Dignity and Design

Architecture for the vision and hearing impaired

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of North Dakota State University

By
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for the Degree of
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Primary Thesis Advisor

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Chapter 1: Proposal

Thesis Abstract

This thesis is aiming to design better for those with hearing or sight loss. Since these are sensory disabilities they directly affect the way in which people experience architecture. With the numbers rising of people experiencing hearing loss earlier in life as well as an increasingly aged population with deteriorating eye sight, this should be a growing concern for people designing the spaces in which people inhabit. Exploring how spaces can be engaged without the use of site or sound can inform how designs can be made better for everyone.

The goal of this project is not to reinvent architecture in an obvious way that alienates or repulses those who are fully abled but instead seeks to remedy the problems that blind and deaf individuals face with common designs with simple, elegant and subtle changes all brought together in a mixed use apartment building.

Narrative

While studying abroad in Europe the class was taken to an exhibit in Hamburg called Dialog im Dunkeln (Dialog in the Dark). In the exhibit a tour guide leads groups around the exhibit which is a pitch black rendition of ordinary life environments such as a market or a boat. Each visitor to the exhibit is given a cane to help guide them through each scenario. Through the whole experience the guide is seamlessly navigating through each scene even moving around each member in the group. In the end it is revealed that each tour guide is blind. This exhibit, while just having the goal of showing people what it is like to be blind, left me thinking about it in relation to everything. Approaching thesis it was clear that I would have to design to try to improve the experiences of blind individuals. Unfortunately they are rarely discussed in the architectural standards put forth by ADA guidelines. I also noticed that deaf individuals were also rarely discussed. Most of the conversations around disability relates directly to individuals in wheelchairs. It was upon this realization that my topic became clear. I wanted to investigate the problems that individuals with sensory impairments had while navigating the built world. The result of the investigation would also help serve to guide all future designs and projects I am part of.

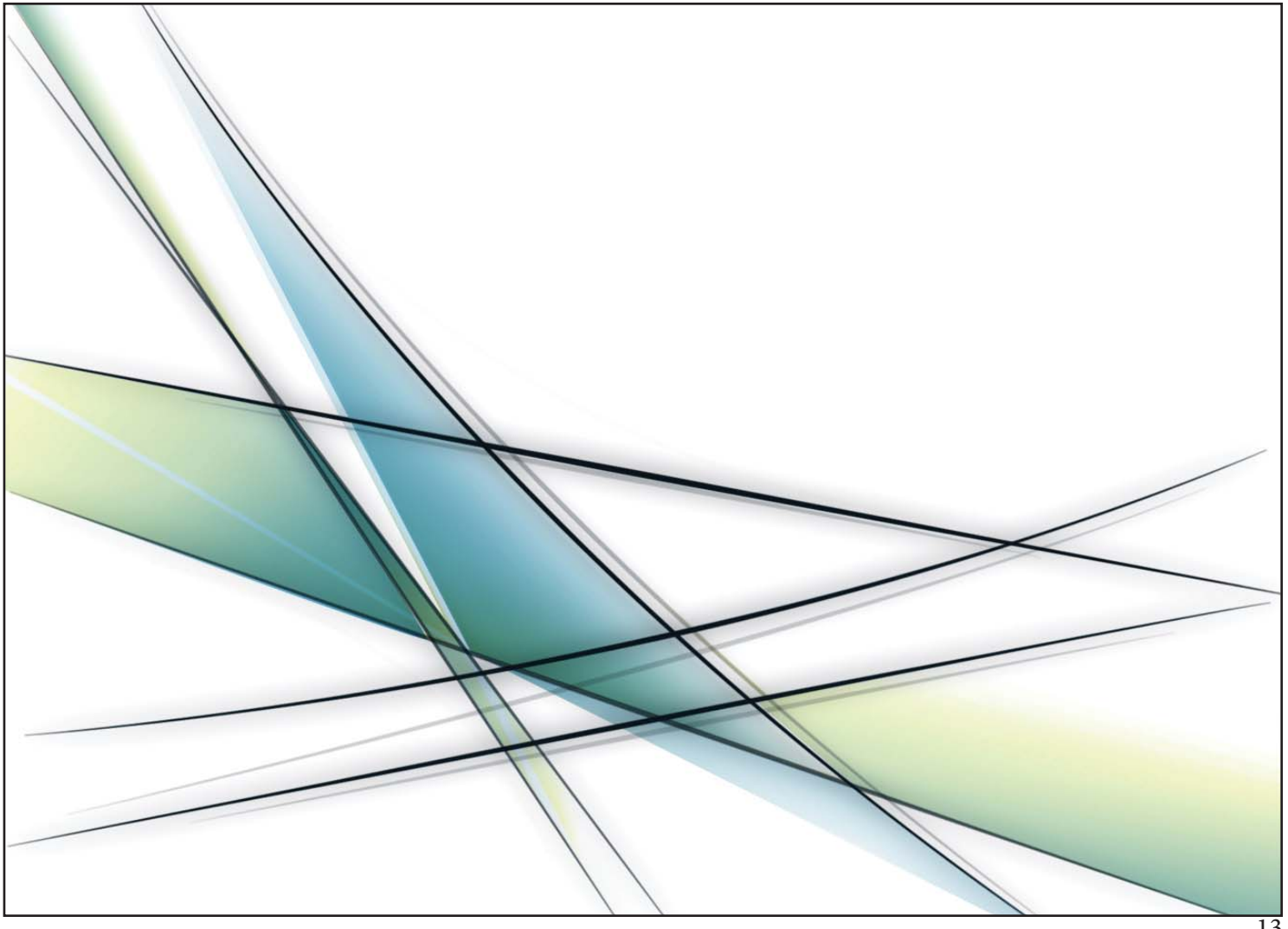
"You shouldn't be designing for the average man or the average woman. That doesn't exist. Anything can happen to anyone that changes their physical limitations."
- Sana Jahani (AIANational, 2015)

In the United States 70% of adults use some form of visual aid including contacts, glasses or having undergone corrective eye surgery (The Vision Council). This high percentage of people with even slight impairments should be accounted for as many of them will continue to have degradation throughout their life.

Along with the architectural purpose of this topic I hope to gather more understanding on the experiences these individuals have every day as well as understand how to be more understanding and sensitive without being belittling or offensive.

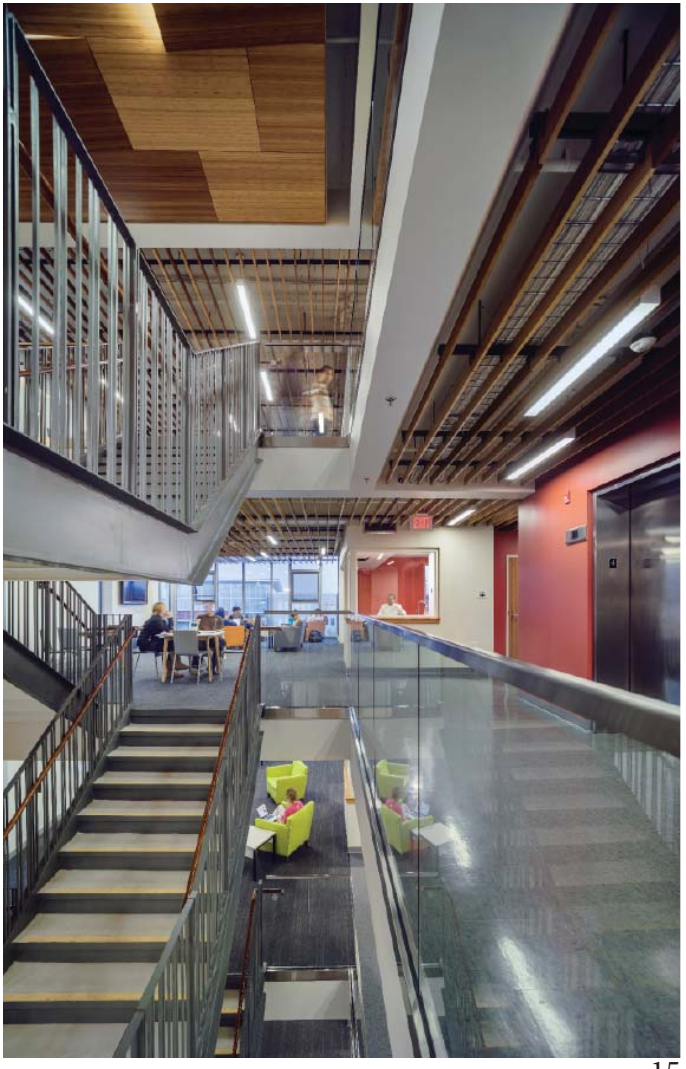
Building Typology

Individuals that have sensory impairments typically have to spend much of their time adapting to environments and the architecture they inhabit. Most of the literature relating to these impairments and architecture details how to adjust homes and apartments to make living easier. This makes it plain how much current architecture solutions for apartments and homes are failing a large part of our population. This thesis, therefore, is primarily an apartment building. However it is made slightly mixed use with the addition of a coffee shop to also bring in people who do not live in the building. This was added with the goal of increasing the interaction of those with and without an impairment as well as increasing interactions of those traveling the path just north of the site.



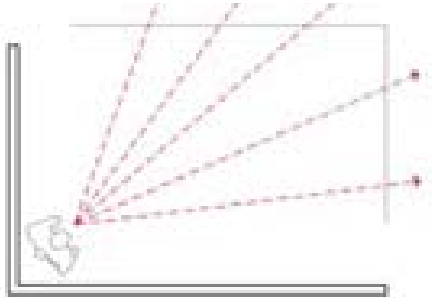
Case Study 1 - Gallaudet University

Located in Washington DC, Gallaudet University is a school for the deaf and hard of hearing. While it has been around for over 150 years it has just recently commissioned Hansel Bauman from HBHM Architects to develop a project they call Deaf Space. This project has sought to develop new techniques that architects can use when designing for deaf individuals. They have now translated these principles into two new campus buildings including a dorm. These principles seek to bring together the ideas of community building, visual language, the promotion of personal safety and well-being (Gallaudet University).



Sensory Reach:

"Spatial orientation and the awareness of activities within our surroundings are essential to maintaining a sense of well-being" (Gallaudet University). This principle focuses on developing elements in the built environment that facilitate full spatial awareness. They should help facilitate orientation and wayfinding within spaces.

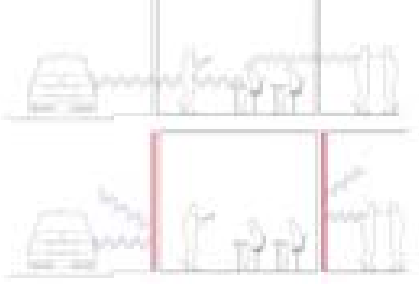


Light and Color

"Poor lighting conditions such as glare, shadow patterns, backlighting interrupt visual communication and are major contributors to the causes of eye fatigue that can lead to a loss of concentration and even physical exhaustion" (Gallaudet University). Proper diffused lighting and controlled daylighting can be used to lessen eye fatigue. This paired with colors that contrast nicely with skin tones can improve the experience of deaf individuals.

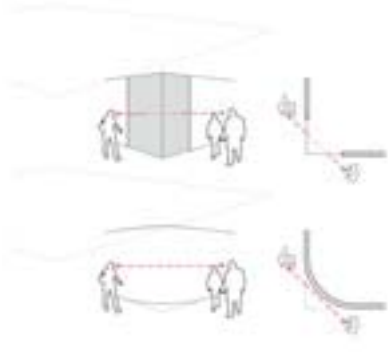
Acoustics

People with assistive devices such as hearing aids or implants can have severe negative reactions to excessive reverberation or background noise. Sound caused by HVAC systems can be especially painful. Controlling for acoustics is therefore crucial in helping maintain reasonable levels of comfort. (Gallaudet University)



Space and Proximity

In order to maintain clear visual communication individuals utilizing sign language require more space, referred to as “signing space” This space is larger than one required for a spoken conversation and so required certain areas in a building. This principle translates most clearly into hallways which double size when accounting for the extra space required. (Gallaudet University)

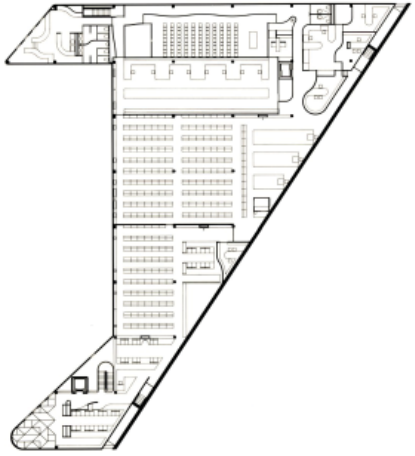


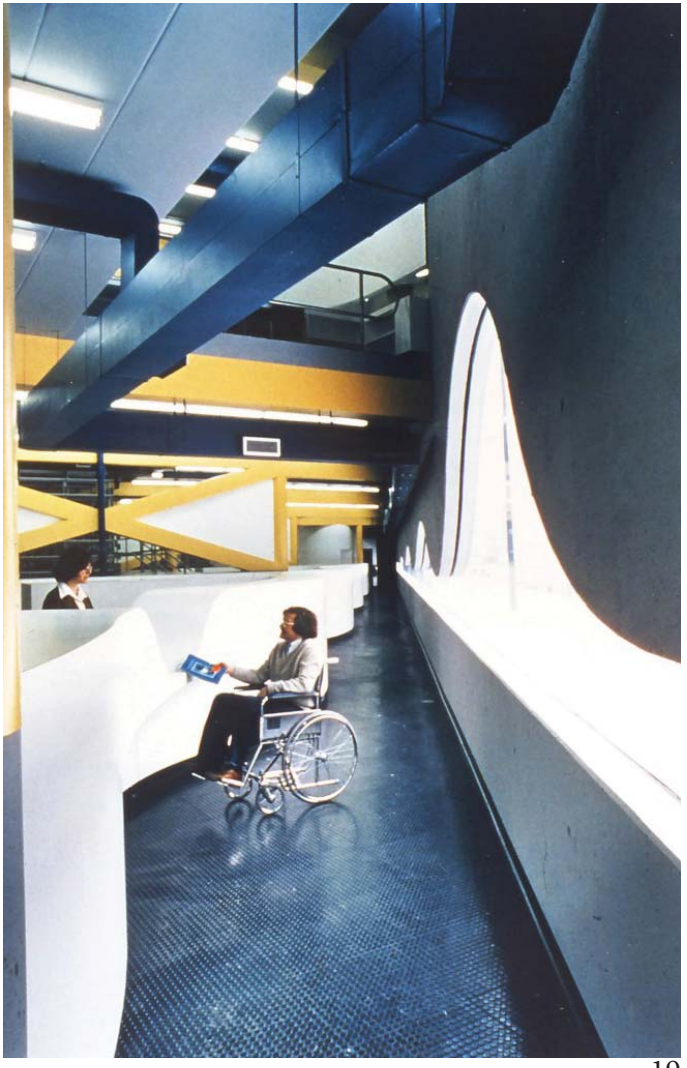
Mobility and proximity

In relating to the previously mentioned signing space, when walking together while in conversation, signers tend to keep a wide distance for clear visual communication. They also shift their gaze from the conversation to the surroundings and back to watch for hazards. With proper circulation design signers are able to move uninterrupted. (Gallaudet University)

Case Study 2 - Illinois Library for the Blind

"The lightweight metal-clad steel skin is opaque while the dense concrete hypotenuse wall is irrationally broken by a Hejduk-influenced (Barbar House) cut: all representing the irrationality connected with blindness. Hard-surfaced to encourage utilization of the blind person's increased perception of sound, the building has no hard corners to maim and all objects are anchored down so that their position can be remembered." -Tigerman McCurry (McCurry)





Case Study 3 - Hazelwood School

Designed by Gordon Murray + Alan Dunlop Architects, The Hazelwood School in Glasgow, Scotland is designed for students who are both deaf and blind. The most unique feature of the school is a sensory wall that runs along the building's main artery to help students orient themselves. The building was designed with the goal of encouraging the children to be independent of which they have found has been successful. (Institute for Human Centered Design)

Features of design:

Each bay of sensory trail wall is individually shaped. This helps children orient along the length of the circulation space in the school.

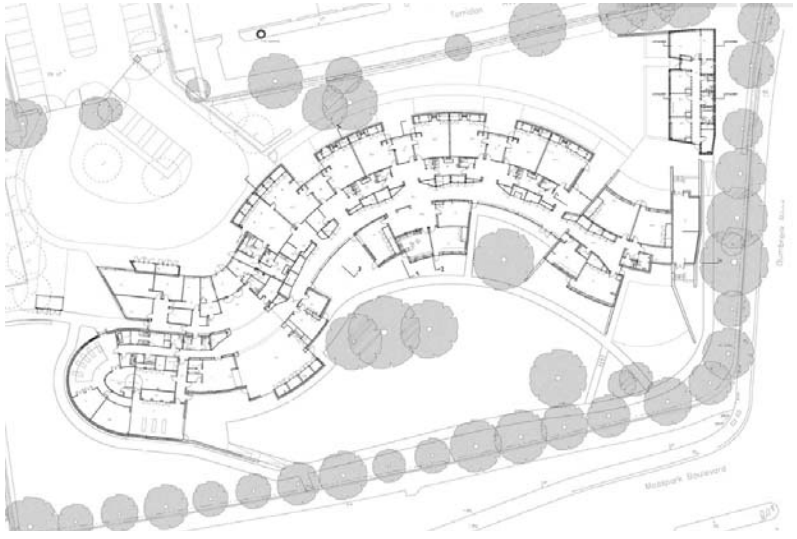
Redundant signage throughout the school, in Braille and pictograph and Moon, caters for the diverse communication abilities of all of the children.

Classrooms are oriented north facing to take advantage of a more even level of light and open onto the quietest part of the grounds, the classroom garden spaces. (Institute for Human Centered Design)

The curved form means that both internally and externally the building is broken down into manageable spaces. The scale of these is then more appropriate for navigating and also minimizes any visual confusion by reducing the extent of the spaces.

The transition between the 'street' and classrooms areas was designed to inform children of their location as well as school events. For instance, the roof over the street pitches to the north and clerestory glazing is incorporated. This is mirrored with glazing to the south, which floods the area with natural light. Through GM + AD's research it became apparent that a good proportion of children who are blind can identify between natural and artificially lit environments.

Differing tactile floor finishes serve as an alternative or enhancement to the trail walls for navigation and cuing in some locations inside the school. (Institute for Human Centered Design)



Case Study Analysis

While the preceding case studies provided many design solutions for helping those with a sensory impairment, the most useful element of the studies is the determination of the biggest challenges this population faces in architecture.

Gallaudet University lays out a very succinct argument for their proposal that community building, visual language and the promotion of safety and well-being are the most important needs for a deaf and hard of hearing individual. Their methods lay out design concepts for addressing these concerns which are vague enough to be applied to every project. Their methods also address problems and needs seen by fully abled people and seek to make architecture better for everyone.

The library for the blind in Illinois offered very little on design methods. They focused very much on affording the blind a poetic experience just like everyone else. They do however mention that the furniture in the building is all curved to avoid having the blind visitors run into sharp edges. However, while this statement speaks to the concern for the well-being of the individuals it does not speak to the wayfinding. There is no evidence that there are any guides to help the blind orient in a space once they have followed a curve around. Stated in many additional testimonials viewed outside the case studies it is evident that curves are very disorienting for people with little to no sight as it is not always clear what direction is being faced once the curve is finished.

The Hazelwood School also has curves throughout the entire building although they are offset by an angular sensory wall running along the length as well. This offset allows the blind and deaf individuals to navigate through the spaces while maintaining a sense of orientation. This school offered many techniques in its design and many of them suggest that wayfinding and orientation are key followed by controlled acoustic situations and quality, uniform lighting.

Going forward safety, orientation, community and independent navigation are all a theme throughout the projects. By having a project that answers to all these needs while remaining elegant and simple will meet the main needs of individuals who are blind or deaf.

Major Project Elements

The program for this project is designed around encouraging interactions between residents. To improve and educate the public on these impairments interaction with people who live with impairments is crucial. Developing spaces that both cater to the spatial requirements of blind and deaf individuals while also encouraging interactions with abled individuals is a key factor in the programmatic elements.

Considerations

Parking for residents
Direct access to greenway
Easy access for bikes into building
Access for delivery for trucks

Major Spaces

Apartments

- 1 Bedroom
- 2 Bedroom

Bike Storage

Maintenance

Lounge Space

Coffee Shop

- Dining Room
- Dry Storage
- Cold Storage

Community Room

User Descriptions

The emphasized user of this building will either be blind of deaf. However the general user is assumed to be abled and may have a slight loss of either hearing or sight. Based on the location off of Lake Calhoun the area tends to be home to mid to upper middle class individuals. It is going to assumed that the building will attract the same population of individuals as well as its target audience.

Being primarily a residential building the building will be constantly in use although the peak usage will be in from about 5 pm to 10 am as well as all day on Saturday and Sunday. Since the building is being occupied by abled individuals as well as the sensory impaired individuals the building will follow the parking requirements of the area of one spot per residence.

Site and Context

Located in Minneapolis, Minnesota, the site is at an optimal spot for people with mobility limits due to sensory deficiencies. It is adjacent to the Minneapolis Greenway which is a grade separated pedestrian and bicycle trail cutting through much of south Minneapolis. It also is just north of Lake Calhoun which is a popular destination for walkers, joggers, and recreational cyclists. It is also just west of the warehouse district which features a very pedestrian friendly plan. Based on the amount of amenities within a few minutes commute by walking, public transit or bicycle, there is little need for automobiles for those living in the area.

This site is unique in that it is in a very busy and high pedestrian traffic area with access to paths around Lake Calhoun as well as the Greenway through Minneapolis. However this traffic consists of a lot of people exercising or commuting instead of wandering consumers. The physical site is generally a rectangle with a sloped southern edge located between Lake Street and the Greenway and is currently an undeveloped lot. This brings a challenge of balancing creating a building that does not negatively affect the Greenway, balances the heavy traffic from Lake Street, and also tries to keep or reuse the trees currently on the site.

Project Emphasis

Emphasis on the human experience

For the last 80 years America has been designed around the automobile. While this is usually thought of in terms of urban design it also has a great effect on architecture. The emphasis on sensory impaired individuals affords the chance to turn the focus away from automobiles and instead return the focus to the individual.

Develop and interpret new guidelines for designing:

This project seeks to determine ways in which buildings can be better designed around blind and deaf individuals. This therefore means that research will be completed that looks at the struggles and hardships these individuals are currently having in relation to the built environment and developing both guidelines and design solutions for alleviating them.

Goals of the Thesis Process

Academic

Explore architecture by a nonvisual means Build a greater understanding of how research influences design.

Be able to work across mediums and software to develop a well synthesized design.

Study how blind and deaf considerations have been addressed in the past and incorporate methods into the design.

Understand how a factor like disability should be influencing design.

Design a building that aids people without the use of sight or hearing without compromising their dignity.

Personal

Improve my rendering skills.

Learn movement simulation software.

Improve my research skills.

Professional

Develop a better understanding of ADA requirements

Understand the relationship between disability, dignity, and design

Plan for Proceeding

Theoretical Premise

To begin designing it is crucial to develop a method for determining the success of the design. To accomplish this an analysis will take place to determine the success of existing architecture. This analysis will determine the success of current design standards as well as provide a medium through which development of a consistent analysis method can occur. This method will primarily determine success based on the information learned in the case studies.

Typology

The typology will be investigated in terms of the theoretical premise. This means that investigation of dorms that have been built for the deaf as well as home alterations recommended for the blind will be the focus.

Historical Context

To understand the stigma and preconceived ideas these individuals deal with it is crucial to look at an overview of the history of these impairments. This will also include looking at their existence in religion and their place in society as well as the types of aids they have used over time.

Plan for design methodology:

The primary design methodology will be determined through analysis of existing apartments as well as trial and error. This analysis will be based on the research completed previously as well as continued research through the design process. Once applied to design iterations each iteration's analysis will inform the future iterations. This process with be informed primarily with graphic analysis.

Software to be used:

AutoDesk Revit
Adobe Photoshop
Adobe InDesign
SketchUp

Documentation of the Design Process:

Saving working model after every large change with a different name to preserve process.

Visual documentation materials created after every major change.

Maintenance of organized folder system for all documents.

Publication of Material

All relevant material will be assembled and recorded in the final thesis book which will be available from the NDSU Institutional Repository.

Plan for Proceeding, Timeline

Project synthesis and revisions – January 13 – 22

Site development – January 25 – 29

Design Development – February 1 – March 4

Midterm Presentations – March 7 – 11

Spring Break March 14 – 18

Design analysis and revisions March 21 – April 8

Design Documentation April 1 – April 21

Electronic Design Documentation due April 21

Thesis Exhibits installed on 5th floor – April 25

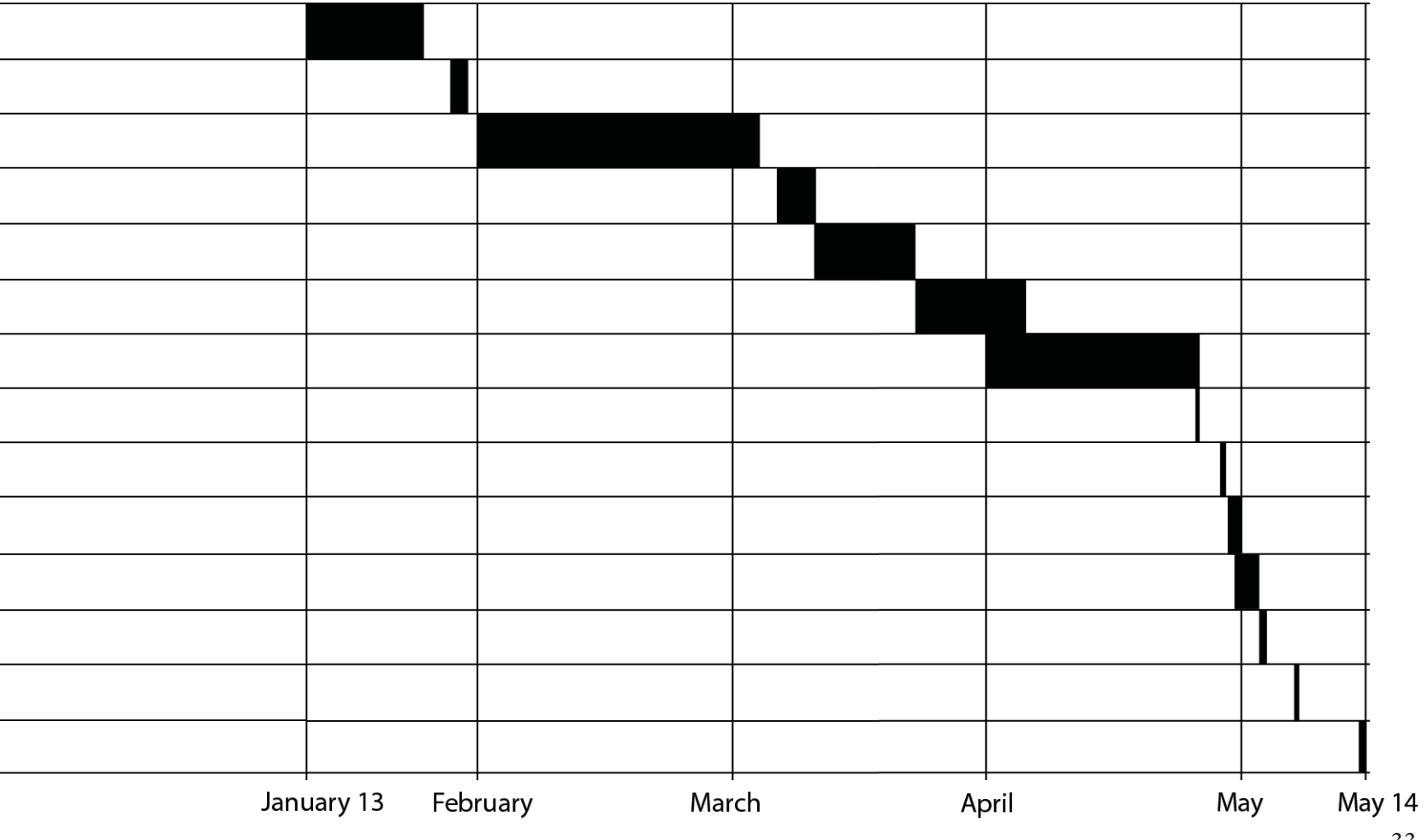
Thesis Show – April 27 – 29

Thesis Reviews April 28 – May 5

Thesis Awards ceremony May 6

Thesis Document due May 9

Commencement – May 14


January 13
February
March
April
May
May 14

Chapter 2: Program

Results from the Theoretical Premise Research

Today, 30.6 million adults in the United States require the use of a wheelchair, cane, or a walker, suggesting physical disability. Only about half that number experience detrimental sensory impairment. 2 million adults are reported as being legally blind (United States Census Bureau, 2012) which is defined as "Reduced central visual acuity of 20/200 or less in your better eye with use of the best eyeglass lens to correct your eyesight; or limitation of your field of view such that the widest diameter of the visual field in your better eye subtends an angle no greater than 20 degrees,"(Hellem). About half that, or 1.1 million, American adults report as deaf. In addition to this 12.6 million adults experience difficulties hearing or seeing. This still falls short of those who are physically impaired but is still a significant part of the United States population (National Federation of the Blind, 2016).

Outside the extreme cases about 70% of the United States adult population requires some form of visual aid including contacts, glasses, or corrective eye surgery. This includes many older individuals and the rate for people requiring aid increases as age increases. (The Vision Council)

It has also been found that 15% of adults have high-frequency hearing loss due to noise at work or during leisure activities. According to the NIDCD, "about 2 percent of adults aged 45 to 54 have disabling hearing loss. The rate increases to 8.5 percent for adults aged 55 to 64. Nearly 25 percent of those aged 65 to 74 and 50 percent of those who are 75 and older have disabling hearing loss. Among adults aged 70 and older with hearing loss who could benefit from hearing aids, fewer than one in three (30 percent) has ever used them. Even fewer adults aged 20 to 69 (approximately 16 percent) who could benefit from wearing hearing aids have ever used them." (NIDCD, 2015)

Currently there are several design solutions that have been implemented to aid those who are sensory impaired. To aid the blind in safely crossing streets there are often raised yellow bumps for a few feet on the curb cut to signal the transition. To add to this many stoplights have also added auditory indicators to the walk and wait lights as well as a noise when the walk button is pressed. However many of these design allowances are clunky and very obvious potentially making the user that requires them feel like they may stand out more than normal.

The deaf also have design allowances that can be obvious such as a blinking light for a doorbell or closed captions on videos. However as far as architectural allowances not many have been done outside of the previously mentioned Deaf Space project.

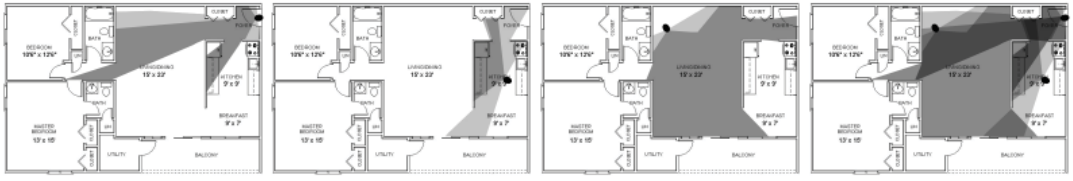
The lack of discrete and intuitive design for these individuals suggests a needed change. If design is done well there should be no need for allowances to be anything but the norm.

Visual Analysis Research

To begin designing it was crucial to develop a method for determining the success of the design. To begin, existing apartment floor plans were collected both to serve as templates for developing both a method of analysis as well as an existing standard. Based on the information gathered by Deaf Space, it was determined that visual access through the apartment would be crucial to providing a space that allows a continued visual conversation. The main areas investigated for this purpose were the living room and kitchen. Since these are the most social spaces of a living environment is was natural that these spaces be open to each other. The final location investigated was the entry. This was added with the idea of allowing control over a space. When visually accessible from the rest of the apartment the occupants can have an increased feeling of safety. This analysis only focused on the living spaces of each apartment with the intention of determining the level of engagement they provide.

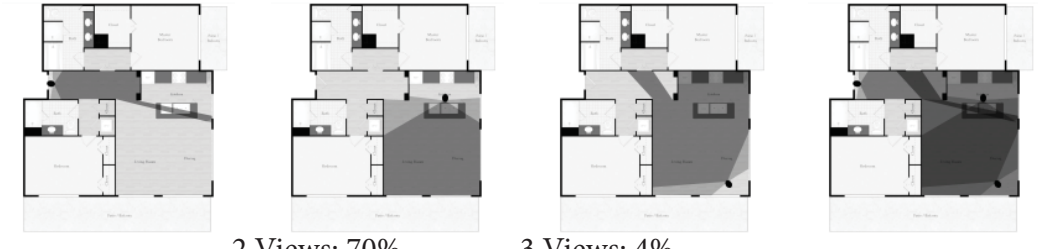
Each analysis location was investigated using the extent of vision of a person standing at each location. The darkest parts of each view was determined by the extent of binocular vision and the lighter part of the view was determined by the extent of the monocular or peripheral vision. These views were all overlapped to determine the percentage of the floor space that is accessible by either two or three views.

Based on the lack of material information as well as volume dimensions auditory analysis was unable to be completed for the existing apartments. However it was determined that general acoustic information would be analyzed to shape the final design.

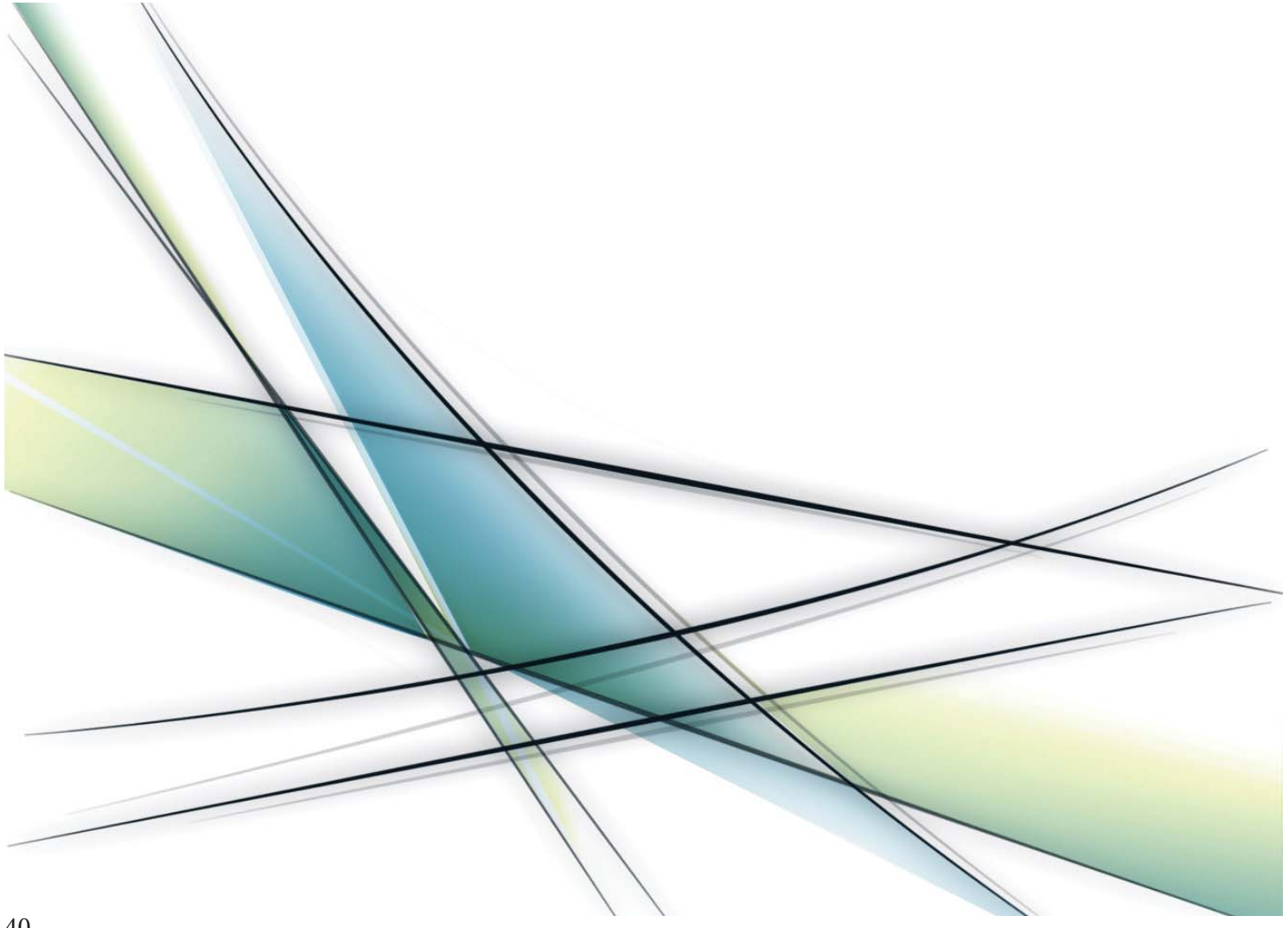


2 Views: 30% 3 Views: 2%

2 Views: 70% 3 Views: 4%



2 Views: 70% 3 Views: 4%



Project Justification

Almost everyone at some point in their life will experience at least a slight loss of either hearing or sight. 70% of adults in the United States require some form of corrective vision being either glasses, contacts or reading glasses. In addition the number of people with hearing loss is increasing due to rising rates of headphones and exposure to loud music and workplace noise. This means that many people at one point in their life may struggle with adapting their life to a world built around the “normal adult”. By investigating what it means to design for a new population of people with entirely different needs while also catering to the typical user, the project will need to investigate every aspect of the building form the form down to the style of handrails used.

Historical Narrative - Blind

Visual Impairment or blindness has been around since human records began. Mentioned in many religious texts it has consistently been referenced as an affliction that hinders an individual or used as a punishment for lewd or otherwise unfavorable behavior. The few exceptions to this standard such as Tiresias in Greek mythology who was noted for his clairvoyance, are looked upon as possessing wisdom or the ability to "see" an untainted truth. In the bible, Jesus is said to have healed many blind individuals although another man was blinded as a punishment. For much of history blind individuals have been pushed to the edges of society and assumed unable to work or contribute to society. It wasn't until 1784 that the first school for the blind was established in France. In 1820 Louis Braille invented the textile reading system now known as Braille. However even with these advancements blind individuals remained on the outskirts of society, destined to forever remain working in 'blind trades' such as basket weaving. As time went on many societies have been established with the purpose of improving the status and opportunities available to blind individuals. Today there are few blind only schools as many have found that with the addition of braille into a traditional school blind students are still usually able to thrive. (Miller, 2015)

Unfortunately today the independence is still a struggle for some blind individuals. Since the invention of the white cane in 1921 it has become both a symbol of their impairment as well as a tool to aid in independence. Using a white cane allows blind individuals to navigate confidently through their environment without the aid of another's arm. (Strong, 2009)

Another tool that has been popularized and more recently accepted in all buildings and modes of transportation is the guide dog. Since the end of the First World War dogs have been used in varying degrees for aid in navigation. In the 1920's guide dog schools started open across the globe to train dogs in mass to aid blind individuals. The development of these two methods have drastically improved their ability to be independent. However with the dying of the downtowns across the country coupled with a move to car-centric urban design many have lost some independence in a vision-focused method of travel. (International Guide Dog Federation)

Historical Narrative - Deaf

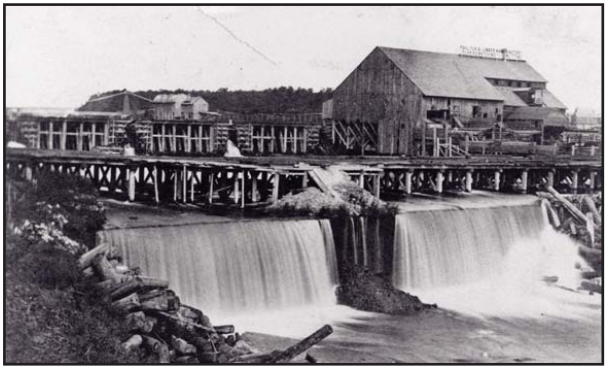
The history of deaf people becomes the history of deaf culture. Unlike most cultures, deaf culture is not determined by location and is instead a global culture of sign language and interpersonal relationships. One aspect of deaf culture that has remained throughout time is the view that instead of a disability, it is instead a language minority. Even so in much of history they have also been on the fringes of society, not always being allowed to participate in religious ceremony and constrained to certain jobs. It wasn't until 1550 that Pedro Ponce De León became the first teacher of a sign language and was therefore able to effectively communicate with the deaf community. In 1817 the American School for the Deaf was founded in Connecticut. This was the beginning of a tradition of deaf-centric schools one of the oldest of which is Gallaudet University. (Lane, Hoffmeister, Bahan)

In modern times the main barrier facing deaf individuals is language and communication. While in their societies there remains a vibrant culture of interpersonal relationships, there remains much to be desired when communicating with the auditory world. In other areas of life they have been able to advance in the job market and hold high paying positions in many fields. In many countries they have also been afforded the ability to drive which has allowed individuals to become independent in car-centric societies.


DGS
LSF BSL
ÖGS
LSFB
LSQ
ISN
LSG
LSA
LSL
LIS
Adasl VGT
SSL
SASL
BVL
BIM
LSM
LSE
YSL
RSL
LSV
BVL
TID
ABSL
IPSL
ESL
LSCV HZJ
CSL
TID
NGT
NSG
JSL
KSL
ESN
MSL
ASL
LSCH
LSCV
FSL
LSB
AUSLAN
LIBRAS
NZSL
NSL
LSV
ZIMSIGN
HSL
LGP

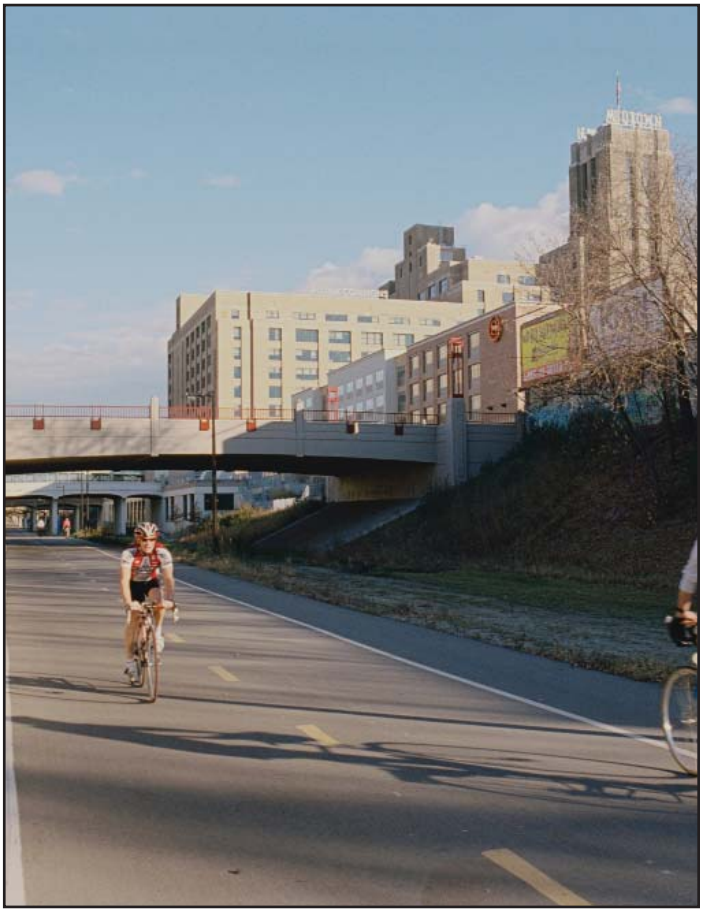
Historical Narrative or Minneapolis

The area now recognized as Minneapolis was first settled by the military at Fort Snelling at the confluence of the Minnesota and Mississippi rivers. Once established settlers began to move to the area, specifically drawn to the Saint Anthony Falls on the Mississippi River. These falls were used to provide power to saw mills that originally dominated the area. Slowly the focus switched to flour mills and they dominated the market for many years (Kane, 1966). Because of the advantage of the falls Minneapolis became a hub of activity for the mill industry and when established also became a hub for railroad activity as a result. This high demand spurred many rail roads to be connected through the heart of Minneapolis. When the industry fell, first in the 1890's and again during the dust bowl of the 1930's, the railroads lines also began going out of use (Hidy, 1988).



By 1950 the population soared due in part to an organized streetcar system. They ran down important roads and to residential areas. This increased mobility was the original push that allowed the formation of the suburbs (Diers, 2007). During the great depression the buildings in the city suffered from a lack of maintenance. This along with the end of the Second World War encouraged even more people to leave the city in favor of the suburbs. The formation of the highways funded by the Federal Aid Highway Act of 1956 along with a push for an urban revival started to reshape Minneapolis.

Beginning in 1935 under guidance from Theodore Wirth the park system in Minneapolis grew significantly beginning with the addition of the Grand Round park system. This created a ring of park space around the city boundaries for recreational use. These started becoming further developed starting in 1970 as a paved trail system was added to this system (Pflaum, 2011). At this time much of the land from the old railroads was beginning to be bought and converted to parks or trail systems. One of the most popular was the conversion of the Canadian Pacific Railway property to the current trail known as the Midtown Greenway. With its location near downtown and its grade separation from the city it acts as a popular highway for both pedestrians and cyclists. (Pflaum, 2011)



Currently Minneapolis has a very vibrant downtown with a ring of suburbs surrounding it as well as St Paul. The two cities are becoming increasingly more connected with more public transit becoming available between the two. In 2004 the light rail was opened in the Twin Cities connecting downtown Minneapolis with Fort Snelling, both airport terminals, as well as the Mall of America (Newberg).

Open, starting in 2014, the light rail's green line was made available directly connecting the St Paul and Minneapolis. This growing transit system is starting to catch up to the urban sprawl making it easier once again to get around without the use of a car within the city (Newberg).

After several years of design the urban cityscape around the car, in recent years there has been a shift to make the city more walkable as well as more bicycle friendly. In 2015 the city made the international Copenhaganize Index which rates cities on the level of bike friendliness. It also has been frequently ranked near the top of national lists including 'Bike Score'. (Copenhagenize Design Co.)

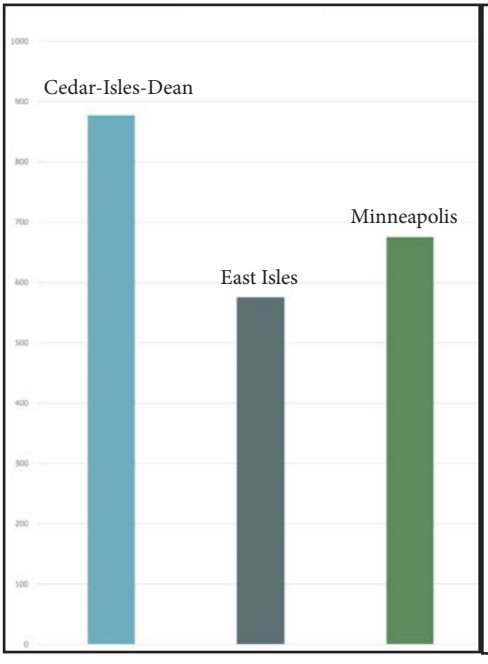
This push for returning to methods of travel excluding the personal car is a movement that has been continually gaining momentum in the city and is a point of pride for many residents. The large amount of parks and trails available within the urban space allows for a pleasant route for commuting or merely for recreation.

Demographics

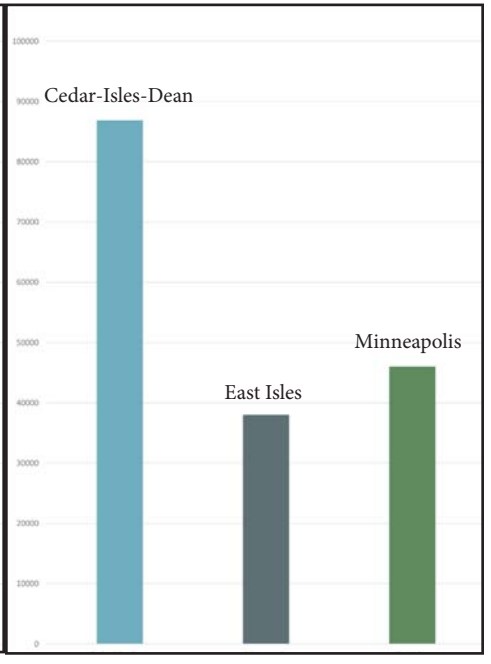
Overall the two neighborhoods are generally wealthy neighborhoods with higher rent as well as a higher average income than the rest of Minneapolis. The typical resident of these neighborhoods is a white young professional living alone. Also typical in the area are older professionals ranging in age from 45 to 64.

Overall the two neighborhoods are generally wealthy neighborhoods with higher rent as well as a higher average income than the rest of Minneapolis. The typical resident of these neighborhoods is a white young professional living alone. Also typical in the area are older professionals ranging in age from 45 to 64.

The mean age for Minneapolis is currently estimated at 31 years old.

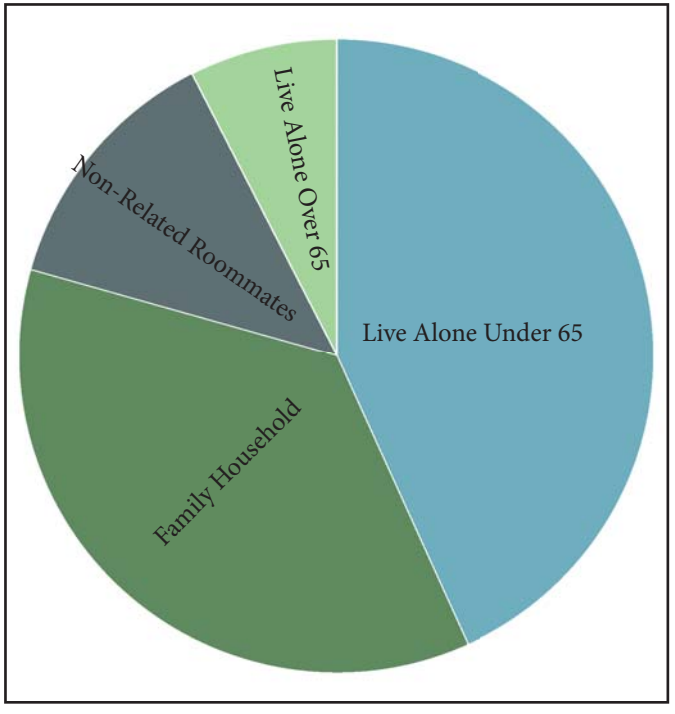


Median Rent

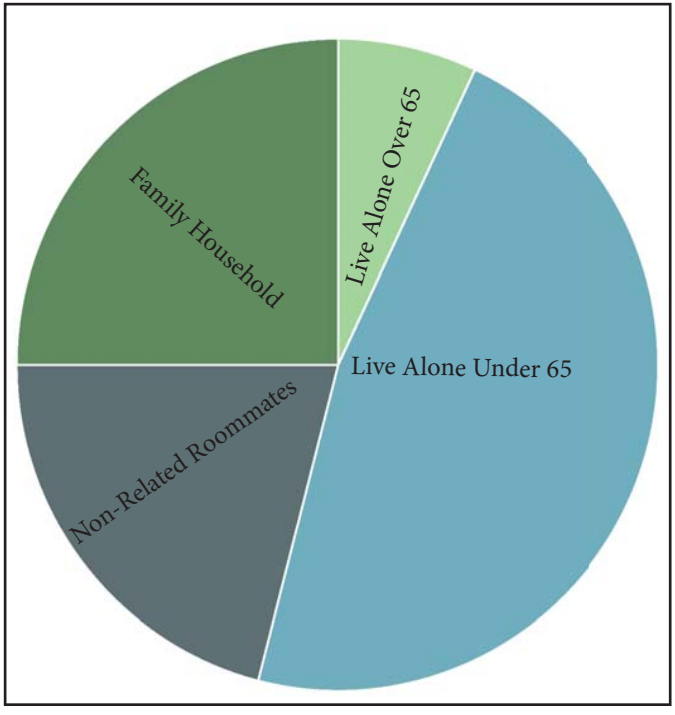


Median Income

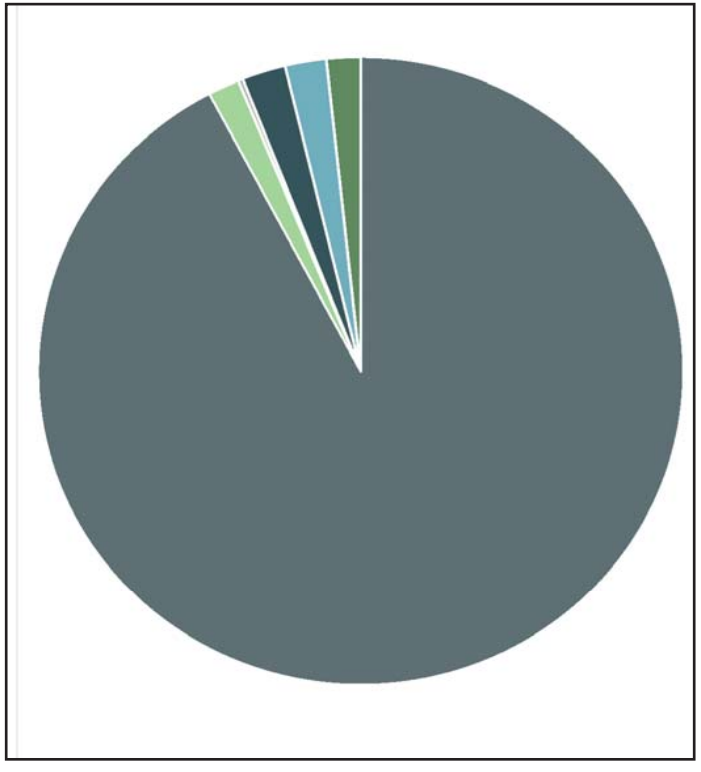
("Minneapolis Neighborhood Profiles", 2012)



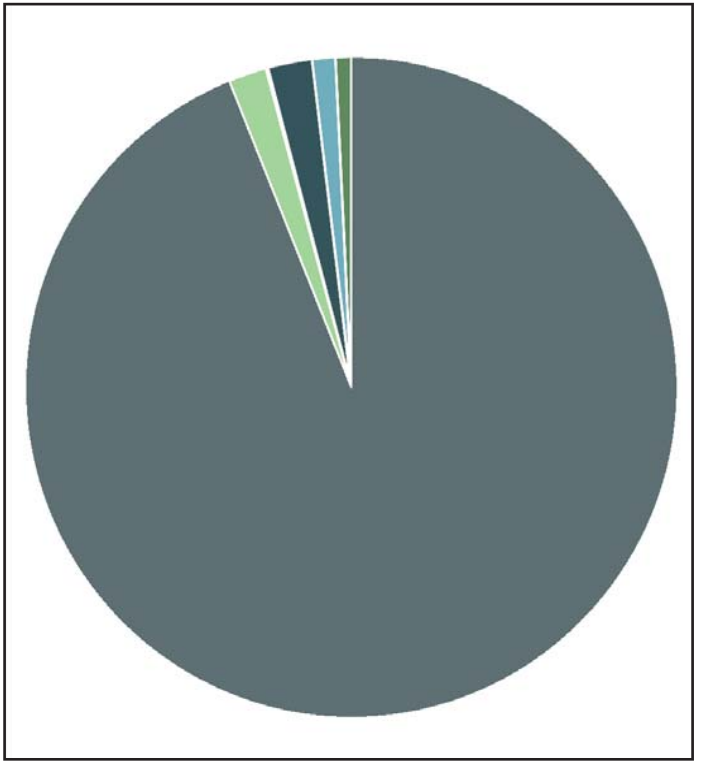
Household Type: Cedar-Isles-Dean



Household Type: East Isles

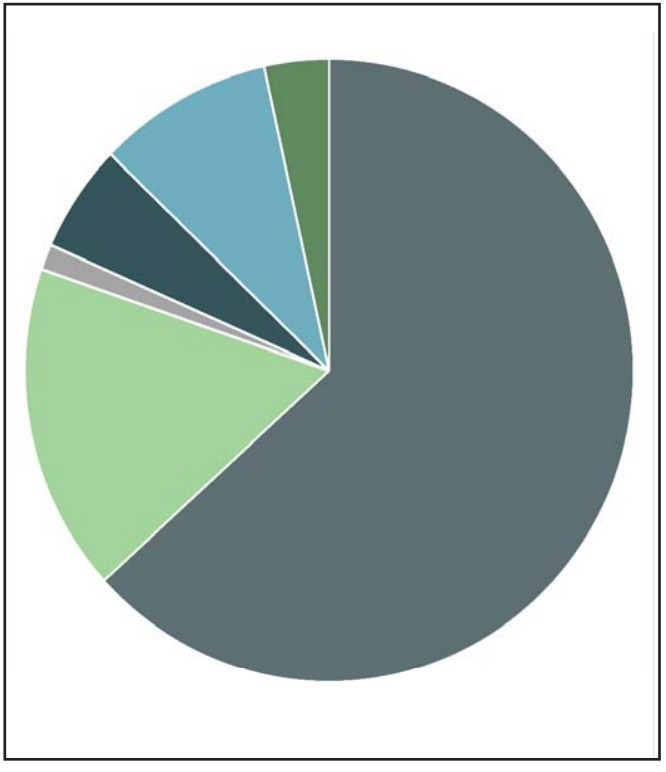


Race Statistics: East Isles



Race Statistics: Cedar-Isles-Dean

White Black American Indian Asian Hispanic Other



Race Statistics: Minneapolis

Both Cedar-Isles-Dean and East Isles are mostly white unlike the whole of Minneapolis. The ethnic diversity for Minneapolis tends to be generalized to separate neighborhoods. However in whole is much better than Cedar-Isles-Dean or East Isles. For this project this means that a majority of people are in a similar class and are more likely to have similar backgrounds which can make marketing to them easier. However increasing the diversity of the neighborhood or at least bringing visitors of other races would be advantageous.

Gender statistics for the specific neighborhoods are unavailable however Minneapolis has a fairly even ratio of 50.4% male and 49.6% female.

Minneapolis race and gender statistics supplied by the United States Census Bureau

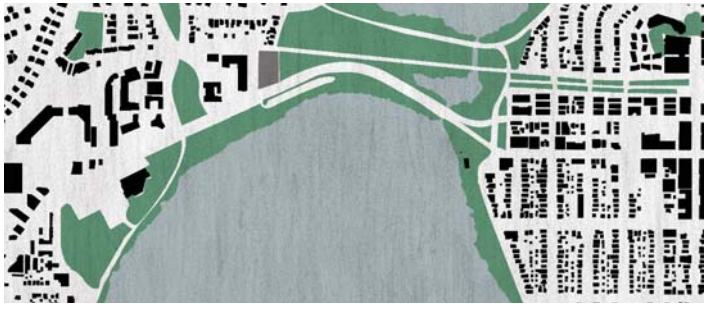
Site Analysis

The site in question is located across Lake Street from Lake Calhoun in Minneapolis Minnesota. It is in-between the road and the Midtown Greenway. To the east of the site are more trails and park space. The site is a rectangle at the end of a triangle shape with the hypotenuse following the curve of the lake. The site is currently a gravel lot housing a few trailers and a small pile of gravel.

In section the site presents a very gentle slope up to the Greenway from the street acting as a link between the two. In plan the slope is most prevalent in the corner opposite the hypotenuse with the site leveling out gently further away from the corner.

The quality of light at the site is very good although weather dependent. There are no buildings to the south of the site so even when the sun is at its lowest in the winter the site will receive a maximum amount of light through the majority of the day. There is a rather tall building directly adjacent to the site to the west which will block direct light in the evenings. The temperature and color of the light varies with the weather and is also effected by the vegetation on the eastern site of the site which cools the light filtering through it.

The vegetation on the site is mostly located on the eastern side. The majority of the plants are green deciduous. At the boarder of the gravel lot the plants are very dense with small shrubs filling in the areas between large, older trees. Further east the vegetation spreads out and the trees are noticeably newer and shorter with manicured grass filling in the open spaces.



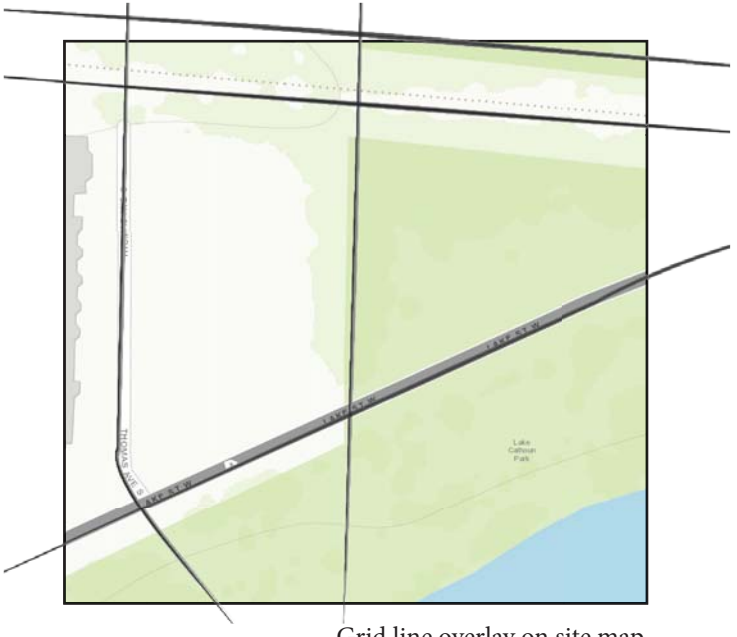
Site Analysis

When observed there was no standing water on or directly around the site. There was also no sign of running water in the area.

The current state of the site is somewhat protected from the wind. The building adjacent to the site as well as the vegetation serve as wind breaks although the south and southeast edge is exposed to any southern winds.

The gravel lot has the feel of an abandoned project. It appears as though the lot is used for storage but is mostly abandoned. Along the fence there is some over grown plants that have not been cut back and the overall state of the lot is poor. Just east of the site is well maintained and full of vegetation. The juxtaposition of the two lots allows the observer to make a judgment about the health of the site with the gravel lot appearing unhealthy and in need of a revival and the neighboring site to the west in peak health.

*The site is currently in the process of being developed but for the interest of this project it will be analyzed in the state it was originally found, before the construction started.



Grid line overlay on site map

Ariel photo showing site character

Site Analysis

Soil Survey

Soil 1: Urban land-Lester Complex

"Urban land consists mainly of residential areas and is covered by impervious surfaces. Most areas have been disturbed to some degree by construction activity. Because of the variability of this component, interpretations for specific uses are not available. On site investigation is needed. More than 6.7 Feet to water table all year." (USDA and NRCS, Soil Survey of Hennepin County, Minnesota)

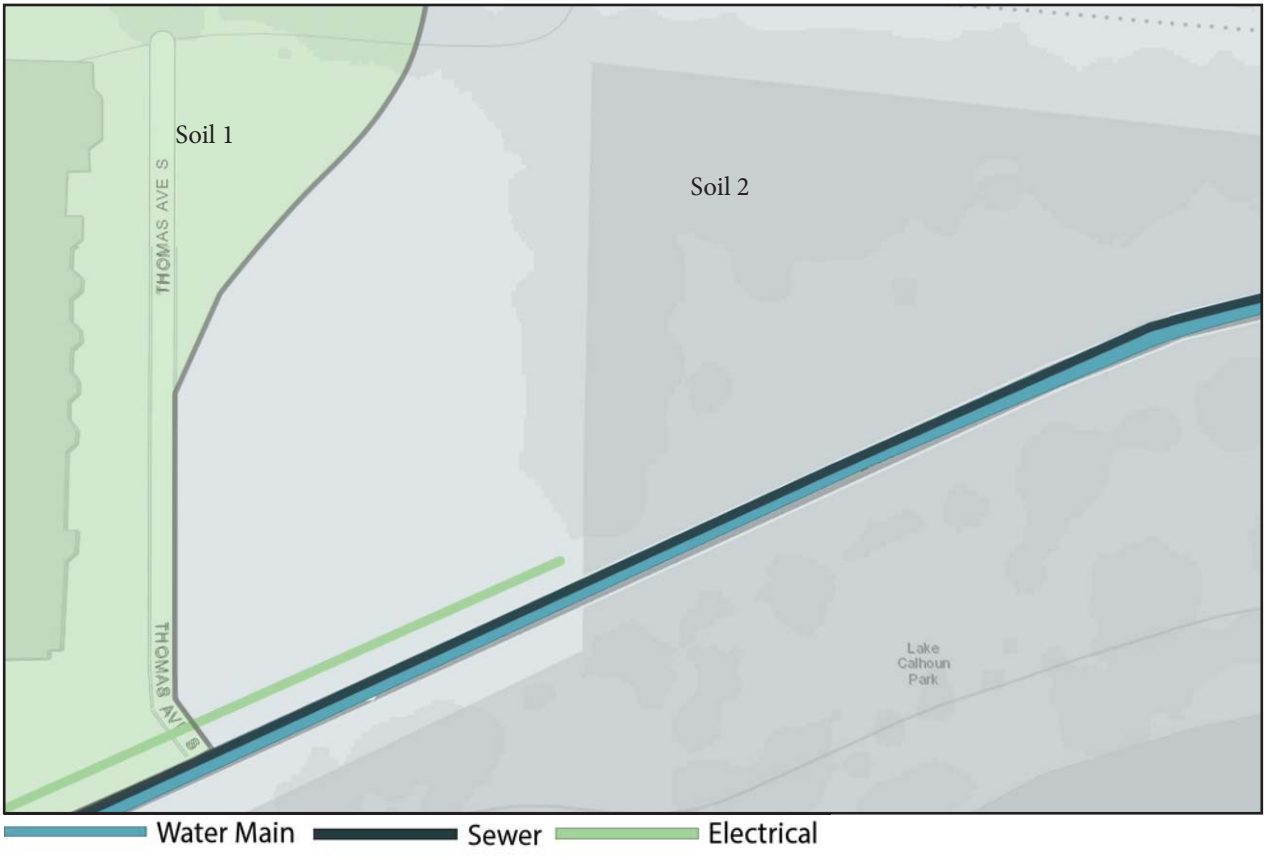
Soil 2: Udorthents, Wet Substratum
"The Udorthents consist of fill material that has been placed in wet depressional areas to match the adjoining upland landscape. Because of the variability of this component, interpretations for specific uses are not available. Onsite investigation is needed." (USDA and NRCS, Soil Survey of Hennepin County, Minnesota)

Summary

The soil on the site is good for building. Extra precaution will have to be taken if sub-grade construction takes place because of the level of the water table in the area. The soil on the site has little chance of degradation based on the current slope on the site. There is also little chance of pooling within the western region of the site based on the soil material and the general slope. The soil does not have to be cleaned before use based on former usage of the site. The bedrock is at an elevation of 764 while the site elevation is around 864.

Utilities

The exact location of the utilities near the site could not be determined however to the right is an educated guess on the location based on the location of elements above ground.


Soil 1
Soil 2
THOMAS AVE S
THOMAS AVE S
Lake
Calhoun
Park
Water Main
Sewer
Electrical

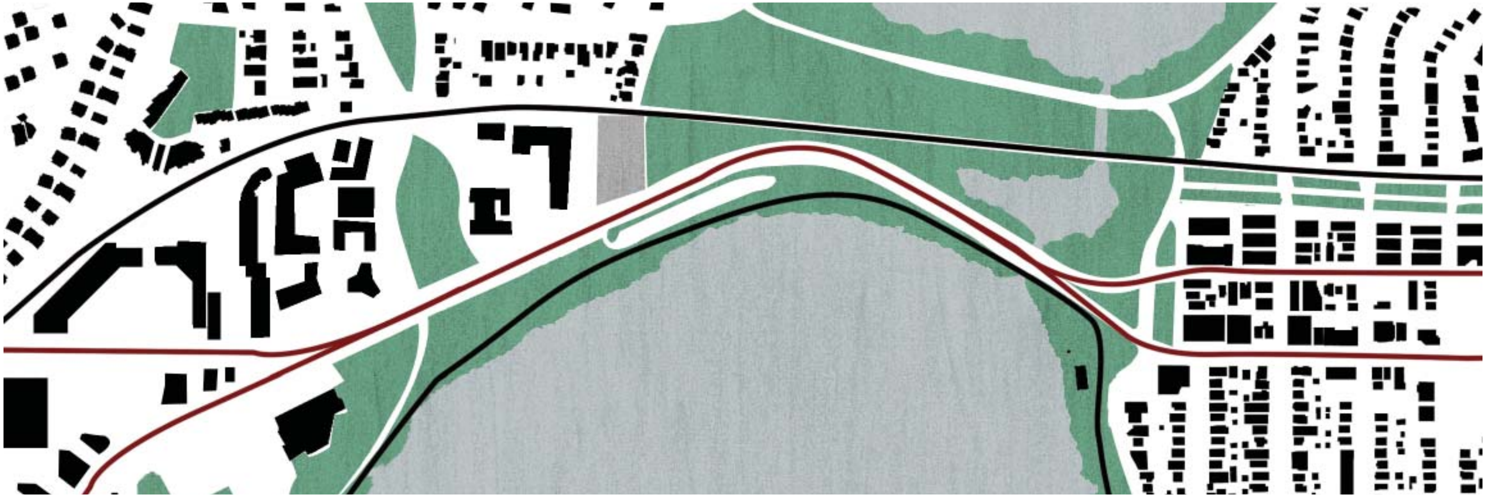
Site Analysis

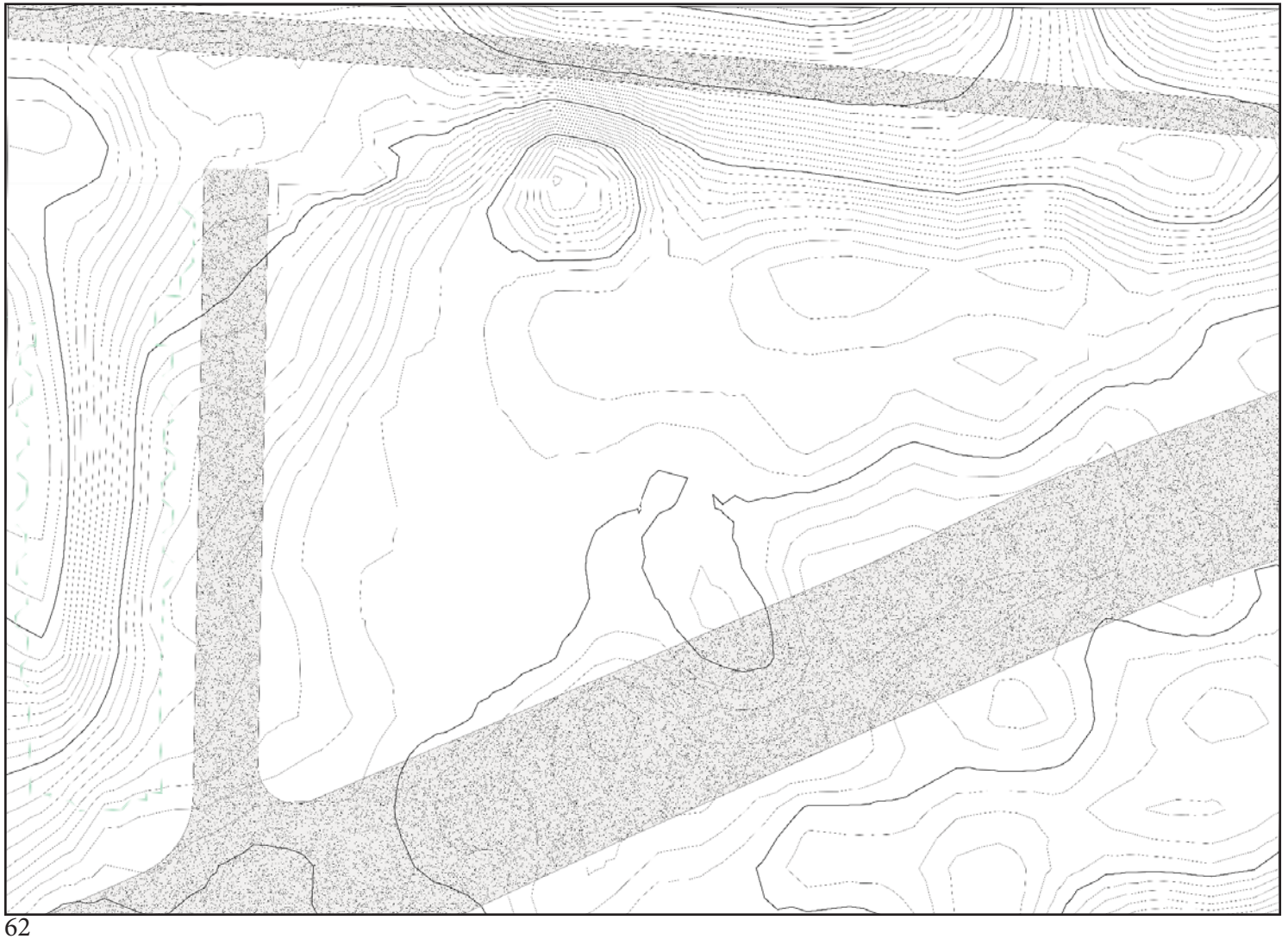
Traffic Analysis

The majority of the traffic around the site is currently vehicular. Lake Street, which lies to the south of the site, is one of the busier streets in the area. The street is particularly because the position of the chain of lakes partially blocks traffic from dispersing more evenly. Most of the vehicular traffic is very linear past the site although occasionally halting at the intersection at the south-western corner of the site. Cars also filter into the parking lot that is located to south of the site and Lake Street. This lot is almost consistently used as it is one of the few public lots around the lake. The majority of users of the lot are recreational users of the trails or other services of the park. A few vehicles do use Thomas Ave for parking or for access to the underground parking garage for the building to the west of the site.

The pedestrian and cyclists primarily use the trails by the lake or the greenway. However since there is an intersection at the site several will use the sidewalk to move between the two. There is also a bus stop at the south-west corner of the site which produces more pedestrian traffic. The main obstacle pedestrians and cyclists face besides vehicular traffic is the closest opening onto the greenway is positioned approximately at the middle of the building to the west of the site. There is little paving here and the opening is primarily for users of the building. However members of the public still use it and walk or bike on gravel to get to Thomas Ave.

The highest concentration of pedestrians and bicyclists is on the greenway at rush hour. Lake Calhoun trails see a large amount of traffic as well but they tend to be recreational users.





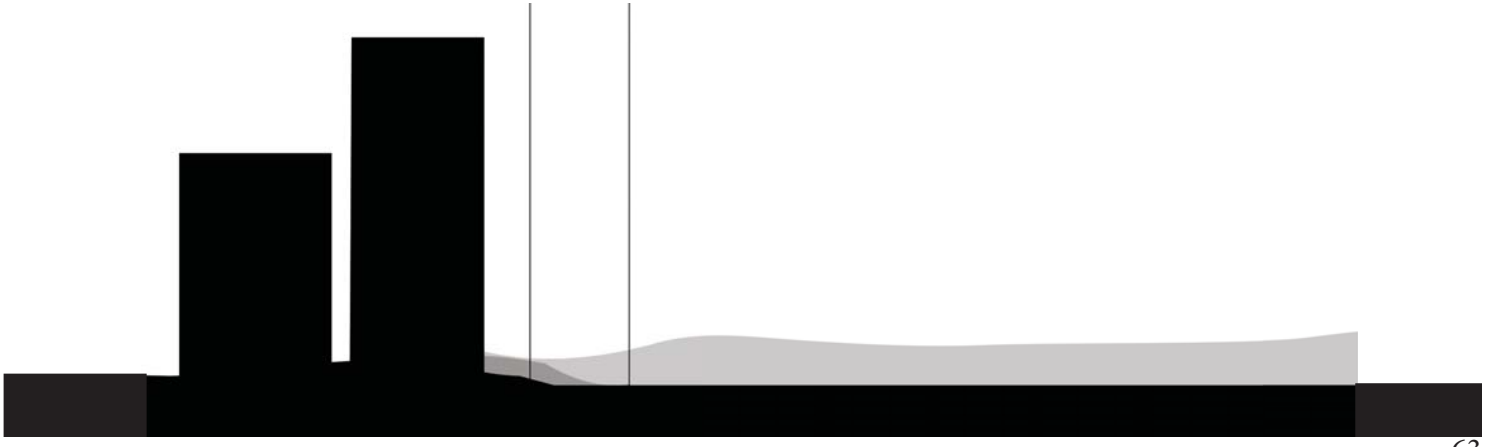
Site Analysis

Topography

The site is relatively flat with a small hill to the north and north-west. Within the limits of the property boundaries and setbacks the site only reaches a maximum of 4% slope and has an average of 0.4% slope traveling north on the site. This suggests that the site is suitable for the planned building. It may need some grading to improve drainage to the east. It also naturally creates an easy slope up to the greenway which can provide easy access for pedestrians and cyclists.

Visual Form

The site is a relatively flat and clear lot with few distinguishing features. The form of the site currently appears as a transition from Lake Calhoun to the greenway. It also appears as a bit of a void as it falls in-between a tall building to the west and mature trees on the east.



Site Analysis

Plant Cover

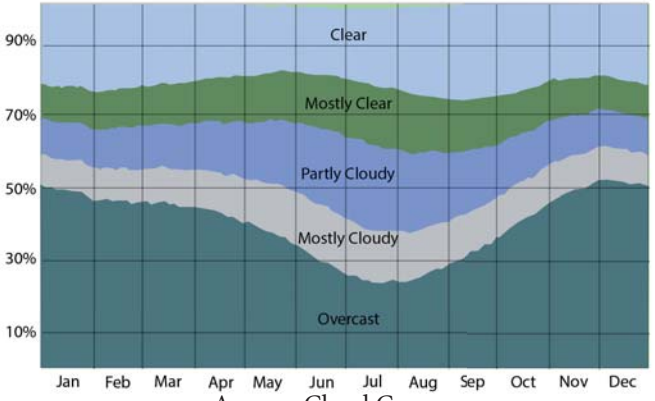
The site is currently in the process of being developed but for the interest of this project it will be analyzed in the state it would originally found, before the construction started.

The site is a gravel lot with mild growth around the edges. The current growth on the west and south side of this lot appears to be unintentional growth. The northern side has a few trees with smaller plants and relatively unkempt grass in-between. There are several trees growing along the eastern border, on the edge of the lot. The plants on the site vary, with several types of deciduous and coniferous trees as well as smaller shrubs.

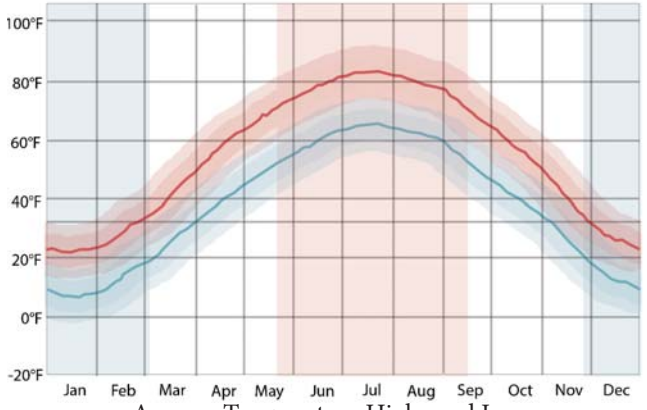
Site Character

The site appears mostly abandoned and uncared for while the opposite appears true for eastern lot. It contrasts greatly with the other park space in the area that it partially connects with which is well manicured and healthy.

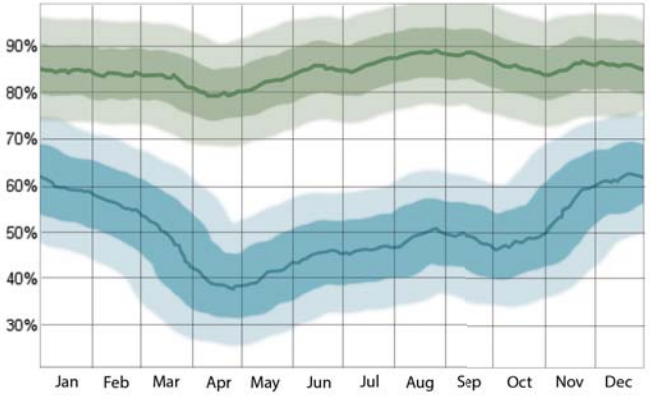
Climate



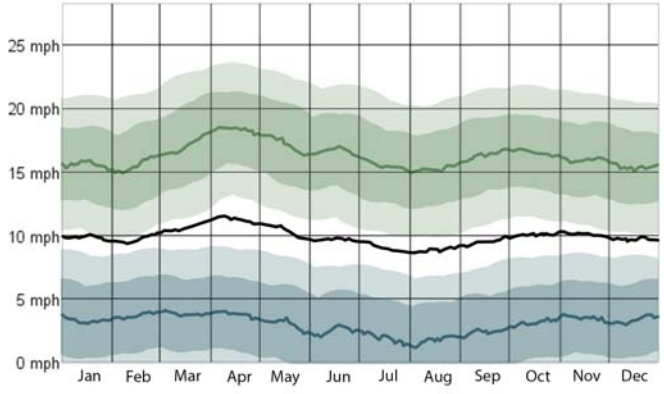
Average Cloud Cover



Average Temperature Highs and Lows

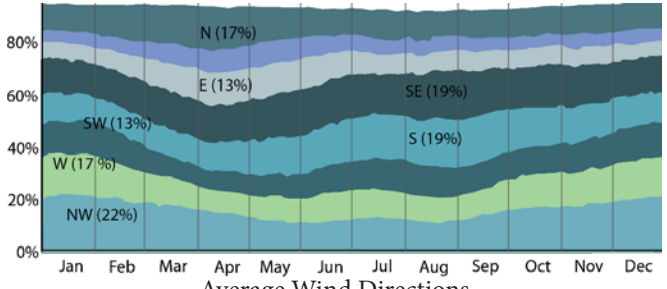


Average Humidity Highs and Lows

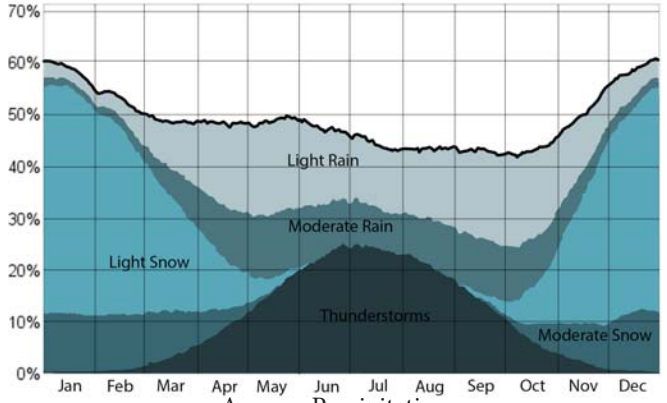


Average Wind Speed Highs and Lows

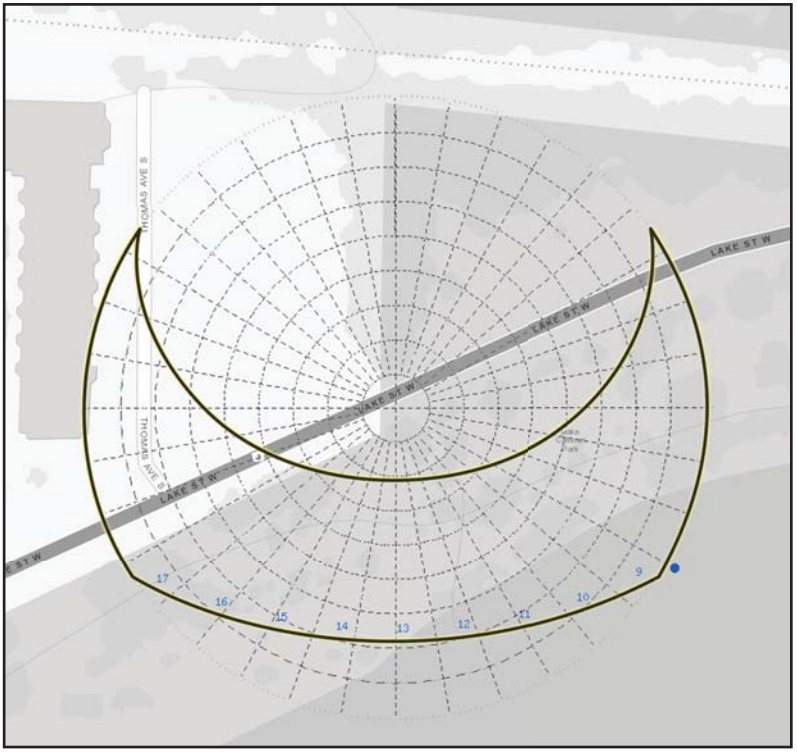
The principle features of the climate of Minneapolis are long, cold winters and short, warm summers. The freezing temperatures typically start in the middle of November and last through March. The mean temperature of the winter is approximately 16°F. The mean temperature of the summer is approximately 70°F. Fluctuations of the temperature are common in the spring and fall but also occur in the summer and winter. The summers feature hot spells within periods of moderate temperatures. The mean annual precipitation is 27.66 inches. The average annual snowfall is about 44 inches. The prevailing winds which from November to April are from the northwest and from May to October are from the south are rarely of high velocity. (U.S. Climate Data, 2016)



Average Wind Directions



Average Precipitation



Final Spatial Requirements

Apartments: Varied

- 1 Bedroom : 440-500 sqft
- 2 Bedroom: 800-1000 sqft

Bike Storage: 270 sqft

Maintenance: 200 sqft

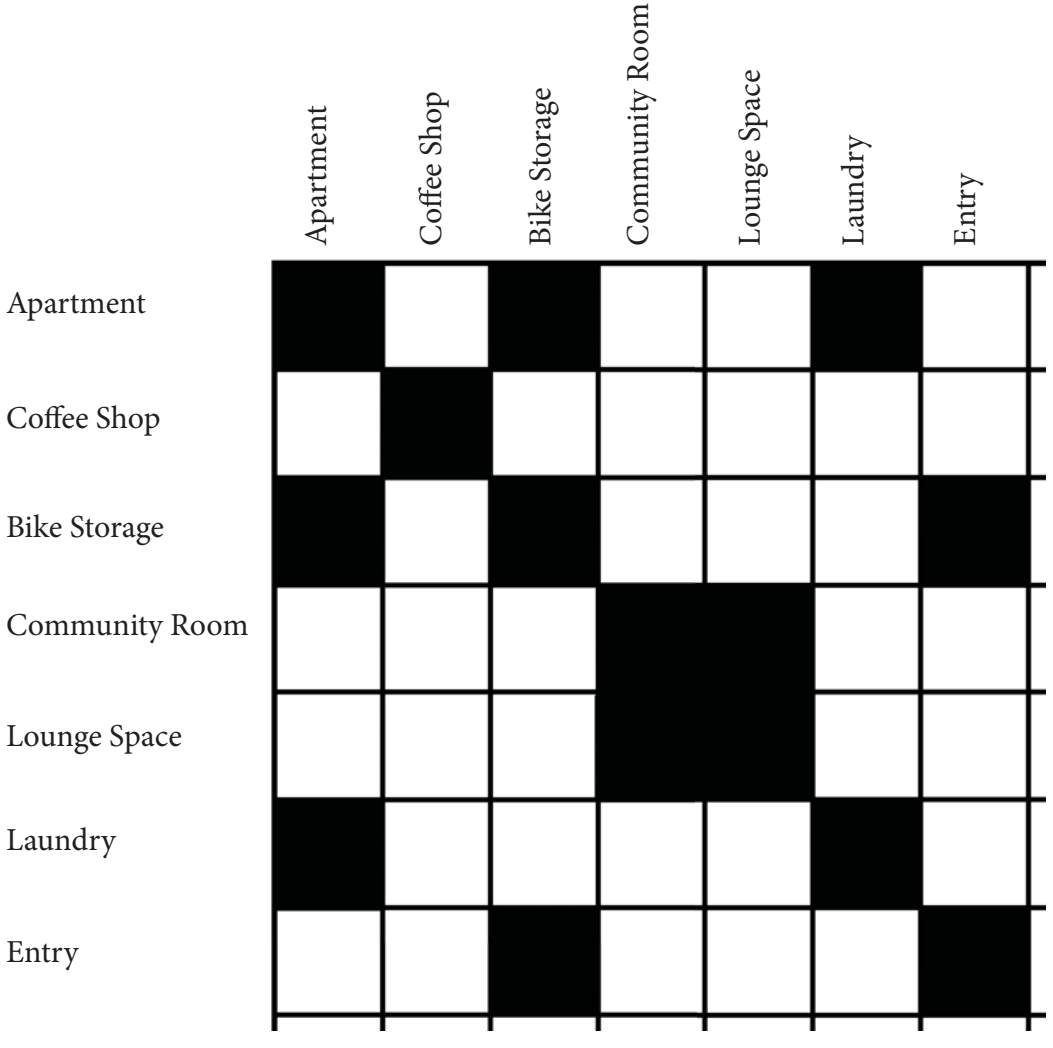
Coffee Shop: 970 sqft

- Dining Room: 900 sqft
- Dry Storage: 40 sqft
- Cold Storage: 30 sqft

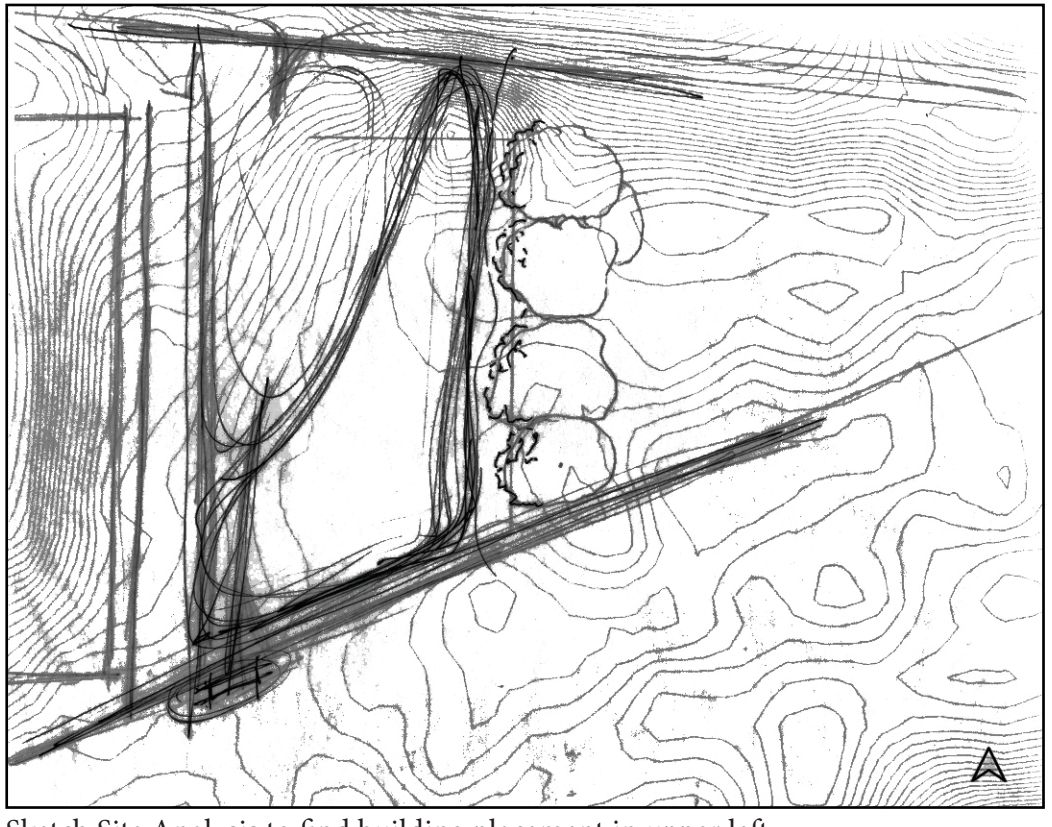
Community Room: 1975 sqft

Lounge Space: 677 sqft

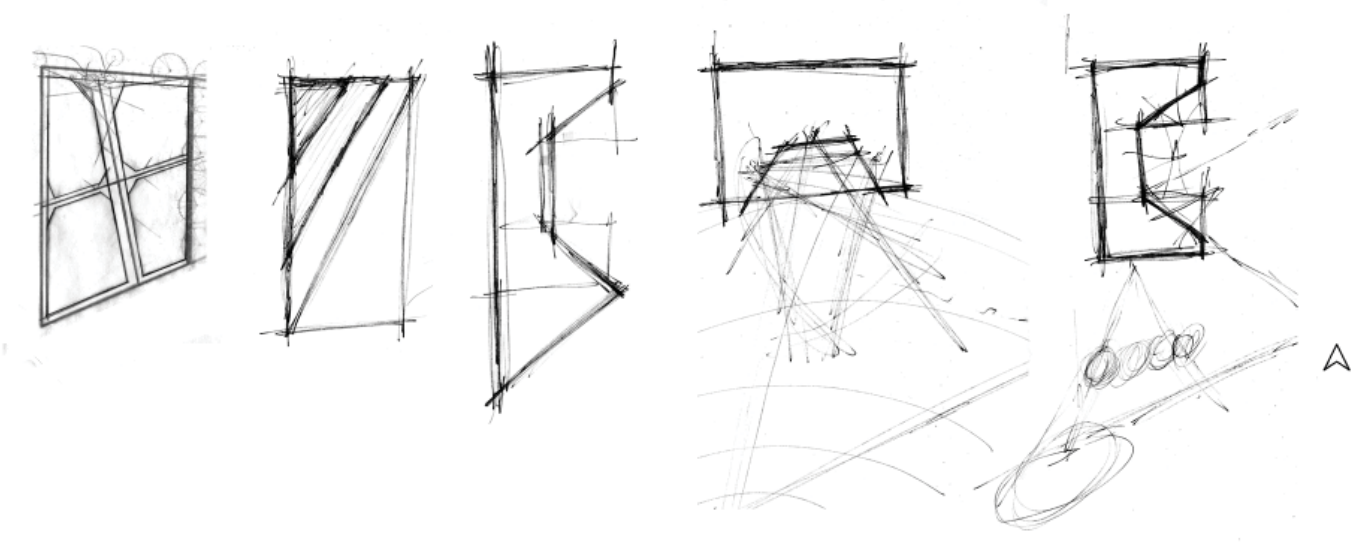
Laundry: 280 sqft (per floor)


Apartment
Coffee Shop
Bike Storage
Community Room
Lounge Space
Laundry
Entry
Apartment
Coffee Shop
Bike Storage
Community Room
Lounge Space
Laundry
Entry

Chapter 3: Design Documentation



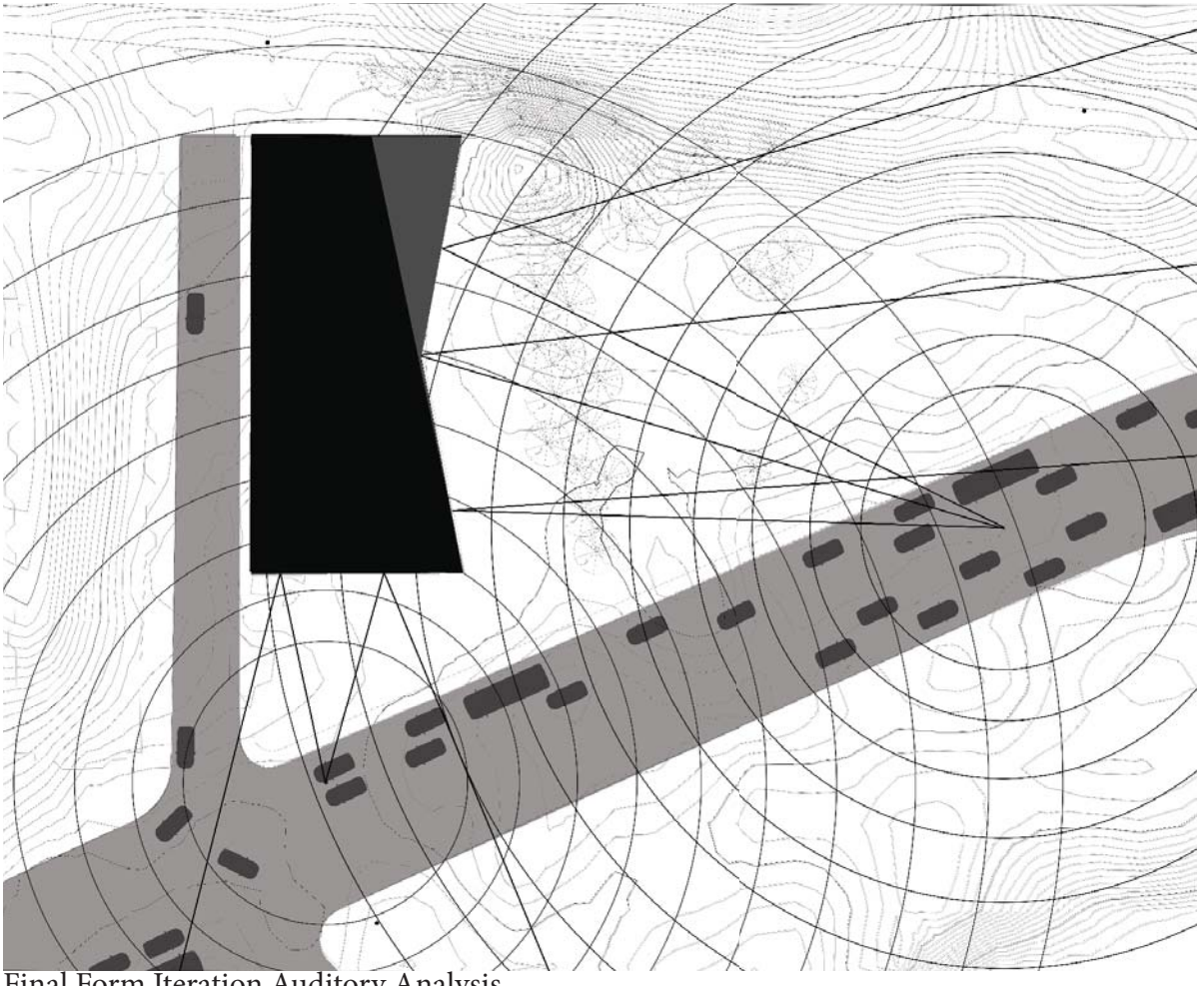
Sketch Site Analysis to find building placement in upper left



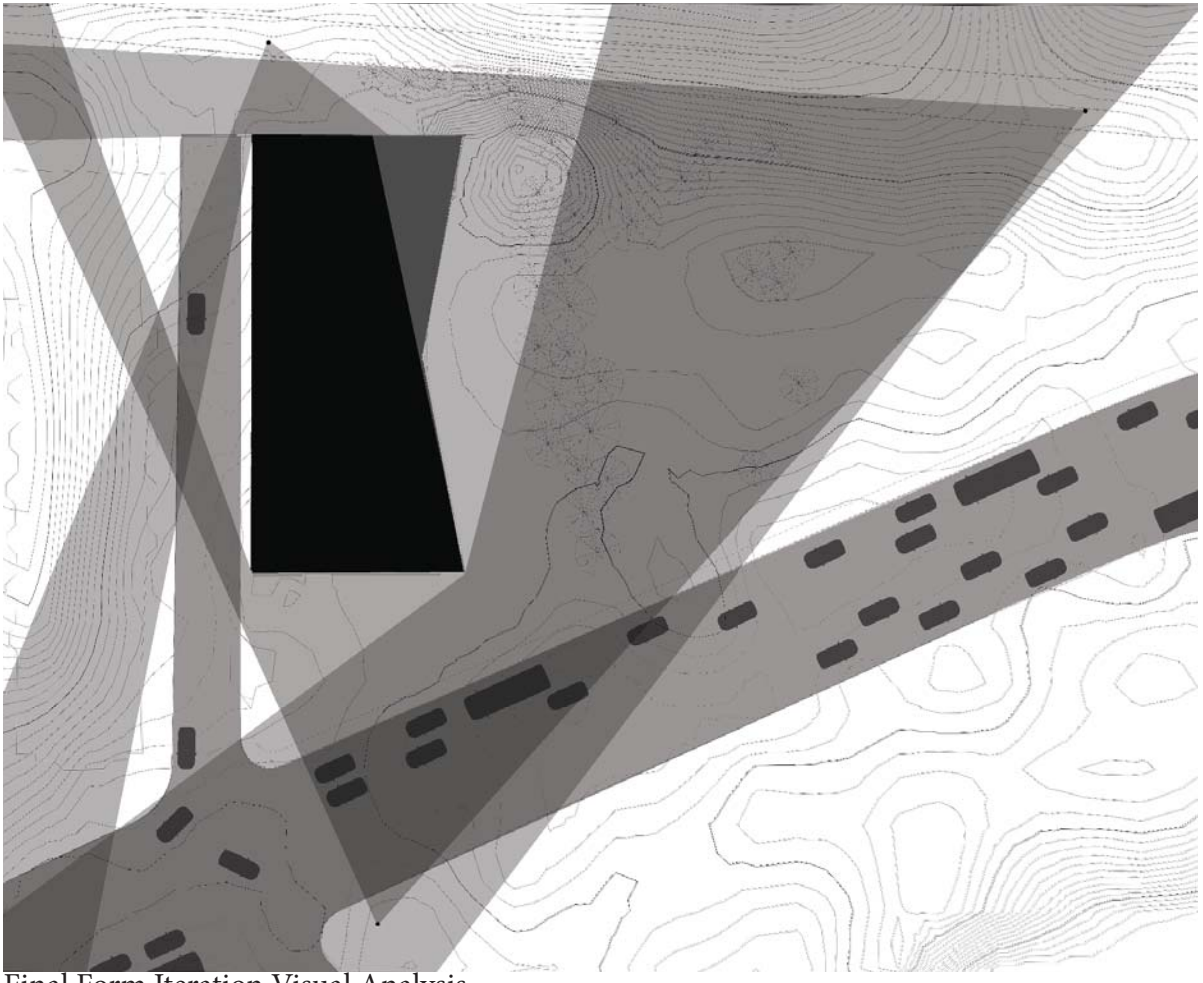
The first iteration was developed with the idea of developing a mixed-use complex on the site and adding shopping and other retail opportunities in the building. This idea was abandoned due to time constraints.

Iteration two was developed with the idea of a building that stepped back away from Lake Street to create very distinct floors in size and acoustics.

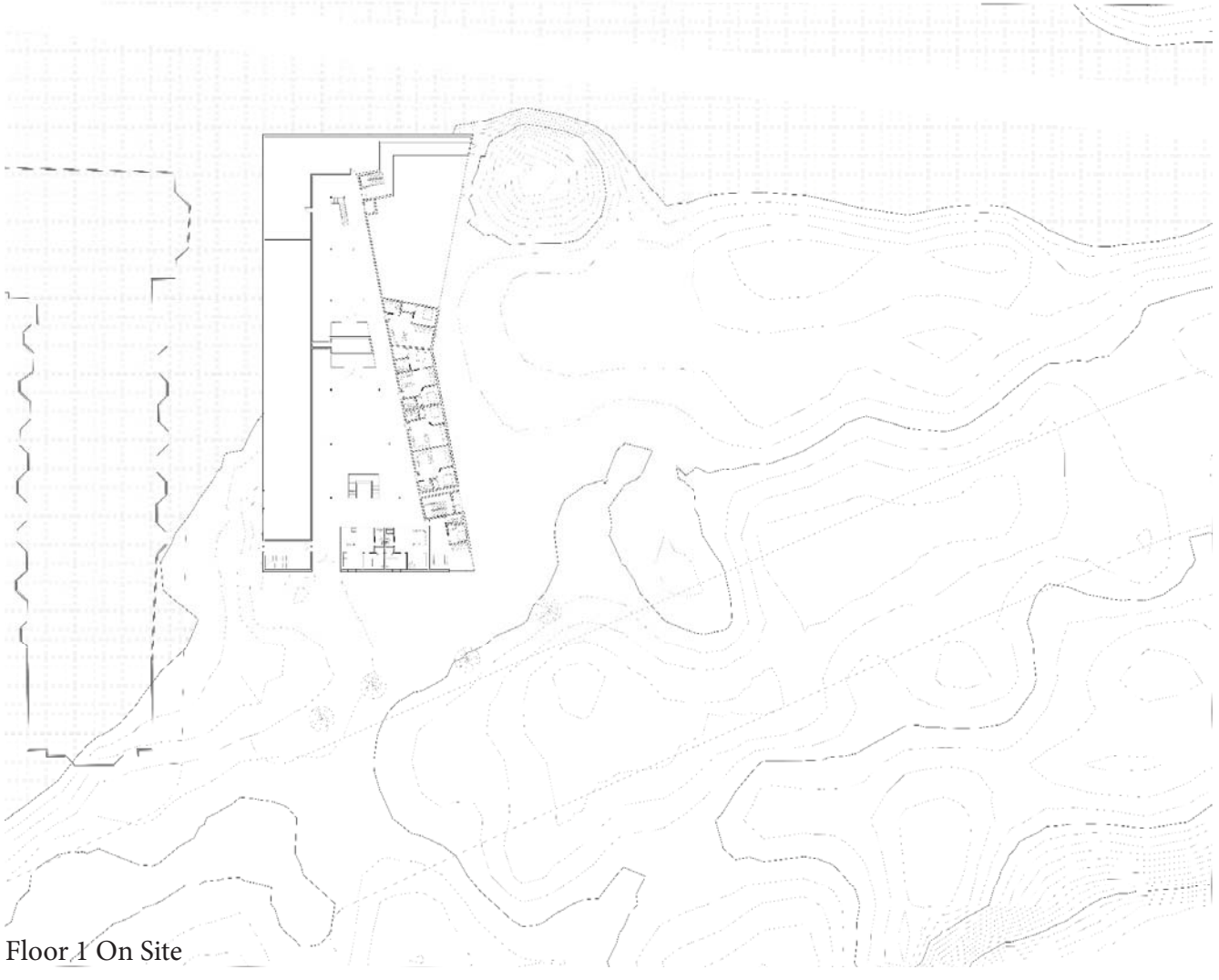
Iteration three through five were developed by cutting into a rectangle to increase the views from the building and providing for views across from one part of the building to the other. This idea was briefly analyzed with facing several ways before determining that it would not provide the unique spaces that would aid in acoustic wayfinding.



Final Form Iteration Auditory Analysis

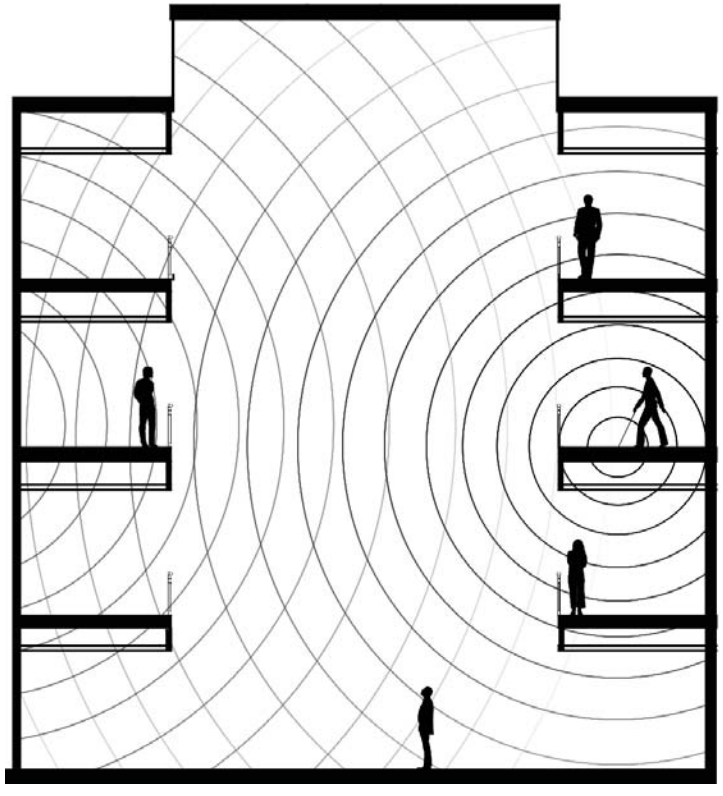


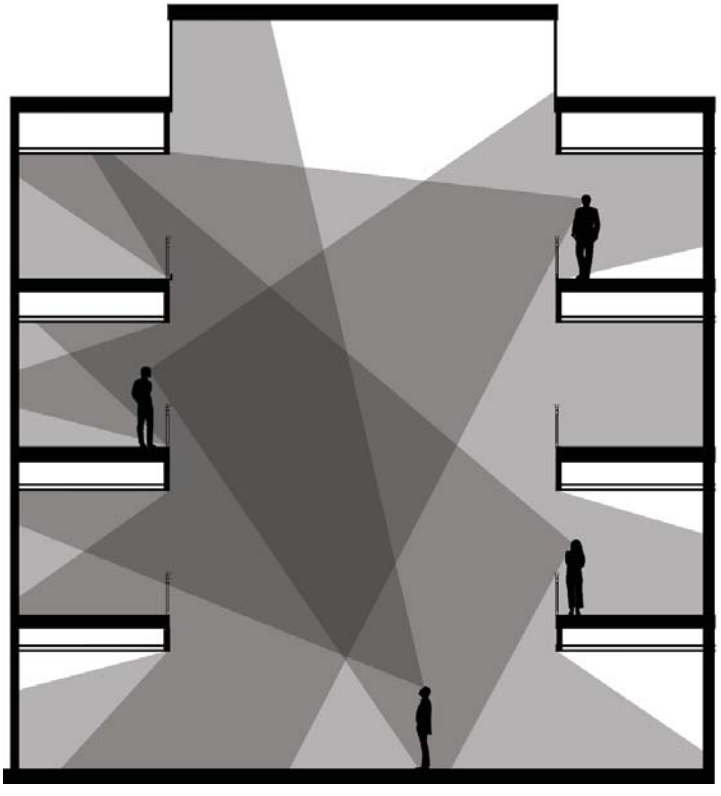
Final Form Iteration Visual Analysis



Floor 1 On Site

Atrium Auditory and Visual Analysis





Floor 1

The entry on floor one is on the southern and eastern facades of the building. The first floors hosts the ramp to the parking garage below as well as the lounge spaces and community room. It has a few apartments along the east and south sides.

Floor 2

The entry from the north side of the site is on floor two along with the coffee shop and an accessible green roof above the community space. This floor is mostly apartments with a shared laundry in the middle separating the north and south atriums.

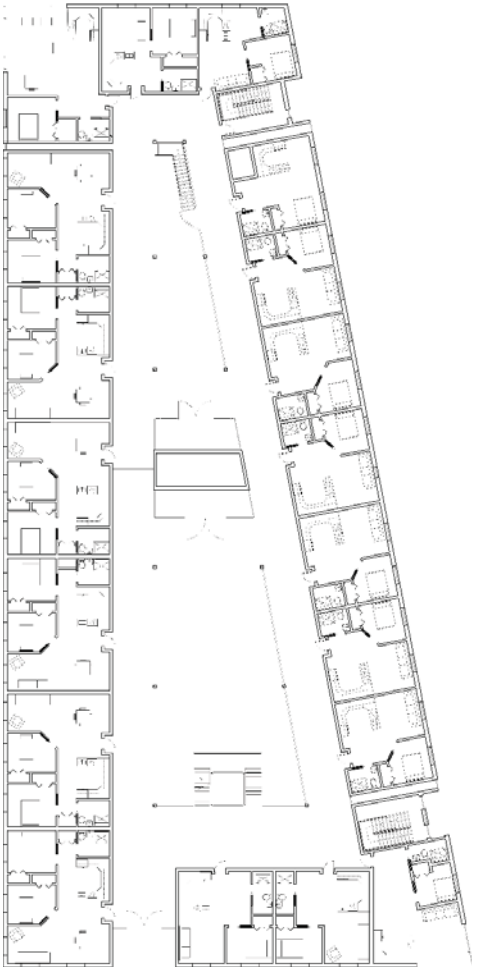
Floor 1

Floor 2

Floor 3 and 4

Floors three and four are the same plan with apartments lining all sides of the building. Like the previous floors they also feature a shared laundry space that splits the atrium space in half. The egress from these floors is varied but all on the east side. Both egress stairs lead to the first floor but with the option of getting out on the second.

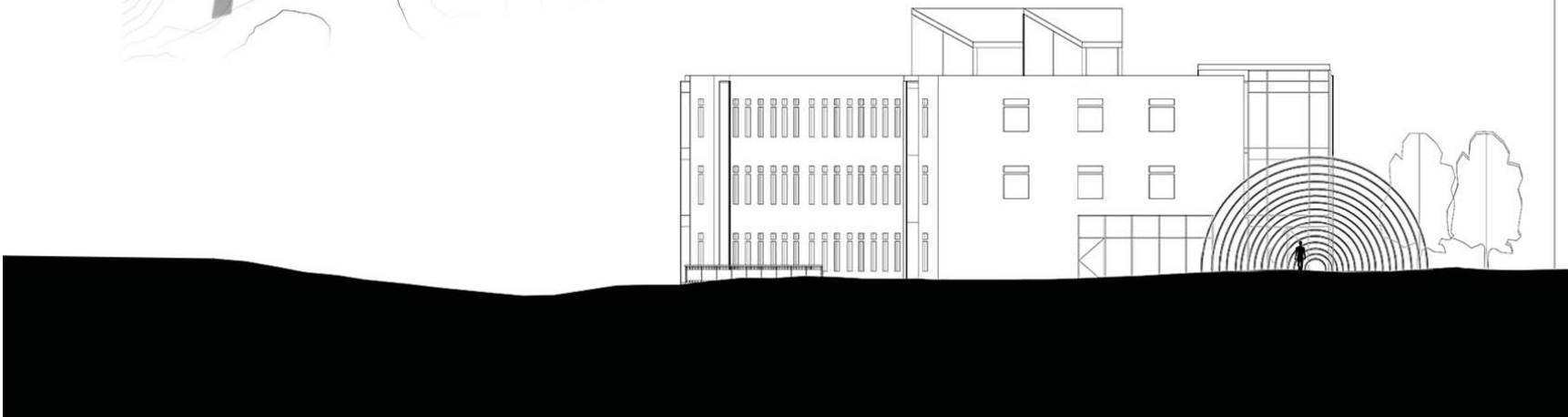
Floor 3

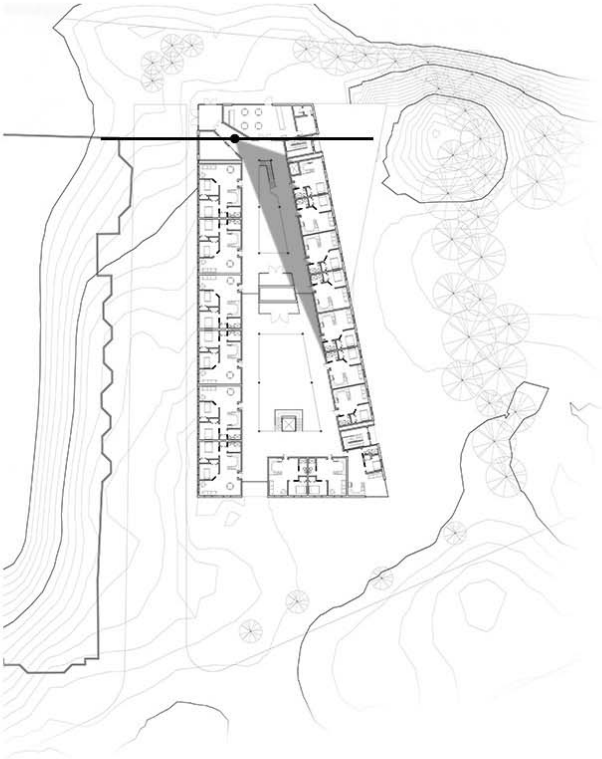


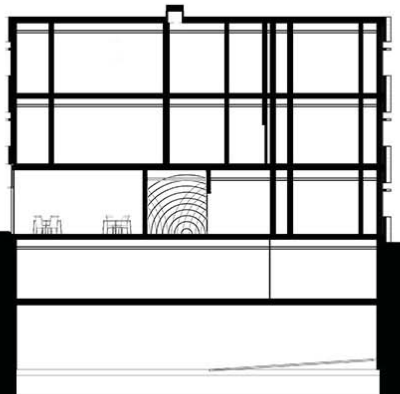
Floor 4

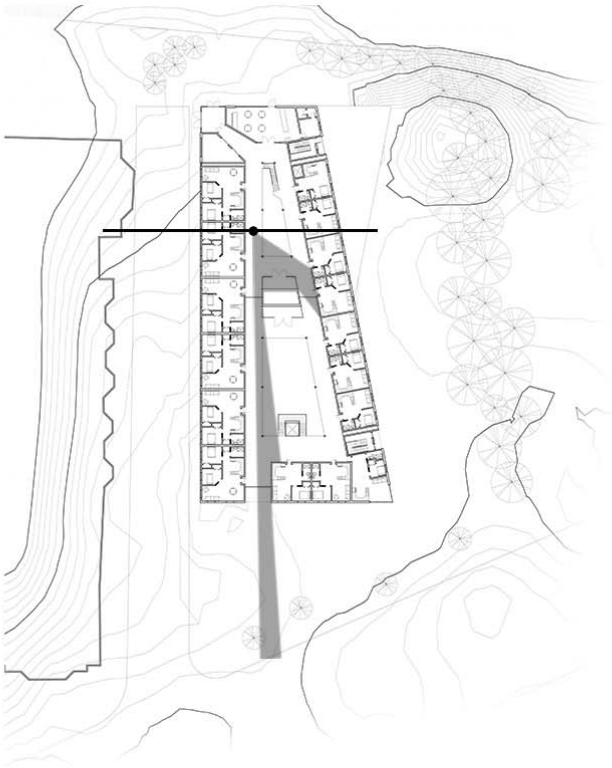
Building Walkthrough

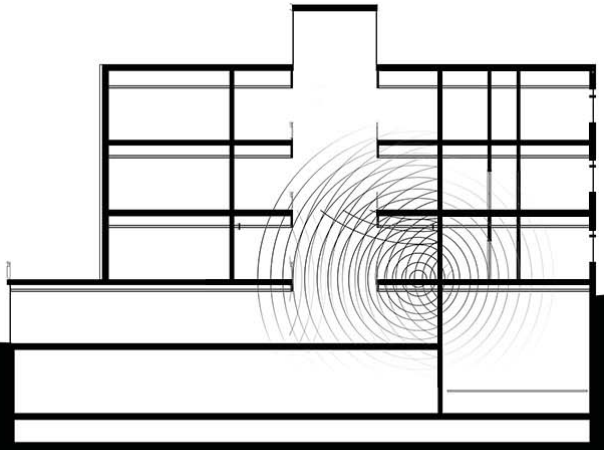
To develop the interior of the building snapshots along a route were imagined and evaluated based on acoustic quality as well as visual access. The resulting form allows maximum visual access with the spaces especially evident in the entry gesture opening up by slicing the corners into a long diagonal. The rest of the snapshots highlight the visual access of the atrium spaces as well as showing the acoustic change between the north and south atrium.

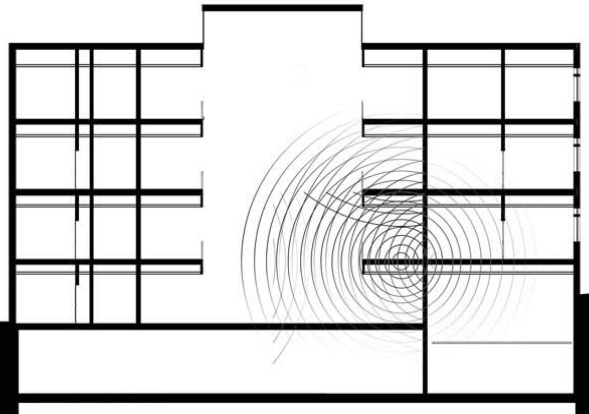












Atrium Lounge

This lounge space is at the bottom of the atrium in a prime location for visual access to the upper floors. Since the lounge is carpeted it also helps control some of the acoustics in the atrium spaces. The carpet also serves as an indicator to the blind individuals that the usage of the space is changing from circulation to lounge.
Finally, as shown in the rendering the stairs have small walls around the bottom to prevent blind individuals from running into the protruding staircase.

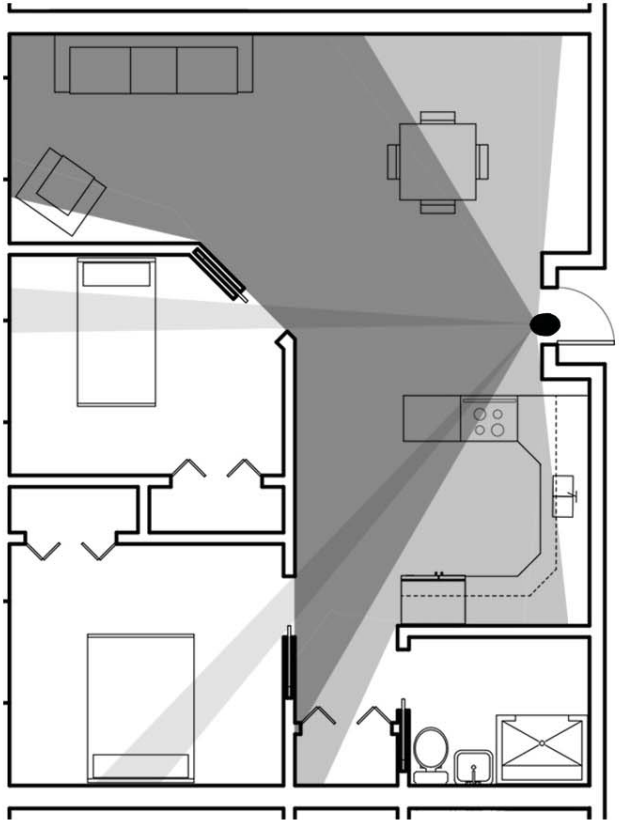
Atrium Lounge Space from 2nd floor

Entry Perspective showing bike storage and coffee shop

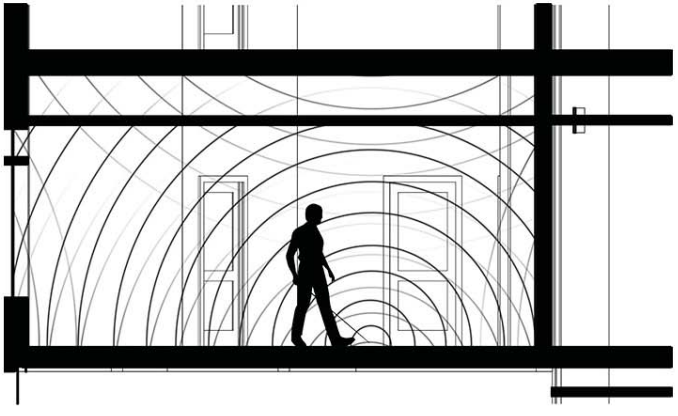
Apartment Walkthrough

To investigate the design of the apartments the space was broken into three views to analyze. Just like the existing apartment analysis done previously the apartment was analyzed for the percentage visible at each location. That location was also rendered to give an idea of the view that would be seen. The area or subject of the investigation was also analyzed for acoustics to understand the overall quality of the space.

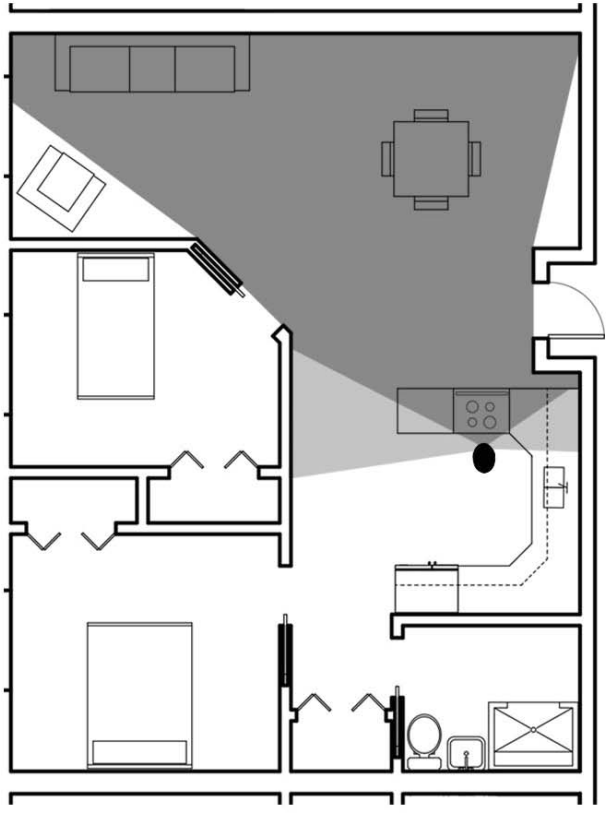
While not laid out here, the spaces were analyzed and found to have an estimated Reverberation time of 0.72 in the common space. 0.7-0.8 is the recommended range for rooms wishing to have acoustics prime for spoken conversations.

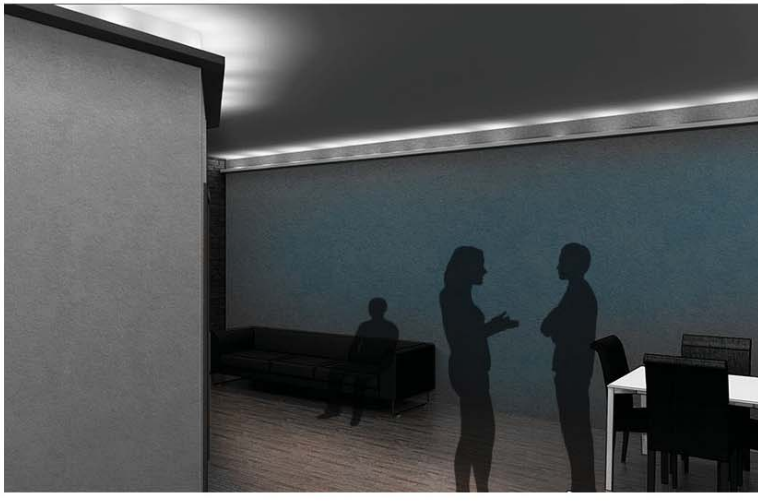


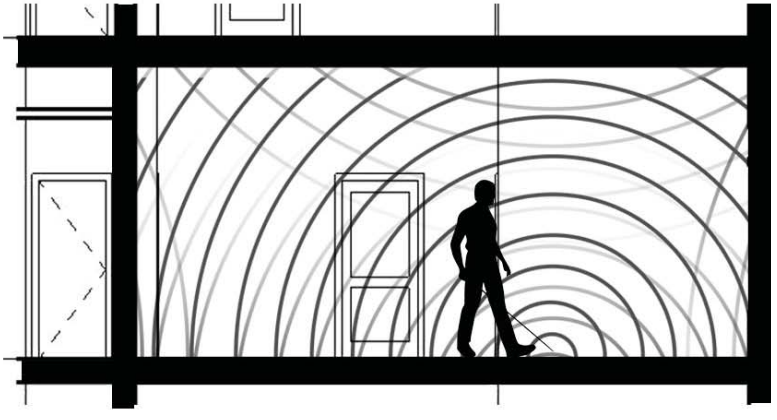
2 Views: 97%

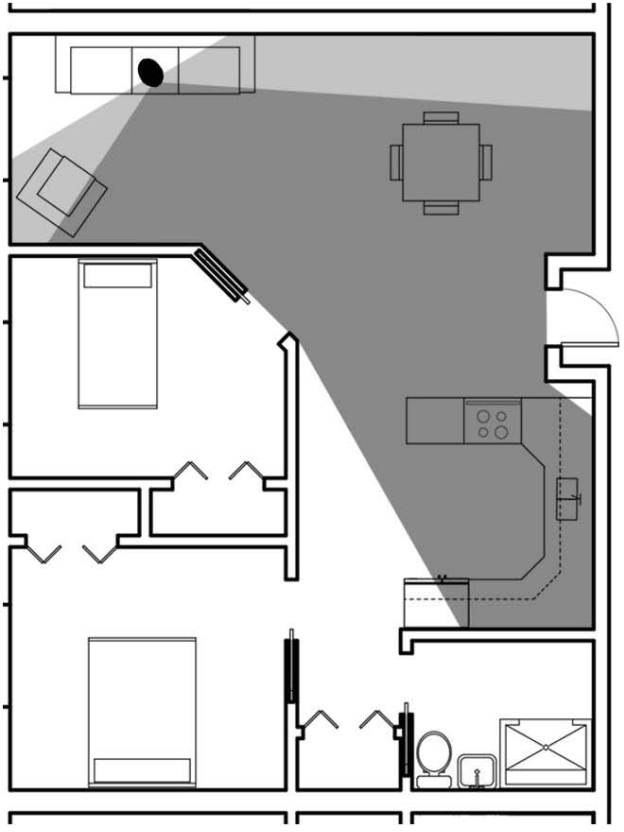


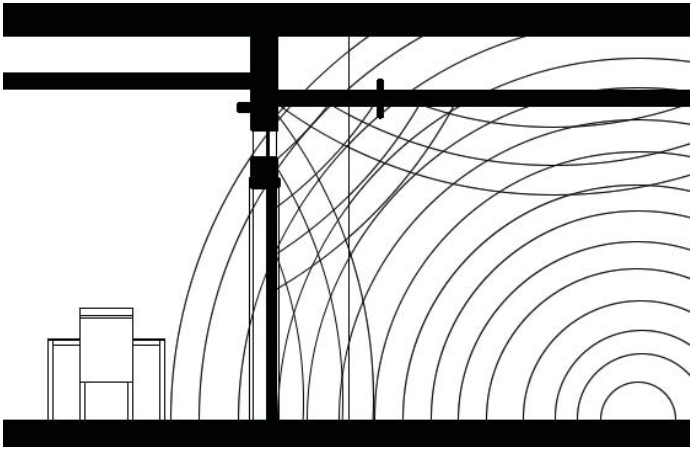
3 Views: 83%

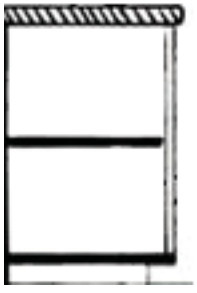




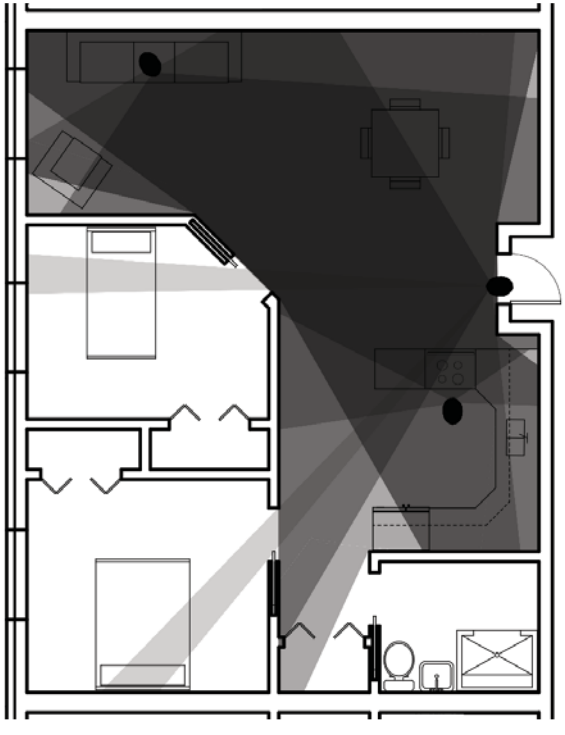




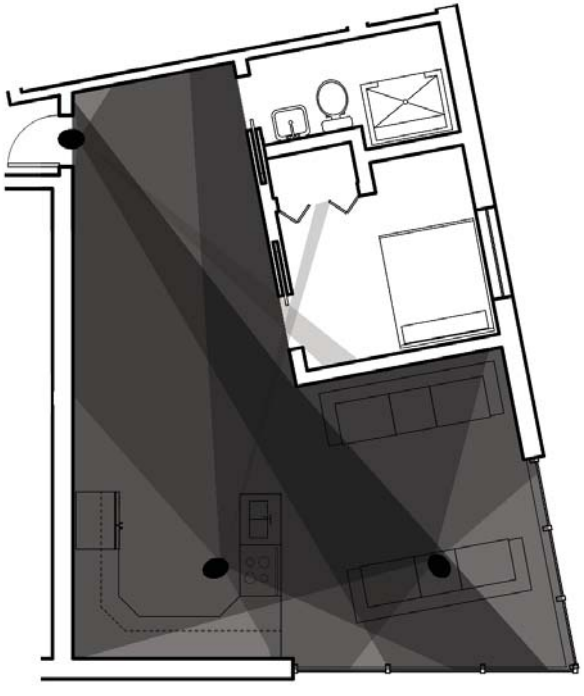




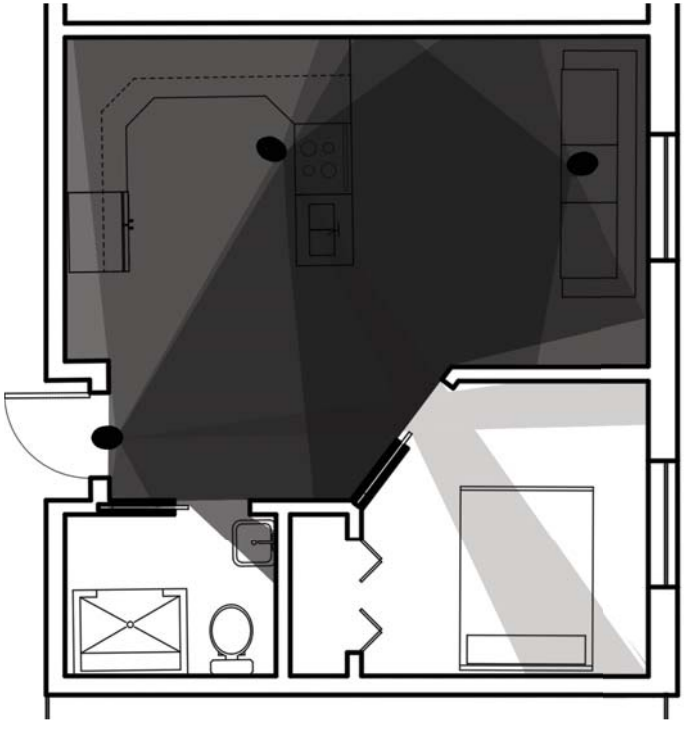
Apartment Visual Access Analysis



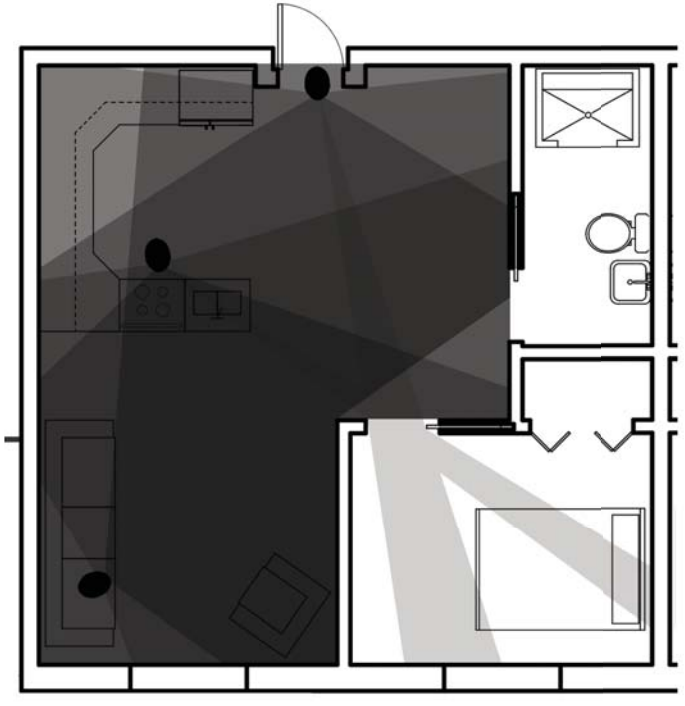
2 Views: 84% 3 Views: 41%



2 Views: 95% 3 Views: 16%



2 Views: 97% 3 Views: 38%



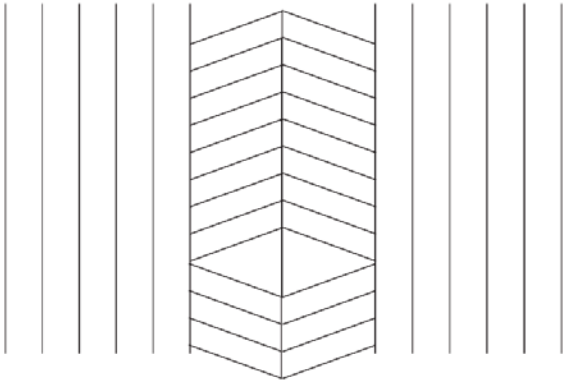
2 Views: 68% 3 Views: 47%

Design Details

A Large part of the design was done in the details of the building. These details aid in wayfinding, orientation as well as acoustic privacy in the spaces. While seeming small, these details could greatly improve the experience had by an impaired user.

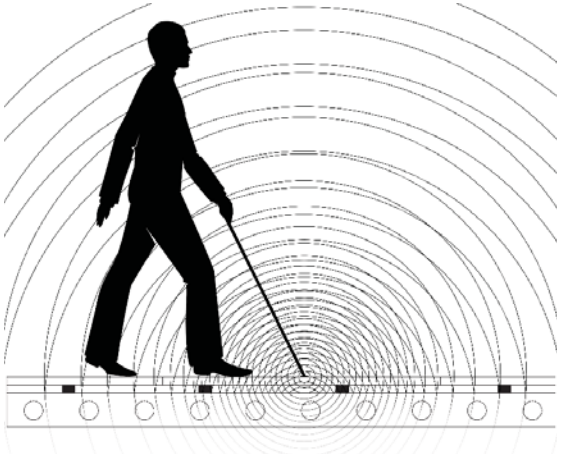
Egress Floor Detail

To aid with egress both in times of emergency and in learning the layout of the building the floor has metal tubing set into the wood with textured ridges on the top. These ridges point to the nearest exit aiding those without sight in finding their way out of the building. Additionally, during a fire water would be released into the tubes cooling them down and providing an auditory guide.



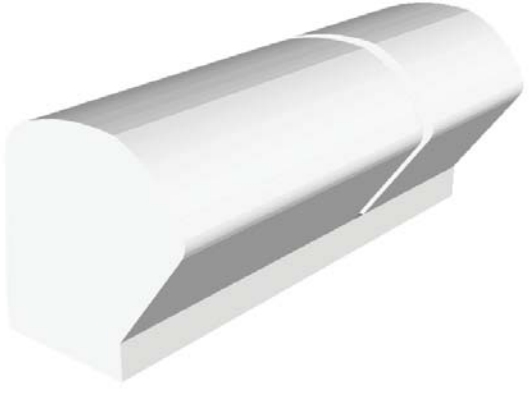
Floor Acoustics Detail

The slight gap between the wood flooring and the concrete allows for more vibration and thereby creates a unique acoustic quality. This flooring assembly is used to aid in acoustic navigation as well as aiding the hard of hearing to the movement of others through vibration.



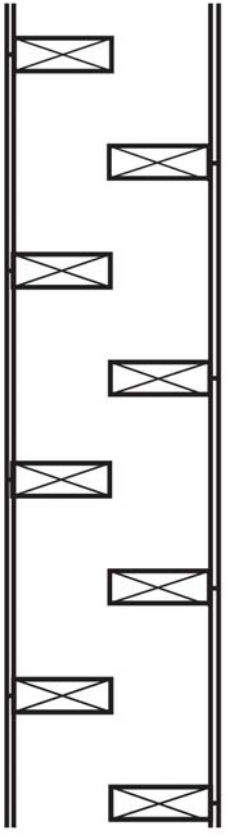
Handrail Detail

To aid in navigation, the handrails around the atriums have a brief gap directly correlating with the location of the adjacent apartment's door knob. This allows those with a vision impairment to swiftly move through the space while maintaining a heightened understanding of the space.



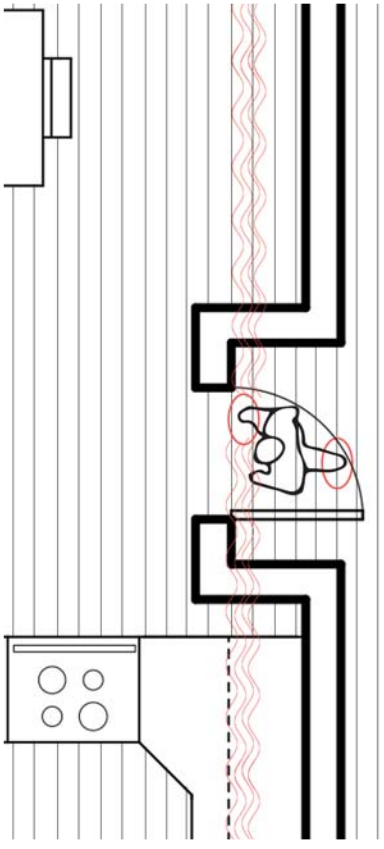
Acoustic Wall Detail

To improve acoustical privacy and to improve insulation the walls between apartments are twice as wide with the studs alternating to avoid unnecessary mechanical energy transfer. Additionally, the gypsum wall boards are attached to the studs with sound isolation soft clips which also decrease the amount of noise transfer.



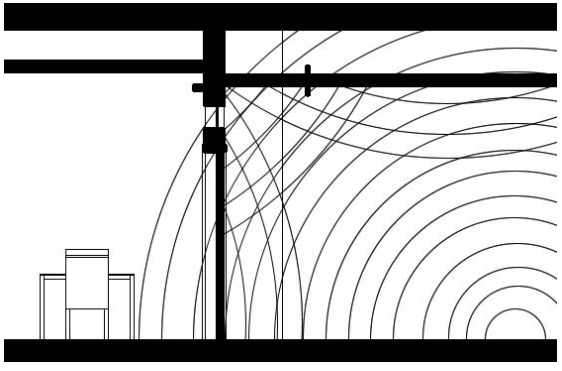
Floor Vibration Detail

To aid in awareness of surroundings for both blind and deaf individuals the entry of the apartment is set into the apartment plan. This allows the wood flooring in both spaces to carry the vibration of someone at the entry into the apartment alerting the occupant to their presence.



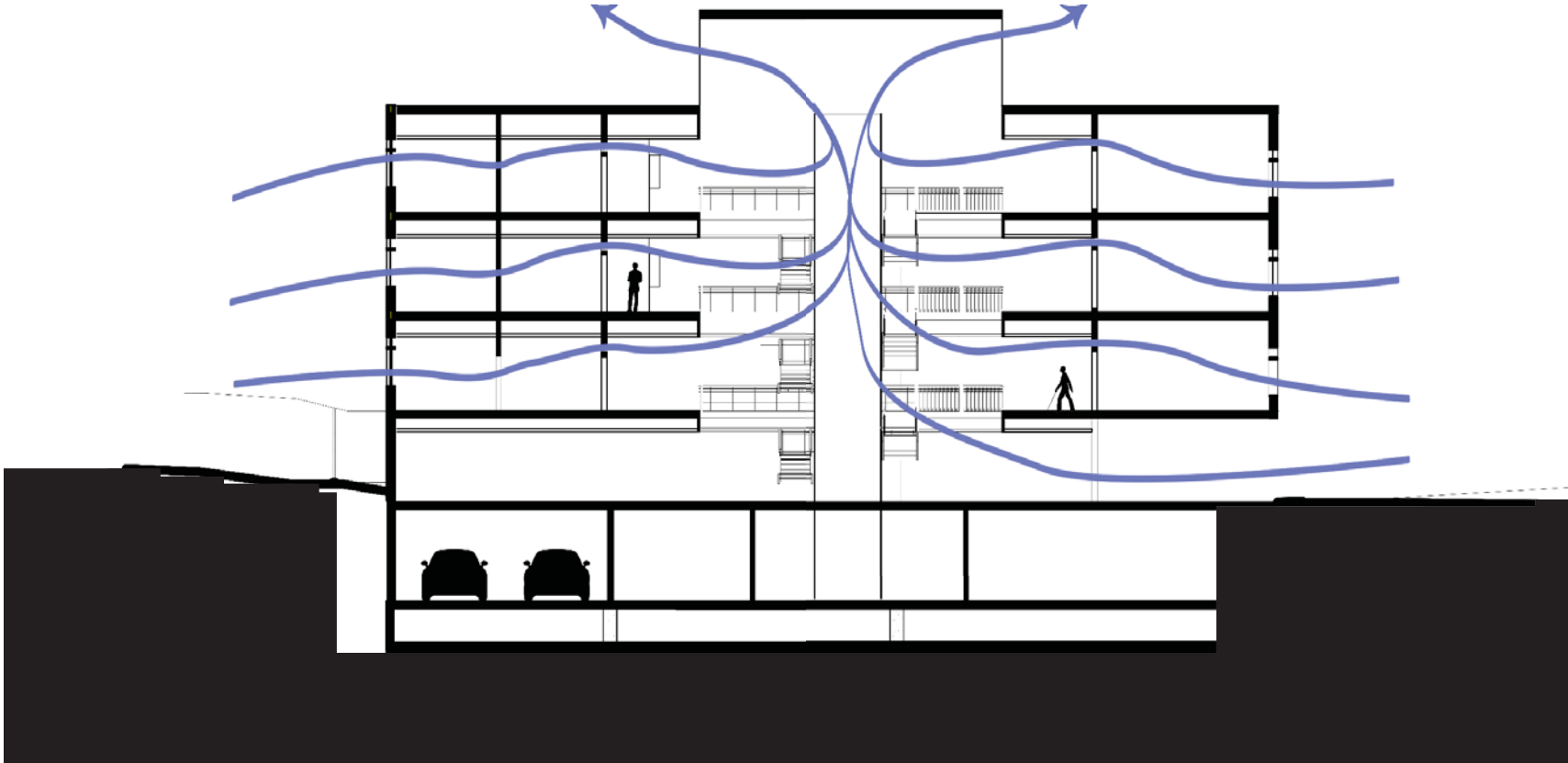
Apartment Entry Section

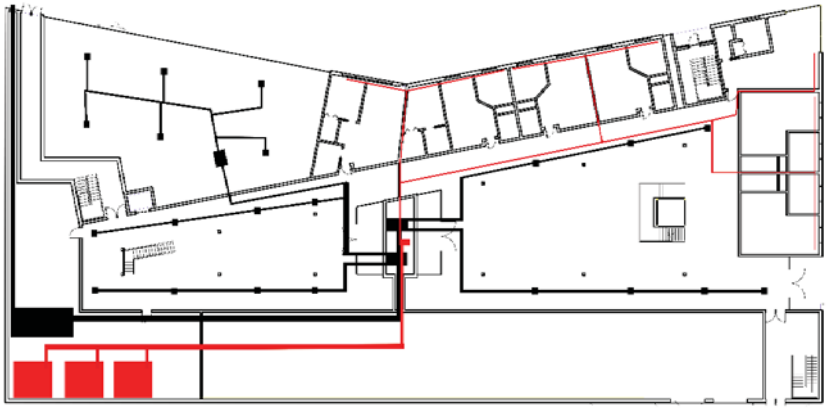
The set back of the door created a unique acoustic condition that alerts those without use of site to the entrance. This is both an acoustic feature as well as a visual feature as the sudden extra space and the shadow that the setback creates will also alert a deaf individual to the entry moment.

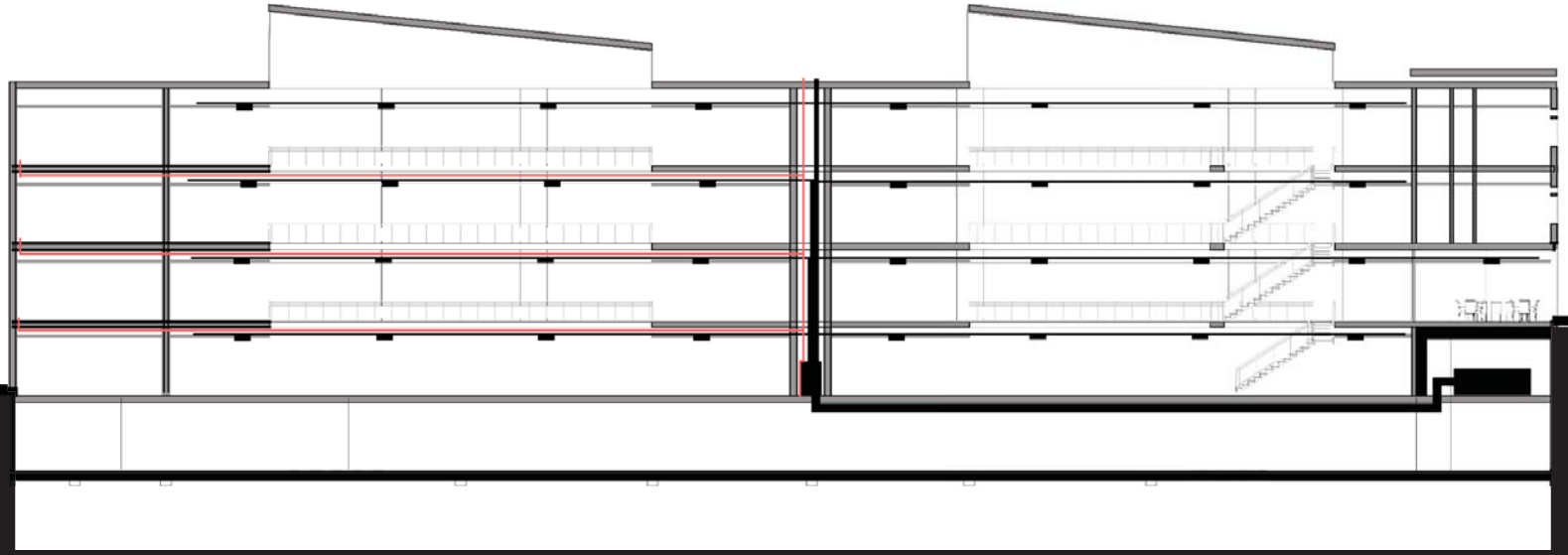


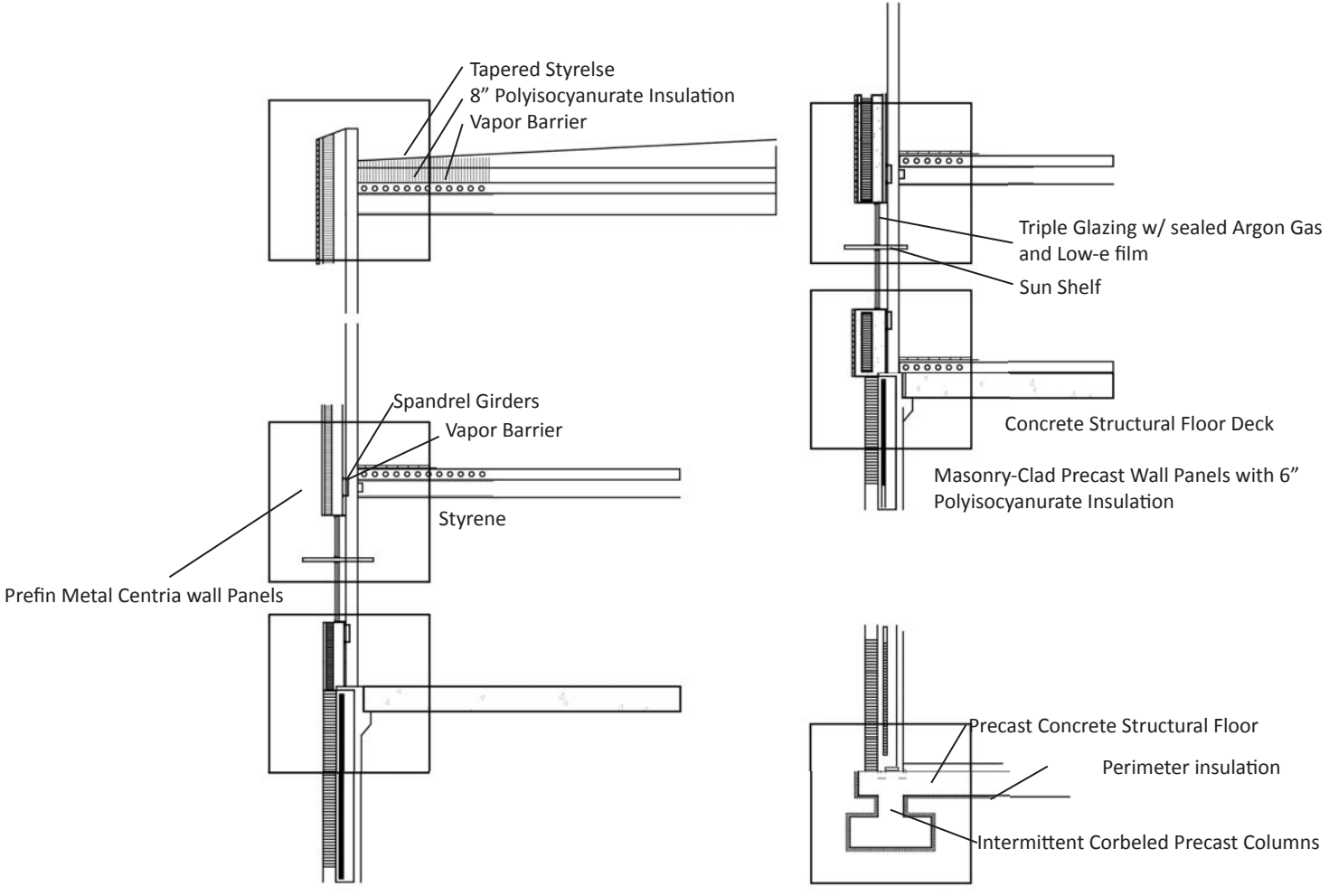
HVAC Detail

The primary ventilation technique for the building is natural ventilation taking advantage of the stack effect. The air is pulled through slits in the building facade aided by fans when the wind is low. The air can also be brought in through the apartments if the residents open their outside windows as well as the transom window above their door.
The active systems being used are Hydronic Systems to heat the apartments and VAV systems to serve as ventilation for the rest of the building. These were chosen based on the fact that they are some of the quietest systems and are unlikely to interfere with hearing aids



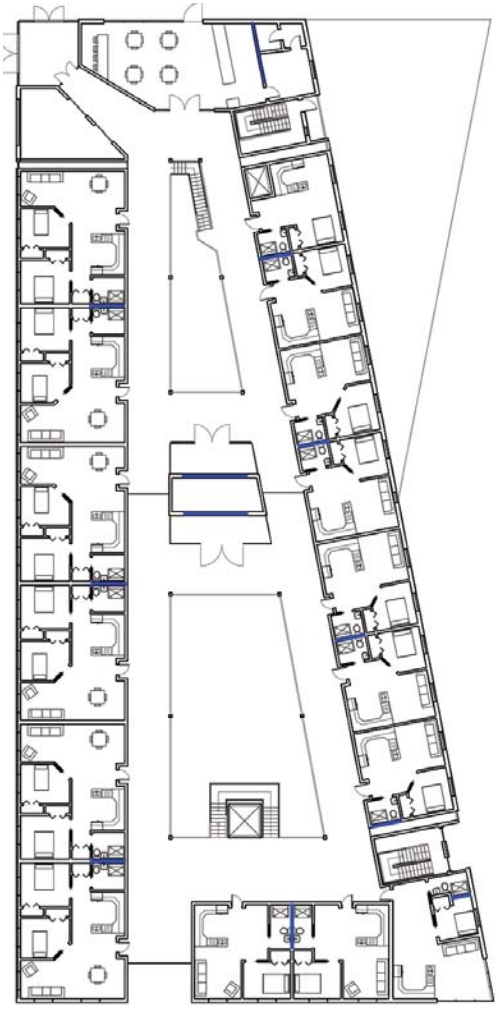




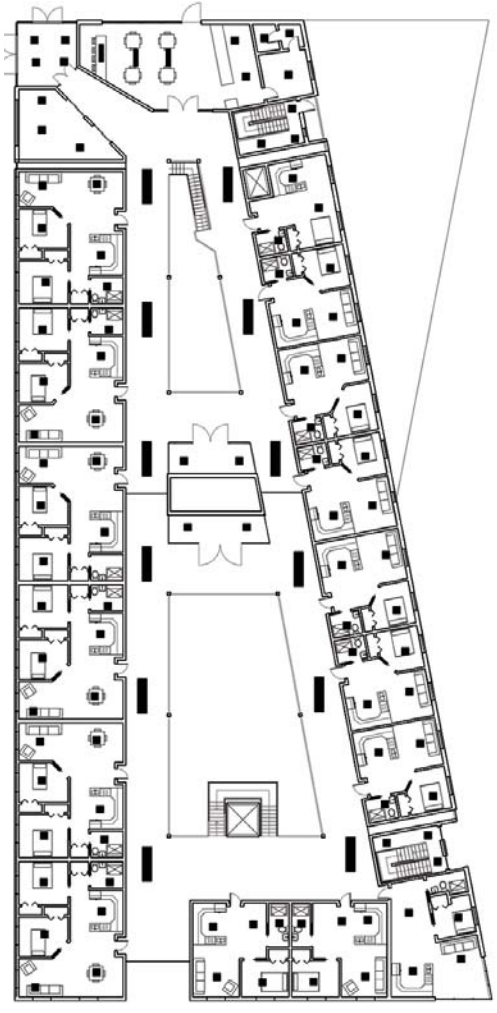

Tapered Styrelse
8” Polyisocyanurate Insulation
Vapor Barrier
Triple Glazing w/ sealed Argon Gas and Low-e film
Sun Shelf
Spandrel Girders
Vapor Barrier
Concrete Structural Floor Deck
Masonry-Clad Precast Wall Panels with 6” Polyisocyanurate Insulation
Styrene
Prefin Metal Centria wall Panels
Precast Concrete Structural Floor
Perimeter insulation
Intermittent Corbeled Precast Columns

Technical Plans

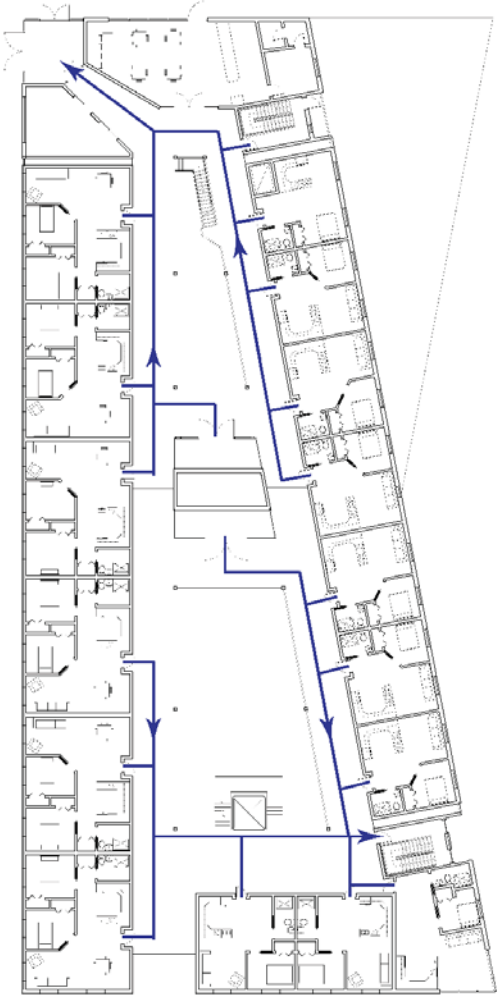
Structural 2nd Floor Plan



Plumbing 2nd Floor Plan



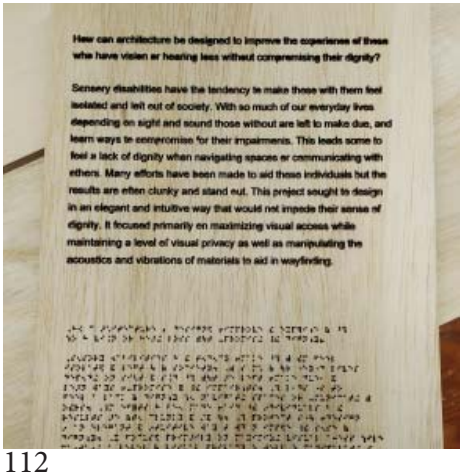
Lighting 2nd Floor Plan

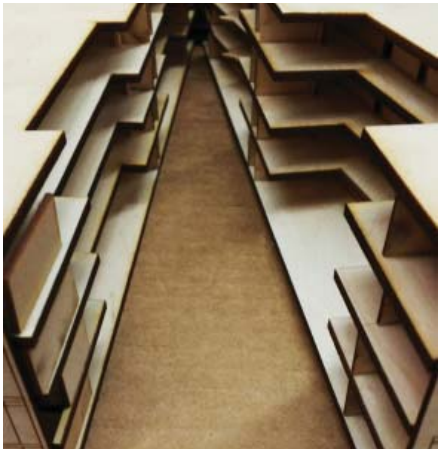


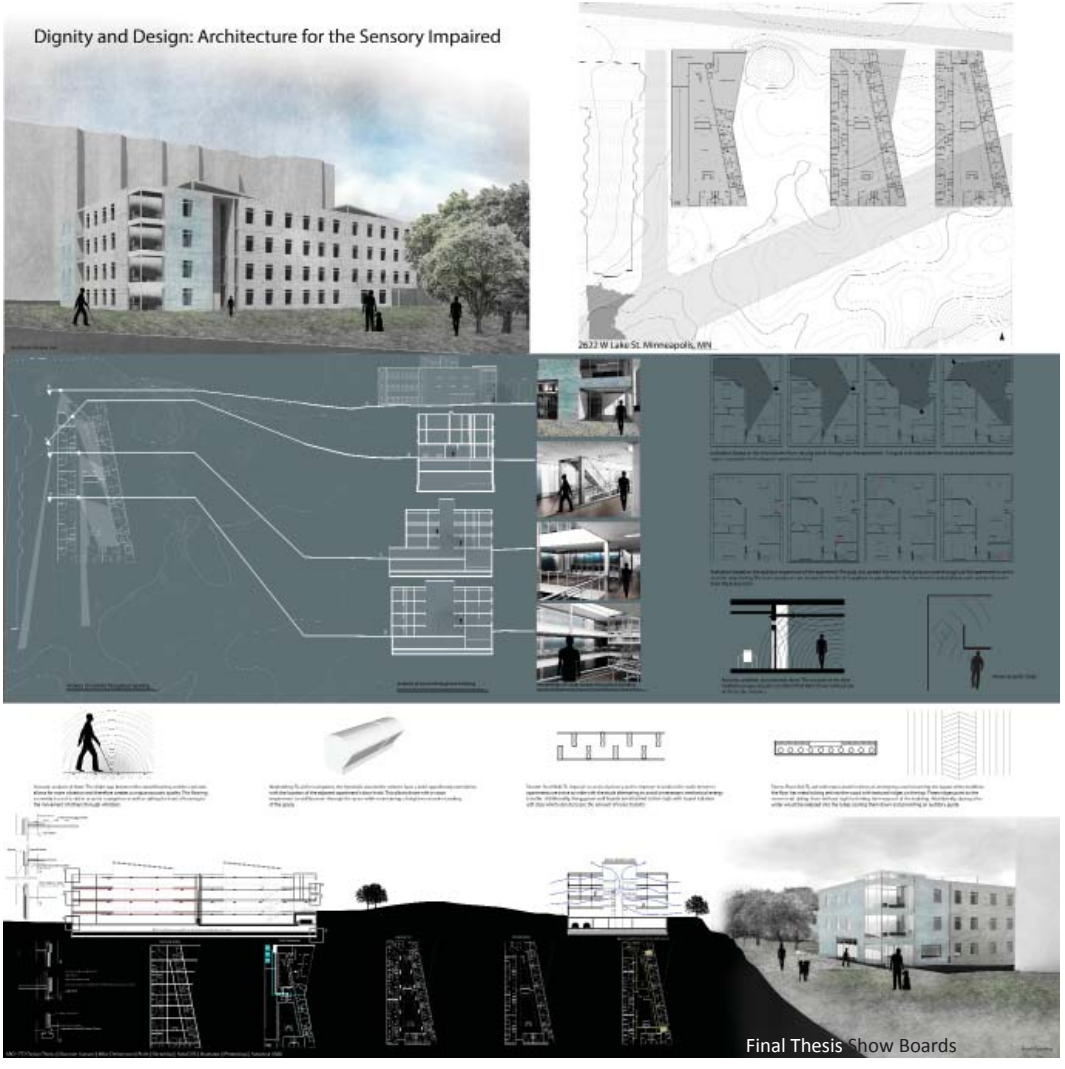
Egress 2nd Floor Plan

Final Presentation

Left: Etched Project Description, Middle: Section Model in Site, Right: Section Model Opened







Final Thesis Show Boards

Appendix

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Previous Studio Experience

Second Year

Fall: Joan Vorderbruggen
Tea House - Fargo, North Dakota
Parti design with site analysis
Minneapolis Boat House - Minneapolis, Minnesota
Architectural expression through a site and client visit

Spring: Phil Stahl
Bio-Mimicry Dwelling
Portable multi-use tiny home that adjusted to varying landscapes
Chair as a metaphor
Furniture piece as a metaphor for an emotion
Dance Studio - Moorhead, Minnesota
Architecture as a movement gesture

Third Year

Fall: Steve Martins
Raptor Center - Duluth, Minnesota
Structural timber construction
Heath Spa - Menomonine, Minnesota
Masonry construction with local materials

Spring: Bakr Aly Ahmed
NDSU Culinary Arts School - Fargo, North Dakota
Steel Construction for culinary education
Boarder Crossing Station - Strömstad, Sweden
Steel Construction for architectural competition

Fourth Year

Fall: David Crutchfield
Urban High Rise - San Francisco, California
Tall structural design reflecting site, code, and historic research

Spring: Paul Gleye
Brussels Urban Renewal - Brussels, Belgium
Study of European urban design

Fifth Year

Fall: Ganapathy Mahalingam
GRA with HKS Architects Knox Advisors
Architecture research through simulation

Spring: Mike Christenson
Design Thesis

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