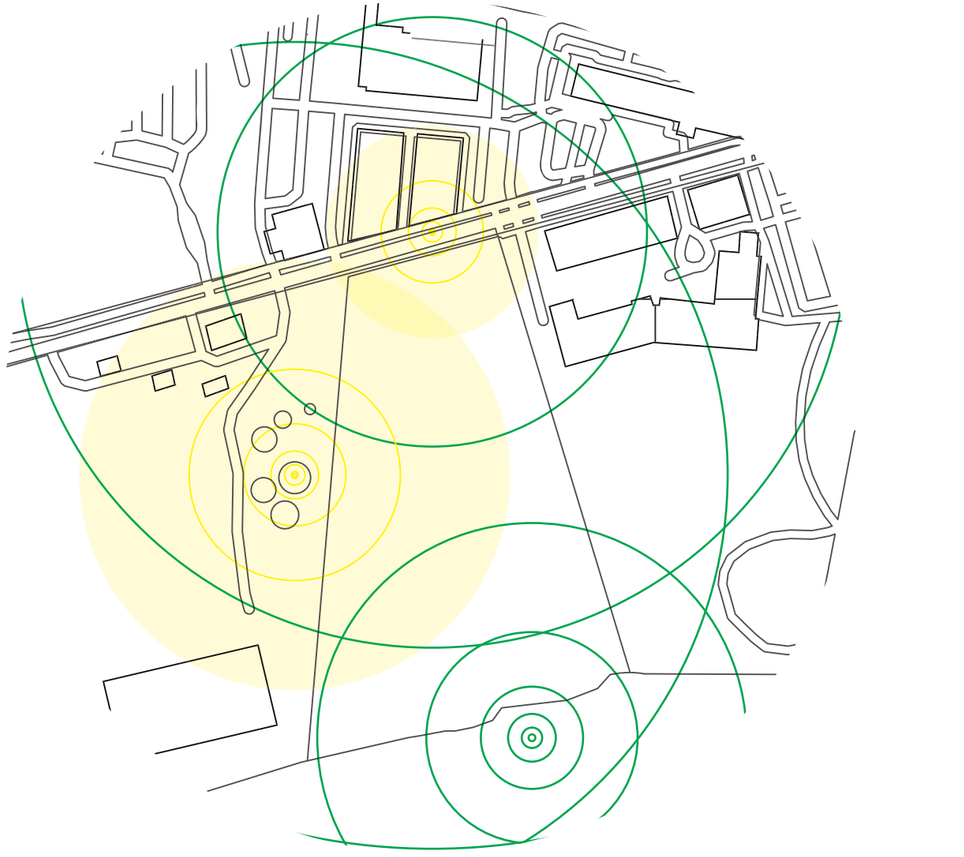
Erlanger Children's Hospital is a pediatric outpatient center, while not generally intended for young adults, may be better suited to meet the needs of higher spectrum residents in the case of emergency. This is especially true in the case of the need for an extended stay.

3.3. Design Relevant Site Conditions

Sun Path



Sound Analysis



<60 dB >60 dB

Figure 3.3. External Site Design Factors

4. Site Implementation

"This would involve developing designs emphasizing order, sequence and routine. Activities could be arranged to follow a sort of one-way' circulation arrangement, according to the daily schedule. Different activities could be clear visually and spatially defined." - Magda Mostafa

4.1. Integration Process

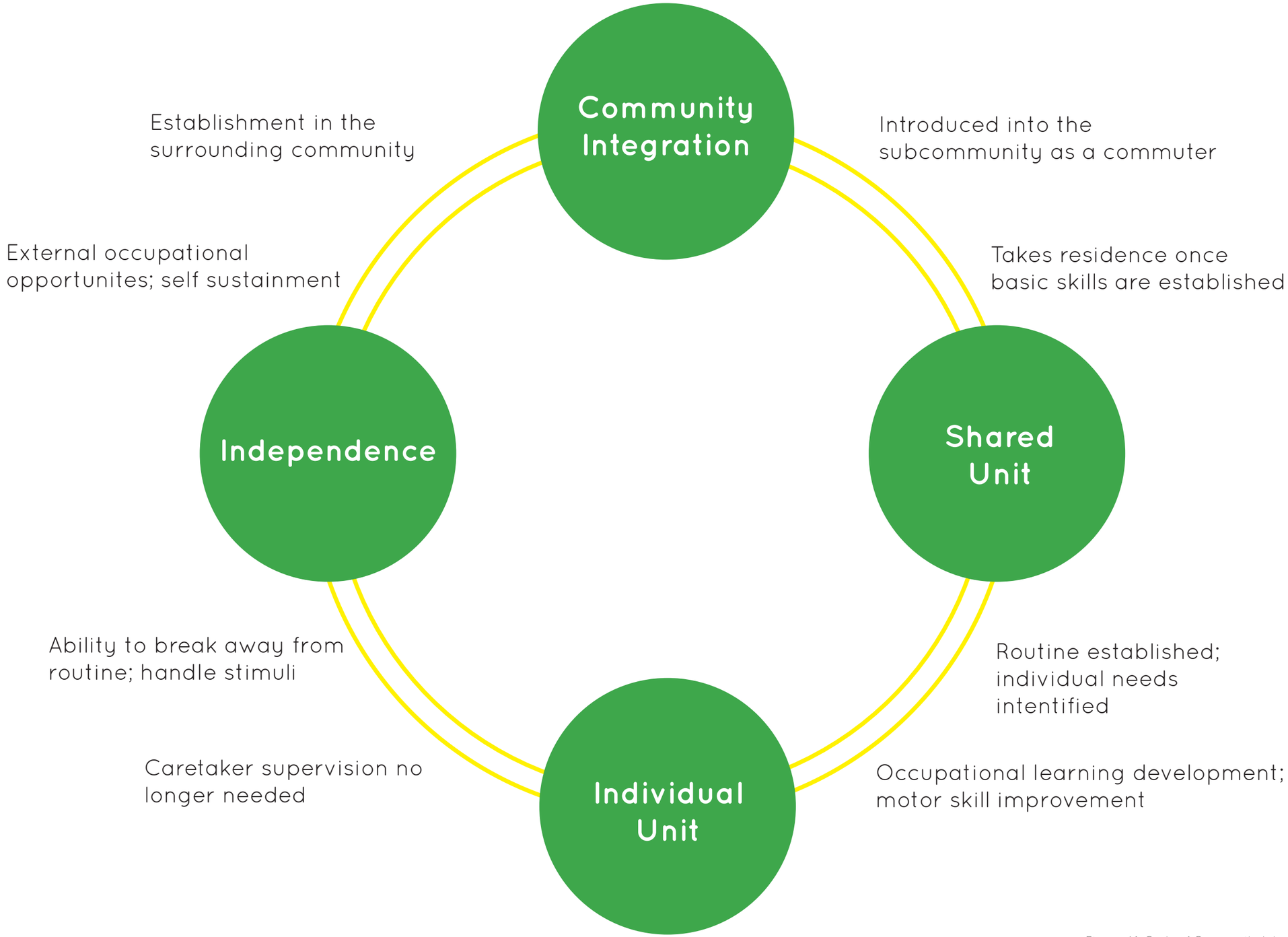
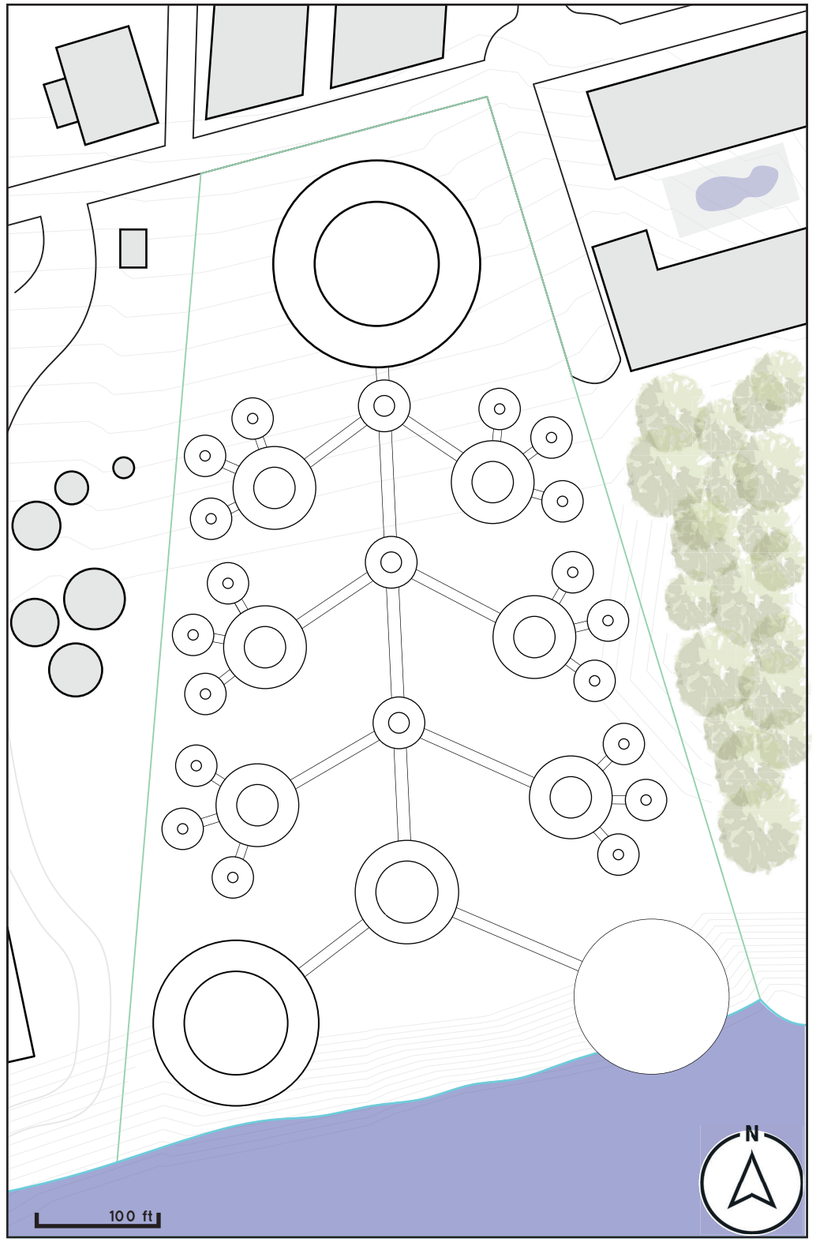


Figure 4.1. Cycle of Community Integration

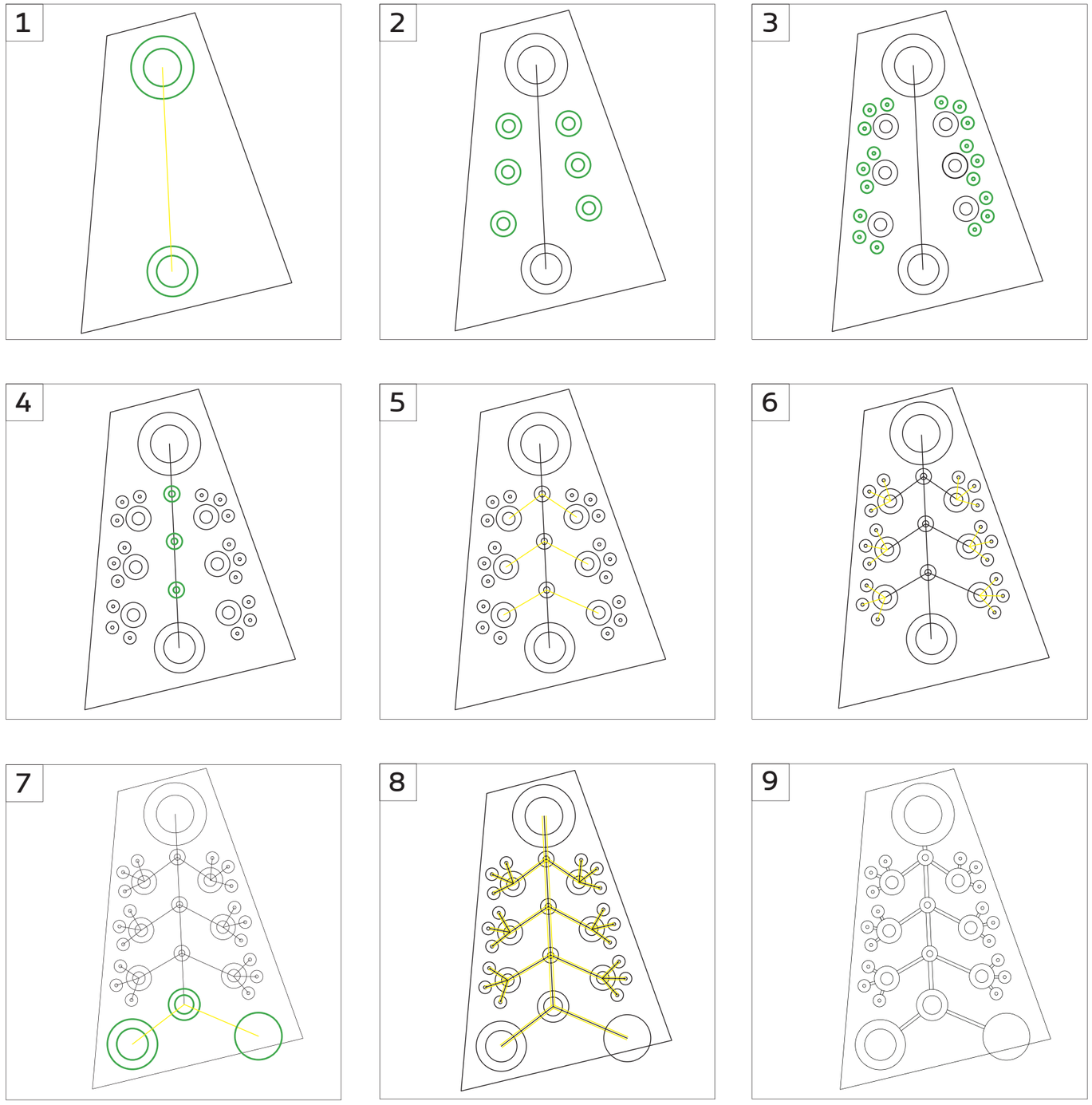
4.2.1. Master Plan



The master plan developed for this project was designed to **simplify a rather broad system of functional spaces** into a seamless project that allows for **reinforcement of routine** without sacrificing opportunities for a universally pleasing architectural aesthetic. Each aspect of the project is meant to **follow a hierarchy that is established by organization according to the level of sensorial stimulus**. From this concept, a **system of spatial sequencing** can be developed simultaneously. For example, the **main path traveling north to south is 12 feet wide**. As one travels from the occupational center toward their on-site residence, they will come across a **wayfinding point that helps them to differentiate** when to branch off toward the secondary path that is 9 feet wide. This will bring them to their **modular unit if they are working residents**. For those who have **established working occupation within the surrounding community and a sense of individual independence**, they can travel further through the multi-bedroom unit courtyard to their own individual unit. Here the **courtyard is meant to serve as an additional wayfinding point**, while also bringing light into the semi-private spaces of the units. A **similar hierarchy is established through the variable height of the buildings and relative sightlines**. The buildings with increased height will be more visible, and deemed more accessible off first glance.

Figure 4.2.1. Master Plan Illustrated

4.2.2. Master Plan



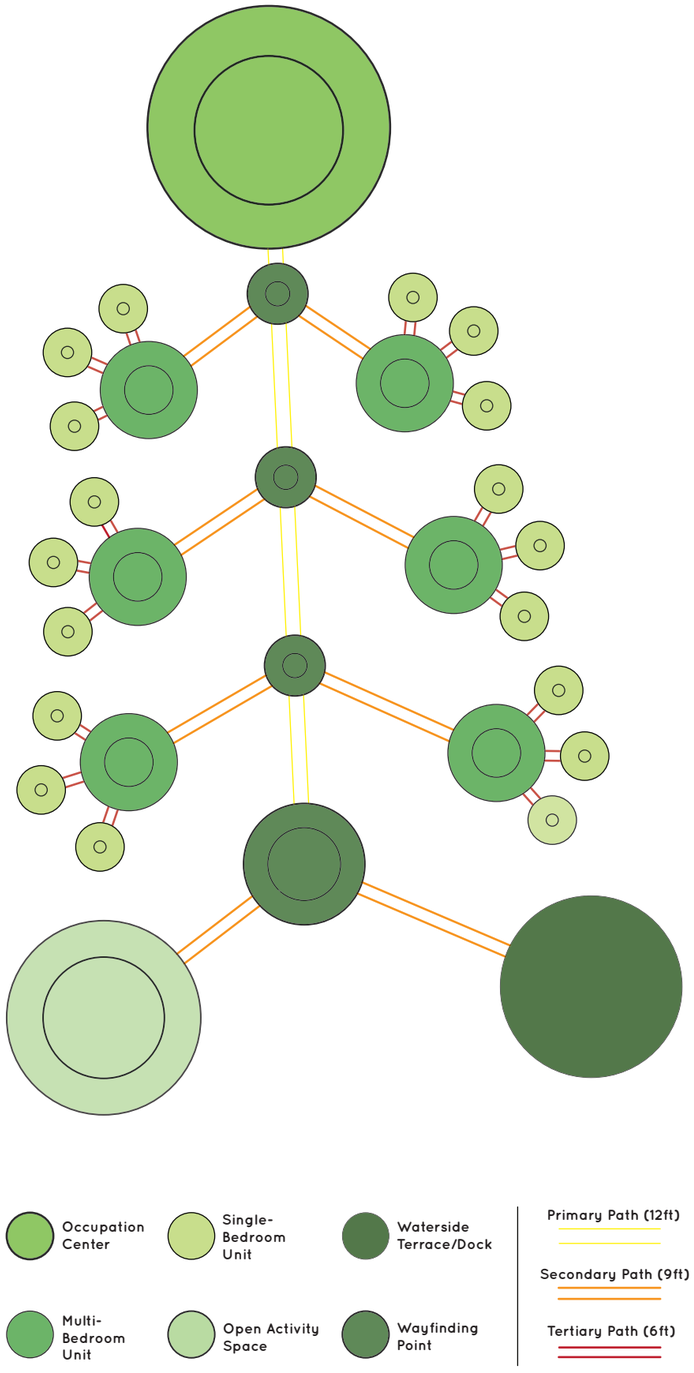
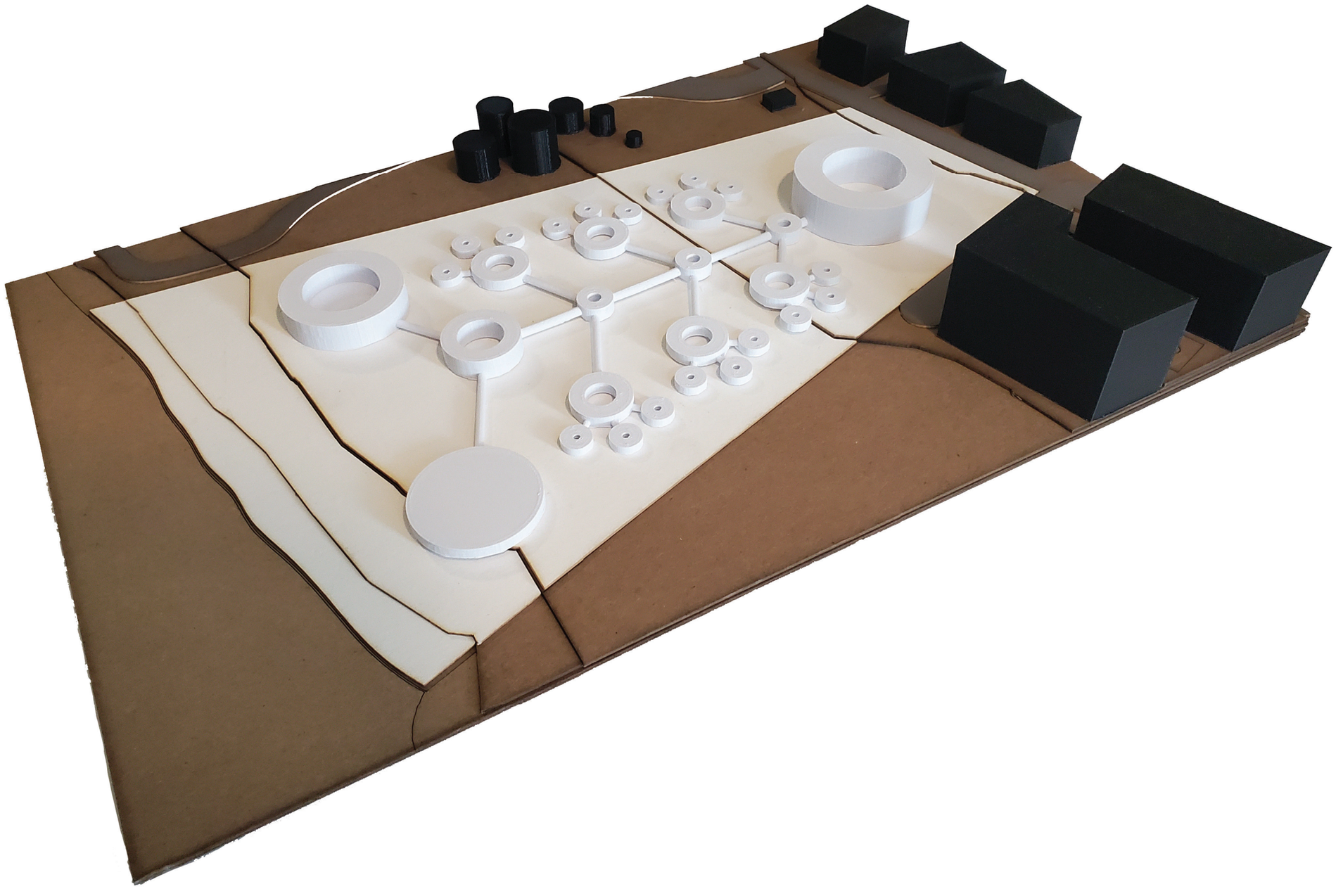


Figure 4.2.2. Master Plan Program Distribution Process

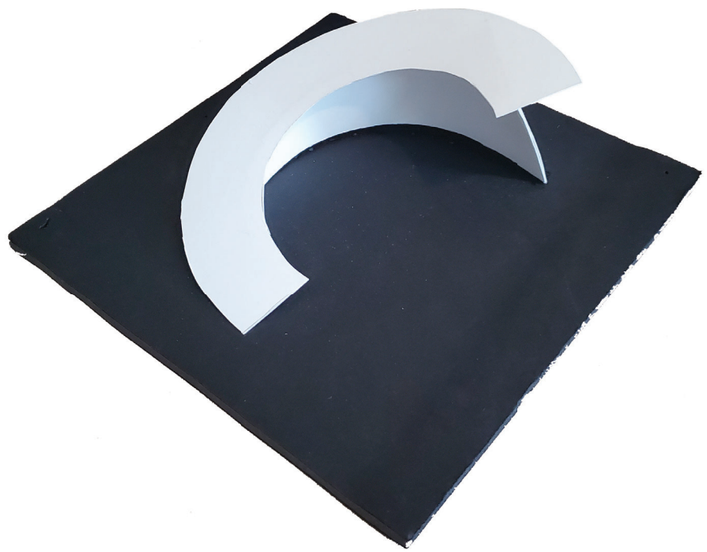
4.2.3. Master Plan

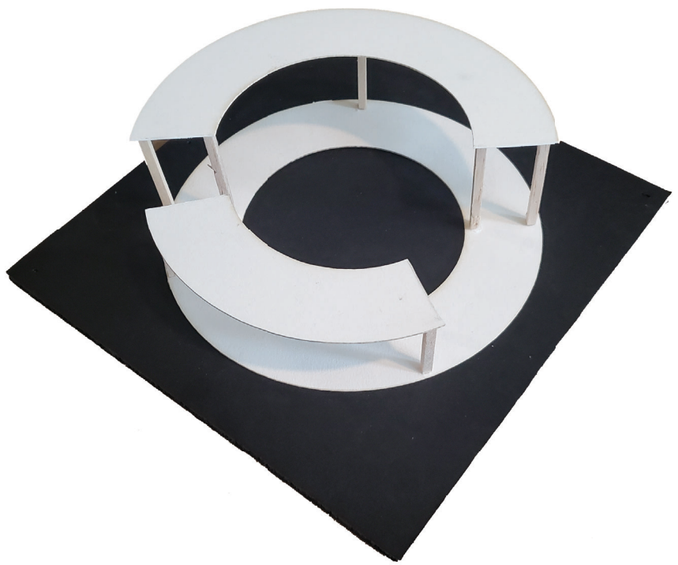


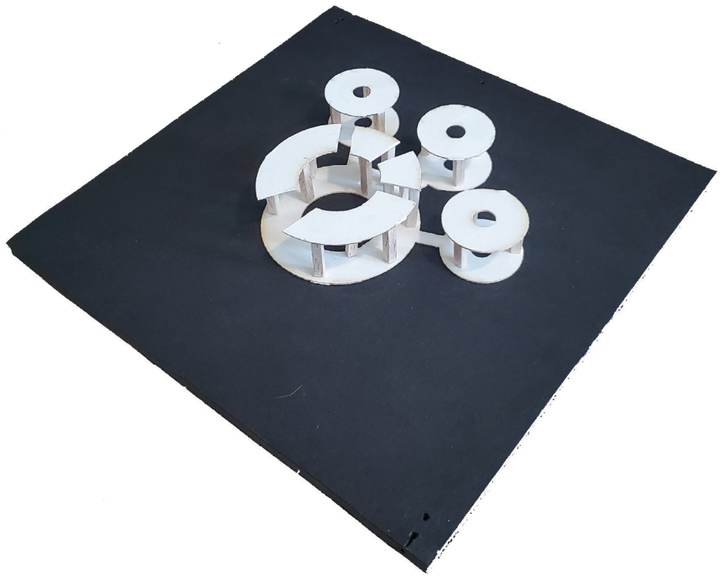
5. Design Development

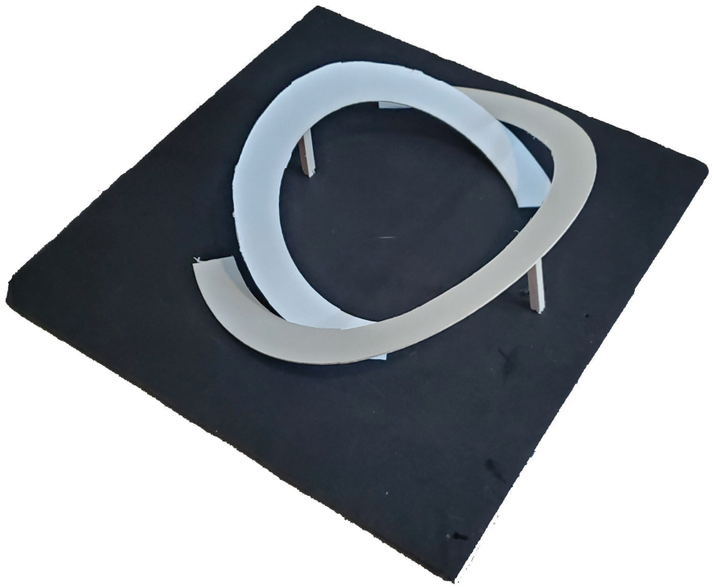
"When designing for a group of individuals with the sensory challenges, the organization of functions with respect to one another is of great importance. This functional organization, or zoning, has great impact on the comfort of the user, the conducive quality of the healing and learning environment, as well as the independence enjoyed as they navigate the center."
– Magda Mostafa

5.1. Initial Form Experimentation









5.2.1. Occupational Center

The occupational center serves as the **primary means of skill advancement** for both on-site residents and outside commuters. The interior spaces are programmed to allow for **educational learning** alongside **physical task and motor skill development**. These spaces are **organized in order of increasing stimuli** both horizontally and vertically from the residental entrance. In contrast**, the exterior garden functions as the pinnacle** of this development, with **exposure to natural stimuli** when ready so that the users can be prepared for them as they encounter them in everyday, uncontrolled environments.

5.2.2. Final Form Finding

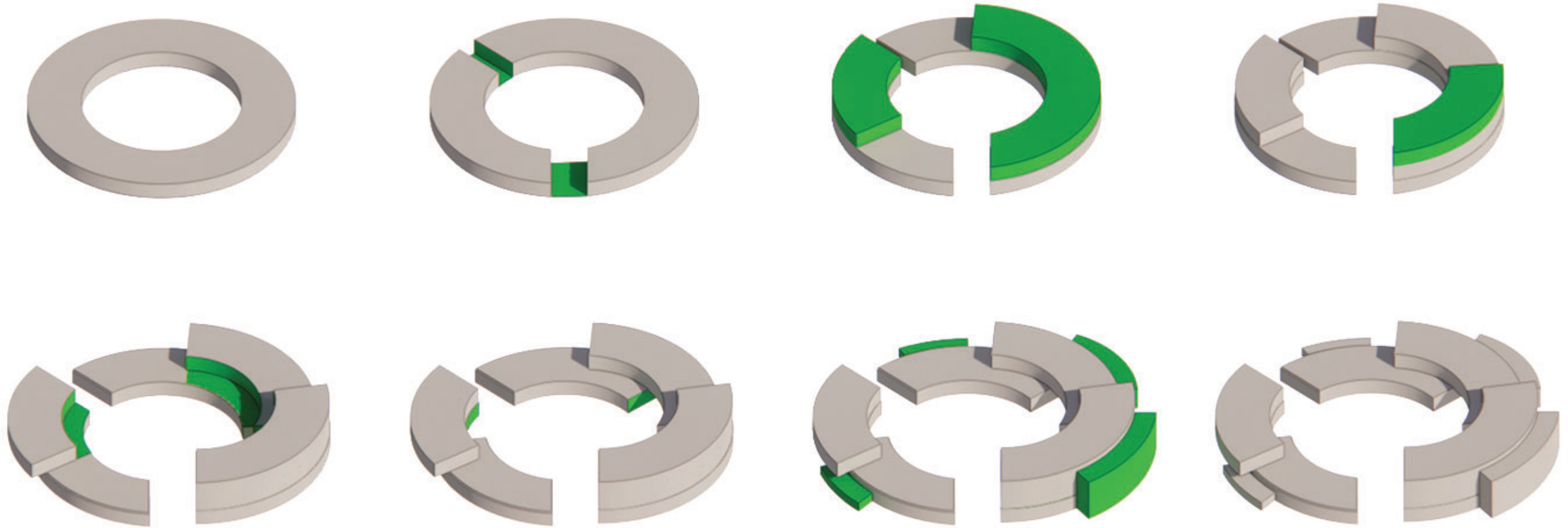


Figure 5.2.2. Occupational Formative Process

5.2.3. Sensory Design Integration

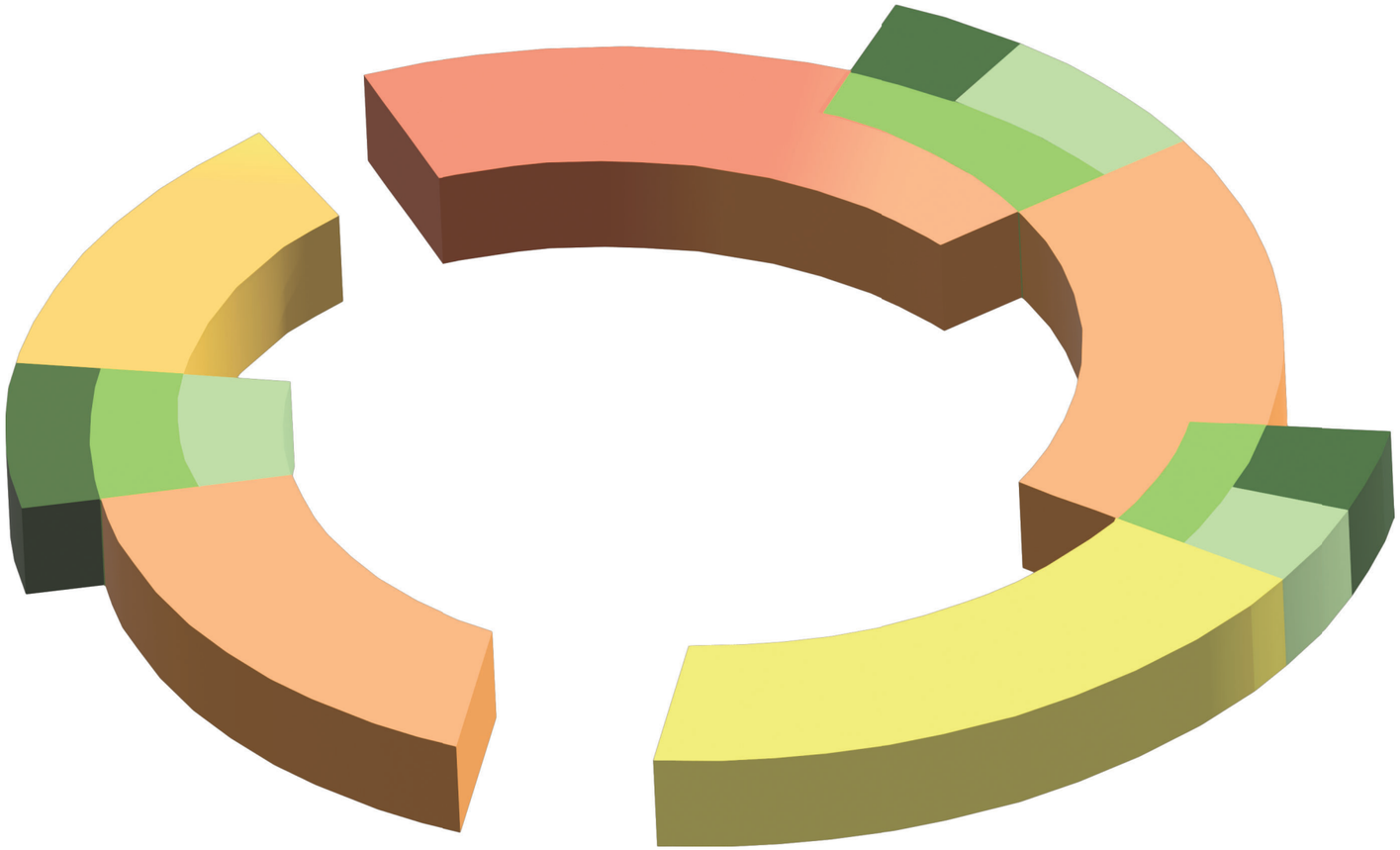


Figure 5.2.3. Sensory Zoning

5.2.4. Transition Zones

Transition zones in the project enable users to **compartmentalize programmatic spaces** from each other and **allow themselves to 'buffer'** when navigating between them. **Viewing windows** can be utilized here in conj unction with **strategically placed seating** to give time to decide when they are **ready to move forward** into the next space.

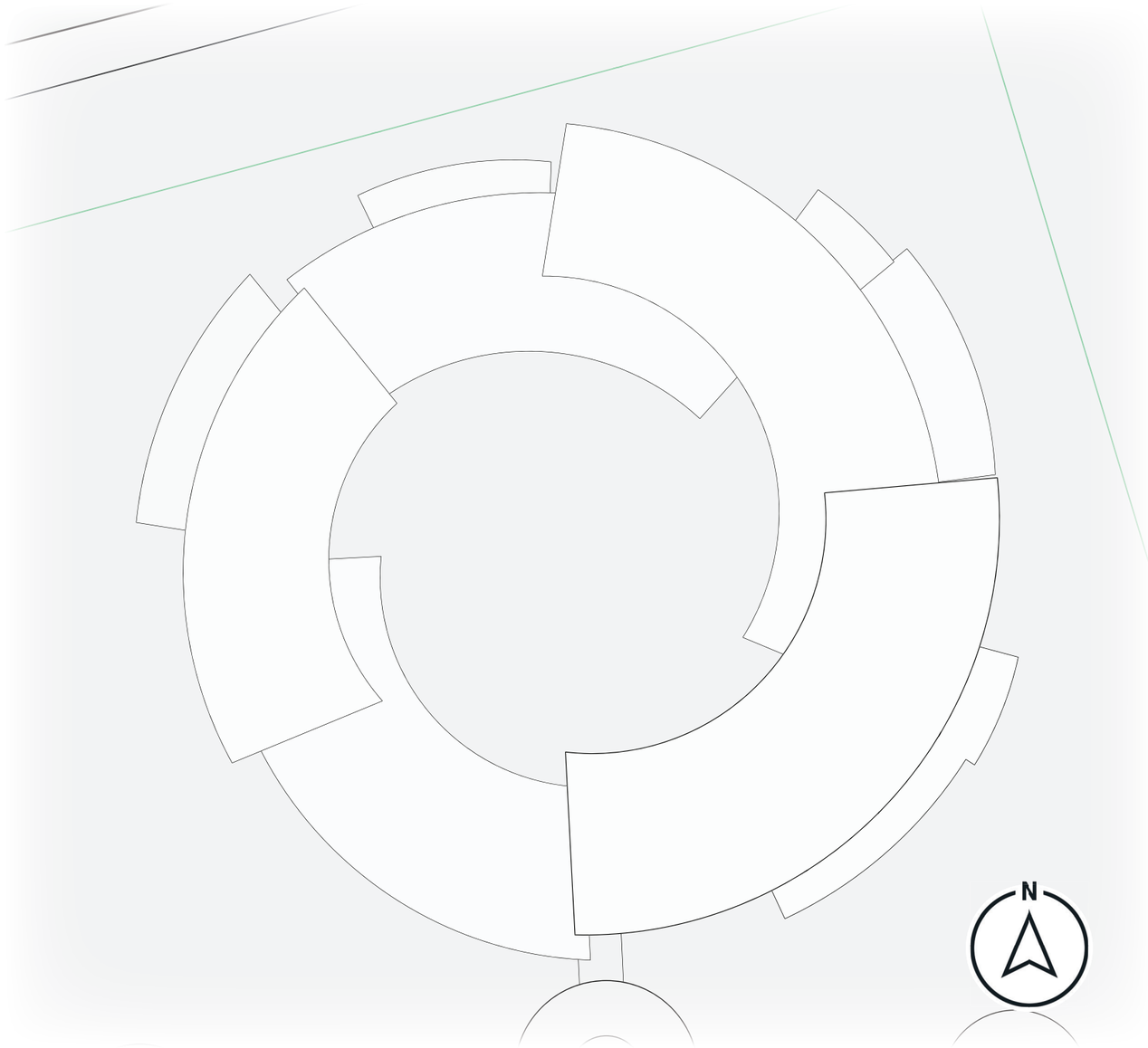
5.2.5. Escape Rooms

Escape rooms in the project are **connected directly to the transition zones** so that they can be be **easily accessible from any given space** in the project. These spaces are designed to allow users to **completely segment themselves** from any programmatic activity for the sake of internal recalibration.

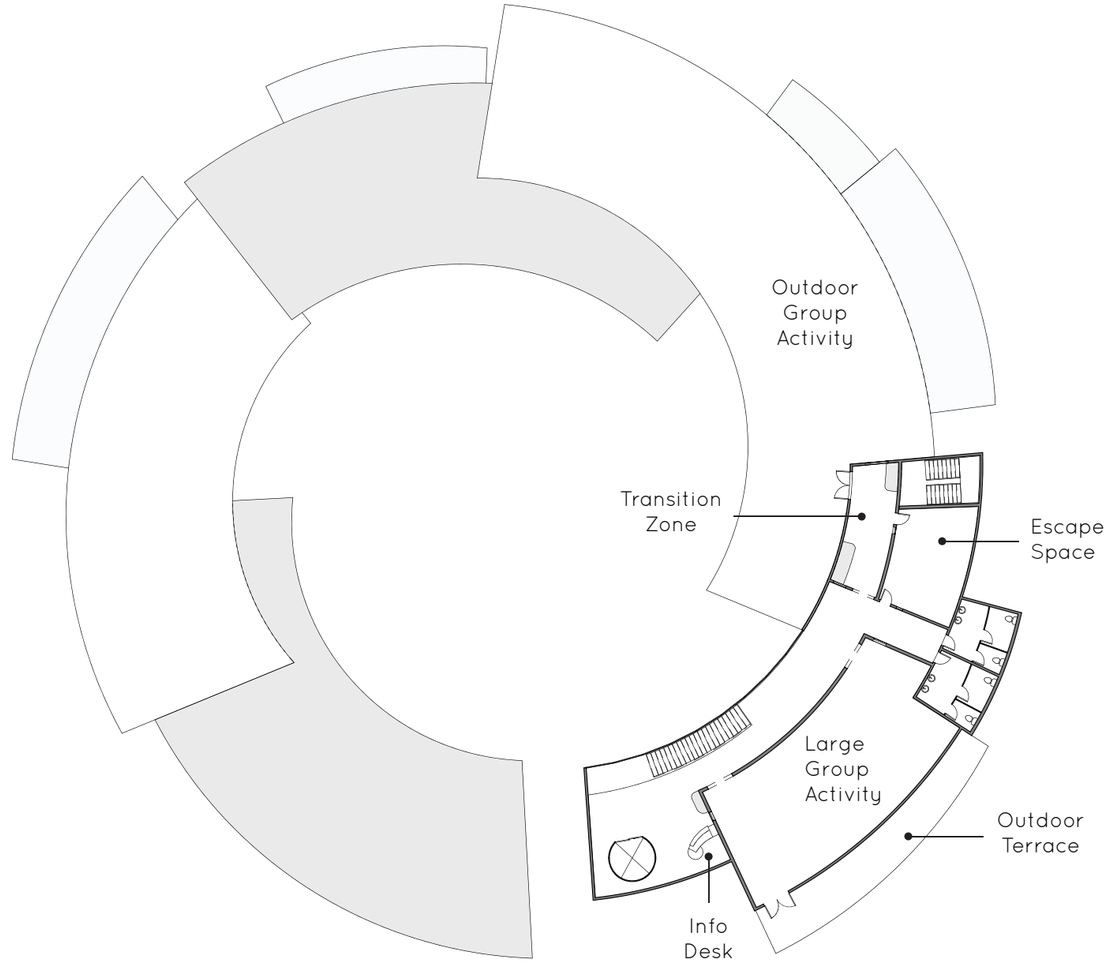
5.2.6. Activity Spaces

Activity spaces are designed to **enable users to advance themselves** both mentally and physically **without the presence of unnecessary stimuli**. The activity spaces feature **acoustic ceiling tiles** to ensure acoustical comfort and **clerestory windows** to allow natural light without overstimulating glare.

5.2.7.1. Occupational Center Floor Plans



Site Plan

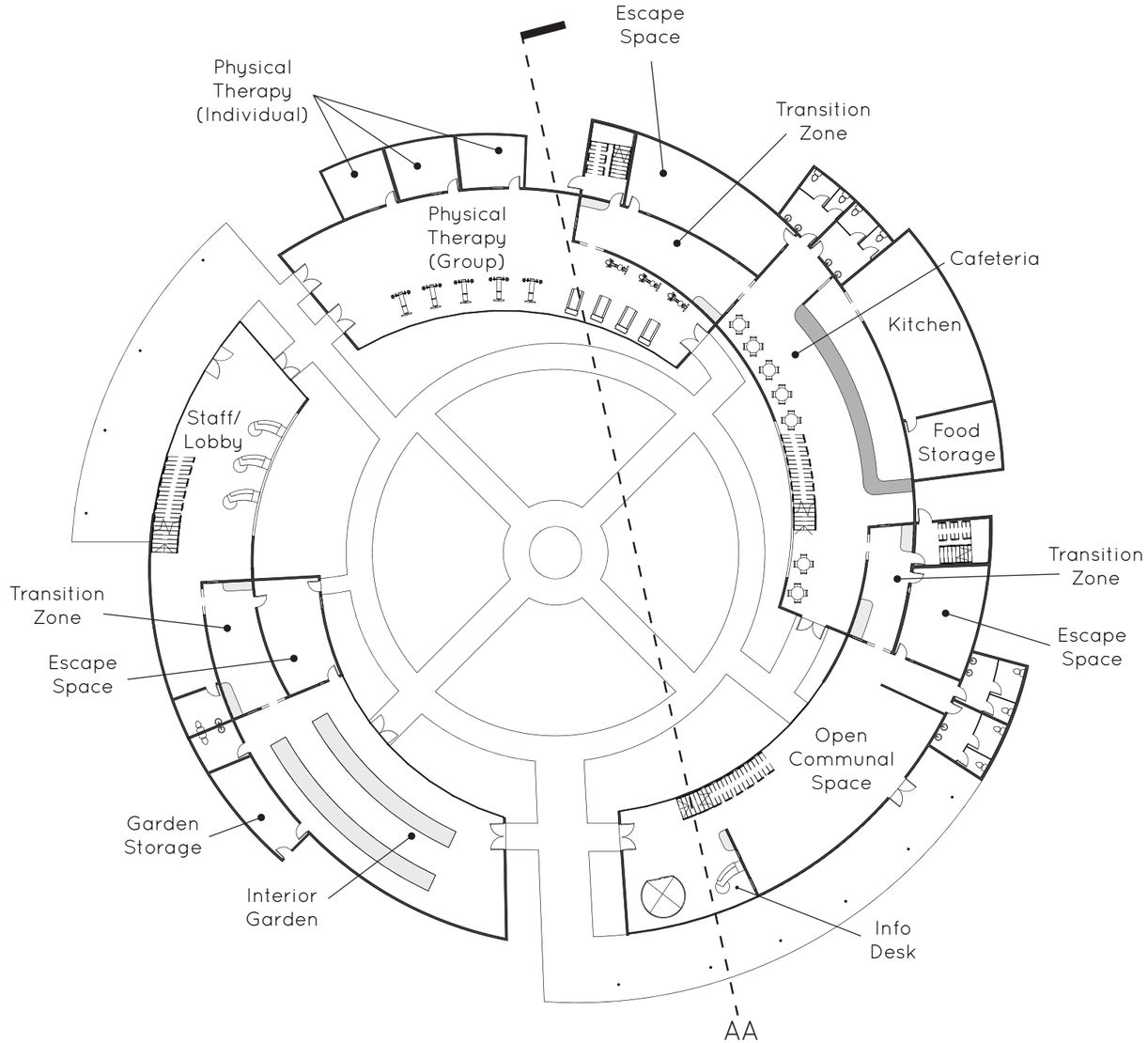


Third Floor Plan

Scale 1/32” = 1’

5.2.7.2. Occupational Center Floor Plans

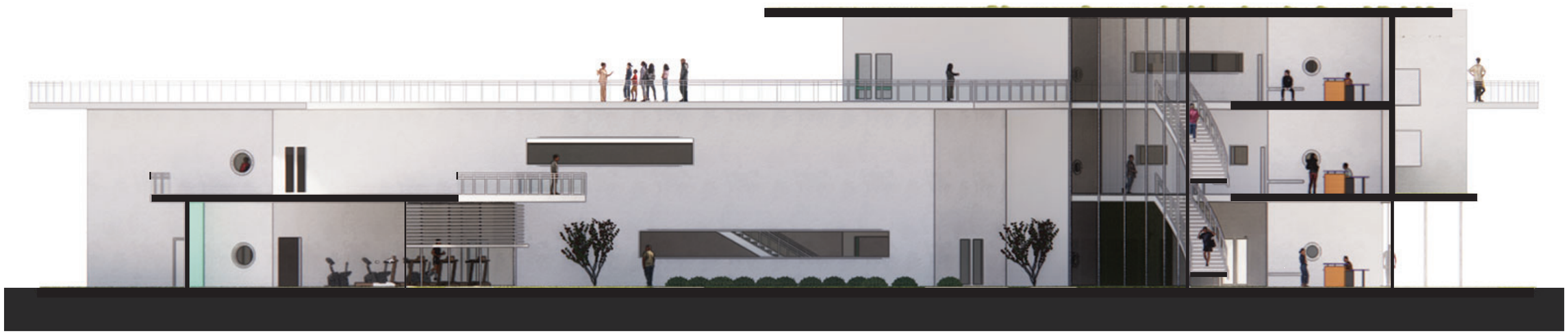
Second Floor Plan



First Floor Plan

Scale 1/32” = 1’

5.2.8. Occupational Center Section



Section AA (Interior Ring)

Scale 3/16” = 1’

5.2.9. Occupational Center Elevation

South Elevation (Exterior Ring)

Scale 3/16” = 1’

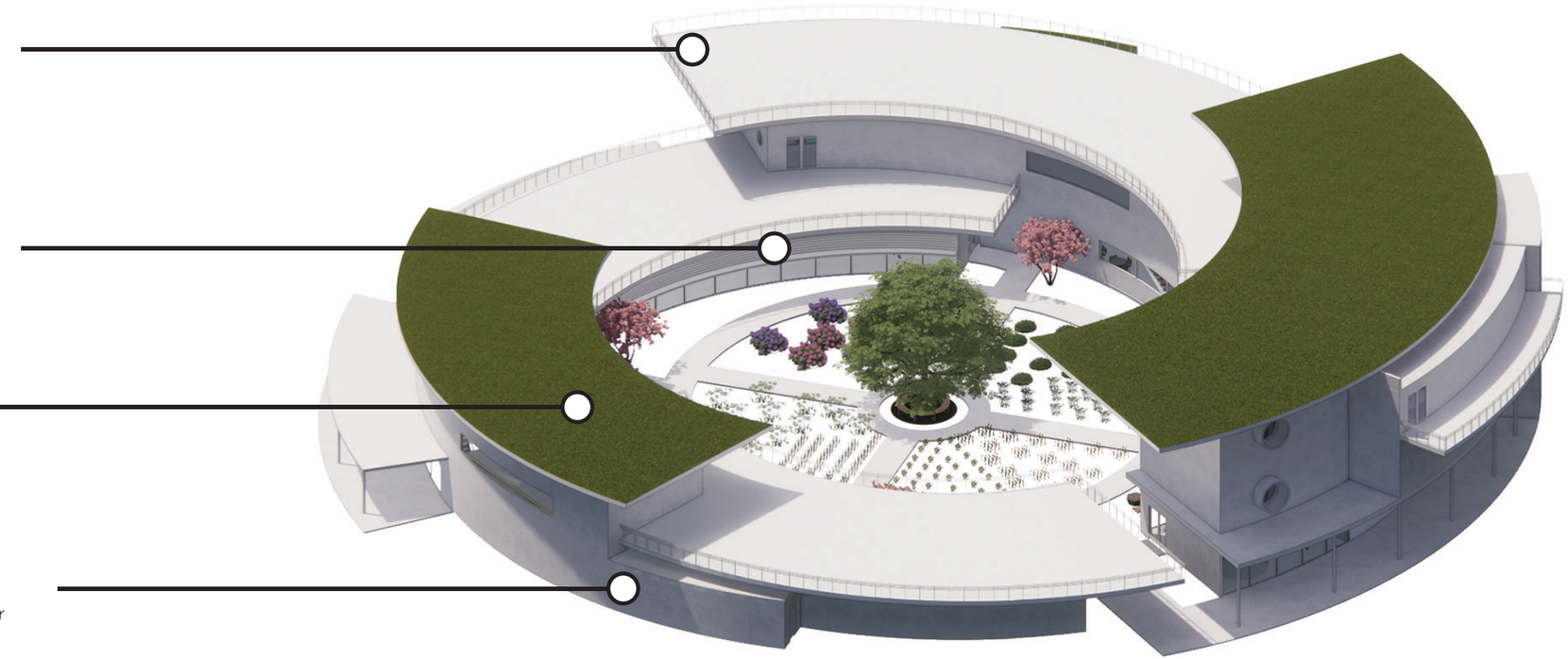
5.2.10. Occupational Center Axonometric

Roof surfaces are extended from the building form to serve as shading devices, work in sync with clerestory windows, and create playful interchanges between the exterior and interior

Louvers placed above eye level in combination with light shelves allow for direct views into the courtyard from the southern facade of the interior ring without direct glare

Green roofs are incorporated where applicable for water collection primarily used to provide supplemental irrigation to the communal garden

The primary building material consists of glass fibre reinforced concrete due to its smoother appearance and increased properties of tensile strength that allow for the overhangs to be more exaggerated



High Stimulus

Low Stimulus

Figure 5.2.10. Occupational Center Informative Axonometric

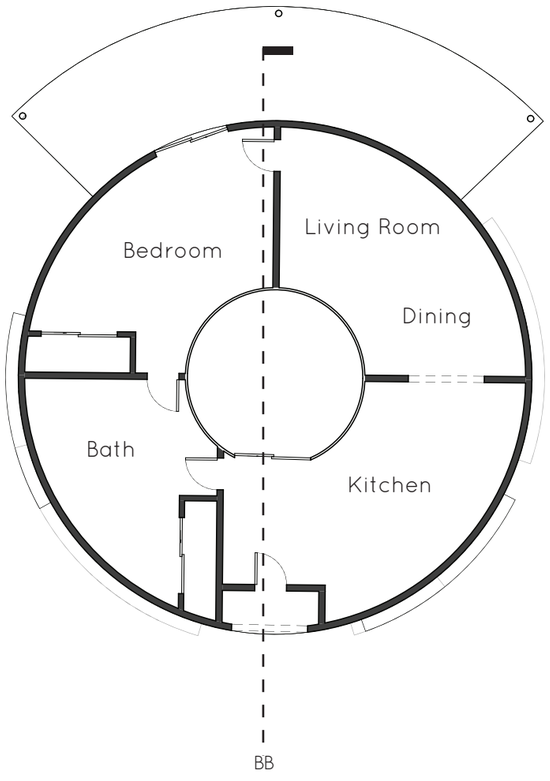
5.3.1. Residential Units

The modular residential units are designed so that they could be **incorportated at any site orientation and scale**. The circular composition of the multi-bedroom plan allows for **changes in the number of bedrooms by simply** adjusting its overall radius with the courtyard garden proportionally. From the courtyard, apertures within the plan allow for **direct circulation and associated sight lines to the individual units**. These units follow a more simplified design scheme for comfortability at the highest tier of independent living within the project and can be rotated so that they **can be 'attached' at any angle of the multi-bedroom plan**. Individuals of the single unit courtyards allow for a single tree to be taken care of so that they can **maintain the core routine** that is established by the subcommunity's system of living.

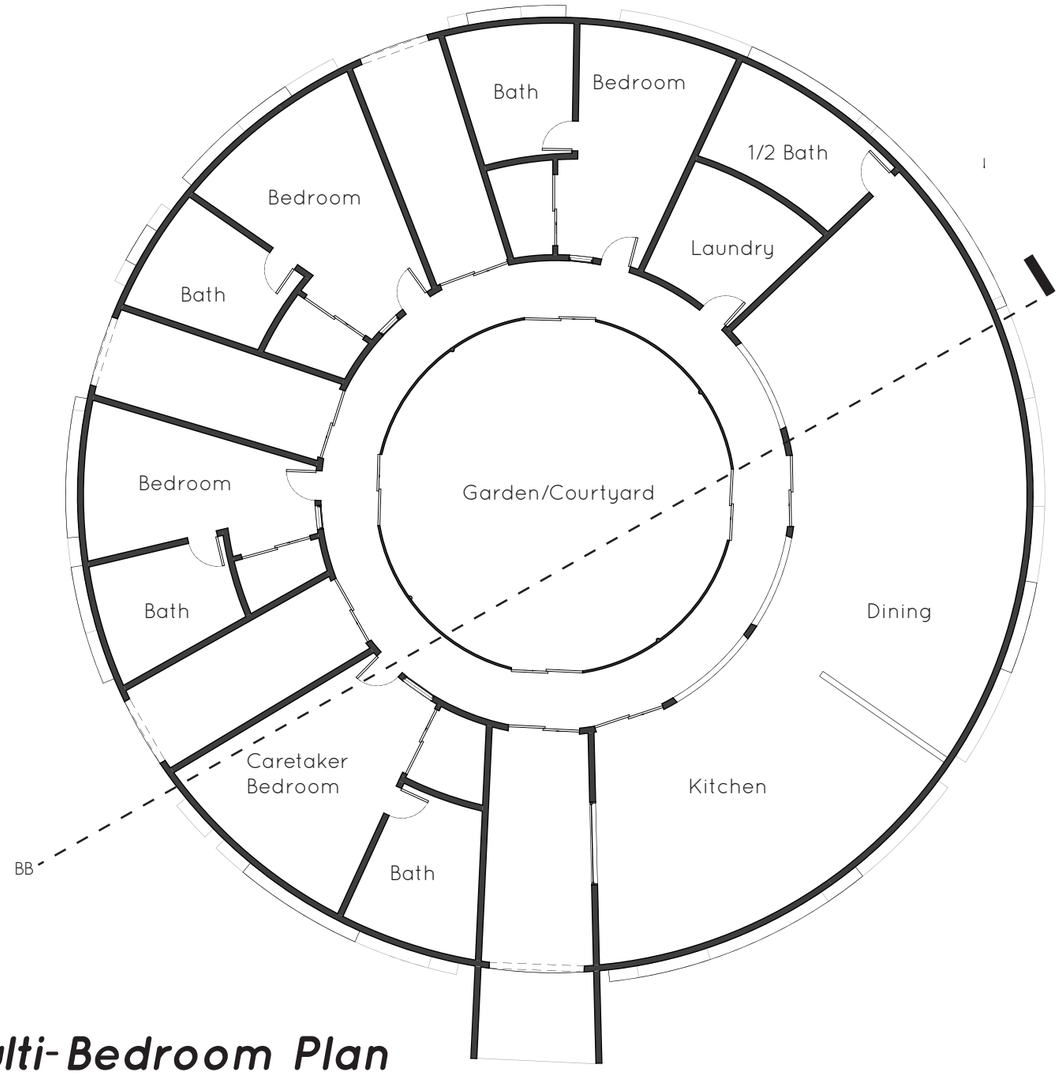
5.3.2. Residential Site Plan

Scale 1/16” = 1’

5.3.3. Residential Floor Plans



Single Unit Plan

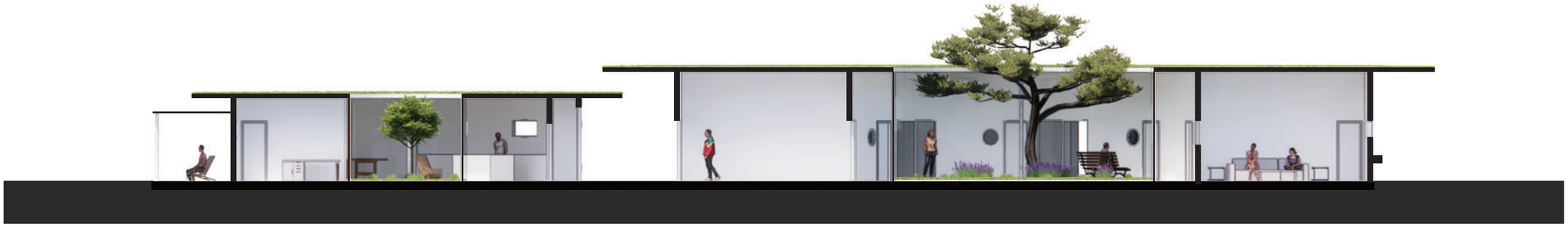


Multi-Bedroom Plan

Scale 3/16” = 1’

5.3.4. Residential Section

Section BB (Through Connected Corridor)



Scale 3/16” = 1’

5.3.5. Residential Axonometric

Rear overhang provides private patio space for individual residents

Private courtyard in individual units allow for resident to maintain the routine established by the community process by caring for a single tree

Large openings in shared unit give direct sight lines to individual units for social connection and wayfinding purposes

Use of herbs/flowers specific to each module to assist users in unit identification by olfactory signals

Extruded facade design uses high-stimulus colors to help users visually differentiate modular design

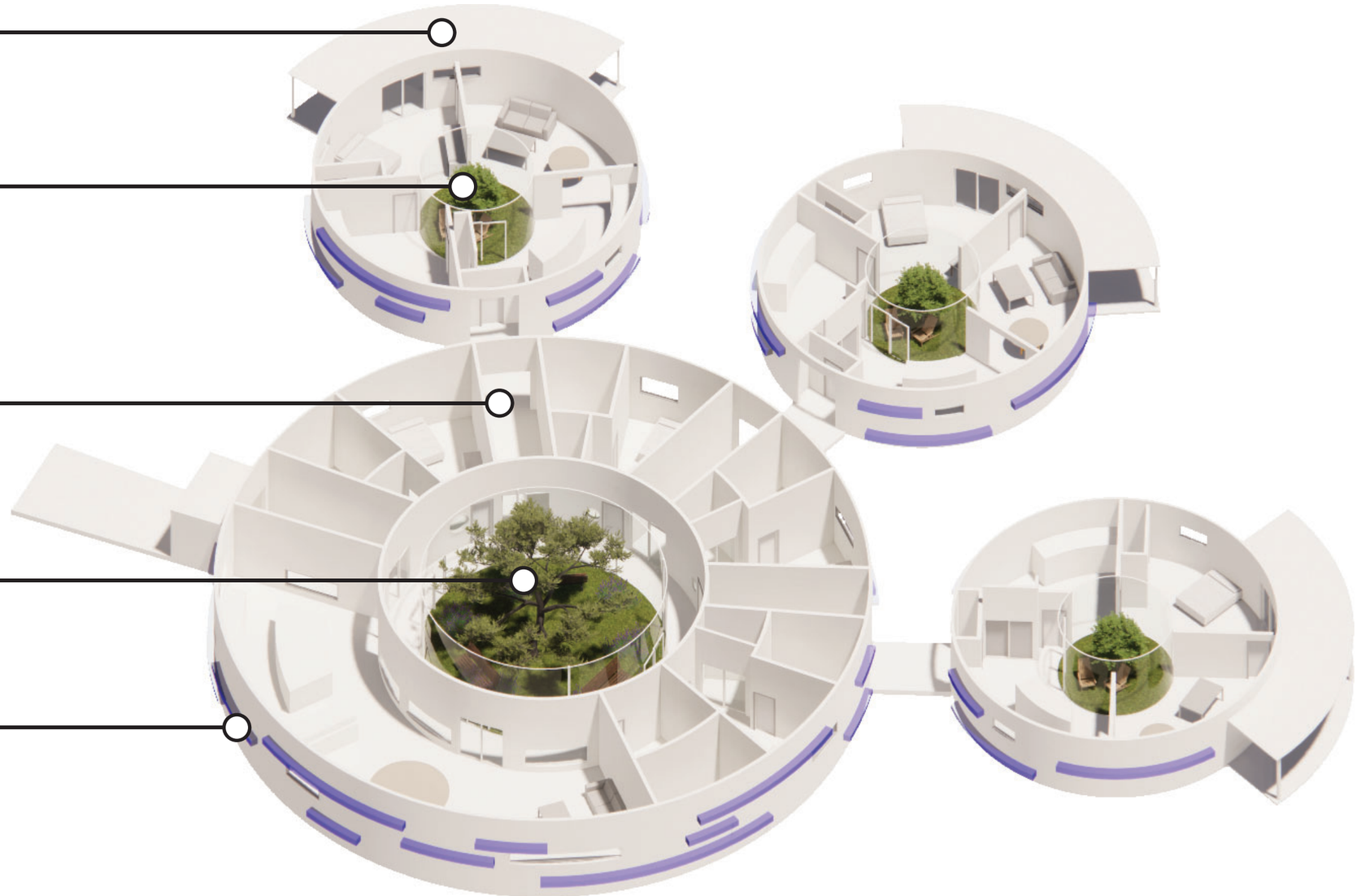


Figure 5.2.10. Residential Center Informative Axonometric

5.4.1. Wayfinding Points

Wayfinding points in the project are primarily used as a means of **indicating intersections that allow for deviation from the primary path**, as well as allows for users to **gain height to and clear sight lines** for navigation purposes. Each point is designed to be unique so that they are **easily differentiated from one another**. The **final waypoint (right) features a returning slope to signify the end** of the path while also providing views across the river.

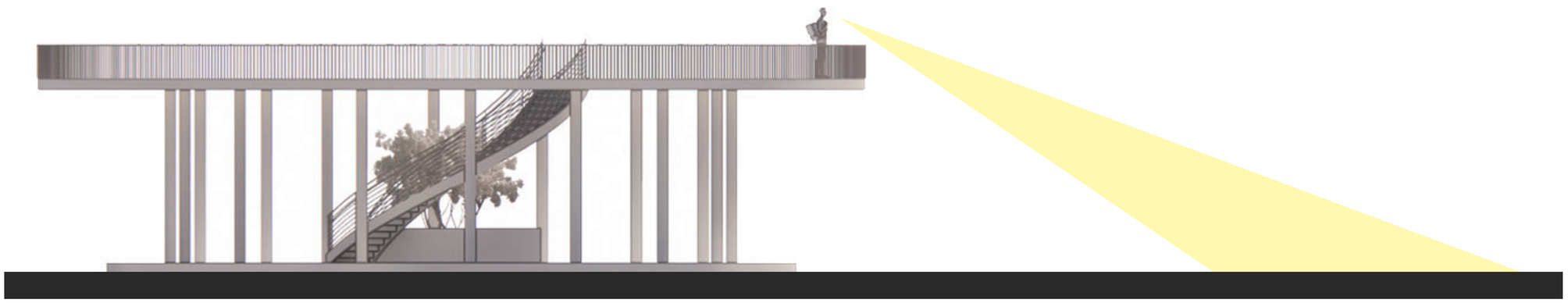
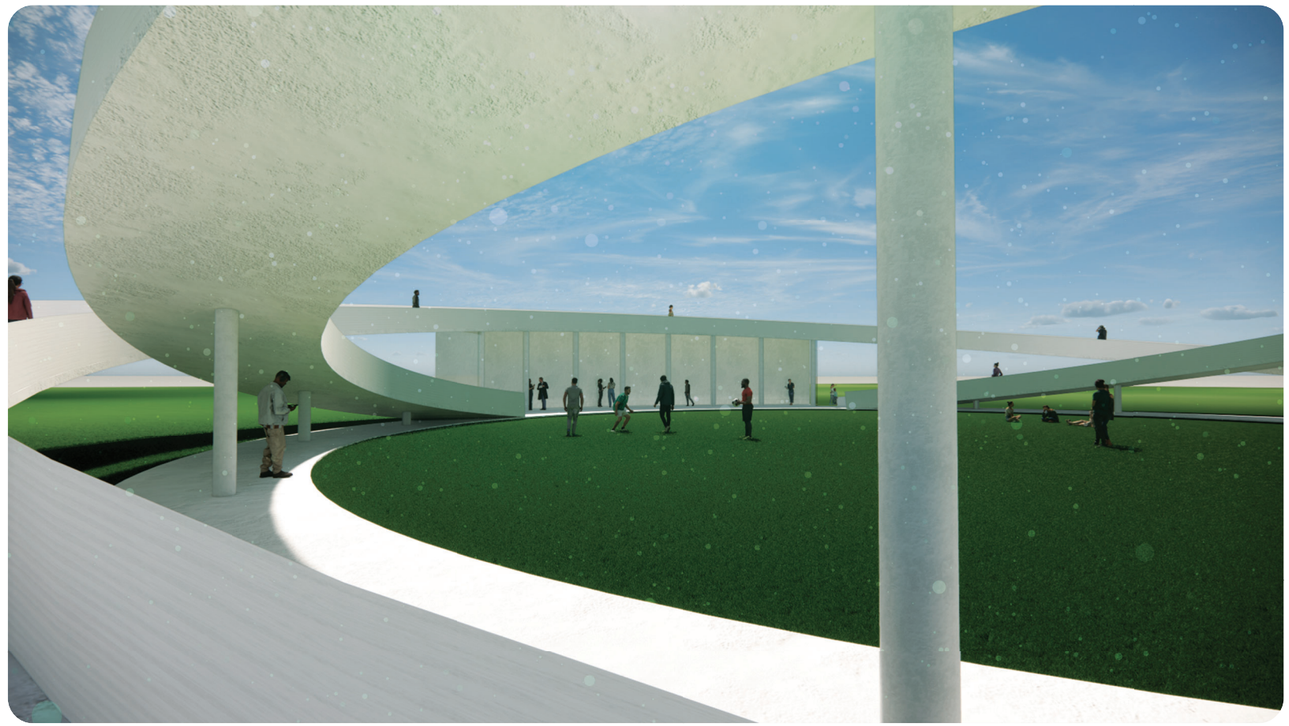


Figure 5.4.1. Wayfinding Diagrammatic Elevation

Scale: 1/8” = 1’

5.4.2. Open Activity Space

The open activity space is designed to **follow the same formative elements** of the surrounding project, while simultaneously **abandoning the rigid methodologies** that define the project as a whole. It allows users to **move freely** and possibly **break away from their routine-oriented lifestyle** in a way that it feels noncompulsary. In the event it still becomes overwhelming, **escapes spaces take form under the elevated pathways** on the east and west ends so that users can also **avoid direct glare from the sun** at any time of the day.



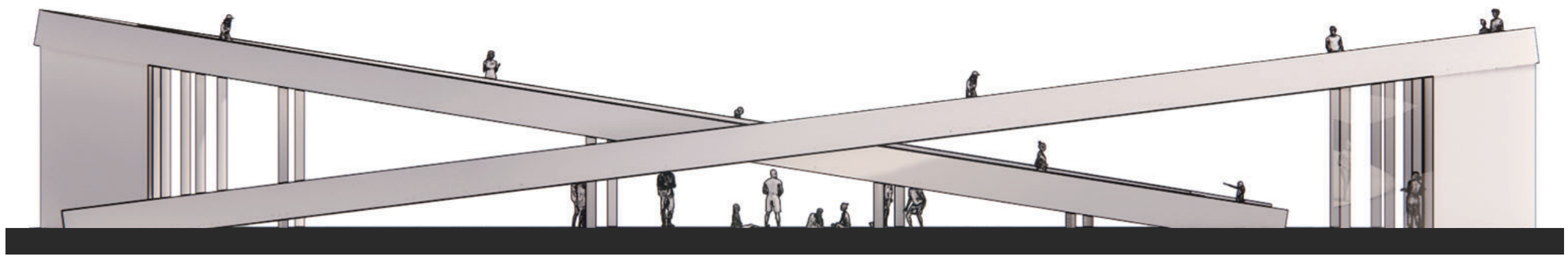
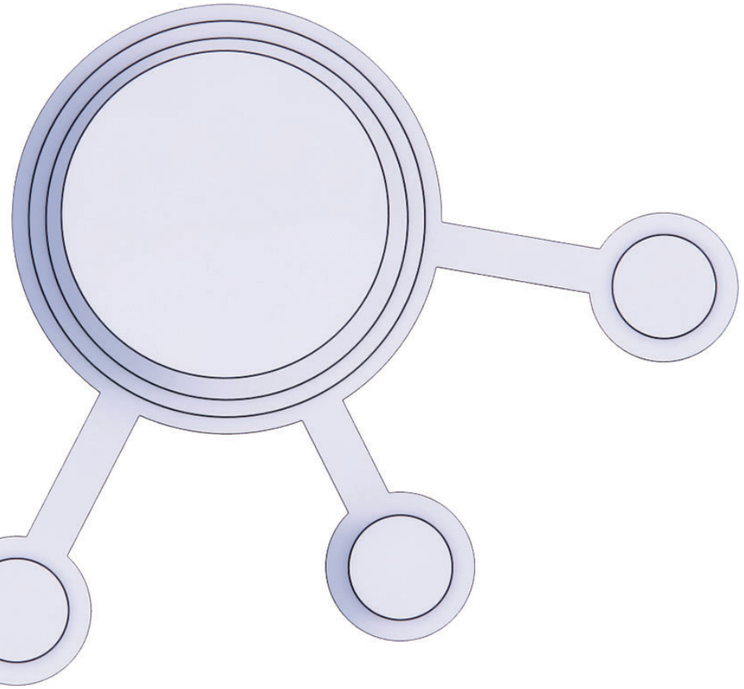


Figure 5.4.2. Open Activity Space Diagrammatic Elevation

Scale: 3/16” = 1’

5.4.3. Waterside Dock



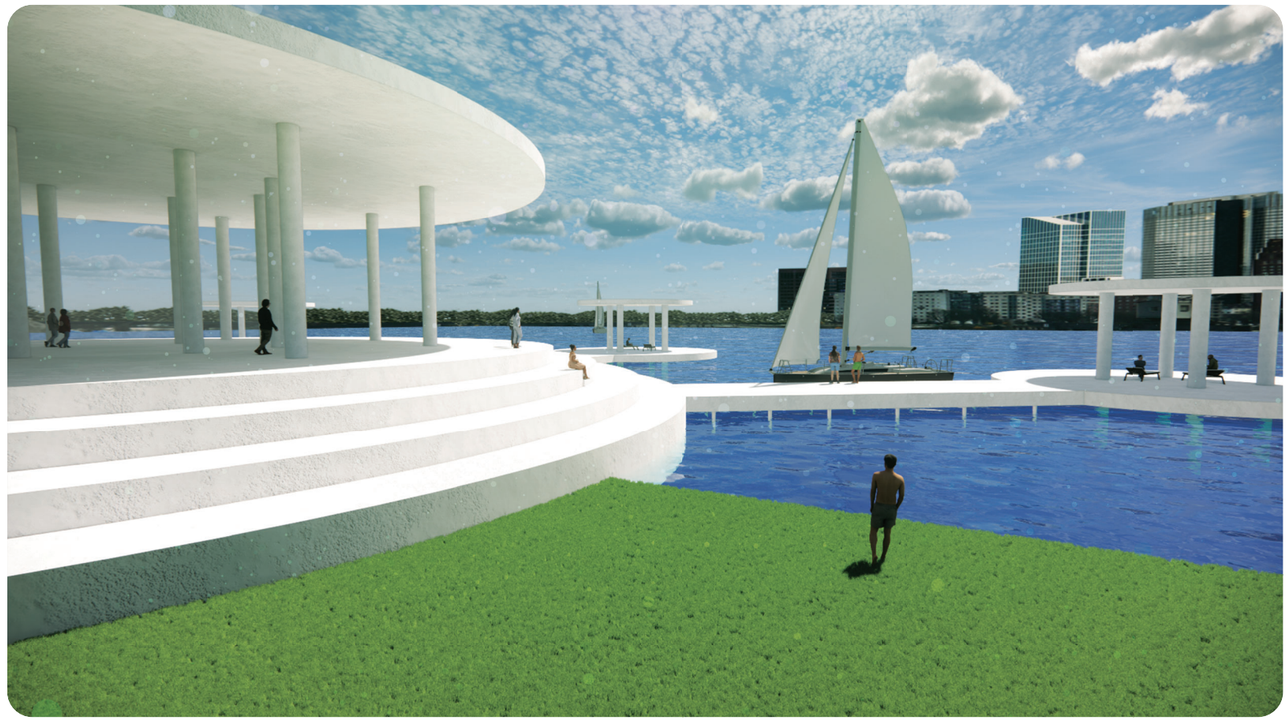


Figure 5.4.3. Waterside Dock Diagrammatic Plan

The waterside terrace's main purpose is to **connect users with the Chattanooga River** that defines the city. The design follows the **same format of as the residential clusters** that can be found in the rest of the project, **bringing familiarity** to one of the most community-engaging aspects of the project. If a user feels comfortable enough they can venture out toward the **extended docks and possibly interact with one of the boats** that may sail nearby. Ideally, this element of the design would also **open up the door to transportation** opportunites across the river.

Scale: 1/16" = 1'

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