



Psychology and Design

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NORTH DAKOTA STATE UNIVERSITY

A DESIGN THESIS BY:
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The Psychological Impact of Architectural Design

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Date

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Date

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Photo Credits

Other than those previously noted - Each image within this thesis were taken by me in my favorite places throughout Minnesota.

THE | PROPOSAL





The theory of this thesis is to consider the relationship between the built environment and its psychological impact. The average person spends about 80-90% of their time indoors. Space, colors, aesthetics, materials, green design and acoustics are all engaging factors of design that play a significant role in providing the user with a psychological experience, and designers can enhance this experience.

This thesis focuses on contextual factors, such as the understanding and analysis of the built environment as well as theoretical research which references the effect the built environment has on our psychological experience. The goal of this thesis is to establish an ideology that summarizes how to manipulate design to enhance each user's psychological experience. This theory would establish an understanding of the complex relationship between design and psychology. Better yet, how we can assist in systematic design that builds a relationship through psychological experience. This idea begins with design analysis, then resonates to the function and formation of each space.

This study will guide us to question: What are the specific ways in which architectural design influences psychology? A way to resolve this question is to consider key aspects of this research proposal, such as literature sources and case studies. Case studies enable us to record past projects that initiate a relationship between design and psychological response. The validation of scientific studies provides a dominant argument when trying to present a theoretical issue. Specific validation comes from two articles, the first is a scientific study done to regard, "Architecture for Well Being and Health" by Koen Steemers, the second is a research lab report done by researchers in Rochester, MN called the WELL Living Lab. The lab supported a scientific experiment, done to process the effects of a physical environment on our mental well being.

Through research, the ability to derive the positive and negative effects of design on psychology will provide me with the knowledge needed to design a space that considers the importance of psychological experience in the form of space, colors, aesthetics, materials, green design and acoustics. This opportunity allows me to advocate for the importance of the connection between psychology and design on the deepest level.

A B S T R A C T

N A R R A T I V E

The connection between space and neural stimulation is applied in the context of design. Leading me to my premise question: What ways does design stimulate a psychological response within individuals and how can this positive or negative biophysical response be manipulated for use in future design?

This correlative relationship dives into a cross disciplinary study between architecture and psychology entertaining how the combination of the two can manipulate design thinking for the future environment. This research records our response throughout everyday spaces, it then takes this response and works to infer a correlative relationship between design and the psychological response that occurred while the user was experiencing the designed environment. Once the correlation between the built environment and our psychological response is recognized, we can begin to strategically design in ways that guide a suggested psychological response.

The ability to enjoy a space depends on how we perceive its design elements. For instance, creating an environment that allows proper access to sunlight can improve moods and overall quality of design. In fact, "people who lack appropriate light intake during the day also are more likely to develop depressive symptoms and have their sleep habits affected." It is safe to say, through guided scientific research, lighting is a design element that innately effects our psychological well-being. Furthermore, appropriate use of daylighting can reduce likelihood of depression. This is an example of how we as designers have the ability to grasp the concept of what design can do to impact the neural responses within occupants. These ideas can then resonates to the function and formation of each space. This concept will guide schematic design in a way that significantly impacts the daily experiences of humankind. Psychology and architecture are indefinitely connected, and the recognition of this connection will aide in the achievement of purposeful built environments that attribute to the community in a positive manner by means of influencing our psychological experience.



Premise of Investigation:

The premise of architectural design is to serve a function. Yet, the question still arises: What more can designers do to initiate psychological connections between the built environment and its occupants?

The goal of this project is to design living spaces that impact the residents. "Your home and work environment are an important influence on your sense of well-being, but they are often overlooked," says UW Health psychologist Shilagh Mirgain. "These are the environments we spend the most time in, so it's only natural they would have an impact on us." In response to this recognition, I have decided to design a residential area.

There are three direct regards for architectural design that will impact the living environment and work to extend the hand of architecture from the physical realm to the psychological realm.

1. The first step towards creating a design that will benefit the well being of the user is **implementing green design** tactics by connecting the resident to the outdoors. Studies have been done to prove "both visual access and being within green space helps to restore the mind's ability to focus. This can improve job and school performance, and help alleviate mental stress and illness" (Wolf P.1)

2. The second step to designing for a psychological benefit will be to create residential units that are considerate of privacy, yet they **develop a sense of community** and inclusivity. "A neighborhood that incorporates easily accessible green spaces into its design may also improve social cohesion and interaction. As a result, the mental health of individuals may also remain positive due to a decreased chance of depression and feelings of isolation and increased self-esteem." (Wolf P.1)
3. The third and final design step will be to implement design tactics that **physically benefit the health** of the residents. An example of this could be designing a space that provides thermal comfort, visual comfort, and has adequate indoor air quality. Each of these factors influence humans on a physiological level and the consistency of these three factors can dramatically alleviate sensations of depression and increase mental well being.

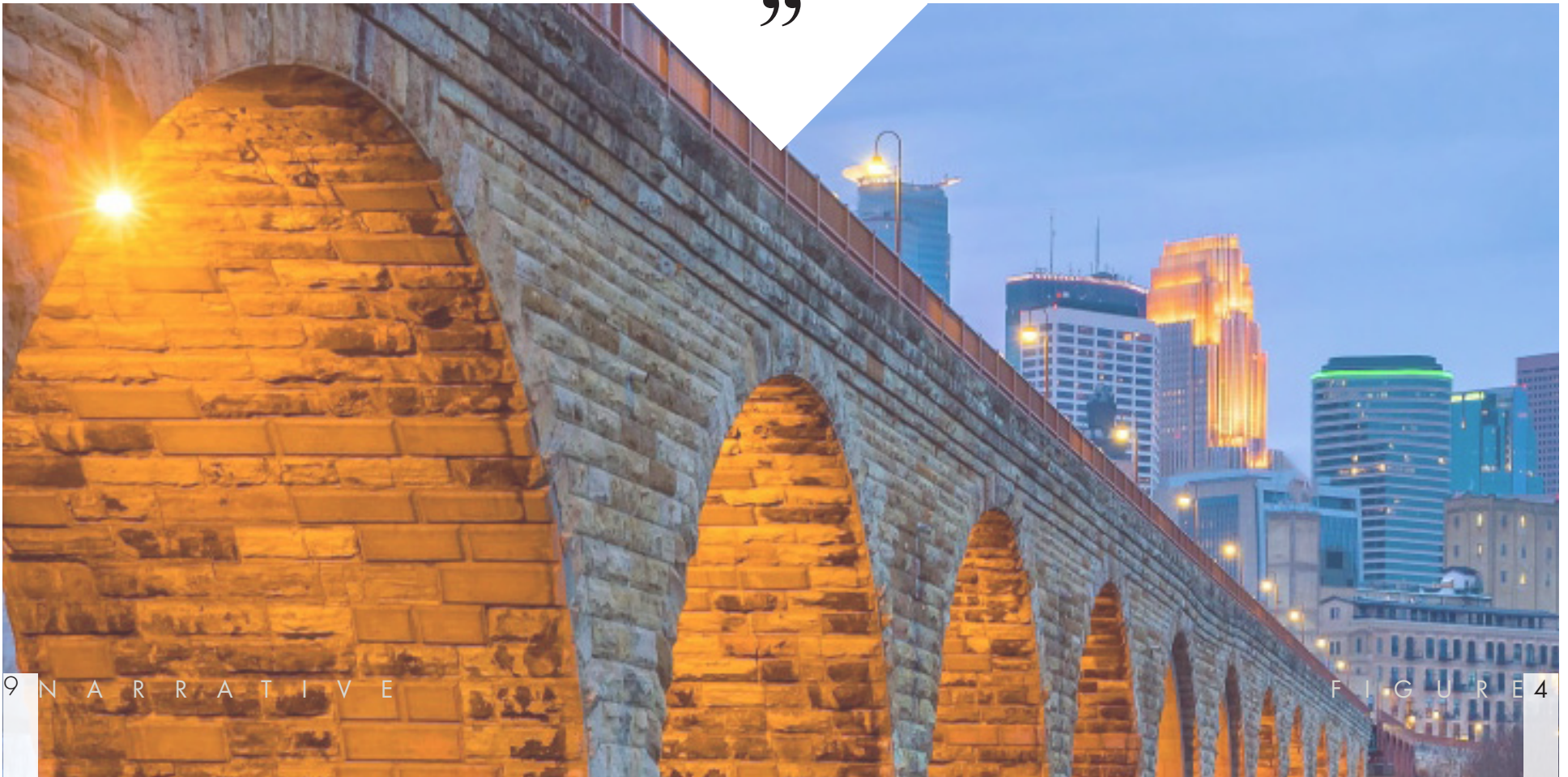
Achievement of these three elements of design will create a dynamic environmental relationship between user and space. Utilizing information guided by scientific studies, I plan to connect the dots between psychological response and architectural design with intent to produce a residential area that promotes green design strategies, implements a sense of community and promotes physical wellness. These three design elements will promote a positive psychological connection between the resident and the built environment.

“

The collaboration between architecture and neuroscience could lead to a better understanding of human nature, and to a better understanding of how people perceive their environment.

Karandinou & Turner P.1

”





C O N T E X T

Moerhead, Minnesota

The design of the rental home community will advocate green living, quality design, and connection to nature. This approach encourages community members to use outdoor facilities, create relationships with neighbors, and gain an understanding of sustainable living. Providing the occupants with human connection, interactive green spaces and homeowner responsibility.

T Y P O L O G Y

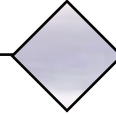
The typology of this thesis is a residential development designed to assist in creation of a space that impacts the psychological serenity of the occupants within and throughout.

This typology was chosen:

1. To redesign the affordable housing unit
2. To introduce housing units that work to influence the subconscious well being of users.
3. To add sustainable housing communities throughout Minneapolis, MN.
4. To create affordable housing developments that influence's a sense of community.
5. To provide owners with a sense of security and financial stability.
6. To investigate the correlation considering the benefits of providing green space throughout the home.

While taking affordable housing, sustainable design and psychological well-being into account the finalized product will represent an ideal residential development. This typology embodies the psychological impact proper home design can influence. This idea will work to maintain the economic elements such as financial ease and construction ease, yet will take into account the influence of the connection between architecture and psychology. "An architect can control human behavior with his design by understanding the way that a building's design can influence a person's behavior, thus, modifying the individual's mood and perception, whether the environment is natural or man-made." (Vats 1)

TYPOLOGICAL RESEARCH



While selecting the primary projects for typological research it was important to take four factors into consideration:

1. CONNECTION TO ENVIRONMENT

The design needs to create a fluid connection between the interior to the exterior so users will feel enabled to interact with the not only the built environment, but the natural environment as well. Implementation of sustainable design strategies drive future design strategies and work to establish an understanding between the environment and the occupant.

2. INFRASTRUCTURE AND DESIGN STRATEGIES

Elements of design such as achievement of daylighting, green roofs, and simulation of ecosystems allow residents to discover the space experience the space in a way that stimulates mental health and cognitive function.

3. PSYCHOLOGICAL IMPACTS OF DESIGN

Creating an environment that influences social interaction through green spaces and landscape design aides in decreasing levels of depression and increasing levels of self esteem throughout occupants through social interaction.

4. SAFETY AND SECURITY

In home design, safety and security is important due to it's ability to implement a sense of ease and trust within the occupant.

The following projects were thouroughly researched in regard to this project:

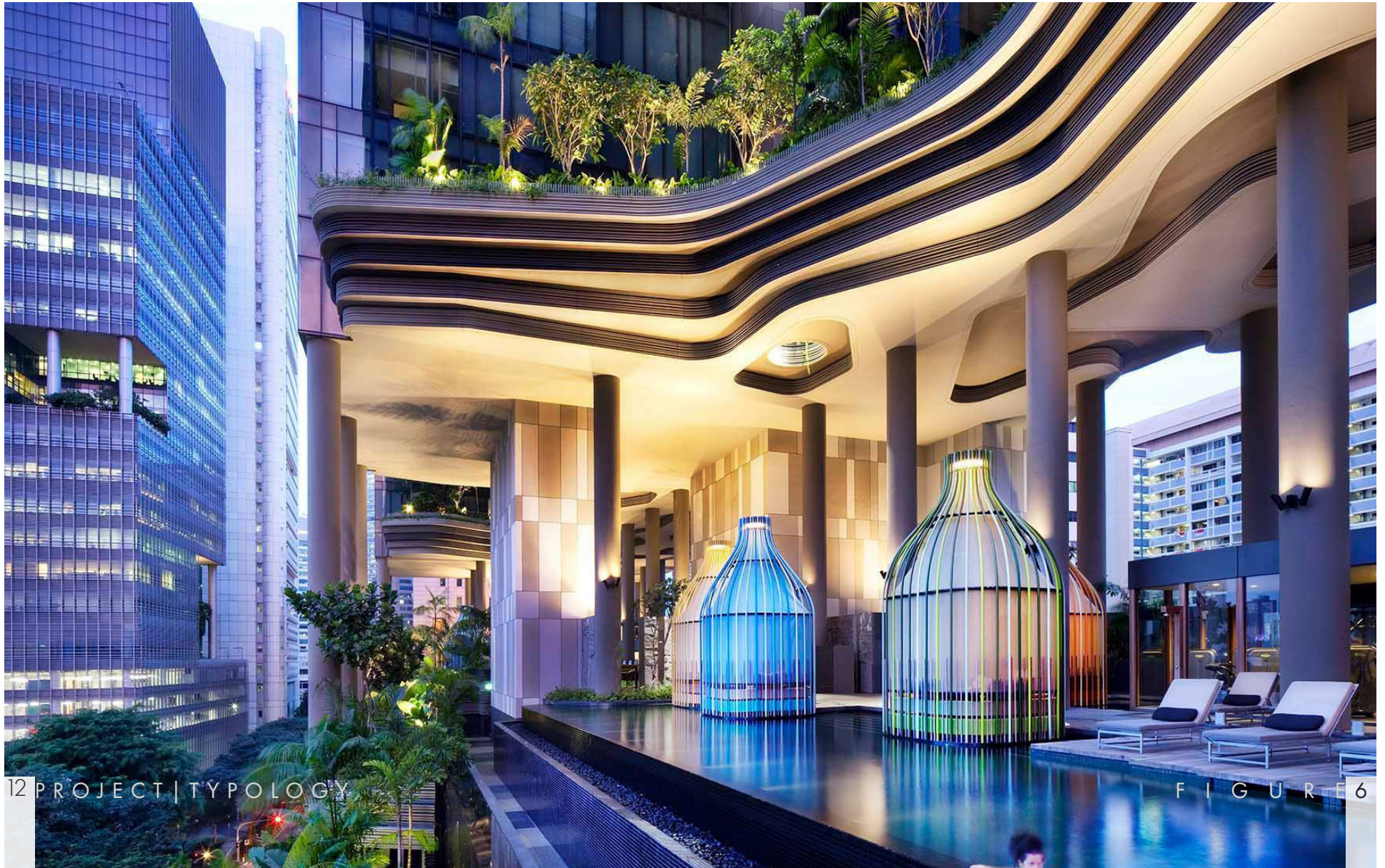
1. Park Royal on Pickering
2. Dortheavej Residence
3. Nuucs Psychiatric Clinic
4. The Baruch Houses

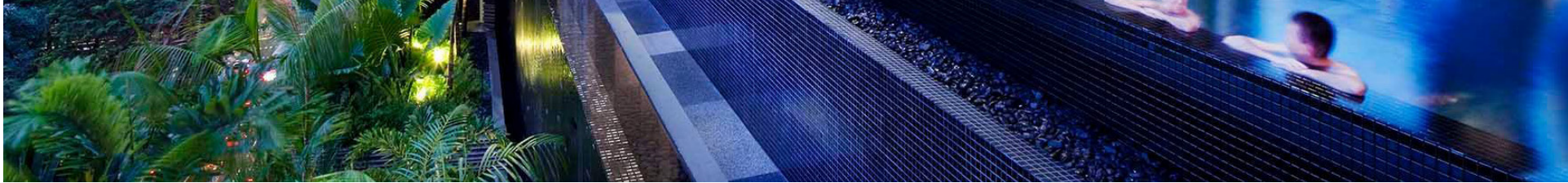
T Y P O L O G I C A L | R E S E A R C H

Park Royal on Pickering

FOCUS:

Sustainable Design
Connection to Environment





Park Royal on Pickering

Location: Singapore

Year: 2013

Architect: WOHA

Project Type: Commercial, Hospitality, Mixed Use, Offices

Area: 29,811 sqm

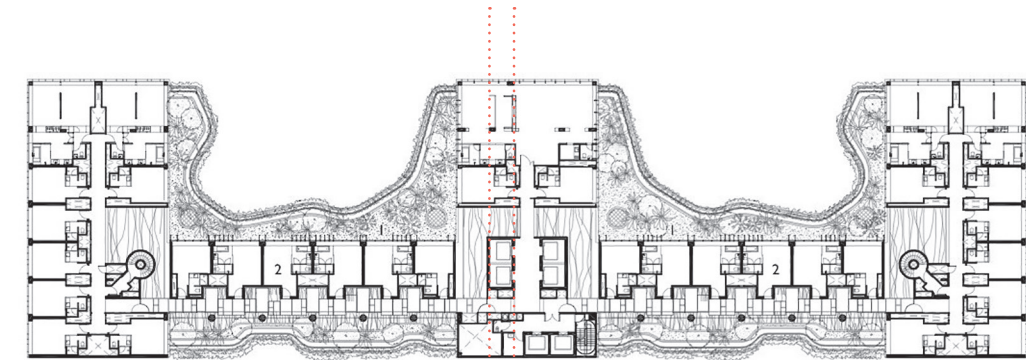
Introduction:

This project is truly a beneficial case study in the context of green design and the environmental impact of a LEED certified building. Some aspects of green design critical to the building's systems includes renewable energy use through photo-voltaic cells and implementation of rainwater harvesting tactics and use of this water throughout building systems. Extensive use of natural light yet sun shading (from vast amounts of plant life) synchronistically improve the natural lighting essence all while lowering heat costs. Natural ventilation is a site varied plus of green design, so this building in Singapore was able to really decrease costs with the use of completely outside air ventilated hallways, yet the use of this tactic in the Mid-West is nearly impossible due to winter weather.

Analysis of Design:

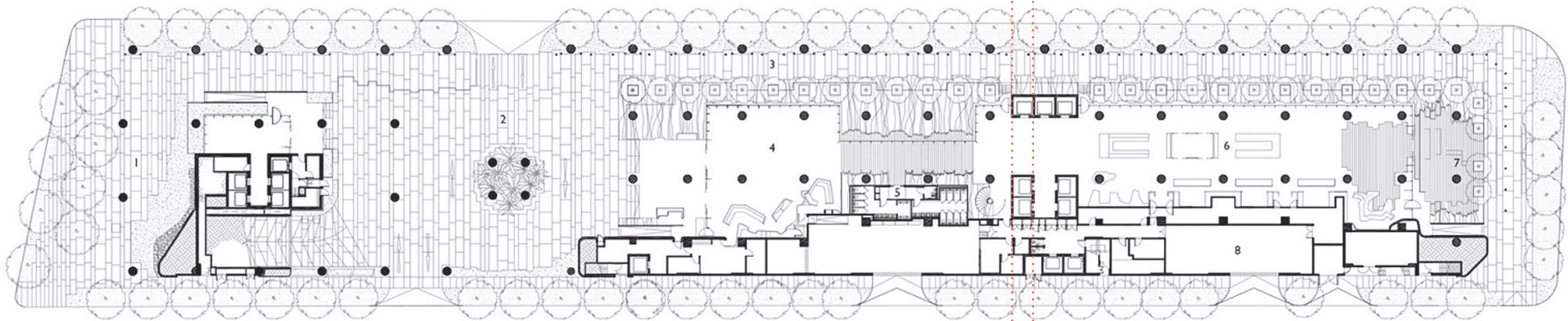
The use of green design throughout this building physically encapsulates the connection between green space and humans. A benefit that not only provides the building with sufficient indoor air quality, yet it also aids in restoring focus, mental stress, and mental illness. This effect has been studied for years, yet the natural connection humans tend to feel within the environment make it an essential space to regard in any building. When a green space is more easily accessible, it creates a space for residents within the building to gather and create connections. This ability to connect with peers may positively impact the mental health of the occupants due to a lower likelihood of feeling isolated and increased self-esteem. This design uses the green spaces almost as a connection floor from one building to the next, influencing participation and guiding residents through the space.

The elements used throughout this case study are viable implementations that would significantly benefit any green design. Some issues to take into account are the severe climate differences and the accessibility of the green spaces. The ability to step inside the green space offers a connection between the occupant and the building in return, a connection between our psychological desires to experience nature and the built environment.



14TH FLOOR PLAN

FIGURE 7



1ST FLOOR PLAN

FIGURE 8

Floor Plan and Site Plan Analysis:

This case responds to the site in an environmentally friendly way. Creating a curvilinear embrace to those who come from the street and instantly pulling the building down to a human scale invites newcomers and embraces the environment. The continuity of the garden-themed aesthetic throughout the building ties the interior to the exterior while allowing users to enjoy the outdoors. This building plan embraces the city theme yet strays from conforming to a rectilinear baseline, adding to the beauty of the street view. The floor plan design allows the base to hold much of the mass creating a sense of lightness as the building protrudes.

C O N C L U S I O N

This study establishes a connection between the environment and the resident through the design of a garden patio that seamlessly connects to the interior. Green design tactics are used to work towards sustainability all the while utilizing materiality and movement to implement a garden-themed aesthetic. The recognition of the importance of the exterior to interior progression and the ability to achieve a sense of human scale in such a large building exposes a comfort between the user and the built environment. Progressively green design steps such as implementation of large garden terraces, sunlighting techniques, and open air environments aide in the qualification of this building as being LEED certified. This connection to the environment benefits the occupants and can work to maintain mental health and well being throughout those who occupy the building. Manipulation of all of these elements aids in the progression towards a sustainable environment that focuses on mental wellbeing, daylighting and indoor air quality.

Key Concepts:

- Green design strategies
- Importance in human connection to environment and nature
- Communal areas to gather



T Y P O L O G I C A L | R E S E A R C H

Dortheavey Residence

FOCUS:

Psychological Impacts of Design

Safety and Security

Low Cost Residential Living

Rental Homes



Dortheavej Residence

Architect: Bjark Ingels Group

Location: Copenhagen, Denmark

Category: Social Housing

Area: 73,194 sq-ft

Project Year: 2018

Introduction:

The Dortheavej Residence works to bring high end design to low class housing, by paying direct regard to affordable housing with prioritization of spatial qualities. A few qualities they focused on throughout the design include analysis of room height, cognitive focus on materials, and prefabricated modules that reduce unit prices.

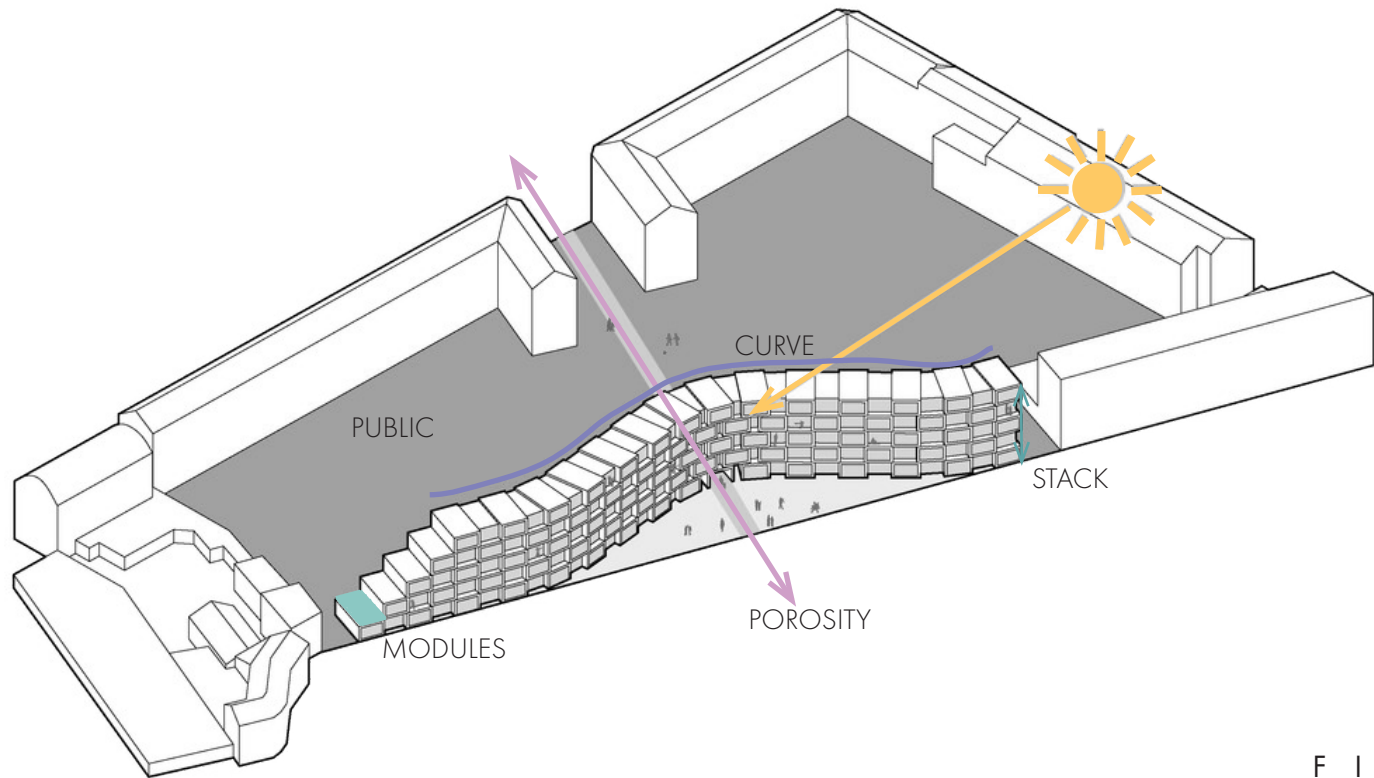
Analysis of Design:

The building process is considerably simple, paying regard to occupant privacy and visual impacts. The residence has a floorspace of 73,194 sq-ft spread over 5 floors and 66 homes that are designed to align in a curve to contribute to the sense of privacy in a highly populated area. This curve also provides space for each module to have large window access in the front of the apartment, without disturbance from another module. This element of design is considerably important, yet I would like to design a space that has windows throughout the apartment's front and back facade. Creating that visual element draws the user through the space and offers a sense of larger than apartment living.

The windows are seemingly large and expensive in such a small apartment complex, yet the designer recognized the importance in creating a modular unit that felt as a home would and gave enough space to connect the user to the outdoor environment. This design element forces a cost yet drives the connection between the environment and the occupant while also providing a small space that does not feel overwhelmingly crowded.

The modular design is simply put as a rectangular form, yet the direction of curve allows the form to conform to sunlight and wind passage. Two elements of passive design that are considerably important. Porosity at ground level draws occupants through the passage to a garden square. This design consideration provides the form with a feeling of weightlessness supporting its otherwise dense appearance. The stacking creates a space for each apartment to use as an outdoor patio, in attempt to create a setting for sustainable living and connection to nature.

An element of modular design that impacts the usability of a home for a length of time is the amount of bedrooms and space for use of more of a family group. In order to change this floor plan and make it more family friendly I would consider connection of four modules, enhancing the building to allow for affordable housing yet also middle class housing prices. This will enhance the building with longevity of ownership and occupancy. In return, allocating the amount of time it takes to create a sense of community between occupants.



F I G U R E 13



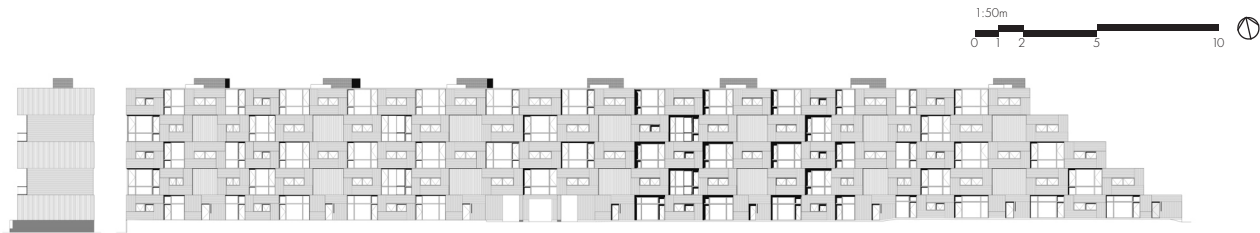


FIGURE 15

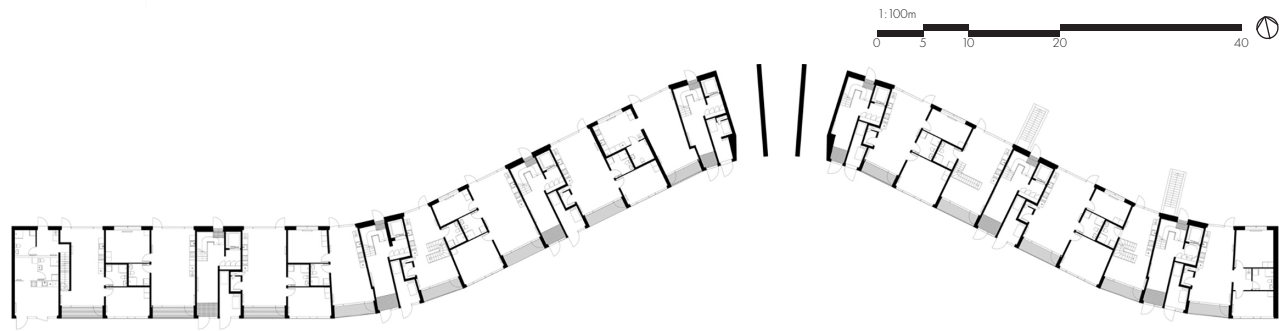


FIGURE 16

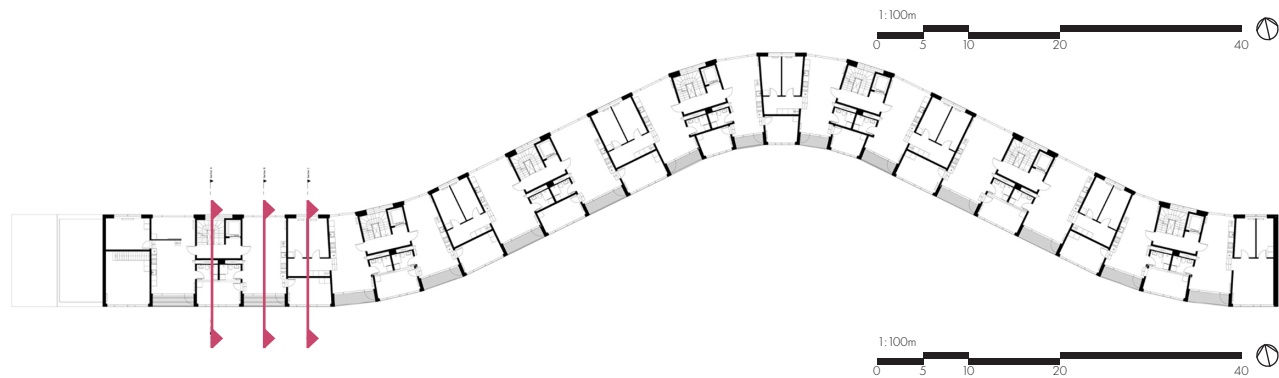


FIGURE 17

C O N C L U S I O N

This case finds precedence in sustainable living and creating a social environment through the use of design elements such as public spaces, modular housing units, and sustainable design elements. Unlike other social housing projects, this project pays strict attention to keeping each home affordable to lower income civilians. This thought, invites people from all cultural backgrounds to be able to afford living within the development. The architects commitment to creating a space that utilizes spatial design techniques such as individual patios, a public courtyard and modular home design influences each resident's experience. The design is successful in using modular home design to create a space that has the essence of a high end apartment building while residing low income. A design does not need to be of low quality to provide for those who hold a lower income.

Key concepts:

- The benefits of modular home design
- Inducing a sense of community through the use of public spaces.
- The importance in providing residents with a space to connect to nature.

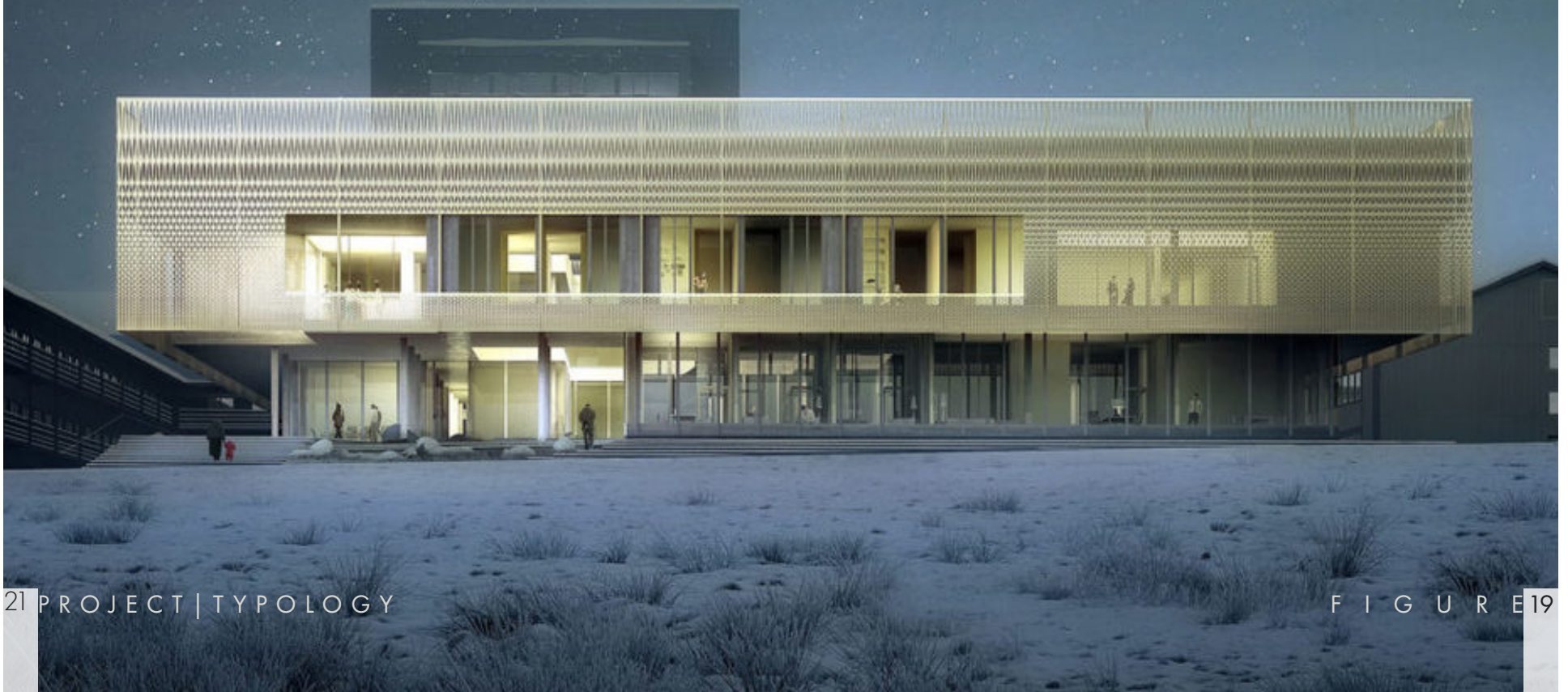


T Y P O L O G I C A L | R E S E A R C H

Nuuko Psychiatric Clinic

FOCUS:

- Connection to Environment
- Safety and Security
- Building Flow
- Psychological Impact





Nuuk Psychiatric Clinic

Architect: White Architecture, Jenny Mäki

Location: Nuuk, Greenland

Category: Healing Architecture

Area: 3,300 sqm

Project Year: Ongoing

Introduction:

The main goal of this project to recognize the ways architectural design can be manipulated to induce a sense of healing throughout the built environment. Healing in design can be done in passive and active ways. They use design to passively promote a sense of dignity, encourage independence, and influence social interaction. They actively design an environment that has an open floor plan, offers outside views, and has free access to the outdoor environment. These passive and active design tactics balance the demands for the safety and welfare of each occupant. In response to recognition of the healing nature of architecture, Nuuk focuses on seven pillars of design that can promote mental well being. Called the seven pillars for healing architecture:

1. Promote dignity
2. Encourage normalcy
3. Create a free and open atmosphere
4. Promote social interaction
5. Promote Independence
6. Offer outside views and free access to the outdoor environment
7. Balance the demands for safety and healthcare

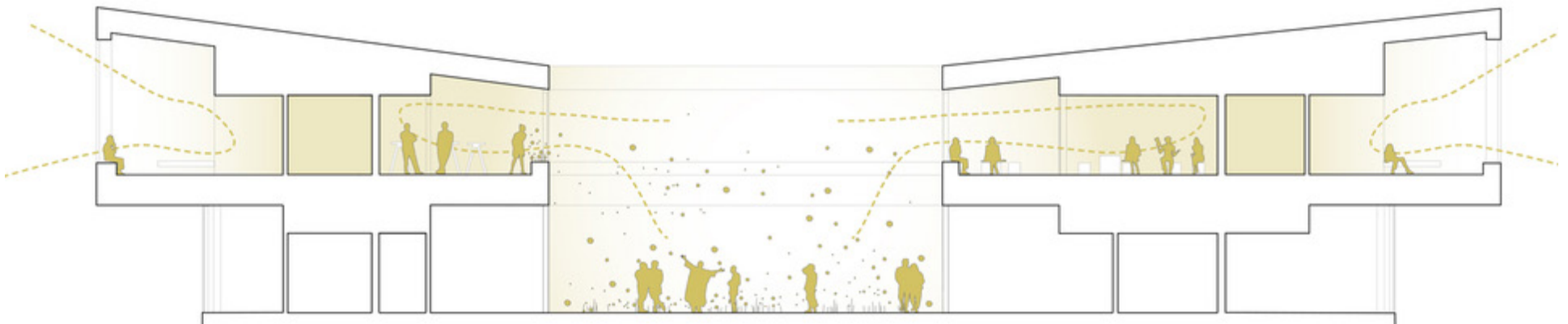
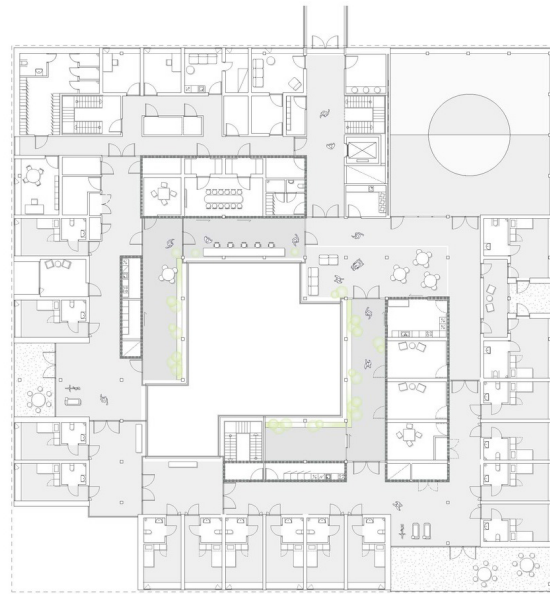


FIGURE 21



1ST FLOOR PLAN

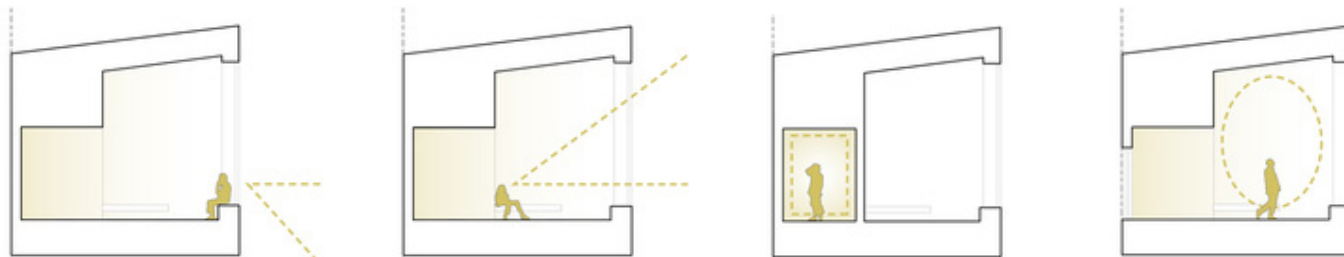
FIGURE 22



2ND FLOOR PLAN

Analysis of Design:

The Nuuk Psychiatric center floor plan is developed in coersion with understanding the needs of each resident. They design each room seperately to provide a sense of dignity throughout the occupants. Allowing them time to themselves when needed and privacy from other patients. This singularity encourages independence and allows patients to find spaces throughout the building that they feel most at ease. Application of four difference sequences of spaces can be seen below. These four spaces encompass the emotions that the patient is feeling and direct a connection between the space and the user. For example, if the patient is feeling antisocial and needs time to themselves the third space from the left can be used to guide their energies inward and allow them to heal internally before going to socialize. When regarding the floorplans and also the first two spaces below, it can be seen that there are spaces throughout the design that influence social interaction and human connection. This is importance in upkeeping the mental well being of each occupant. The mid space (seen in floor plans) is a garden space where patients can gather together. The first two spaces (represented in figure X and X below) show the spaces the architect designed in direct regard to allowing social communication while also giving the user their needed space. Incorporation of these four spaces throughout my design will aide in formation of community spaces that work with all personality types and provide comfort to users.



C O N C L U S I O N

This case finds precedence in inclusivity of design by creation of spaces that enable the resident to feel a sense of comfort and social interaction. The provided spaces allow the resident to heal and gain a sense of community without overstimulation. The concept of space is thoroughly understood and mitigated throughout the floorplans and the design itself allowing residents to engage in expression brought forth through personal dignity, a sense of independence, and social interaction.

Key concepts:

- Inducing a sense of community through the use of public spaces.
- The importance in providing residents with a space to connect to nature.
- Manipulating spaces to provide a sense of calmness and comfort.



T Y P O L O G I C A L | R E S E A R C H

The Baruch Houses

FOCUS:
Safety and Security





Baruch Houses

Architect: Emery Roth & Sons

Location: New York, NY

Category: Residential Towers

Project Year: 1959

This case study is done to create an example of what should not be done in a residential area to create a secure and safe environment. Each research element is considered through the scientific study and book, "Defensible Space" by Oscar Newman. The research guided throughout the book recognizes the study as grant work funded by the National Institute of Law Enforcement and Criminal Justice of the United States Department of Justice.

The Baruch Houses in New York City provide inadequate methods of surveillance due to three factors of design: Circuitous paths of movement throughout landscape, concealed lobby entrances, and building windows that are not street facing.

While looking at the site plan it is precedent that the random positioning of the high-rise towers has influenced path systems that are filled with circuitous turns and blind corners. This unintentionally makes this site an influence of unsecure design tactics to the point that "residents express strong fears about turns in the path system connecting the streets to the building lobby" (Newman P.82). This impact compromises the mental well being of residents by adding a stressful element to their daily lives.

The concealed lobby entrances force residents to walk a prolonged distance from the street to the lobby entrance. This disconnect from the street inadvertently removes an integral form of surveillance, patrolling automobiles. Removing this form of natural surveillance increases the possibility that residents feel less comfort while walking to and from their apartment building, especially at night. For the Baruch Housing development this has caused "many project residents to choose to remain at home rather than use the streets in the evening" (Newman P.80).

Correlative Research impeding the project shows that the highest crime rates occurred in the type of buildings that has less than 30% of the buildings facing and within 50 feet of the street. The Baruch Houses, for instance, uses spatial programming tactics that create a disassociation between humans and the street.

C O N C L U S I O N

Designing an environment in consideration of safety and security introduces a concept of human reliance. The reliance on those within the community to observe. The ability to design an environment that connects residents to the space and orients the windows in a way that makes outsiders feel as though they are under surveillance is directly correlated to more peaceful behavior of outsiders. In the study, the plan of row-house street connection is considered the most reliable form of residence to street life connection advocating how this type of connection provides visual surveillance by residents and automobile surveillance, it also implements a quick path to the lobby entrance. Implementation of adequate correlation to street, paths of movement to the lobby space, and street facing windows initiates a sense of natural surveillance in residential areas. This sense of natural security is brought forth through optimum security measures in return driving the lowest crime rates and the most sense of emotional security throughout residents.

Key Concepts:

- Designing in regard to outdoor safety
- Taking advantage of human surveillance
- Providing a sense of security throughout residents





Typological Research

T A K E A W A Y

The relationship between architecture and health is progressing beyond the requirements of constructing a healthy building. Moving towards the idea that space is a multifunctional form of design that can be manipulated to initiate a psychological response throughout users. This response moves beyond singular parameters such as temperature and humidity, but rather works to implement environmental factors such as human connection to nature, social interaction, feelings of comfort and designing for safety. Purposeful design solutions that influence these forms of social, intrapersonal, and environmental connections will aid in benefitting the health and wellbeing of those who are living within the space. Throughout the case study analysis I recognized the preceding four principles as influential elements of architectural design:

Implement Safe Design Strategies

Safe design strategies provide a sense of security throughout residents and allows them to trust their environment. Throughout my residential design it is very important to implement safety elements to provide the residents with peace of mind throughout the landscape design.



“

Psychology and architecture are significantly connected, and the recognition of this connection will aid in the achievement of purposeful built environments that attribute to the community in a positive manner by means of influencing our psychological experience.

”

Sustainable Design is More Prevalent than Ever

The design industry seeks to minimize its environmental impact and improve the efficiency throughout buildings. Designing with sustainability in mind will benefit the ecosystem at large and positively impact the environment. Nonetheless, “substantial research shows that natural scenes evoke positive emotions, facilitate cognitive functioning, and promote recovery from mental fatigue for people who are in good mental health.” (Wolf)

Architecture Impacts Health

If we feel positively stimulated in a space this can lead to better rest, can reduce anxiety levels and can even provide a sense of comfort. Our senses influence the way we think, feel and act thus effecting our whole body. If we can design for positive stimulation, the health and well being of our bodies will benefit from it. Elements of design such as, “planters, gardens, green roofs, and other features can be incorporated into building design to address mental health and cognitive function.” (Wolf)

Human Connection is Important

Designing spaces that influence social interaction can aide in creation of a safe social space. This ability to influence human connection is importance because studies have proves that, “effective social support networks restore feelings of personal control and self-esteem by buffering the effects of stress and poor health.” (Wolf) This connection influences the mental well being of the occupants by ensuring they feel important, necessary and a part of the community. Beautiful things happen when designers initiate the opportunity for human connection.

P R O J E C T | E L E M E N T S

RESIDENTIAL UNITS | LIVING SPACE

Formation of low cost, modular units will provide each resident with a design quality, comfortable space that is also cost appropriate. The living spaces within the units are meant to accommodate to all stages of life so design quality and floor plan functionality are two elements that need to be fully considered.

GREENSPACES

These spaces will provide each resident the opportunity to experience the outdoors within and throughout the residential area. A goal of this project is to enable each resident a private garden space. Making it easier to do things like: take out the dog, eat outside, plant a garden and enjoy the outdoors.

WELLNESS CENTER

Inclusion of a wellness center on site will aid in my goal of achievement

of a positive living environment. The inclusion of a wellness center may inspire residents to start working on their physical health indeed impacting their psychological health. Regular exercise aids in the balancing of hormones and stimulates release of neurotransmitters such as serotonin and dopamine. These neurotransmitters each contribute to feelings of happiness and well-being.

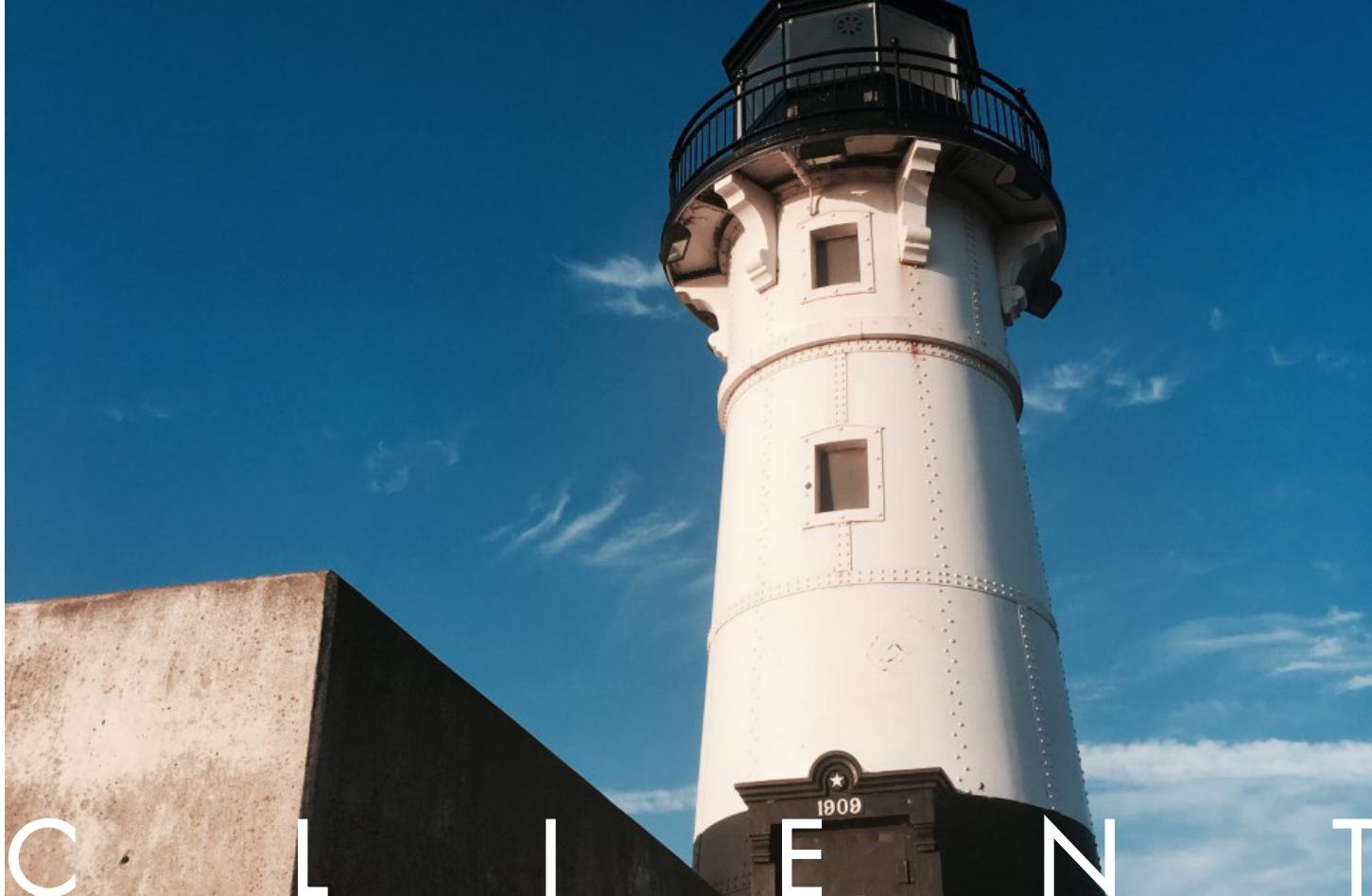
ENTRY CONDITION | ACCESS

It is important to consider how the residents will enter the community space and their own residential units. It is also important to consider how the entrance vestibule will be showcased to the public. It is meant to be a private residential area so the orientation to the street needs to be set back and oriented accordingly. This initiates the need for walking paths, while regarding the Baruch House's case study, I can work to consider what type of paths are best to use

in regard to personal security. It is also important to consider the path of movement that each vehicle will take to get into the site.

COMMUNITY GREEN SPACES

A greenspace will implement a sense of community and connection between tenants. This space will provide an opportunity for residents to interact with one another and experience living in a sociable community. Circulation of the environment will direct the residents to either move into the community spaces or walk along the outskirts, so implementation of a circulation pattern that guides the residents towards the community space will ensure proper usage.



This project is for people living through a transitional period of life. This design is considerable important in allowing those within this transitional period to experience the benefits of living within a home in a community, before they are financially capable of buying a home. The placement is near the downtown scene, yet in a different light of the average downtown home, due to its proximity to natural landscape features such as Woodlawn Park.

The beauty of the design is the resident's may be young, old or middle age yet the goal is to provide a connection between generations. The true beauty of this environment is that it provides a living space that may be permanent to some and semi permanent to others, yet the essence will feel like home.



S I T E
M O O R H E A D , M N

Region:

Popular for its title of being the “land of 10,000 lakes”, Minnesota is now the 21st most populous state in the US.

Demographics of Minnesota:

Population: 5,655,925

Land Area: 86,943 mi²

Counties: 87

No. of people per square mile: 66.6

City Explanation: Moorhead, MN

City Demographics:

Population: 422, 326

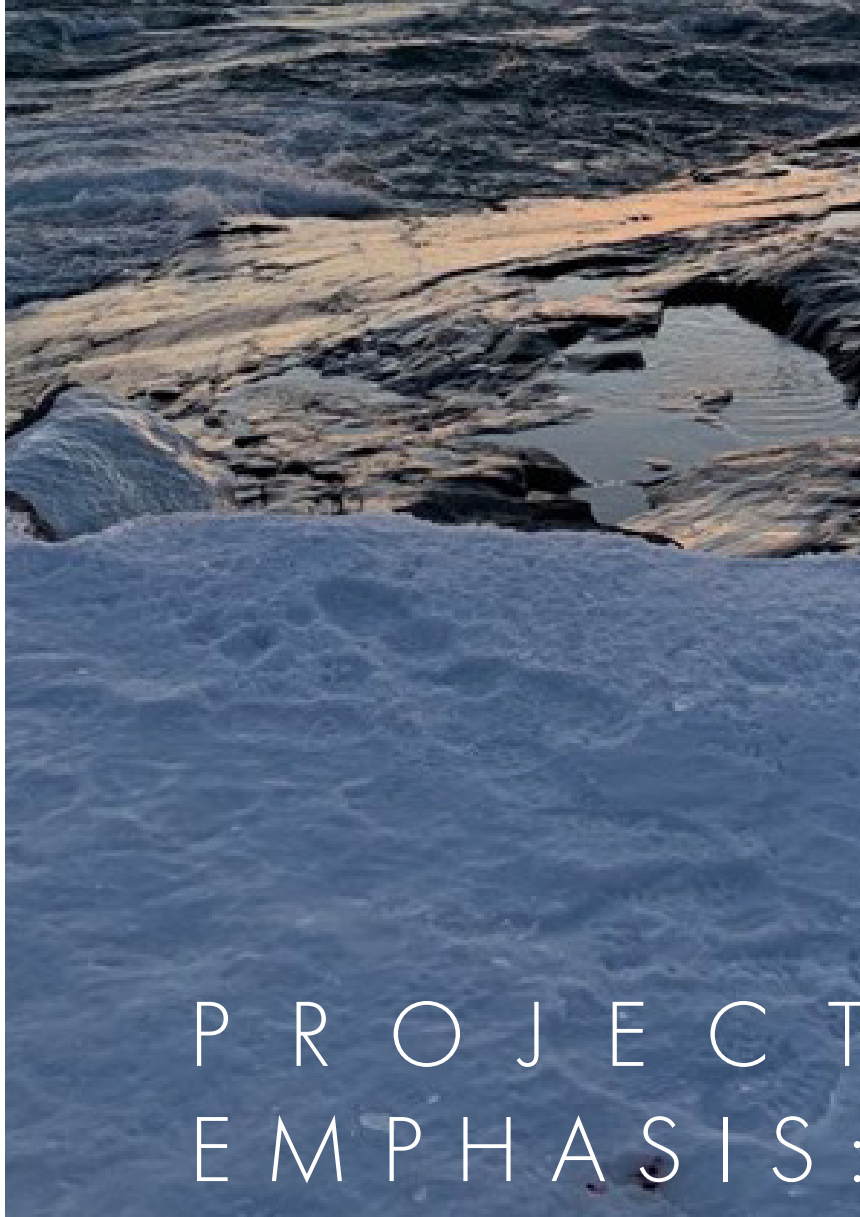
Land Area: 57.49 mi²

No. of people per square mile: 7,019

Zoning: Residential

Site:

If we want to create a connection between individuals and the environment, we need to design spaces that initiate accessibility to the natural environment. This site does that exactly by situating the residential area just minutes from the Red River and The Mississippi Gorge Regional Trails. Public transport gives residents the ability to travel downtown and experience the city while not living directly within the city.



The project's emphasis will directly relate architectural design and psychological experience. This ability to develop a connection between the built environment and each residents' physiological response initiates a connection between the built environment and our biophysical nature. Some areas of design that will aide in recognition of this emphasis include:

THE DEVELOPMENT OF A RESIDENTIAL COMMUNITY

Focus on designing a residential area that meets every need of the resident while providing space to initiate public connections and ability to access the environment. This residential community is built to sustain the health and well-being of each occupant.

THE GREENSPACE

An important aspect of design is inclusion of greenspaces allocating a connection to the natural environment. The site directly regards this connection by providing users the opportunity to experience the river, the walking path, and the design of the residential greenspace. "Green spaces can serve as a sort of ecotherapy, as marginalized people can find empowerment, respite from stresses, and personal involvement in environmental stewardship." (Wolf)

THE STIMULATING LIVING ENVIRONMENT

Stimulated living environments work to stimulate the residents throughout their own living environment, whether that be through accessing the wellness center, experiencing the greenspace, or chatting in a centralized public space. This ability to be active in the community allows each resident to gain social and environmental ties. As individuals, we are increasingly aware of the impact we and others have on the environment. Now we need to take that a step further and start establishing more green design tactics throughout our residential areas.



T H E S I S | G O A L S

INITIATE SOCIAL ENVIRONMENTS

Determine the qualities of a social living environment and establish guidelines that will aide in the successfulness of the social environment.

CONNECT PSYCHOLOGY TO ARCHITECTURE

This connection initiates a positive reflection of the design strategies. By researching more about how spaces influence psychology, I can schematically design a living space that will initiate a positive connection between the built environment and the resident's biophysical well-being.

DESIGN AN INTERCONNECTED RESIDENTIAL AREA

Connect the environment, the design, and the biophysical response to initiate a relationship between space and psychology. If the relationship between these three elements is healthy and stimulating, this means my design is successful.

CREATE A SEAMLESS ENVIRONMENT

It is important to develop a design strategy that links the interior to the exterior and vise versa, so an overall understanding of landscape design is important. This will enable my design to tie the environment to the built space while working to move people towards the exterior environment.

P R E C E D I N G | P L A N S

Definitions of Research Direction

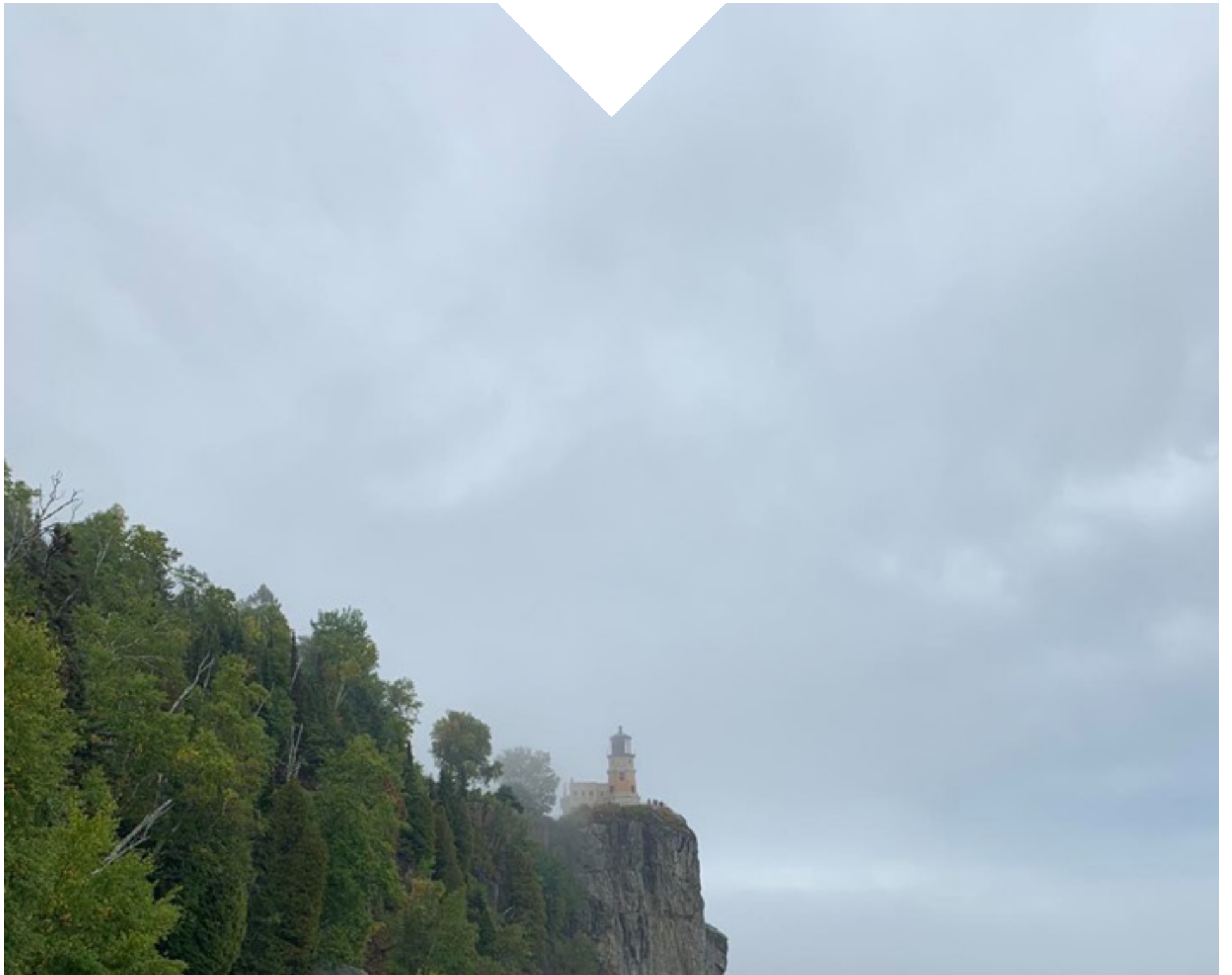
The system of inquiry that governs this research project is phenomenology with subliminal references toward grounded theory. Phenomenology is regarded through the connection between consciousness and stimulation experienced throughout architecture. Research of the connection will be integrated through in depth consideration of literary research, scientific articles and experimental case studies. The study will also recognize emphasis towards the grounded theory, which works to validate the collection of information regarding psychological well being in design by guiding research based on data analysis and inductive reasoning. In coordination, the use of these theories will aide to recognize that humans are psychologically impacted by the built environment.

Design Methodology

My plan works to initiate a connection between our psychological responses to architectural design with intent to induce a positive user experience throughout the built environment. This research study begins with qualitative analysis of case studies, literature sources, and scientific experiments. Critical analysis and consideration of these sources influence the development of a diagrammatic analysis model. This model works to correlate spatial design and psychological reactions, in return dictating the spatial programming of a simulated environment. The combination of techniques will provide me with the information necessary to access the correlation between psychology and architecture. Providing the world with an environment that is much more than a space to shield us from natural elements, rather a space that establishes connections between humans and the built environment. As stated by Karandinou and Turner, in a scientific report regarding the connection between architecture and neuroscience, "the collaboration between architecture and neuroscience could lead to a better understanding of human nature, and to a better understanding of how people perceive their environment."

Documentation of Design

All research collected and regarded will be analyzed and documented digitally. This digital documentation will aide in the thesis proposal and the overall thesis program. Theoretical analysis of case studies will guide sketches and interpretive design tactics initiating the beginning phases of the design process. This design process will then formulate into a more strong ended design idea initiating the final project review. This will be documented in an oral and digital presentation. The research report, text, and graphics are to be documented in a thesis book available digitally through the NDSU library. The entirety of the project is to be turned in May, 2020.





THESIS PROGRAM

Results from Theoretical Premise & Unifying Idea Research

LITERATURE | REVIEW

The Well Living Lab

Literature Review: The WELL Living Lab

This literature review covers environmental conditions that impact the emotional and physical responses of participants that work within the living lab environment. The well living lab focuses on the importance of designing interior environments that emphasize the comfort and wellbeing of the occupant. In the article it states, "to design successful indoor environments and to inform new iterations of building standards, it is vital that we understand conditions' interactive impact" (Jamrozik, P.190). The WELL living lab researches the physical and mental reactions of participants in specific environmental situations, in efforts to conclude how design elements impact humans. This literature review is an effective form of simulation research that will provide relevance to this thesis.

Living Lab Study | Advantages and Disadvantages

The living lab paradigm is a section of field study that provides an advantage to researchers because it has complete control over the environment surrounding the participants, yet the natural sense of the environment supports typical behaviors throughout participants. This allows the study to gain real behaviors and reactions rather than skewed results due to the natural regularity of the study. The length of time the study is conducted also benefits the results because it is necessary for the participants to experience the environmental conditions for long periods of time to get accurate data. This allows for in depth studies that recognize differences in reactions across individuals throughout time.

The disadvantages of these studies are the limited sample size due to constrained experimental space and desire to meet the needs of the occupants working in the space. The largest living lab study will rarely reach 25 people because of these constraints. This proves itself an issue when considering the lack of variability in demographics, leading to results that may not generalize the entirety of the population. A way to work with this set back is to follow the living lab study with a large-scale field study that tests the data concluded in the living lab study.

WELL | LIVING | LAB

Living Lab Study | Overview of Study Design

The goal of this study was to examine the environmental conditions of a living lab office space to determine the effects these conditions have on the human occupants. The employees from the Mayo Clinic were recruited to participate in this study, and they were asked to do their regular office work for the day, in the living lab. Six environmental scenes were tested, these scenes altered the acoustic, lighting and thermal conditions. The scenes were set up as follows: "One scene (scene 1), with environmental conditions commonly found in offices, including participants' previous office, served as the baseline. This scene had daylight and view, controllable sheer shades, a correlated color temperature (CCT) simulating typical office lighting, a cool-neutral air temperature, and no sound introduced to the office, and was predicted to be near optimal based on previous research. In one scene (scene 2), conditions were further optimized: a neutral CCT was used, and automated tinting of the electro-chromic glass was used to minimize glare from daylight. Two scenes (scenes 3 and 5) were predicted to be sub-optimal: there was no access to daylight and view, the air temperature was uncomfortably cold, and noise was added into the office. Two scenes (scenes 4 and 6) were mixed: noise was added, the air temperature was neutral-high, and there was access to daylight and view" (Jamrozik, P.191).

The participants responded to a survey, which examined experience inside and outside the lab, each day at the end of their work hours. The survey questioned: their satisfaction with the environment, their workday experiences, their mood and emotions, and their health behaviors. The lab theorized that changes in environmental conditions would change the participants experiences both inside and outside of the lab.

Table 1
Environmental scenes were made up of combinations of acoustic, lighting, and thermal conditions.

Scene Number	Color Temp (°K)	Electrochromic Tint	Sheer Shades	Blackout Shades	Air Temp (°C)	Audio
1 (Baseline)	3500	Clear (1 of 4)	Open, Controllable	Open	21.7	Off
2	4200	Intelligence (1-4)	Open, Controllable	Open	21.7	Off
3	2700	Dark (4 of 4)	Closed, Not Controllable	Closed	19.4	White Noise - Low Volume
4	2700	Clear (1 of 4)	Open, Controllable	Open	23.9	Simulated Speaking I
5	6500	Dark (4 of 4)	Closed, Not Controllable	Closed	19.4	White Noise - High Volume
6	6500	Intelligence (1-4)	Open, Controllable	Open	23.9	Simulated Speaking II

◆ LIGHTING | CONDITIONS

The qualities of electric lighting including luminance and correlated color temperature (CCT) affect physical conditions such as mood, alertness, performance and sleep quality. To test this theory, the living lab studies three window conditions that differed in the amount of daylight they let in, as well as four electric lights that have CCT conditions. Windows with electro-chromic coating, sheer shades and blackout shades were used in the experiment to vary the amount of daylighting and view. In scenes 1 and 4 windows were completely clear, in scenes 3 and 5 blackout shades were kept lowered, and in scenes 2 and 6 the electro-chromic tint on the windows was mechanically triggered to vary the tint throughout the day to limit glare. The lighting was a can lighting system using LED light-bulbs, throughout scenes different CCT conditions were tested: in scene 1, a warm-neutral white color, scene 2 showcased a cool-neutral white color, a warm color was introduced in scene 3 and 4, and a cool white color in scenes 5 and 6.

The study concluded that windows are beneficial in allowing daylighting and view access for the office occupants yet care needs to be taken to minimize glare. Daylighting is considerably preferred over electric light. When occupants have a view to the outdoors, it allows them to analyze their surroundings and weather, minimizing discomfort and improving performance levels. Illumination and CCT are qualities of electric lighting that affect satisfaction, mood, alertness, and sleep quality. Blue light has a wavelength of approximately 480 nm physically effected occupants due to its ability to regulate the circadian cycle and affect sleep quality. Thus concluding, "the presence of blue-enriched light during the workday can improve self-reported quality of sleep."

◆ THERMAL | CONDITIONS

This study tested three air temperature conditions after close consideration of the Center for the Built Environment Comfort Tool which recognizes 78.8°F as an ideal radiant temperature. The living lab tested "a cool-neutral air temperature set point (21.7 °C/71 °F in scenes 1 and 2), neutral-warm set point (23.9 °C/75 °F in scenes 4 and 6), and an uncomfortably cold set point (19.4 °C/67 °F in scenes 3 and 5)" (Jamrozik, P.192).

The study concluded, thermal comfort is affected by air temperature, radiant temperature, humidity, air flow speed, the metabolic rate and clothing of occupants, and the season of the year. The performance of individuals within the space improved dramatically when occupants felt neutrally cold. Satisfaction lessened as participants experienced uncomfortably cold conditions as it reduced their manual dexterity and impacted their overall productivity levels within the office space.

◆ ACOUSTIC | CONDITIONS

This study tests five acoustic conditions, no noise, two forms of white noise, and two forms of simulated speech. These sounds emanated the office through a system of ceiling mounted speakers. In scenes 1 and 2 no noise was emitted into the study, in scenes 3 and 5 white noise was played at two volumes of intensity. In scenes 4 and 6 two looped field recordings of background noise were played. In conclusion, "office acoustic conditions can affect the occupant's satisfaction and their ability to concentrate on work tasks" (Jamrozik, P.192). The concept of an open office environment invites noise into and throughout the space, resulting in frequent complaints over noise disruption. Environmental (white) noise is deemed as less intrusive than that of overheard speech, as the speech is particularly disruptive to people's general ability to be productive and concentrate.

◆ DATA | PROCESSING

After the participants were exposed to the work environment for a full workday, a survey was completed to document the participants workday experiences based on a rating system of 1 to 5. The survey asked a series of questions to capture the participants moods and feelings by considering qualifying factors such as: workday experience, energy levels, interactions with others, and feelings of being overwhelmed. There were even surveys regarding the overall health behaviors of the individuals taking into consideration how active and healthy their lifestyle is. Weekly surveys questioned their overall awareness and satisfaction with the work environment conditions, asking if the participant recognized any form of lighting, acoustic or temporal conditions throughout the week that caused them to notice it. Each daily survey and weekly survey were sectioned off into which scene was experienced when the survey was taken, and a linear mixed-effects analysis was formulated to allow the living lab researchers to examine how exactly the participants reacted to each scene.

DATA | RESULTS

The baseline scene was used to compare how the participants felt and experienced other scenes. In conclusion, participants felt that it was harder for them to get their work done in scene 3 and it was moderately hard to get work done in scenes 4 and 5.

The acoustical levels, which introduced simulated speech noise, in scenes 4, 5 and 6 considerably lowered the satisfaction levels of participants, whereas scene 2's low volume white noise did not impact the satisfaction levels of the participant. The blackout lighting levels, in scenes 3 and 5 reduced the participants levels of emotional satisfaction due to there being no access to daylighting or views. The temperature in scenes 2, 3 and 5 fell below the baseline scene temperature of 78.8°F, resulting in lowered levels of satisfaction and productivity.

The weekly surveys focused on work environment, mood and emotions and health behaviors. After thorough analysis of survey responses, it is recognized that the environmental conditions in scenes 3 and 5 were not satisfactory. It was derived not satisfactory due to the impact the environment had on the participants mood, feelings, and sleep. Participants were most aware of the lighting conditions in scenes 3 and 5 because they were the most limited daylighting tactics. They were most aware of the acoustic conditions in scenes 4 and 6 because these were the scenes with the simulated speech noise. Lastly, participants notice significant temperature differences in scenes 3 and 5.

These simulations worked to gather enough information to suggest scene 3 as the scene most participants felt the least amount of happiness and energy. Scene 5 led to an increase in distraction and a decrease in productivity. The scenes in this study each impacted the participants in different ways, some more subtle than others, yet scenes 3 and 5 were detrimental to the work environment due to the temperature of the space and the restriction of natural daylight.

CONCLUSION

"The built environment can impact occupants' comfort and satisfaction, mood, health and well-being, and performance. To optimize the built environment for occupants, we must begin to understand the interactive impact of environmental conditions on occupant outcomes" (Jamrozik P.197). It is not a question of whether the environment influences occupants, this study formally concluded that scene 1 was near optimal, scene two was further optimized, scenes 3 and 5 were sub-optimal, and scenes 4 and 6 received a mixed response.

Changes in environmental conditions throughout the scenes affected the occupant's daily experiences inside and outside of the living lab. Inside the lab, the environmental conditions affected the workday experience, productivity levels, and overall satisfaction. Participants felt as though the sub-optimal scenes (3 and 5) made it harder for them to get their work done. This is due to less satisfaction with lighting quality, temperature and acoustical impedances. "people's perceptions of environmental conditions may be holistic, rather than compartmentalized: dissatisfaction with one set of environmental conditions may affect people's perception of the whole environment" (Jamrozik P.197).

The lab influenced the participants reaction to the space outside of the office space as well, when the participants were outside of the lab, their mood and emotions were affected by changes in the environmental conditions. When conditions in the office space were considered sub-optimal, the occupants felt less happy and energetic. This led the occupants to feel as though they were more distracted and expending more efforts to do household and work-related tasks. The environmental conditions also led to improvements in sleep quality, particularly when they experienced blue-enriched electric lighting conditions.

Architectural design is a significant platform that has the power to influence the emotional wellbeing of occupants within the environment and throughout their daily lives. To study this impact further, future living lab studies should be implemented to uncover similarities and differences in reactions to environmental conditions throughout people of many demographics and of longer time periods.

LITERATURE | REVIEW

ARCHITECTURE FOR WELL BEING AND HEALTH

Enhancing the human experience begins with enhancing the built environment, so the built environment “needs to move beyond optimizing single parameters such as temperature and humidity, to more holistic approaches that take their cues in health-supporting human behaviors” (Steemers P.2). This article focuses on the importance of establishing a connection to physical wellbeing in the built environment and recognizes that design can establish this connection in return, improving the quality of life for the occupant.

This article focuses on the presence of well-being to focus the efforts towards supporting positive mental well-being, to determine the future opportunities for housing design that benefit physiological health. The goal of this article is the balance and improve strategies of building design that improve the well-being of the general population. These design strategies are rationalized into rules of architectural design that will help designers to formulate spaces that improve the mental wellbeing of those experiencing the environment.

The article states an importance quote made by the World Health Organization regarding the determinants of health, “Whether people are healthy or not, is determined by their circumstances and environment. To a large extent, factors such as where we live, the state of our environment, genetics, our income and education level, and our relationships with friends and family all have considerable impacts on health.”

DEFINE | WELLBEING

Well-being is recently recognized as “a state of complete physical, mental and social well-being” by the World Health Organization. The definition of health is an ever-changing process.

Recently, awareness of the importance of interrelationships and mental health have come to the forefront of the term due to the importance in the way humans’ function in a societal standard. Steemers states, “Health is no longer simply a question of access to medical treatment, but it is determined by a range of factors related to the quality of our built environment.” This is because the quality of the built world influences everyone in the community.

The outreach our environment has is further than any treatment or cure. In our world, prevention is as important as cure and long-term solutions are considerably more looked for than short term fixes. The design of our homes, neighborhoods and work environments can significantly impact our health and well-being. Staying healthy in these areas of our life decrease the pressure our society puts on health services. Vitruvius considered three elements as a requirement for a well-designed building; I “firmitas” or firmness (health), II “utilitas” or commodity (comfort), III “venustas” or delight (happiness). The requirements for well-being, Steemers claims, is health, comfort and happiness. Health is considered as the absence of disease measured in terms of body temperature or blood chemistry. Comfort is a form of overall satisfaction with the environment, whether that be visually, acoustically or thermal. Happiness is considerably important because it connects each human with their environment and refers to their overall experience, from contentment to joy.

Some challenges that arise when designers try to quantify health are the systems of measurement. For example, air quality and building treatments can improve the impact on particularly vulnerable occupants yet measuring this in terms of intensity can only be measured during health-threatening times. The quantification of well-being and happiness moves the approach to a more psychological perception. This, combined with the Physiological Comfort Theory and the Adaptive Comfort Theory, introduces a form of health seeking design strategies that adapt to a wider, more expansive community of people. “Well-being consists of two key elements: feeling good and functioning well” (Steemers P.7).

DESIGN | WELLBEING

Research has determined five behaviors that increase physical and mental well-being, called the “five ways of well-being”: Connect, Keep Active, Take Notice, Keep Learning and Give, each of these terms have been associated with positive mental health. The built environment has the power to emphasize these behaviors, in turn influencing people to experience these acts associated with positive mental health.

Connection begins in everyday public spaces; this environment is a necessary resource of well-being throughout the community. Some qualities of design that benefit the usefulness of the space include; Location, proximity is the forefront of use, this allows people to experience the space in a casual manner and allows encounters to be more fleeting. Adaptability increases the use within a space due to the space not having a specific prescribed function. This allows people to feel as though they are welcome to be spontaneous and use the space how they please. Homeliness ensures a sense of safety and familiarity. Specialness gives the space an aesthetic feel, either pulling people in or deterring them. This sensation ensures the experience is memorable. Pedestrian-oriented spaces provide a sense of community because pedestrian environments offer more moments for social interactions to occur. Lastly, green spaces and green design are used to benefit the health of users and support connection to the environment. “Public spaces that brought people together and where friendships and support networks were made and maintained were key to a general sense of well-being” (Steemers P.10).

Design can be manipulated to ensure that occupants have the opportunity to participate in physical activity facilities. This opportunity leads to actions that are needed to support a flourishing population. Some key efforts that can be put in place to assure that people use the facility are; convenient access to the facility, positioning in a residential area, and mixed land use that supports walk-ability and safety. Design strategies that work to promote physical activity throughout occupants includes the provision of a shared exercise space, encouragement of stair use and enforcement of circulation through distribution.

“Physical activity is widely associated with reducing causes of chronic conditions and the burden of disease, disability and premature death” (Steemers P.10). The next strategy can be achieved if a designer diligently introduces opportunity to take notice. These opportunities can be displayed in the form of art, plants and landscaping, wildlife features and strategies seating. Interventions were tested and ensured to provide an increase in occupants taking notice of their surroundings. Designed spaces that interrelate green landscaping with hard landscaping and public versus private spaces can be introduced to allow occupants to experience this sense of mindfulness.

Physical environments can influence intellectual development, yet there are variables such as cleanliness, safeness and vibrancy that effect the ability to learn. “In order to support learning, interior environments need to be physically and thermally comfortable, safe, well lit, quiet and have clean air” (Steemers P.10). A good environment can have vast impacts on the ability to learn as compared to a poorly maintained environment, yet beyond the “good enough” space, extravagant facilities show no further impact on one’s ability to learn. The ability for occupants to participate in activities such as art, music and late-night studies increases the well-being of the occupant, therefore designers should implement spaces that allow for these activities to occur.

Urban environments introduce spaces that integrate green spaces and contact with nature, while also increasing the proximity of one person to the next. “Although it is difficult to observe altruism and its explicit relationship to design parameters, it can be shown that self-reported altruistic behavior is more prevalent in neighborhoods that incorporate the positive environmental and physical characteristics of space design (diversity, proximity, accessibility and quality) that have already been mentioned” (Steemers P.11).

DESIGN | STRATEGIES

There is no universal approach that ensures everyone experiences similar flourishing within every parameter of health. Rather, it is most important to design inclusive and adaptable environments. Design should be responsive to user needs, behaviors and requirements of the space which ensures users have freedom and control over their environment. Design strategies implemented into neighborhoods specifically allow health benefiting experiences to occur.

NEIGHBORHOOD | NATURE

Within the neighborhood it is important to encourage health and well-being. Some ways to encourage that sort of behavior through design are inclusion of high-density mixed-use developments that encourage walking and cycling (Keep Active). Creating public open spaces that are diverse and multi functional. Providing the occupants with facilities that intrigue them and encourage growth. It is also important to design not only the buildings the occupants will use, rather, the spaces between these buildings. These spaces between can be manipulated to create outdoor spaces that connect the built environment to the natural world. Lastly, designers should consider the importance of providing occupants with views of the neighborhood from their own occupancy. This application is associated with psychological benefits because it encourages social interaction (Connect) and provides the neighborhood with added security of the watchful eye (Take Notice).

MOVING | ACCESS

Our American lifestyle is generally sedentary, not allowing people enough time during the day to complete modest levels of physical activity due to space and time. Improvement of fitness for all is of the utmost importance due to the lack of gym goers and overall necessity to improve cardiac health, counteract obesity and maintain general fitness levels throughout the population. Even modest increases in domestic and neighborhood activity levels would benefit the health of the general public. There are design options that should be considered throughout the neighborhood to increase the overall likelihood that occupants participate in physical activity (Keep Active).

The first step towards making this a reality is through designing circulation patterns that are enjoyable and provide rewards for added movement such as intriguing corridors, abundance of natural light and green spaces, and opportunities for people to meet up and converse (Connect). Another tactic that designers could implement is separation of key spaces with stairs and walk paths. This encourages movement and adds a simple level of activity to each person's daily life.

There are also ways to encourage disabled users to stay active. These design strategies provide inclusive spaces with accessible dimensions for circulation, initiate level access thresholds throughout each entrance and exit, provide window sills that are low enough to view out of in a seated position, and adding a lift to the stairs for adaptation of a second story home to still be at ADA standards. It is importance to incorporate strategies that are inclusive to all abilities and all walks of life.

DESIGN | NUTRITION

Poor nutrition leads to obesity and health related issues. To combat this common issue, designers can implement community gardens within urban neighborhoods. This would initiate a sense of community (Connect) and provide occupants with the means to grow their own food and cook at home. Sometimes design needs to give nothing but opportunity. With respect to the design of the home, it is important to consider the proximity of the accessible counter space and seating space. This way the table is in a close vicinity to the kitchen and those who are preparing the meal can also be a part of the conversation. Conversely, the lounging space should be centered farther from the kitchen space to prevent TV dinners and eating on the couch.

◆ INDOOR-ENVIRONMENTAL | QUALITY

Natural light is an important aspect of any home design as it introduces a sense of connection to nature, while also creating an awareness of outdoor conditions. Specific design strategies that circumnavigate sunlight throughout the day can initiate benefits to physical health and counteract seasonally affective disorder (sad). Start with the morning sun and orient rooms used in the morning, including the kitchen and the bedrooms, towards it. This dose of morning light stimulates the circadian rhythm and aids in the beginning of one's day. Commonly used rooms should maintain daylight and have direct sunlight for at least two hours throughout the day. Clerestory windows may benefit the overall daylight distribution throughout a home. Bedrooms should have options for effective blackout and dim lit spaces. This allows the occupant to experience deep levels of sleep, while also providing them with the morning sunlight. Personal control over the amount of daylight throughout the home is important as careers, personal preferences and environmental factors may come into play.

Temperature is significantly important when considering the overall effect temperature can play on the human body's level of comfort. Each function of thermal heat including, air temperature, radiant conditions, air movement, and heat conduction are elements of design that can be taken advantage of. Designers should work to create sunny places within the home to sit on cool days as vice versa, there should be cool places to be during the day when it is hot out. Occupant control over temperature levels also influence the overall experience of the space, generally occupants enjoy controlling the temperature levels of the spaces they reside. Lastly, implementation of passive design strategies that influence night-time ventilation and enable stack and cross ventilation are necessary design qualities that benefit the user's happiness within the space and the overall sustainability levels of the building.

Acoustical Conditions within the environment can influence the feelings of privacy within the home, yet acoustic contact with the neighborhood and nature can be of value.

To encourage learning, it is important to provide quiet spaces for reading and studying. Yet indoor activities such as music and exercise need a space that separates the acoustic connections. Operable windows allow occupants to experience the noises of the outer world when they desire. Air paths are common sources for acoustics to travel, so creating noise-attenuated air paths is important. While designing, it is important to consider separating noisy appliances, such as the laundry and dishwasher, from living and studying spaces. It is important to add spaces throughout the home that implement acoustical qualities just as it is to eliminate them.

◆ DESIGN | QUALITY

The aesthetic appeal of design can impact the five behaviors we are trying to influence. Firstly the color of our environment can impact our learning and behavior. "Red enhances performance on detail-oriented tasks, whereas blue enhances performance on creative tasks" (Steemers P.16). Ceiling heights can influence our social perspective and ability to concentrate. Lower ceiling heights influence concentration and temptation to do tasks that are focus orientated. High ceiling heights tend to influence more abstract styles of thinking due to people feeling more free and able. The formation of space also influences our emotions, as curved forms tend to be perceived as more pleasant.

Regarding all the information previously established, one can consider a high ceilinged, blue, curvilinear space with views of the sky as more likely to be a pleasant sociable space. Rather than a space which is low ceilinged, red, and rectilinear. This space would be considered as a space that encourages focus and concentration to details.

CONCLUSION

Designing for well-being and health is an attainable solution that nudges user towards more positive behaviors. This is done by providing a range of stimuli that increases the likelihood of behavioral changes. Designers can implement quantitative design tactics that stimulate our well-being by incorporating some of the design guidelines that are stated previously.

Architects possess the opportunity to manipulate form, space, materiality and environmental factors to influence our relationships with others and our environment. This mitigation of resources creates interactive settings, moments of pleasure and strategies circulation to better insure our physical health. Using design tactics, architects "provide opportunities to improve our sense of well-being, enrich our lives, make our lives healthier and more pleasurable" (Steemers P.17). These pleasurable moments are difficult to record on a quantitative scale, yet the moments happen all the time often without recognition. The effect these small moments can have on one individual mitigate into an orchestra of many moments of delight that support the five ways of well-being.

PROJECT | JUSTIFICATION

This purpose of this thesis is to emphasize the importance of the biophysical connection between the human psyche and the environment. In theory, these elements can coexist to manipulate the relationship between experience and emotion. This emotional response to the built environment is necessary because it creates a biophysical relationship between humans and their environment in return, creating a sense of well-being. Architecture is a realm of design that guides the user on their journey due to physical limitation. This limitation can be manipulated to induce an emotional narrative influencing what each occupant does, experiences and remembers. This opportunity to promote emotional response throughout occupants justifies the project and creates the necessity for implementation in a social context.

To manipulate this source of human connection, architects need to evaluate the senses and how the built environment stimulates each sense. After thoroughly evaluating the articles, "Architecture for Well-Being and Health" and "Building and Environment," it can be reasonably assumed that this stimulation occurs while the human experiences design qualities such as materiality, ambiance, aesthetics, noise control, and temperature. In finality, the human's biophysical connection to their environment stems from physical elements that stimulate the five senses. These articles recognize the impact that architectural design can influence throughout humans, beginning with consideration of environmental design decisions.



Studying this form of architectural design will progress my skills as a designer and has already caused me to think of design in a human context, rather than a theoretic context. After all design should be thought of as a space to be enjoyed and experienced, rather than a restricting form that protects from the weather. To further implement this process, a set of design standards should be curated to inspire the implementation of design strategies that induce a positive biophysical human experience through each built environment.

Deliberation of the journal articles, previously stated, inspired this commitment to discovering what proper environmental design can do to establish a sense of well-being throughout occupants. They led me to the conclusion that design can do much more than stimulate a response, rather it can be used to impact the health and well-being of occupants. This can be done by creating pleasurable moments throughout our everyday environment, accumulation of these moments influences the emotion of our overall day to day experience by supporting our five ways of well-being, as established by Koen Steemers: Connect, Keep Active, Take Notice, Keep Learning and Give. If we, as architects, focus on designing all spaces to allow people to connect, be active, notice others, learn and take pride in giving to others, we will significantly impact the general public.

Research and correlation had led me to the conclusion that there is a stable connection to be made between emotional well-being and architectural design. This correlation emphasizes the importance of design throughout the built environment, specifically recognizing the impact it can have on our emotional connections to those around us. Furthermore, this research is necessary due to fact, "the collaboration between architecture and neuroscience could lead to a better understanding of human nature, and to a better understanding of how people perceive their environment" (Karandinou & Turner).

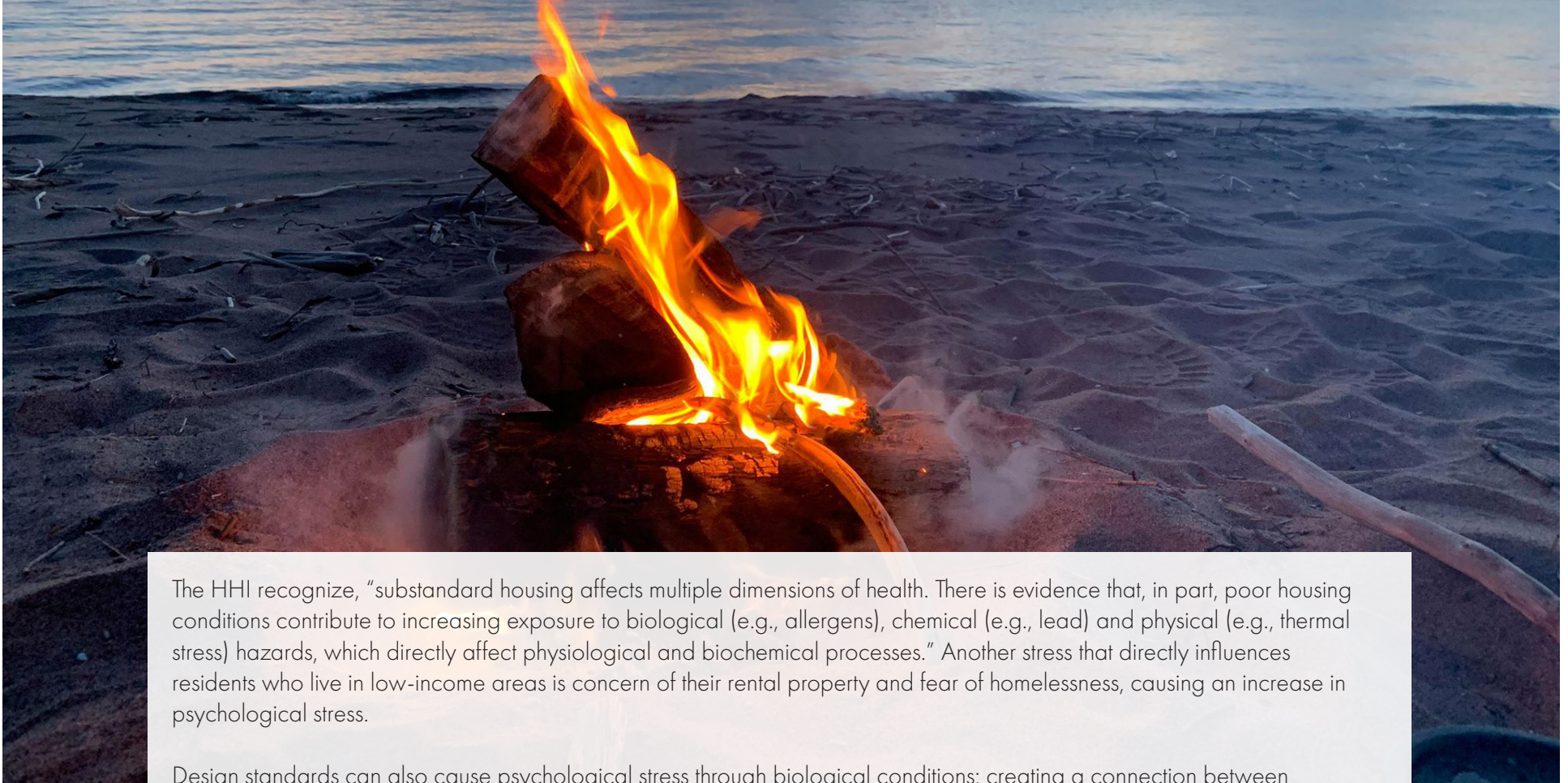
History

HEALTHY HOMES | INITIATIVE

A quality living environment is a commodity everyone should experience, because our homes have a profound impact on our physical and mental health. The Healthy Homes Initiative (HHI) program was founded in 1993, due to the lack of government initiative towards the implementation of environmental and physical health conditions within the home. To this day, the HHI has worked to protect families from the inadequacies within their own homes by providing examples of how to protect a home from toxins while also developing grant programs to enable low income families to live in a hospitable environment. This society has done scientific research to guide their understanding of the direct impact our homes can have on our mental, social, and physical well-being.

The Housing and Urban Development home page states, "in response to a Congressional Directive over concerns about child environmental health, the US Department of Housing and Urban Development (HUD) launched its Healthy Homes Initiative (HHI) to protect children and their families from housing-related health and safety hazards." This initiative was set to advocate the importance of healthy home standards to the public, due to the immense physical and mental toll inadequate housing can take on residents, especially children. The company has proved itself necessary and successful throughout the years by funding \$14.6 million towards the initiative, annually. To date, the 101 Healthy Homes Demonstration and Healthy Homes Technical Studies grants have been awarded to HUD providing them with approximately \$81 million. This company can be deemed a reputable resource due to its success and continual necessity. We will always need adequate homes and we will always need architects who can manipulate these healthy living standards through design.

The company, Healthy Homes Impact, recognizes the necessity for health standards within the built environment. HHI is working to better buildings that are completed, but residential environments can envelop these ideas within the beginning phases of design. This will drastically reduce the waste and cost throughout the building's operating life. The HHI initiates an understanding of the way homes are supposed to be designed in response to health. In response, design can be guided by the organizations standards and implement these tactics into the building during the design development phase, lowering construction costs and implementing better health within the home.



The HHI recognize, “substandard housing affects multiple dimensions of health. There is evidence that, in part, poor housing conditions contribute to increasing exposure to biological (e.g., allergens), chemical (e.g., lead) and physical (e.g., thermal stress) hazards, which directly affect physiological and biochemical processes.” Another stress that directly influences residents who live in low-income areas is concern of their rental property and fear of homelessness, causing an increase in psychological stress.

Design standards can also cause psychological stress through biological conditions; creating a connection between biological response and mental health. For example, poor insulation can lead to excessive noises, in return initiating sleep deprivation. Inefficient indoor temperature can be associated with irritability and social intolerance. Damp, moldy and cold interior temperatures can induce anxiety and depression, and crowding can be associated with psychological distress among women. In children, homelessness and living in temporary housing may lead to social isolation due to the reluctance of occupants to invite guests over to their home. Just as the design of a high-rise building lacks the social spaces to initiate social interaction among residents. Residents who experience these daily issues within substandard housing would psychologically benefit from improved design within their living environments. This organization works to better the lives of the occupants within these residential areas to better their physical health, mental well-being and socioeconomic standing by means of design strategy.

I M P A C T ON MENTAL HEALTH

History

WELL LIVING LAB

While the Healthy Homes Initiative is looking at how our homes influence our health, the WELL living lab in Rochester, MN focuses on how the office space does. They do this by researching neurological simulation, within the living lab, to determine what variables improve cognitive function and lower stress levels. This lab was first announced on September 9, 2014 through Mayo Clinic, allowing researchers to develop an understanding of how exactly environmental variables influence our mental health. To test this hypothesis, they manipulate variables such as: temperature, noise, scents, lighting and floor plan design. Following the variable manipulation, a correlational study is established to consider each occupant's overall health, stress levels, ability to sleep, comfort and work performance levels in response to the environmental change.

Study 1 researched, "the effect of sound, light, and temperature on employees in an open office environment." Thorough analysis of the experience led the WELL living lab to conclude, "the combination of cold temperatures, noise, and lack of window views and natural light caused employees to feel the most distress." (Study 1. P.2) This connection between the environmental elements and the employees caused them to feel unhappy and less energetic, and elements such as the ability to see outside improved the mood of the occupants. This study provides us with the information necessary to conclude that building variables induce a biological response within occupants, in return influencing their mental health in a positive or negative way.

Study 2 focuses on, "The impact of Scent Diffusers on Indoor Air Quality." Indoor air quality is an element that is also studied within the Healthy Homes Initiative because it is so important for human health. High concentration of volatile organic compounds (VOC) and particle matter within the air impact people with asthma and chemical sensitivities.

So, as concluded in the study, it is important to maintain ventilation levels throughout the building in sequence with the device that is releasing the scent. This will maintain the levels of particulate pollution as well as VOC levels. Since occupants are physically affected by the air quality within a space, it is important to balance the levels of VOC's and particulates as they can induce a positive or negative effect on the health of the occupant.

Study 3 tests the, "Impact of office lighting on cognitive performance and sleep." This study justifies the importance of lighting within the home and the office space considering we spend about 90 percent of our time within these spaces. Lighting influences our productivity levels alongside influencing our health, mood, behavior and comfort levels. The study proved that blue-enriched LED light influences better productivity levels, better task switching performance, and better sleep at night. This study proved the benefits of blue-enriched LED light, yet also justifies the need for daylighting due to daylight's natural ability to improve alertness throughout the day. The efforts of studying this information support my research in recognition of the impact daylighting can have on biological responses.

These three living lab studies provide a source of quantitative analysis that directly regard the built environment and its physiological influence over the occupant's overall health, stress levels, ability to sleep, comfort and work performance levels. Scientific studies and journal articles work to conclude that human performance levels and productivity indeed are correlated to the office environment. With that in mind, it is important to take this information and apply it in the context of design. These studies present research that proves: having the thermostat set at 71F, limiting distracting sounds, providing access to natural light with a window view, using blue-enriched LED lighting and implementing balanced levels of VOC's and particle matter, benefit the biological response of the occupant, in return influencing their mental health in a positive manner.

S O C I A L | T R E N D S

GREEN DESIGN

The U.S. Department of Housing and Urban Development issued a Healthy Homes strategy plan that investigates the future of the green building movement. It takes direct initiative to consider the green building movement as a “key opportunity to assess the potential health benefits of green practices and promote the inclusion of health-promoting features into green construction and rehabilitation strategies.” This statement legitimizes the importance of green design throughout a residential area.

Green design is influencing the future of our cities by means of developing spaces that initiate connections between individuals all the while, passively benefiting the environment. The climate change issue has become a fundamental design problem that needs to be strategically dealt with. This strategy involves initiation of passive design elements, promotion of sustainable building material uses and emphasis of the importance of modular construction strategies. Throughout the years, the importance of sustainable architectural design has skyrocketed due to rising levels of CO₂ in the environment from buildings.

Passive building design initiates a connection between the built environment and nature. Benefiting not only those who are using the space, but the environment around the building. Three strategies of passive design that will be implemented within this project include: passive heating, cooling and ventilation. These forms of passive HVAC work to ventilate the building by using stimulants of the natural environment including wind, sun, rain and temperature. The site is in Minneapolis MN so weather endurance, especially passive heating tactics, need to be widely considered during the design process. Sustainable materials lessen the impact our materiality has caused on the environment. Ways to preserve natural resources and lessen the impact of building design is by using materials that are local to the site to minimize embodied energy.

Since the site is in Minnesota, it will be best to take advantage of materials such as wood and concrete, while planting native plants around the site. The level of negative environmental impact rises as we begin to look for materials that need to be specially transported.

Modular design is another way to minimize the amount of waste created through production. Efficiently manufactured modules are revolutionizing complex design by implementing a form that can be manufactured off-site then moved to the site. Some home design companies have conjured design plans that build 90% of the building off-site cutting construction time on site to as little as a day. This form of design allows buildings to work to the highest efficiency, while also allowing production to occur 12 months of the year. While the housing market is specifically impacted by modular design, office buildings, apartments and even high rises may begin to consider this form of construction for future projects.



AFFORDABLE HOUSING

The Department of Housing and Urban Development organize to provide direct assistance to the large community of people who cannot afford suitable housing due to the shocking reality that “12 million renter and homeowner households pay more than fifty percent of their annual incomes towards housing.” It is an economic fact that families who pay more than thirty percent of their income towards housing suffer in other categories of cost burdens such as food, clothing and transportation. According to this data provided directly from the Department of Housing and Urban Development there is evidence that something needs to change.

According to the National Low-Income Housing Coalition, the fair market rent for a one-bedroom apartment in Minnesota is set at \$811.00 per month. Whereas the two-bedroom fair market rent is set at \$1,027.00 per month. This means that the average amount per hour that workers need to make to afford housing at 30% of their income is \$15.21 per hour or greater. If the worker makes minimum wage of \$9.86 per hours, they would need to work 63 hours per week to afford a one-bedroom apartment at fair market rent. With these statistics in mind, recognition of the issues throughout the country stand prevalent. Workers cannot afford housing if they are making minimum wage, without lowering their quality of life. In return, lowering their psychological well-being. A way to combat this is to design affordable housing communities. This change would enable families to lessen the financial burden and biological stress that prevail over the housing industry.

PHYSICAL | CONTEXT

MOORHEAD, MN

This thesis project is set in Moorhead, Minnesota in an area of residential use. The ability to present the residents with an occupancy that is surrounded by other residential units provides accessibility to previously established bus, biking, and walking routes as well as proximity to other residential units. This site was chosen with interest in the spaces just West of the site, including the Red River and the Moorhead Viking Ship Park Bike Trail. This site initiates human interaction, initiates residents to stay active, connects residents to the natural environment, and provides modes of transportation to the downtown district. Each of these elements play a specific role in benefiting the biological response and emotional health of the occupant.

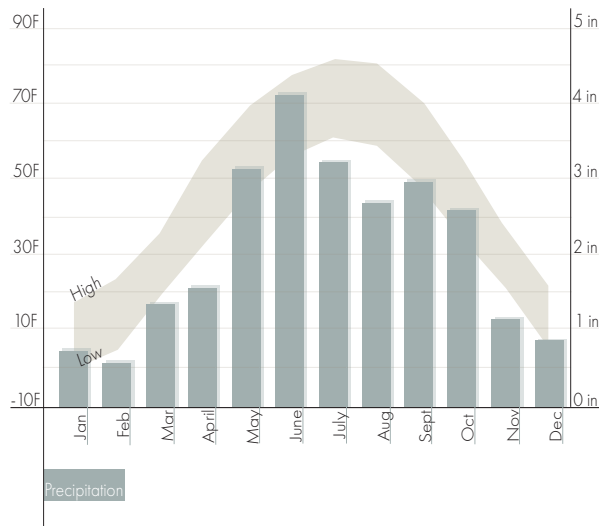
As stated previously, the proximity to other homes provides residents with an opportunity to form connections between residents and their neighbors. This social connection ties families to their environment and establishes a sense of purpose within the community. This establishment is thoroughly important for the psychological success of the community. The following information, recognized within the article, "Architecture for well-being and health" emphasizes key design elements that establish connection throughout a community. The first is location, due to its ability to enable or disable accessibility and proximity to other sources of human interaction. The next element of design is production of spaces that support casual encounters, such as a gathering of benches where people can seamlessly communicate. Homeliness is considered as an important aspect because it allows occupants to feel a sense of safety and familiarity. Pedestrian oriented spaces are also important due to their functionality and ability to create a sense of community, social interaction and public safety. These design elements provide necessary elements of city orientation that lead to connection and interaction between humans. In return providing humans with an experience of social connection, in turn, benefiting our emotional well-being and physical health.

ARCHITECTURE AND PSYCHOLOGY

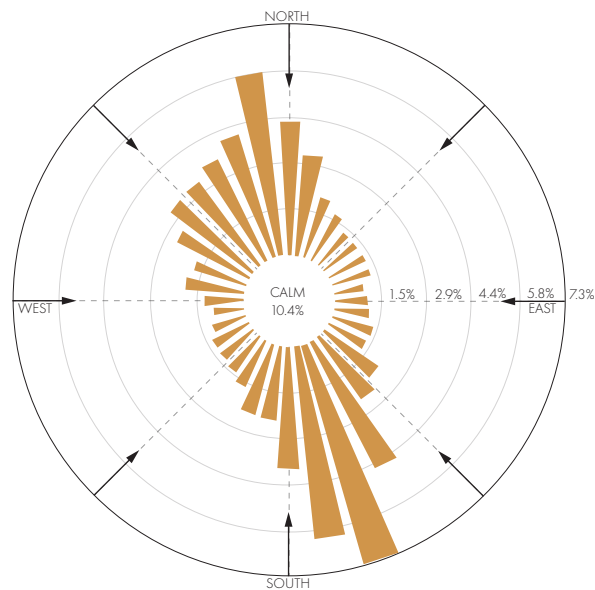
The World Health Organization defines health as, "a state of complete physical, mental and social well-being." This concept of health allows awareness to be had of the interrelationship between the built environment and social health, rather than the past recognition of health being just an absence of ill-health. According to a Daylight Article, "health is no longer simply a question of access to medical treatment but it is determined by a range of factors related to the quality of our built environment." The recognition of this connection allows designers the justification needed to study and emphasize the importance of the design of our physical environment, due to its determined impact on human health.

Q U A L I T A T I V E | A S P E C T S

Site Analysis



Climate Data
TEMPERATURE, PRECIPITATION, WIND ROSE

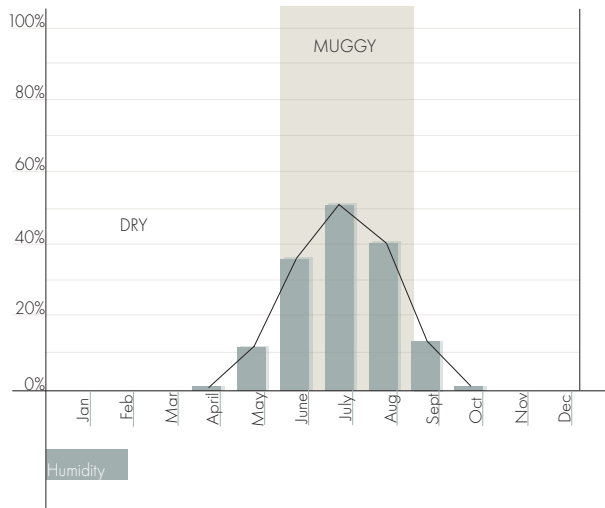


Residential Design:

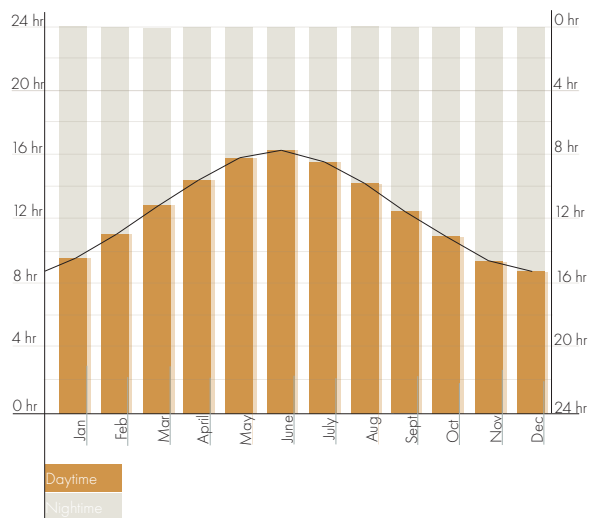
The necessity for residential spaces has led to the accumulation of many tract housing neighborhoods throughout Fargo, Moorhead and West Fargo. A series of homes that sell for an affordable price and uphold a standard mean, yet do not offer a substantial curb appeal, or architectural flair. Tract housing developments make use of few design skills which allows labor costs to be reduced because construction workers do not need to spend the time to learn new skills of construction, rather they build quickly due to repetitive rhythms. These housing complexes lack community spaces, services, attractions or greenspaces. This, in return, forces people living within the residential area to travel elsewhere for these experiences. Raising the need for a car and lowering the ability to connect with neighbors. This can leave residents who are unable to travel with a sensation of extreme solidarity.

This is the issue surrounding housing developments; noteworthy spaces, that initiate connection, social atmospheres and greenspaces, are suddenly not important. Where did this idea for suburban regeneration all begin? The post- World War II boom. The transitional period after the war left families with stable employment for once in their lives, and now they were ready to buy a home and succumb to their version of the American dream. It was with this that the U.S. recognized they needed homes and they needed them fast. For reference of how quickly; "5 million residences were needed to house people by the end of 1945" (Matarrese). This is when Levitt and Sons, a real estate investment agency, announces that 2,000 affordable rental homes would be built on their land (Kershner).

Soon thereafter the Levitts began building 30 homes a day, following demand. The homes were built quickly due to their identicality of construction and sold quickly due to the intense demand. This is when the Levitts changed their business title, rather than just renting land and building homes on it, they began to create homes within a factory due to inspiration from the Ford assembly line model. The tactic moderated the construction workers, initiated partnerships with supply companies, and furthered the ease of construction and material accessibility. Now, nearly 75 years later, companies still work to mass produce houses yet in a less mundane fashion.



Climate Data
HUMIDITY & DAYLIGHT ANALYSIS



The Site:

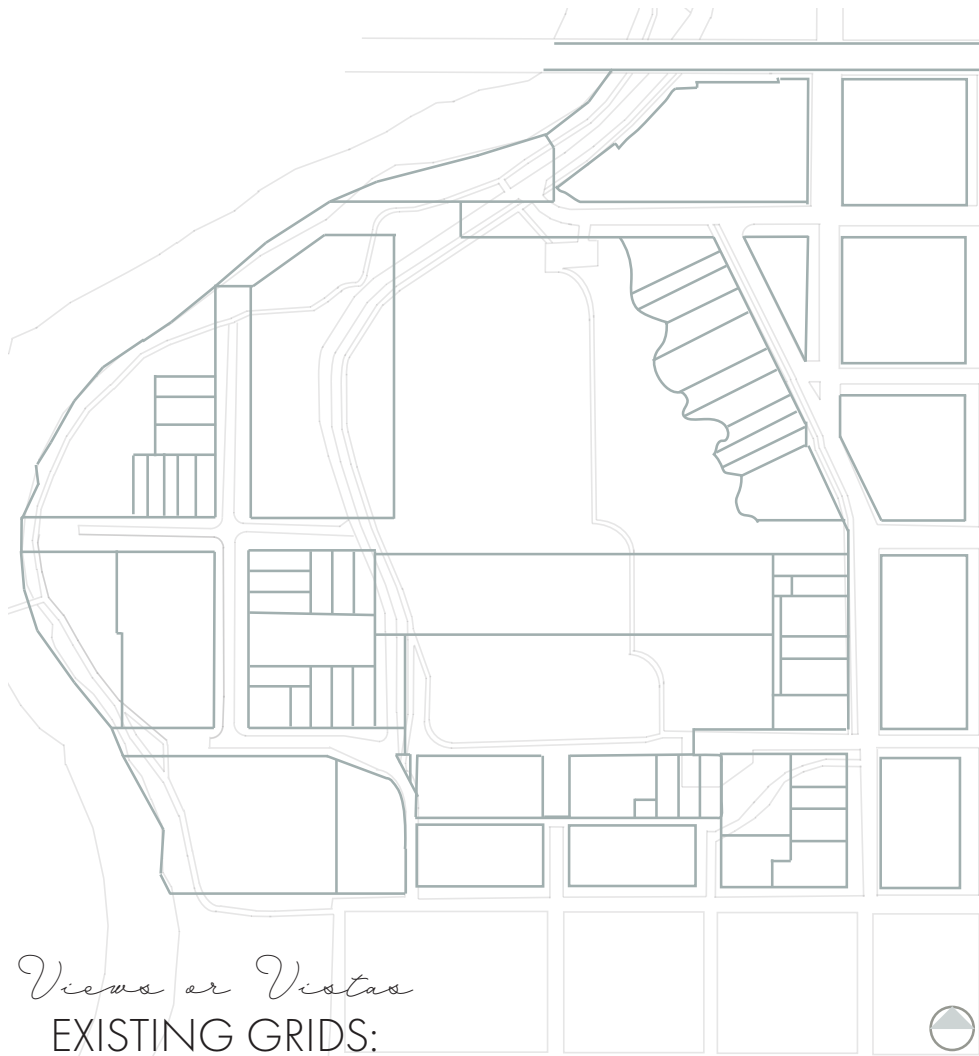
The site, located in Moorhead, MN, was chosen due to the Fargo-Moorhead (FM) area's intense growth rate of 34%, since the 2000 census. The community is growing and with growth comes the responsibility to maintain and develop residential areas. The site resides in an area that is close to downtown Moorhead and Fargo, offset a bit from the rivers edge. This offset is necessary due to the immense amount of flooding the community experiences nearly every year. The proximity to the downtown area is important due to radial walking distances and connection to the community. The site does not only focus on downtown connections, it is also within walking distance of a Woodlawn Park which features amenities such as sports fields, picnic areas, a playground and a biking trail.

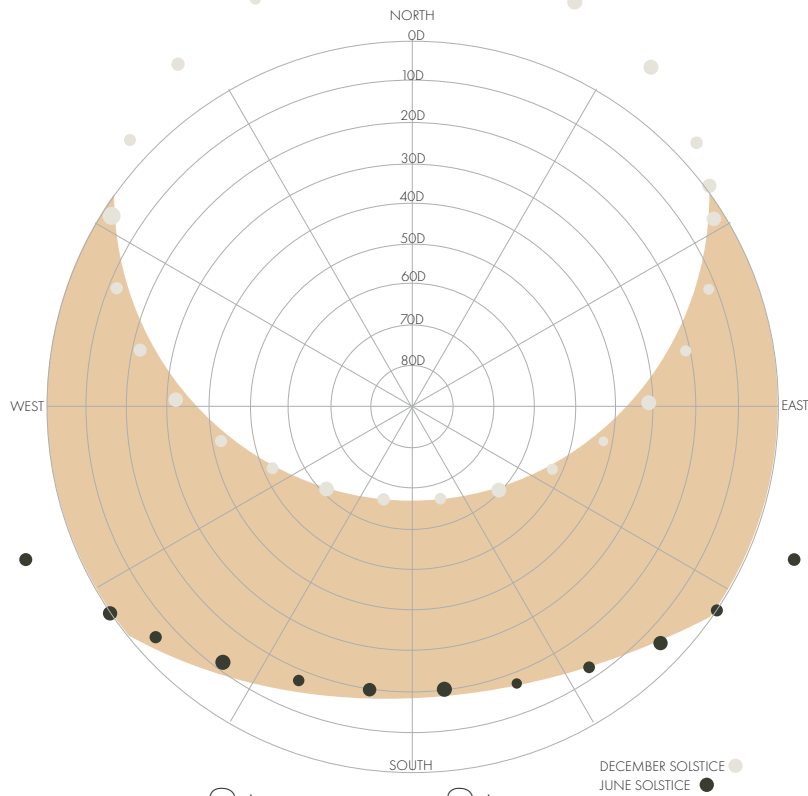
When choosing whether to project my site across the river, in Fargo, I looked to the Sperling's best places for the qualitative facts: Moorhead is 3% less expensive than Fargo, and the housing costs are 13.6% less expensive. Enabling Moorhead to take the lead in affordability.

The FM Metro area provides opportunity for a large job market due to the proximity of towns. According to the Fargo Inc. "In 2015, a workforce study was conducted in the Fargo-Moorhead area and discovered that, at the time, there were 6,700 current job openings and in the next five years, that number was projected to increase to 30,000." This increase is in part a response to the opening of the Sanford hospital in West Fargo as well as the immediacy of universities such as North Dakota State University, Concordia, and Minnesota State University Moorhead. These are a few of the many job opportunities that lead to the projection of a 30.2% job growth rate in the FM area.

The site offers opportune amounts of greenspace and lush trees. Standing in it, a feeling of connection to nature and the river induces a sense of calmness. It is an opportune space to settle, as it is close to downtown and the noises of the city, yet the open space and proximity to a park will give residents the opportunity to travel outside and experience the senses of Fargo throughout each season.

S I T E | A N A L Y S I S





Views or Vistas

SUNPATH | SHADE AND SHADOWS:

The site is generally South facing, allowing access to sunlight all day. The only shade that occurs is from the large amount of trees covering the site.

Views or Vistas
TOPOGRAPHY & SOILS

Plastic-Silt, Non-Plastic Clay and Plastic or Organic Clay are the most common soils found in Fargo/Moorhead. The area has weak soil and deep bedrock.

The site itself is situated on a hillside, allowing design elements that connect the landscape and the building design. There is a level of distress that occurs in the Woodlawn Park, due to low topography.

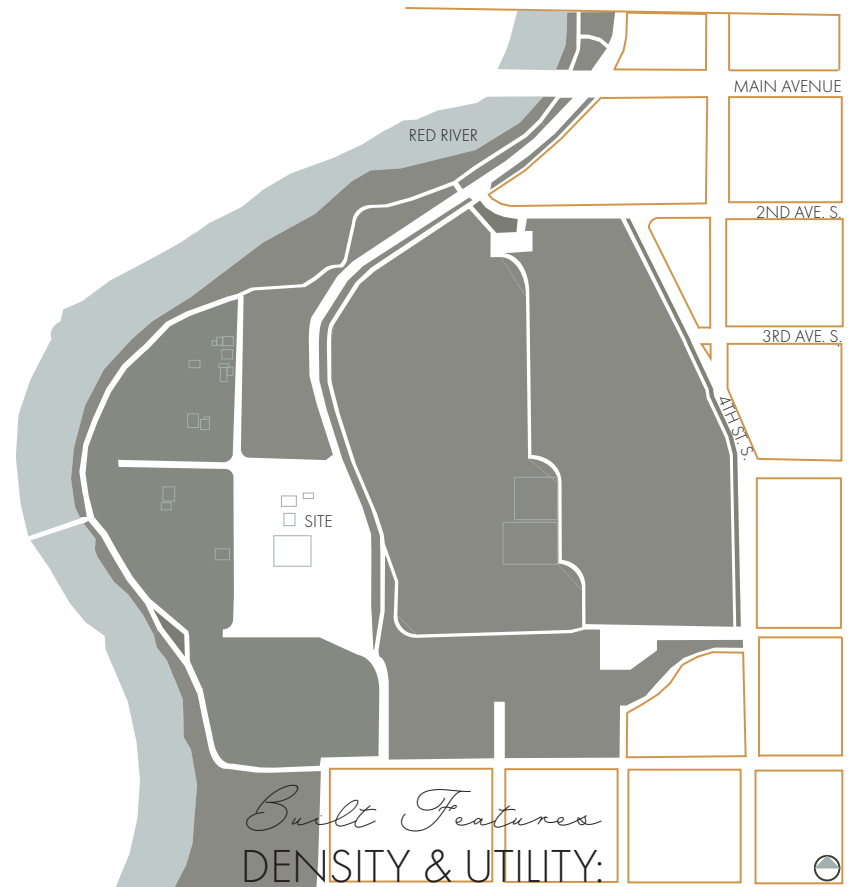
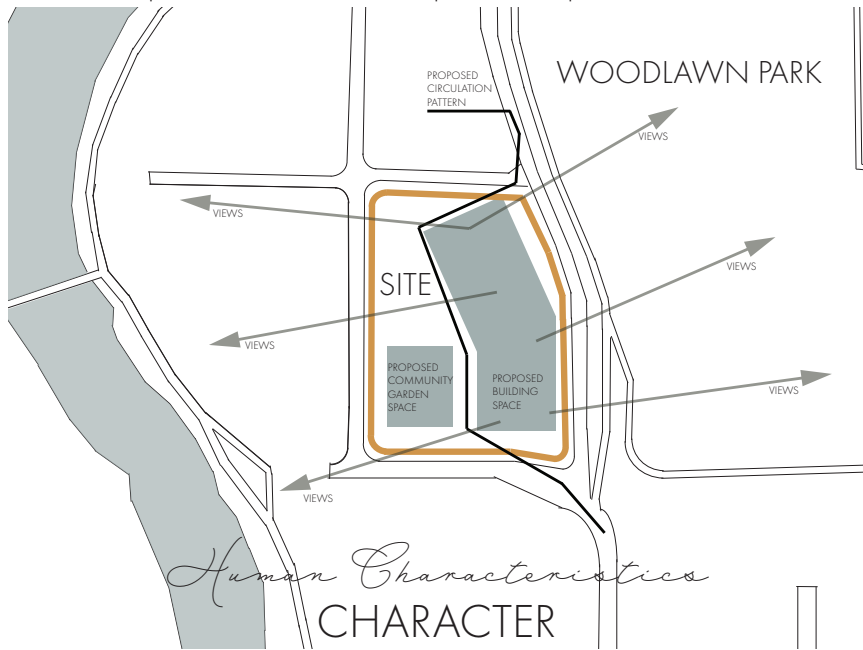


S I T E | A N A L Y S I S

The site is currently utilized as a residential area, yet the ability to turn this into a community space that centralizes itself on residential living would bring people to the area more.

It is positively impacted by the nearby park and river walkway, yet seems out of the way from the downtown area. This is ideal as it provides a suitable amount of distance, yet is close enough to utilize the downtown area simply. There is a lot of potential for revitalization throughout the site as it has beautiful views of the river and the Woodlawn Park. This offers occupants a space to exercise, walk and contemplate.

The residential building as well as implementation of a vertical garden space, and proper landscape design would pull the space together for more occupants to experience, providing the city of Moorhead with a new development that enlivens the spirit of the space.



There are very few buildings covering the site. One of them is the residential home and the others are sheds and garages of the homeowners.

UTILITIES:

Electric & Water: Moorhead Public Service manages utilities for the City.
 Natural Gas: Xcel Energy provides natural gas for the Moorhead area.
 Wastewater (Sewer) & Stormwater: The City of Moorhead provides wastewater (sewer) and stormwater service for the City.

S I T E | A N A L Y S I S



Vegetation/ Plant Cover COLOR, TEXTURE, PATTERNS:

The site is lush with green space and plant life. This includes aged trees and shrubbery. It adds character to the site and implies a sense of solidity in terms of design.

A goal of my design would be to include these aged trees and consider them as an influence throughout my design rather than a bother. It will add a natural curve to the spaces and allow views to happen naturally.

The red river resides to the West of my site. It is a running water feature of permanent stature. The river benefits the site by adding to the quality of views, and the calming noise of the running water.

The Red River does flood nearly every year, the diagram to the right shows the flood line in red. The research I have done analyzes the flood line to be West of the site. Concluding that the site will not be negatively impacted by the river even if it floods, because of its high elevation and proximity from the river.



Qualitative Aspects WATER/WATER TABLE

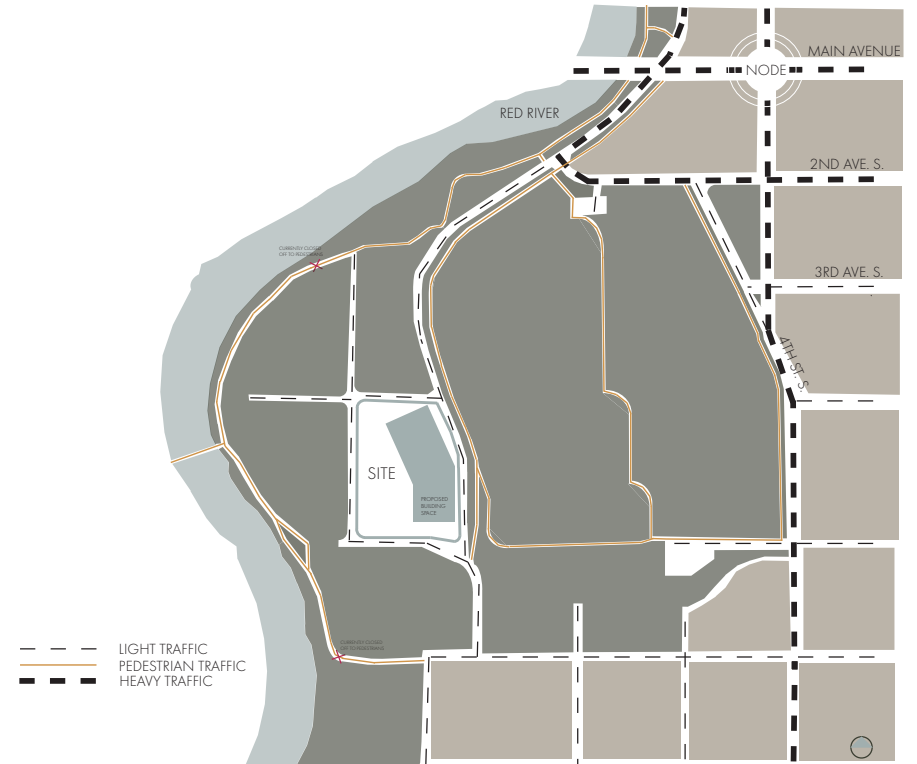
Quantitative Aspects
SITE RECONNAISSANCE



Quantitative Aspects
CIRCULATION

Surrounding the area are roadways and circulation areas for traffic that are simple to get to. The drive to downtown Fargo is approximately 5 minutes and the drive to downtown Moorhead is approximately 3 minutes.

This site is ideal due to its proximity to the downtown areas and Main Ave. Public transit is accessible at a distance of about 2 blocks, due to the minimal amount of residential homes in this area.

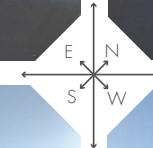
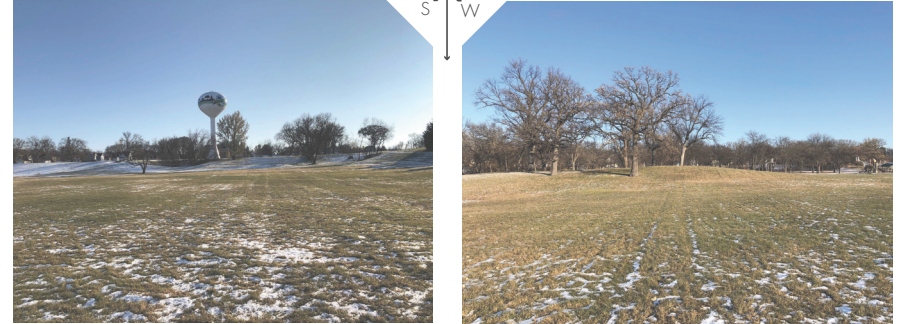


Quantitative Aspects
SITE RECONNAISSANCE: 1



Quantitative Aspects
SITE RECONNAISSANCE: 3

Quantitative Aspects
SITE RECONNAISSANCE: 2



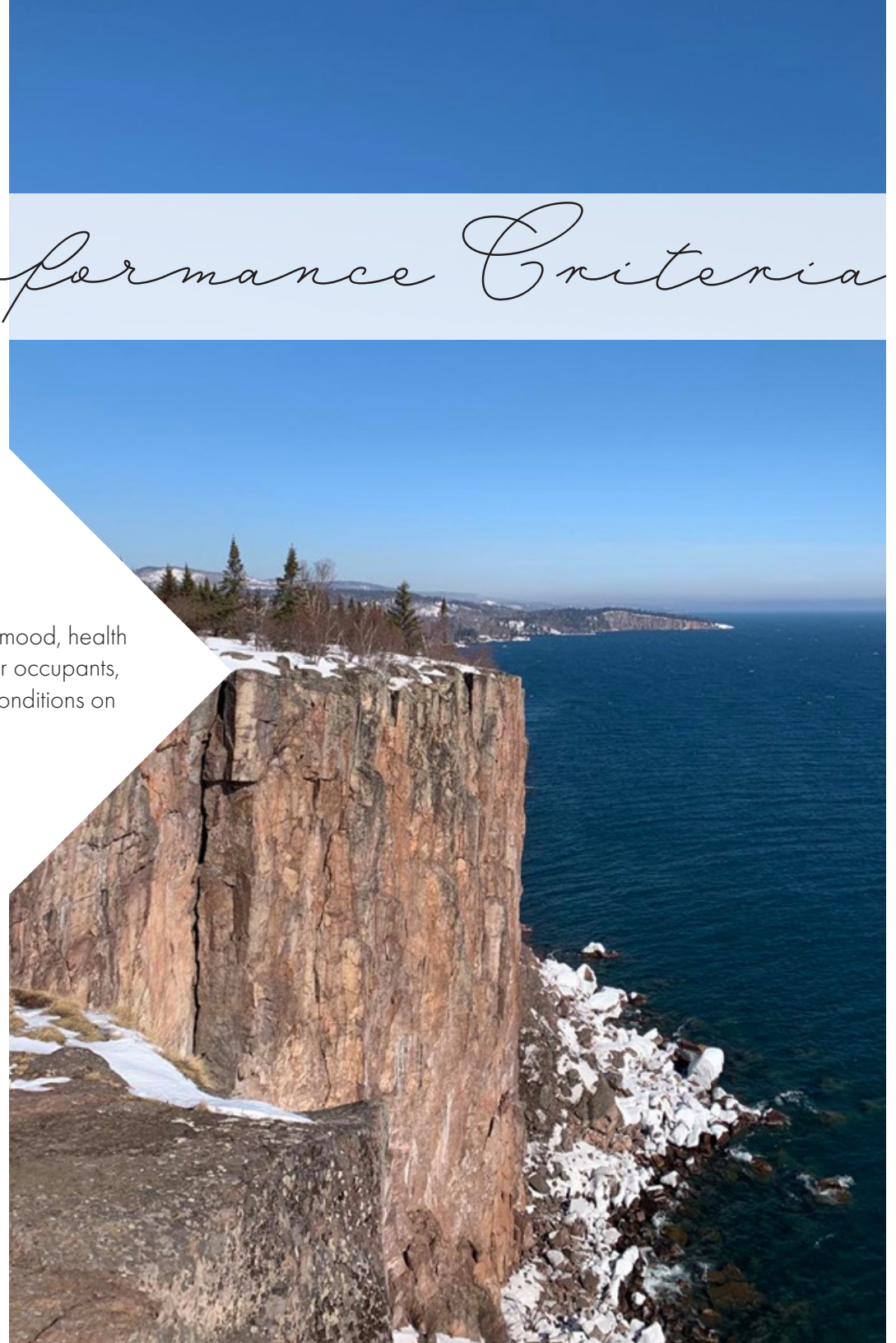
Quantitative Aspects
SITE RECONNAISSANCE: 4

Performance Criteria

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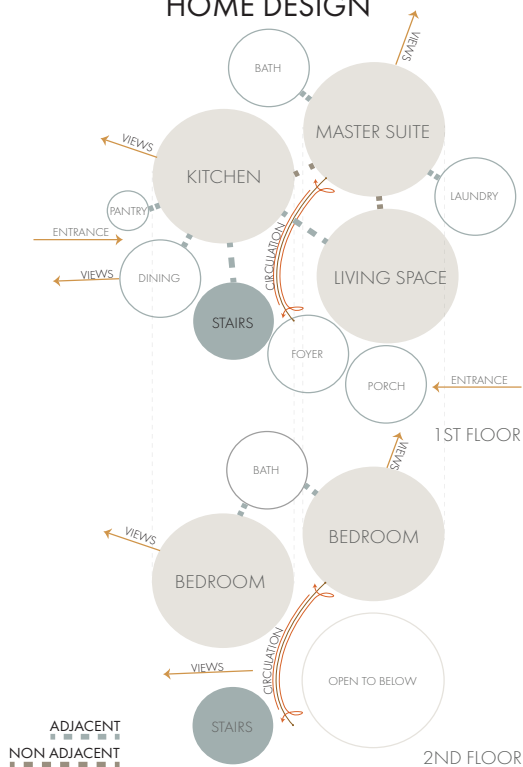
“The built environment can impact occupants’ comfort and satisfaction, mood, health and well-being, and performance. To optimize the built environment for occupants, we must begin to understand the interactive impact of environmental conditions on occupant outcomes” (Jamrozik P.197)

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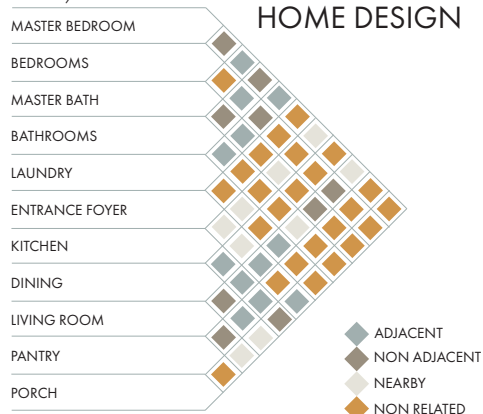


P E R F O R M A N C E

Space Interaction Net HOME DESIGN



Space Interaction Matrix HOME DESIGN



Psychological Impact

The overall goal of the project design is to create a connection between space and design. Throughout literacy research and project development it can be concluded that spatial orientation and design quality influences the overall sense of well-being and satisfaction throughout occupants. Now, the spatial arrangement needs to follow suit. For this section of the document, I will focus mainly on the WELL living lab research, and "Architecture for well-being and health" as both inquiries show evidence of design having an influence on emotion. To design a space that is considered a comfortable experience, designers need to consider the acoustics conditions of the space, the thermal conditions, and the lighting conditions.

Environmental Performance

Beginning with acoustics, it is important to provide enough space throughout the home so the occupants can be away from noisy appliances, yet still have an open floor plan. This allows the homeowners the ability to communicate throughout the home, yet still provide opportunity for continued learning through design of quiet spaces for reading and studying. Indoor activities such as music and exercise also need an allocated space to encourage this form of play. Noise-attenuated air paths can reduce the "white noise" effect.

It is important to consider the effect a home's acoustical property have not only on those within the home. Neighborhood and nature connection allow those within and throughout the environment to enjoy the noise of the neighborhood and feel a sense of place while they are within their home. Operable windows allow for this connection, yet also allow closure. Windows are an important design consideration as meaningfully placed windows in return influence the daylighting pattern of the home.

Natural light introduces a sense of connection to nature, while also creating an awareness of the outdoor conditions. Specific design strategies that circumnavigate sunlight throughout the day can initiate benefits to physical health and counteract seasonally affective disorder (sad). As mentioned throughout the literature review, circumnavigation of the sunrise to sunset throughout the home stimulates the circadian rhythm and aids health benefits of the occupants throughout the day. This is an important design standard that will be met throughout the home design.

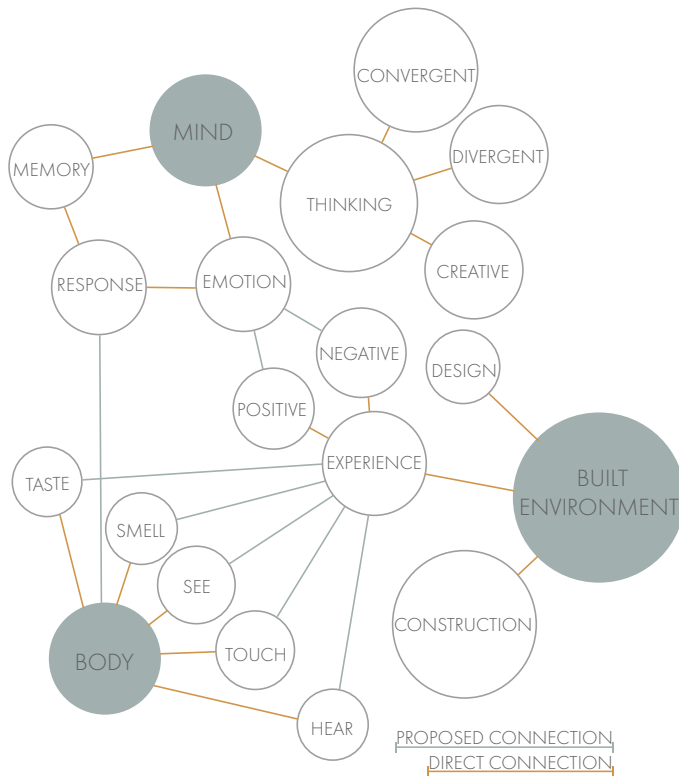
Space Allocation Table

HOME DESIGN

SPACE	SQUARE FEET (SF)	PERCENTAGE (%)
MASTER BEDROOM	231	11.6%
BEDROOMS	261	13%
MASTER BATH	130	6.5%
BATHROOMS	161	8.05%
LAUNDRY	102	5.1%
ENTRANCE FOYER	101	5.05%
KITCHEN	306	15.3%
DINING	216	10.8%
LIVING ROOM	300	15%
PANTRY	37	1.85%
PORCH	155	7.75%
TOTAL	2,000 SF	100%

SPACE ALLOCATION TABLE

Space Interaction Net BODY, MIND, ENVIRONMENT CONNECTION



Temperature of the space is important due to the intense influence temperature has on the human body's levels of comfort. When it comes to home design in a cold climate it is important to include passive design strategies that heat the home and retain this heat throughout the night. Passive design strategies may not keep up with Moorhead's cold winter nights, so electric heating is a must. Occupants will have control over the temperature of the building yet passive design strategies such as stack ventilation, daylighting and continuous insulation.

Space Allocation

Inside the home it is important to consider the use of each space and how those uses tie to another space. For instance, it is important to consider the proximity of the accessible counter space and seating space. This way the table is in a close vicinity to the kitchen and those who are preparing the meal can also be a part of the conversation. Conversely, the lounging space should be centered farther from the kitchen space to prevent TV dinners and eating on the couch. Floor plans can be designed in thousands of patterns, yet the design of different floor plans that fit different lifestyles can benefit the environment and introduce a neighborhood that is inviting to elderly, mid aged, and young families alike.

When focusing on the overall neighborhood design, many aspects should be considered to provide a space that connects occupants, is accessible to all, considers green spaces and has a curbside aesthetic appeal. Design should be responsive to user needs, behaviors and requirements of the space which ensures users have freedom and control over their environment. Design strategies implemented into neighborhoods specifically allow health benefiting experiences to occur. Community gardens can be planted throughout the summer months, walking paths that lead to specific viewpoints influence circulation and exercise, green spaces encourage connections to occur, accessibility allows elderly and handicapped to access the space comfortably. These design strategies manipulate the environment in a positive manner by means of influencing the occupant's lifestyle. The landscape design provides the occupants with opportunities that they would not have if they lived in an ordinary apartment building or a town home.

Design Solutions

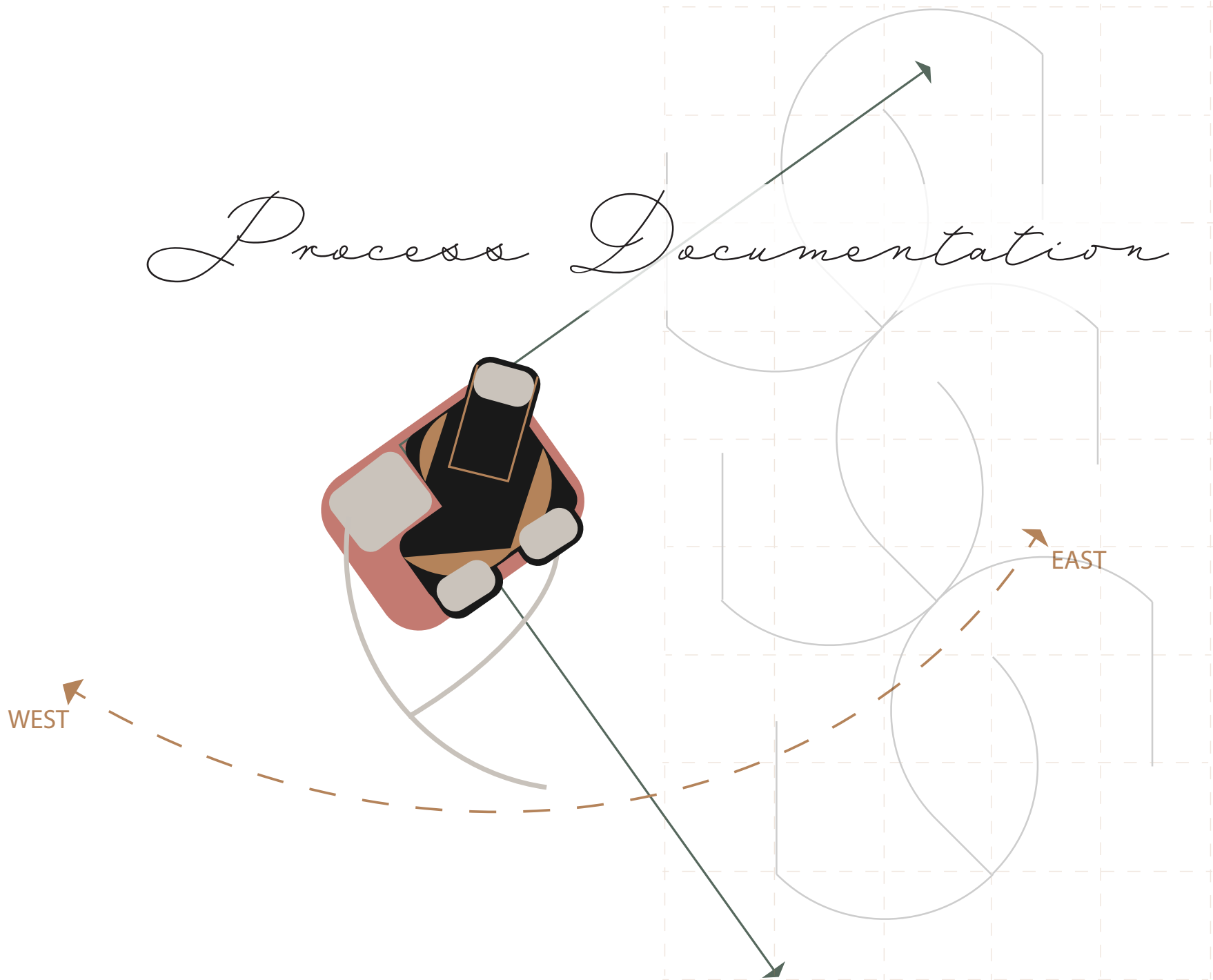


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Designing a space that influences these key elements of feeling good and functioning well will in return impact the overall well-being of the occupant.
(Steemers)

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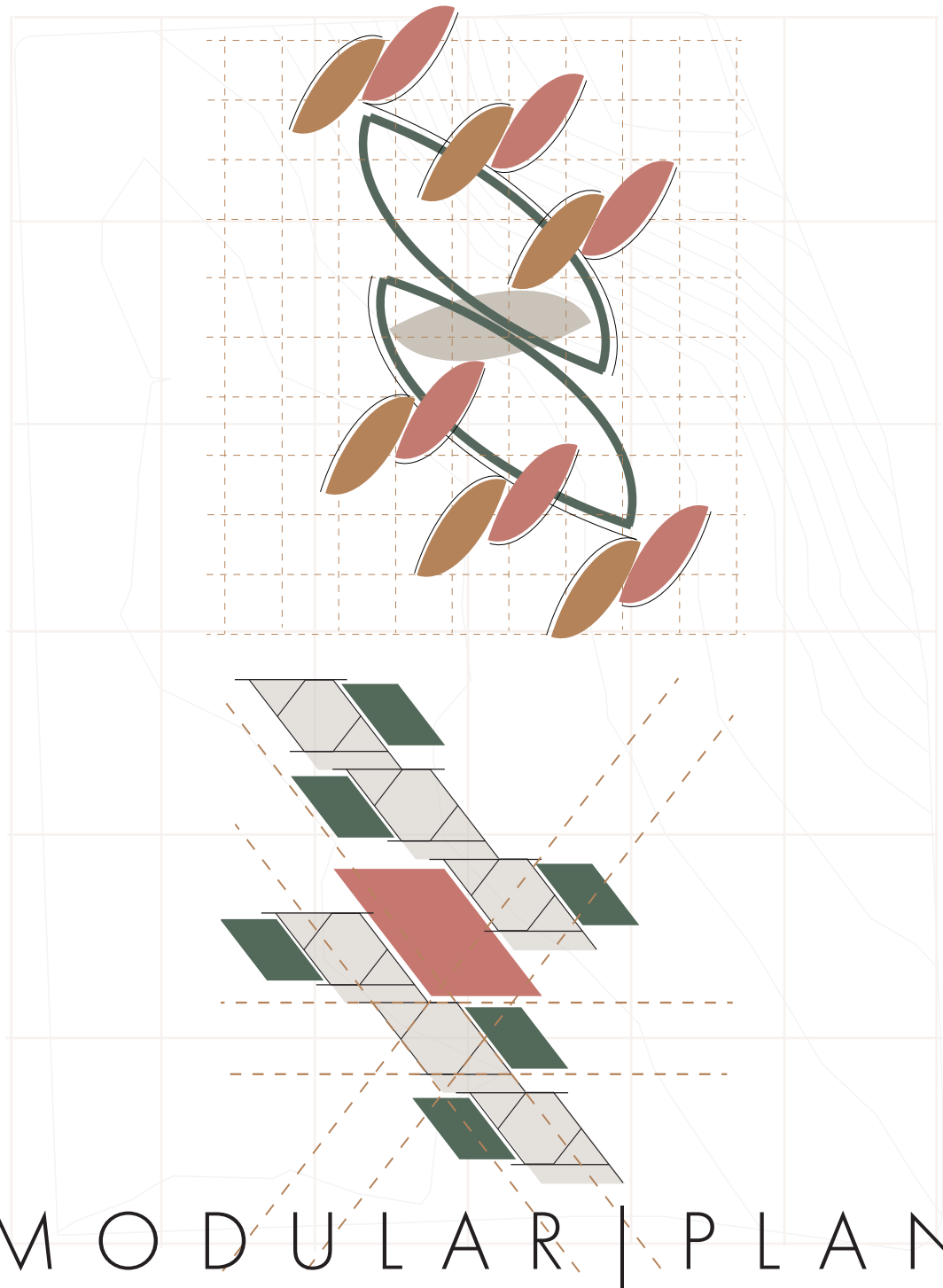
Process Documentation

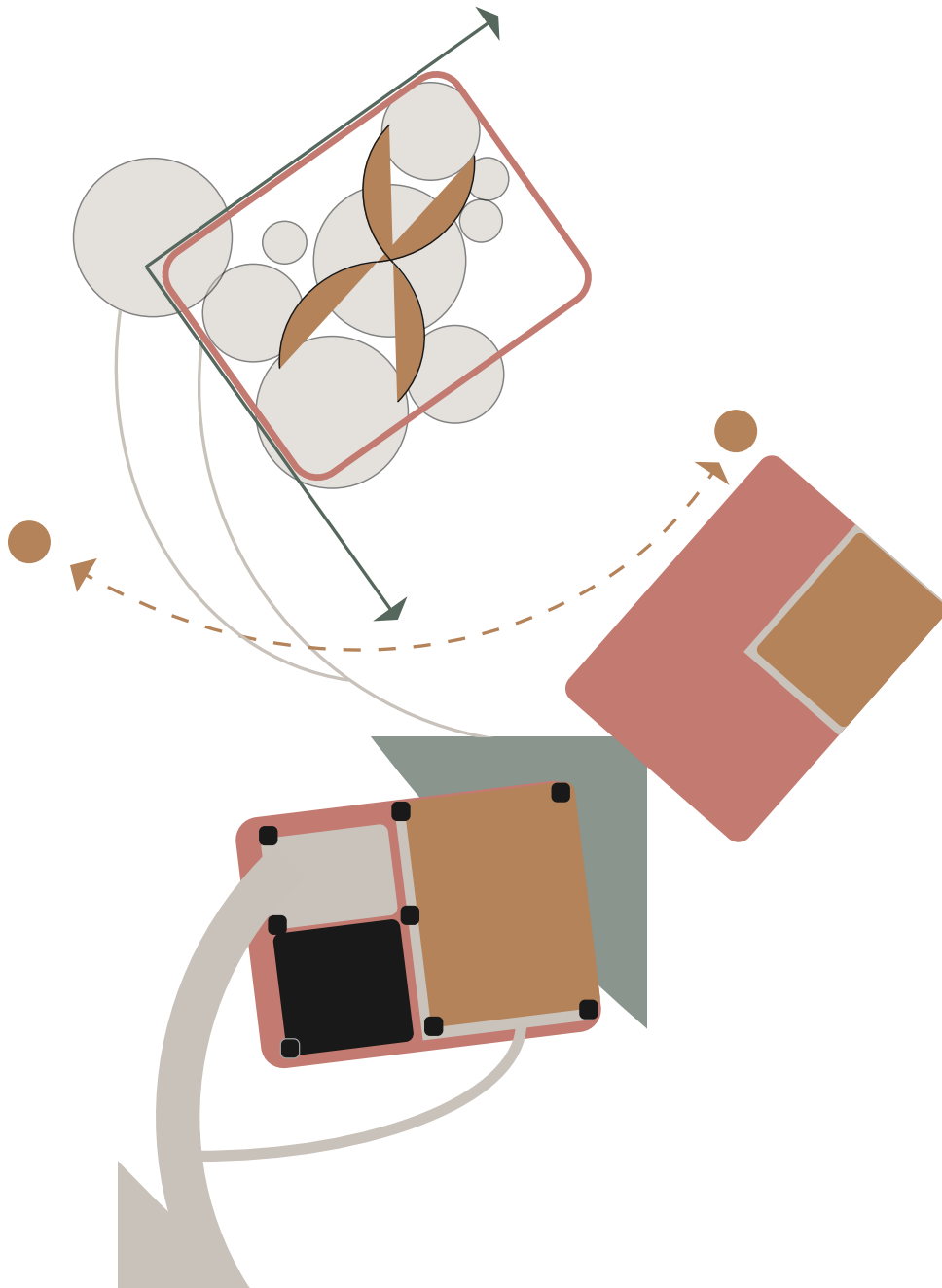


I began designing in a modular way, these modular forms are an example of the relationship I wanted to occur between my buildings (which were initially 6 homes, now 5 homes.) These modular forms allocated a specific amount of space to each home, while also allocating a specific amount of green space.

The modular forms were manipulated in a more realistic manner once I recognized the scale of the site, which is 3 to 4. This allowed me to create a scaled grid over the top of the site which I could now manipulate throughout my modular designing.

Once I looked at the site I recognized that I wanted the buildings to follow the curvilinearity of the site, and be oriented towards the downward slope. It was this decision which guided me towards a resolute modular design decision on the site. This is exemplified in the image below.





Once the site decision was finalized, I moved on to the building orientation based on the site grid. This orientation rotates the building 20 degrees and begins to channel the proportions of the interior spaces.

This part of the design process was successful in evaluating what angle the home sits at, but the interior spaces were changed considerably from this phase to the final phase of design, as would be expected.

Some things I considered when working with the interior was the placement in correlation to the sunrise and sunset as well as where the stair structure, and mechanical system should be placed. In finality, I placed the mechanical system in the Northwest corner of the home to block winter winds. Then I oriented the rooms within the home to work with the rising and setting sun pattern, leading me to a linear pattern of movement from East to West. Another important aspect was the views and vantage points to the exterior from each room and level.

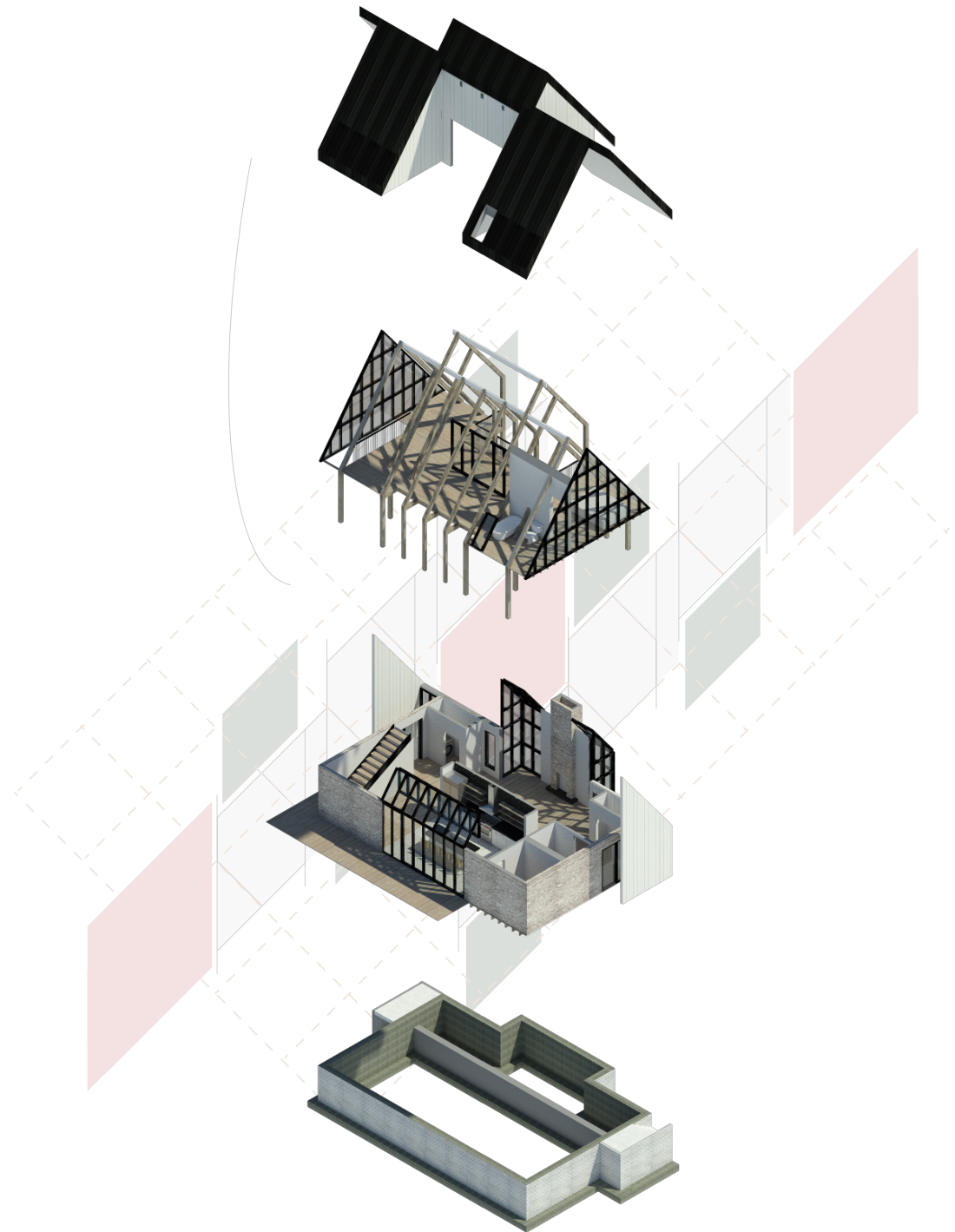
During the midterm presentation I had a final design that looked like the exploded isometric to the right. From this point I changed a few aspects of the design to allow better visions to the exterior and a more cohesive design from the first level to the second level.

Some things I changed include:

1. The Column and Beam System
2. The large triangular windows leading down from the bedroom.
3. The orientation of spaces surrounding the entrance
4. The exterior condition of the back entrance.
5. The roof over the bedroom

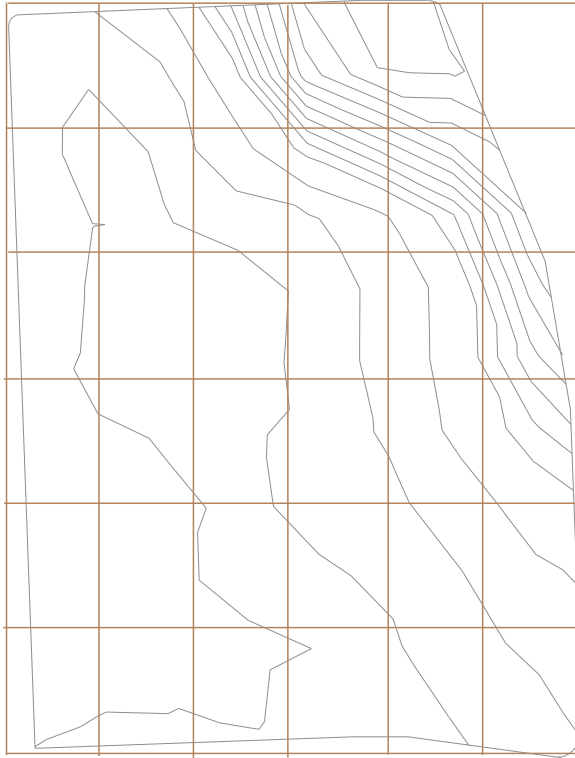
The column and beam system was protruding into the second level balcony space, so I decided to cut off the trusses before they protrude into the space. The large triangular windows did not cohesively connect the second level to the first level. The orientation of the interior main entrance space was adjusted to create more space for people once they enter the home. Also, the first level restroom was adjusted from a full bath to a half bath due to lack of necessity. The exterior panel covering the back entrance was not necessary, as the home would cover that entrance from Northwest winter winds. Finally, windows were added to the bedroom roof to allow those laying in bed to see the night sky and morning light. This was mimicked on the opposite side of the home over the stairs to create a moment when you are walking up the stairwell.

All of these changes will be expressed in the following slides.



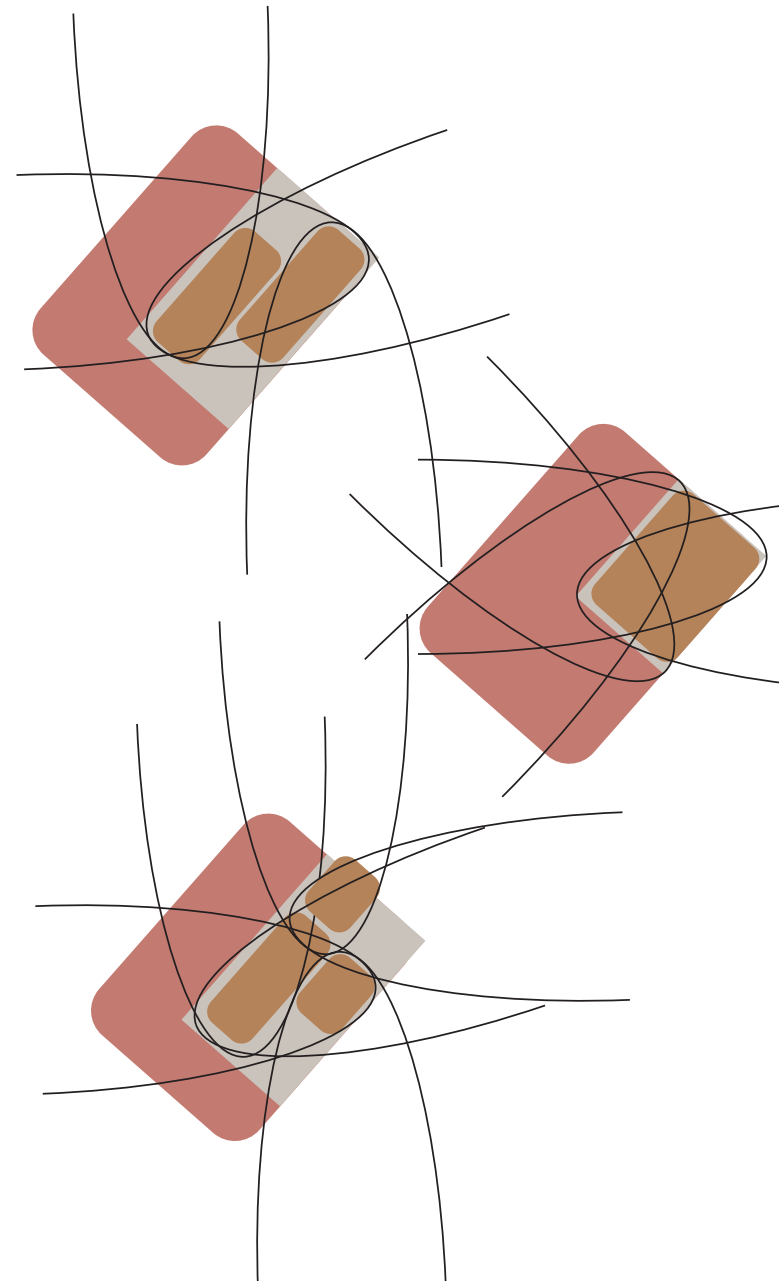
S I T E | D E S I G N

PERFORMANCE ANALYSIS: RESPONSE TO SITE OR CONTEXT



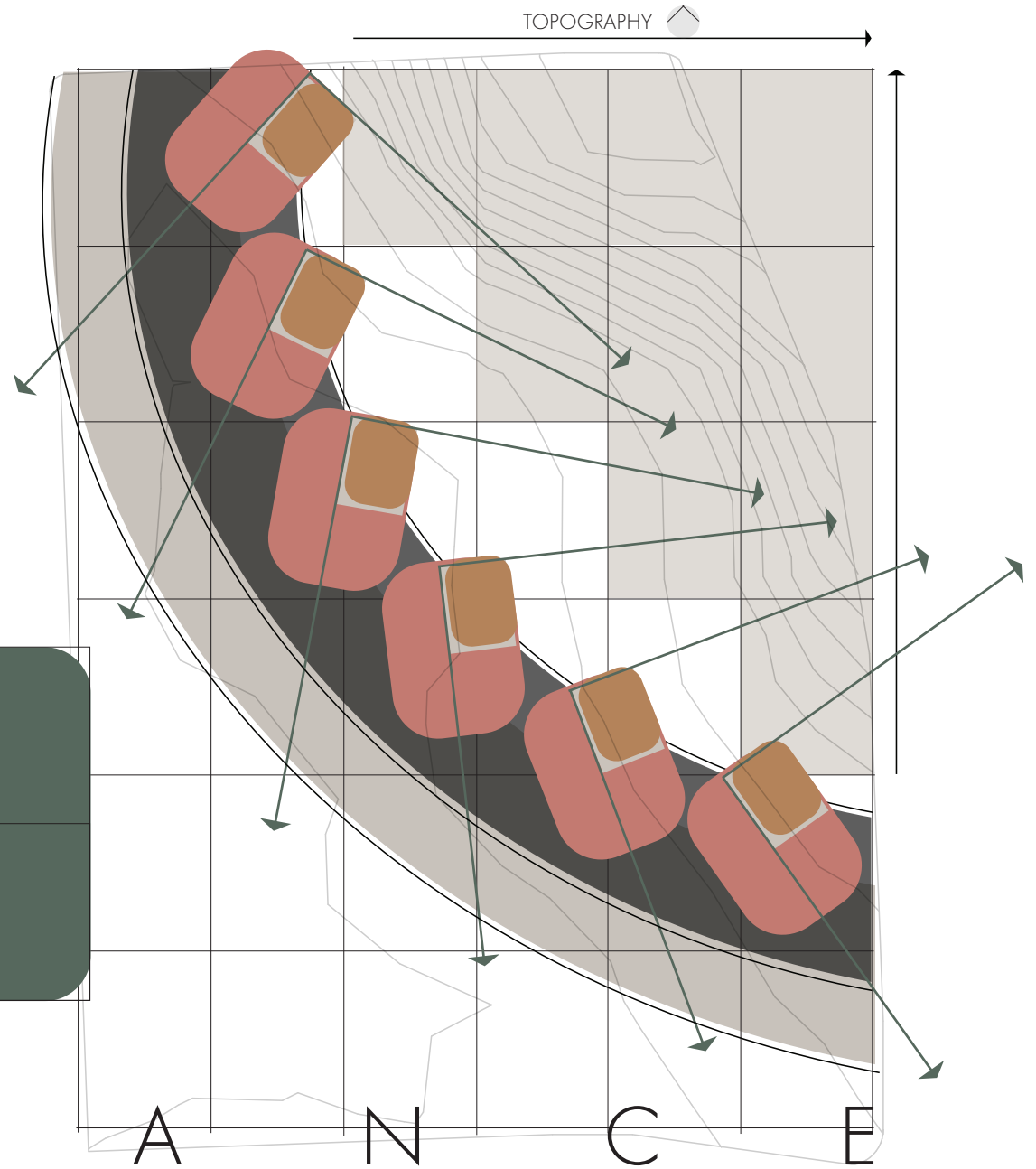
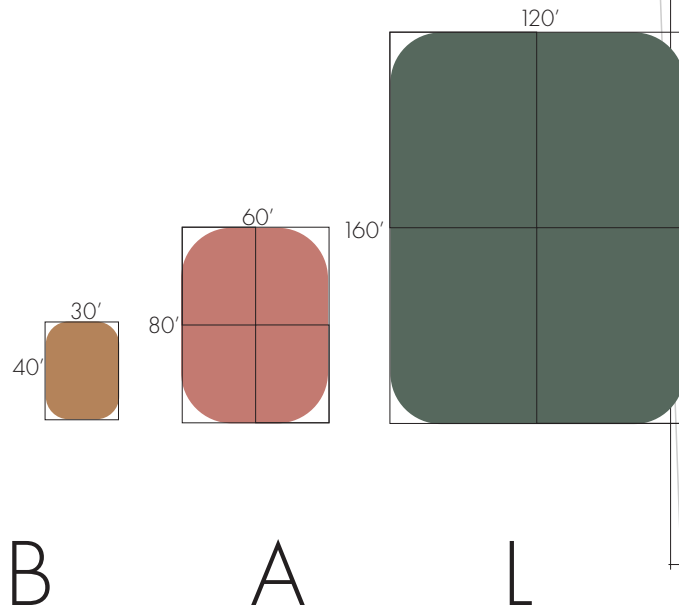
Throughout the design of my site, I considered the importance of the modular ratios that connect the site and the design. This began with me laying a grid over the entirety of the site. Naturally this grid has a ratio of 3:4.

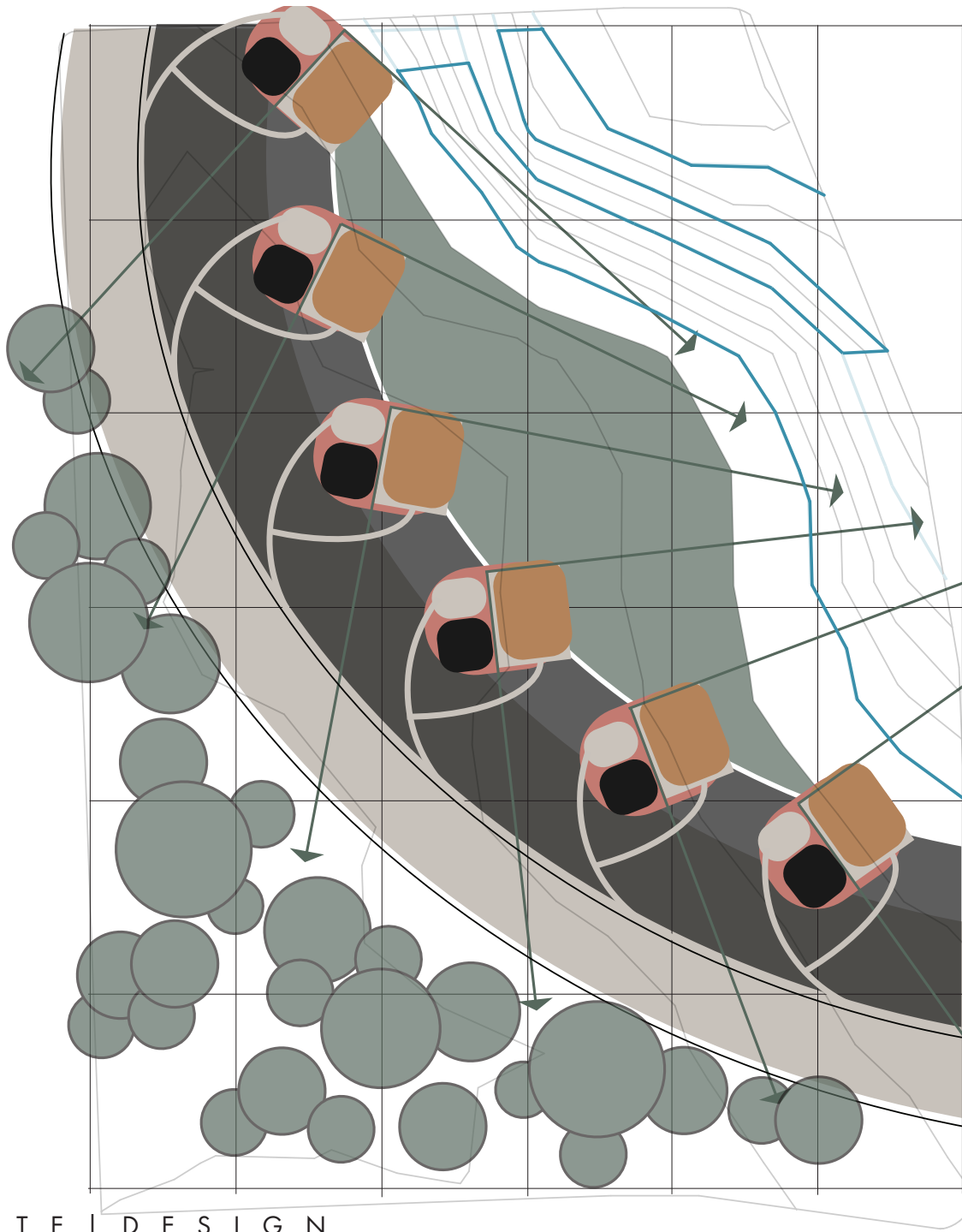
The grid of the ratio was implemented into every aspect of the home design. From the foundation of the home to the pitch of the roof. For example, the floor plan holds a geometry of 30' x 40'. and the pitch of the roof has a rise of 16' and a run of 12'. Each plot of land for each home has a dimensional value of 60' x 80'.



This modular relationship connects the building and site on a universal level of order, before the design begins.

Another central focus was the allocated plot for each home, and the orientation of the selected plot. It was configured, that if I rotate the axis of each home by 20 degrees, they each have better view points and connections to the site rather than the surrounding homes. Creating a residential area that allows appropriate amounts of privacy and seclusion in a downtown area was a challenge. Some ways I designed for privacy was including this rotation, allocating a select size plot for each home, and using landscape design to orient viewpoints and structure the exterior of the home.





The proximity to other homes allows residents to form a connection with their neighbors, and take notice of what is happening in the community. This social connection ties families to their built environment, allows people to feel a sense of ownership over their home and a sense of pride throughout the community. Establishment of this is important for the psychological success of the community and the physical success of the buildings and site.

It is important to design a space that seamlessly ties together the interior of the home to the exterior of the site. Each aspect of the orientation, ratio and spatial development for best view points (as we will see in the next few slides) connect the resident to the exterior site.

“

Public spaces that brought people together and where friendships and support networks were made and maintained were key to a general sense of well-being.

(Steemer P.10).

”

S I T E | P L A N

“

Green spaces can serve as a sort of ecotherapy, as marginalized people can find empowerment, respite from stresses, and personal involvement in environmental stewardship.

(Wolf)

”



FINAL SITE PLAN:

The site a home resides on is indefinitely important. Due to the impact the site and its usable spaces can have on an occupant. For this site I included a community gardening space, for fresh produce consumption throughout the summer months, a curvilinear walking path that winds down the topography, to initiate the occupants to take walks in the comfort of their back yard. I also included 1st and 2nd level patio spaces outside of the home to allow the residents the ability to keep a watchful eye over the shared walking path. This will induce a sense of security over the residential neighborhood.

The five circles in the top right corner of the page represent each component to the 5 ways to well being. (will be explained in the following slides.) The reason each of the 5 elements are on this page is because throughout the site, each element was considered individually and designed for.

KEEP LEARNING: Learn to Garden

GIVE: The connection of yards to neighbors yards will give the residents an opportunity to communicate with their neighbors and practice pro-social behavior.

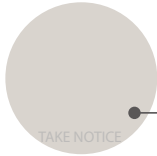
CONNECT: Interaction and connection between those using the spaces.

TAKE NOTICE: Homes have interior and exterior views to overlook the exterior spaces, in hopes of keeping the site safe and clean.

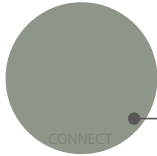
KEEP ACTIVE: Proximity to an exterior walking space will allow residents the opportunity to take walks and practice proactive health.



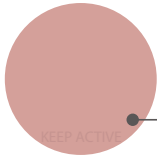




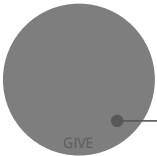
TAKE NOTICE: being mindful – paying attention to the present and being aware of thoughts and feelings – is a behaviour that reduces symptoms of stress, anxiety and depression.



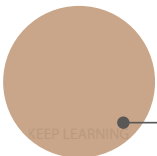
CONNECT: the quantity and quality of social connections (e.g. talking and listening to family or strangers) correlates with reported wellbeing as well as physical health.



KEEP ACTIVE: there is ample evidence from global and meta-studies to demonstrate that physical activity reduces symptoms of mental and physical ill-health.

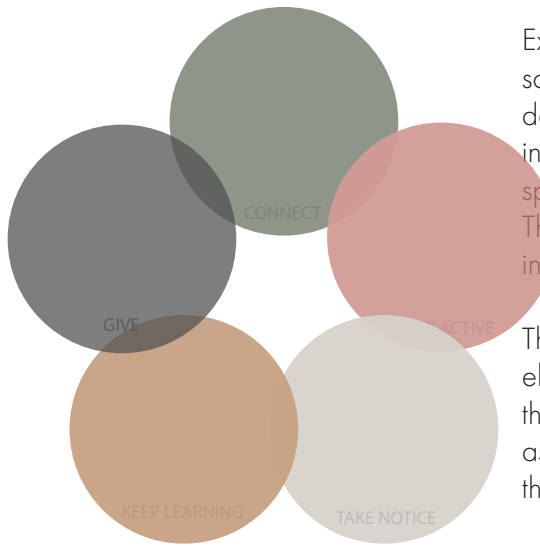


GIVE: evidence has emerged that pro-social rather than self-centred behaviour has a positive impact on happiness. Such consequences of altruistic behaviour are related both to spending on others as opposed to oneself and through volunteering and offering help.



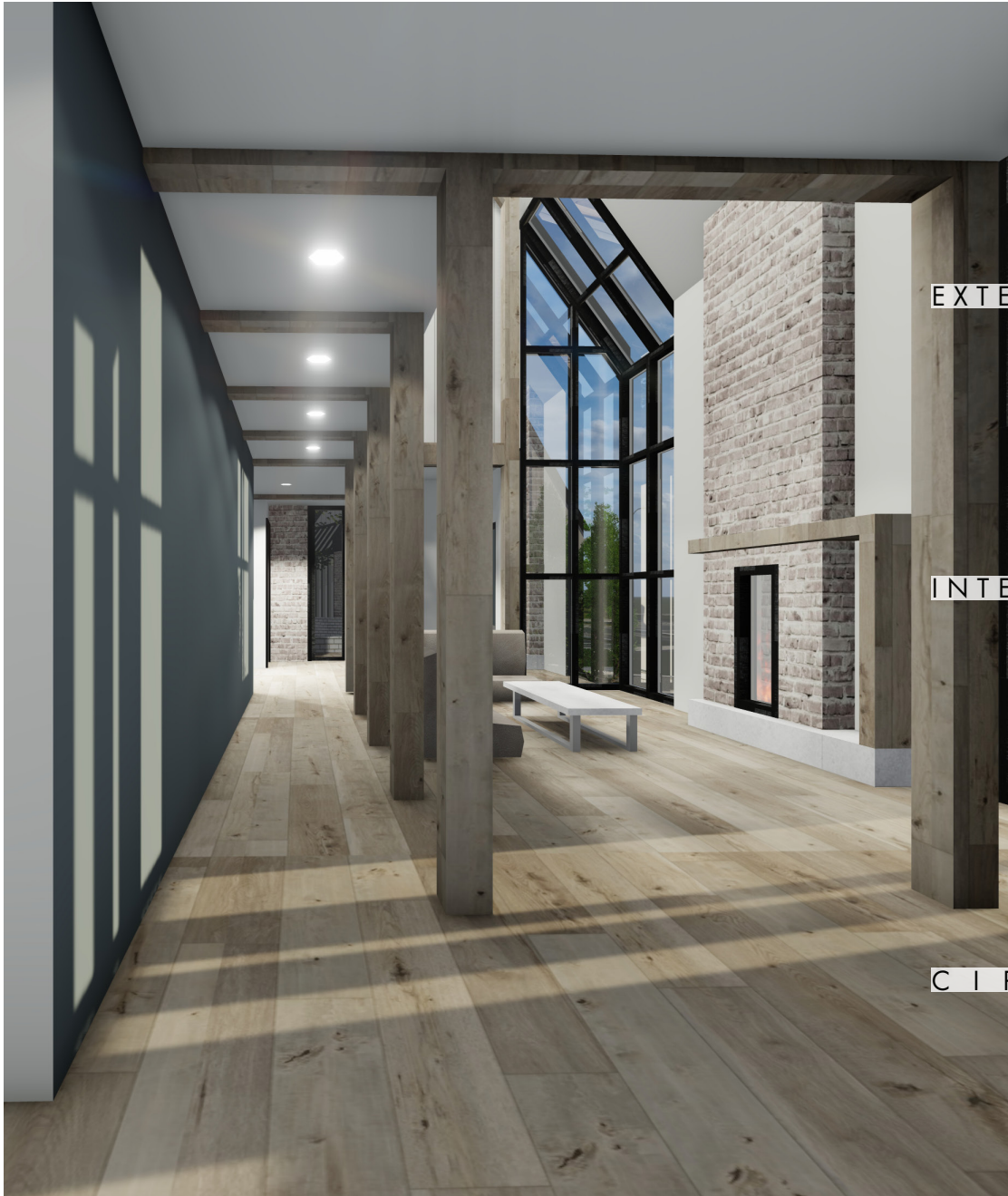
KEEP LEARNING: aspirations are shaped in early life, and those who have higher aspirations tend to have better outcomes. Such aspirations are modified by the environment. The evidence shows that, also later in life, those participating in music, arts and evening classes, for example, attain higher subjective well-being.

5 Ways to Well-Being



Extensive research of literary articles such as, "Architecture for Well Being and Health", by Koen Steemers and scientific studies of the WELL building institute have guided me toward re-imagine the standards of architectural design: These standards will aide in the achievement of spaces that initiate moments of connection between individuals. They will establish boundaries to include space for physical activity, while also allowing controlled space that supports deep thought. They will work to seamlessly connect humans to the outdoor environment. These design standards work to create space that impacts the occupant in a biophysical manner - further influencing each occupant to experience their day by day tasks in a new light.

The proposed building is a residential unit located in Moorhead, MN. The residential units uniformly consider the elements of design, previously stated. In hopes of creating a new standard of residential developments that impact the mental wellbeing of each occupant. There is an innate connection between architecture and psychology. We, as designers, are responsible to manipulate that connection to benefit the mental wellbeing of those experiencing the environment.



Throughout my design journey, continual consideration of many design elements revolutionized my design and allowed it to evolve into a home that works to benefit the mental well being of all users. It is important to walk through each element of space that was design in an essence to resonate alongside the 5 ways to well being (as recognized by Koen Steemers). Beginning with the exterior entrance and moving throughout every aspect of the home.

EXTERIOR | ENTRANCE

The covered exterior entrance offers a sense of protection from the exterior environment, while the extensive height of the roof does not quite enclose the occupant. The wall also acts as a barrier between the second floor bedroom window, and the residential unit to the West.

INTERIOR | ENTRANCE

Right upon entry, the ceiling height is lowered initiating an innate recognition of security and human scale. This entrance is the circulation point for general home needs such as mechanical space and storage. The mechanical space is placed along the Northwest wall, due to the prevailing winter winds that blow from the Northwest, it creates a sort of boundary between the rest of the home and the cool of the winter.

CIRCULATION

The space that ties it all together. The circulation of the building is linear in nature and this linearity pulls you from one side of the building to the next with no disturbance as far as levels and ceiling heights. The main entrance and back entrance are aligned to provide clarity of intention and a sense of understanding throughout the first floor.

“

to design successful indoor environments and to inform new iterations of building standards, it is vital that we understand conditions' interactive impact.

(Jamrozik, P.190)

”

GIVE: Within a home, the kitchen is a proactive space to invite guests to dinner and practice pro- social behaviors.

CONNECT: Interaction between residents within the home and those invited over can happen within this kitchen due to the design of seated spaces that are in close contact with the cooking space. This allows those making the meal to connect with those who are enjoying the meal.

TAKE NOTICE: The large window to the left of this image looks down and out to the walking path, allowing those within the kitchen to see what is happening on the shared property.





K I T C H E N

A kitchen is the heart of the home, so getting the design intent of this space is considerably important. Beginning with the design and color scheme, this space separated itself from the rest of the home. The low ceiling was put in place to initiate a sense of comfort and relaxation, then we move to the skylight to the north that will let in indirect sunlight all hours of the day. Providing the option for the use of electric lighting which can be straining to the eyes. The WELL living lab studies (as mentioned throughout my theoretical premise) recognize, "qualities of electric lighting including luminance and correlated color temperature (CCT) affect physical conditions such as mood, alertness, performance and sleep quality.

The study concluded that windows are beneficial in allowing daylighting and view access for the office occupants yet care needs to be taken to minimize glare. Daylighting is considerably preferred over electric light. When occupants have a view to the outdoors, it allows them to analyze their surroundings and weather, minimizing discomfort and improving performance levels. So the lighting conditions throughout this space were considered with the utmost importance.

Poor nutrition can lead to a variety of health problems, so I designed the kitchen to enable interaction between those cooking and those who are chatting with the cook. This close consideration is intended to promote communal eating while also provide a space for social interactions to occur. Conversely, the living room is less accessible than the dining space, diminishing the temptation for TV dinners and potential separation between those within the living and dining area.

L I G H T I N G

Natural light is an important aspect of any home design as it introduces a sense of connection to nature, while also creating an awareness of outdoor conditions. Throughout this home, natural light is used to orient the occupant and influence movement throughout spaces. Specific design strategies that circumnavigate sunlight throughout the day can work to benefit physical health and counteract seasonally affective disorder (sad). I began by considering the morning sun, then oriented rooms used in the morning, including the kitchen and the second level loft, towards it. This dose of morning light pulls the resident from their bedroom to the stairs. This morning light stimulates the circadian rhythm and aids in the beginning of one's day.

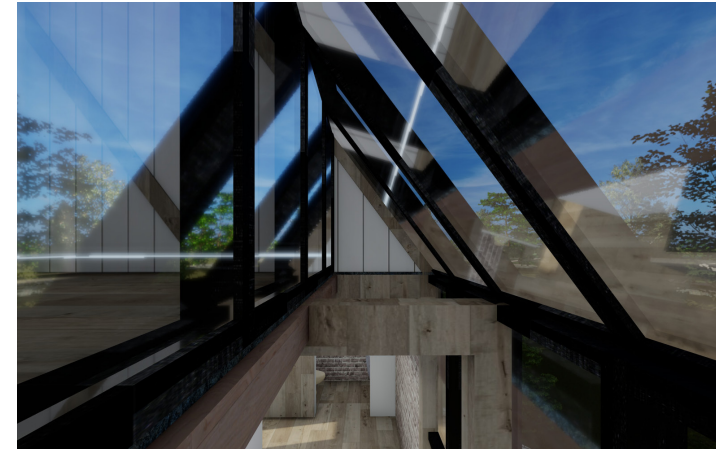
The living room maintains direct sunlight for at least two hours during the day. Clerestory windows are installed in the second level above the patio door, in hopes of increasing the overall daylight distribution throughout the entire home. The bedroom has access to morning light, yet also can be completely blacked out, allowing the occupant to experience deep levels of sleep, while also providing them with the morning sunlight. Personal control over the amount of daylight throughout the home is important as careers, personal preferences and environmental factors may come into play.

“

Lighting influences our productivity levels alongside influencing our health, mood, behavior and comfort levels.

(Jamrozik)

”





“

“Public spaces that brought people together and where friendships and support networks were made and maintained were key to a general sense of well-being”

(Steemer P.10).

”



L I V I N G R O O M

The height of the ceilings in the living area are completely unconstrained, leading directly up the second floor and through to the pitch of the roof. This space was instinctively designed in recognition of the effect high ceilings can have on our psyche. According to Koen Steemers, "More generous spaces influence us to feel free, which tends to lead people to engage in much more abstract styles of thinking." This ultimately leads those within to encounter a wider perspective on figures of thought and perspectives. This type of a space is most appropriate for social gatherings, just as a living room is generally used for.

The living space is oriented towards the driveway and the road, allowing those within to keep watch of the neighborhood and activities happening along the road and in their front yard. Two large curtain walls in the corner of the room orient the views towards the exterior, yet not allowing those on the street to face a paralleled window into the interior of the home. Bilateral daylighting is achieved through the entirety of the home, yet this living space is the core of the most amount of daylighting due to the South facing windows.

Since this home is based in Moorhead, MN it is important to consider passive forms of heating. The combination of South facing windows and a wood fireplace will warm the home in the winter season, while the unconstrained space will allow the heat to be ventilated throughout the entirety of the home.

During the summer months, passive cooling will be enabled through stack ventilation i.e. "A passive stack ventilator is a vertical or near-vertical ventilation shaft where moist warm air is naturally drawn up and expelled outside through a vent above the roof line. Temperature differences lead to a natural, continuous movement of air. (LEVEL.org)"

Elements of designing for Wellbeing:

KEEP ACTIVE: Move away the furniture and roll out the yoga mats, this space has high ceilings and wont make you feel claustrophobic if you spend time jumping, lunging or stretching.

GIVE: A living room is the general area that residents and guests practice pro-social behaviors.

TAKE NOTICE: The living room was designed to have windows facing the front street, this allows residents to see if someone is pulling into their home or using the community garden.

CONNECT: The living space is designed for interactions to occur between guests and those living within the home, it is a space with a high ceiling allowing a lot of people to be in the area, yet not feel crowded.

THERMAL | CONDITIONS

The body senses thermal conditions through matters of air temperatures and radiant conditions. These radiant conditions allow designers to play with materials in order to stimulate comfort levels. Due to the climate in Minnesota, it is important to have Heating Ventilation and Air Conditioning as the bulk of the systems to influence interior temperatures. Yet, as a designer, I have considered spaces within the home that can take advantage of the sun and the wind, even in a climate such as Minnesota's.

The large windows found in the living area let in the Southern sunlight continually throughout the day. These spots of sunlight provide sunny places to be during a cool winter day and bring down the cost of heating the largest space in the home.

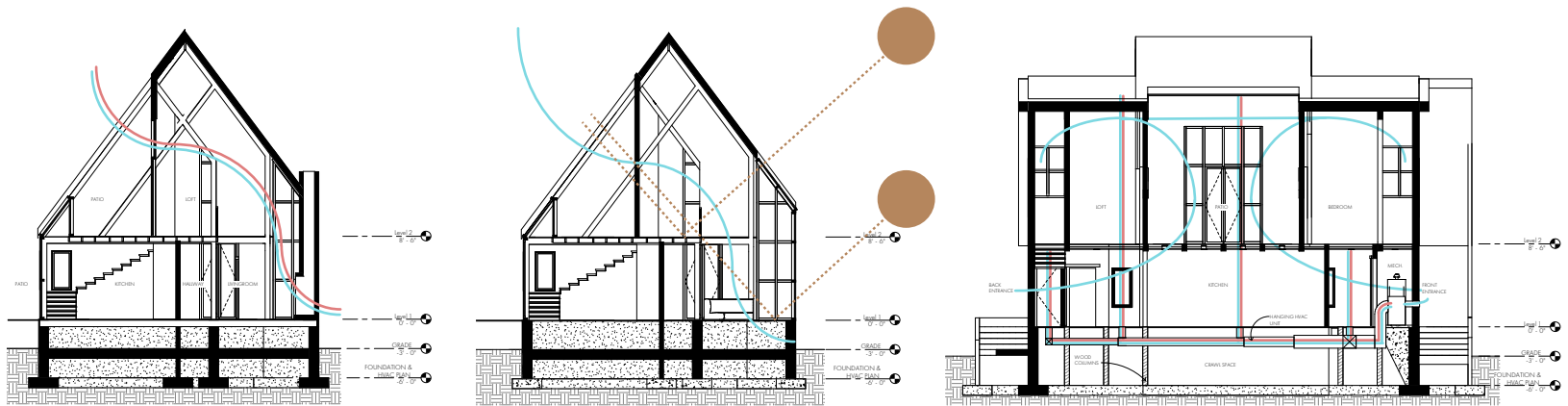
Whereas Stack ventilation is used to cool the building in the summer months. Occupant control over temperature levels also influence the overall experience of the space, generally occupants enjoy controlling the temperature levels of the spaces they reside.

ACOUSTIC | CONDITIONS

Moments of privacy alongside connection to the environment have been combined throughout the home design to provide the occupant with proper acoustical attributes. For example, the second level "loft" has an excluded space that could be manipulated and used as an office area, through design consideration and attention, noisy appliances, such as the laundry and dishwasher, are a great distance away from this proposed space for continual learning. The bedroom, similarly, is secluded from the bustle of the first floor, allowing the resident privacy and good sleep.

The loft, both patios, and excess space perpendicular to the stairway allow enough room for exercise or more noise perpetuating activities. Use of many operable windows, allow the residents to experience the outdoor noises. All circulation spaces are enclosed, to reduce echo. Whereas, the living room has high ceilings to enforce the idea of conversation. The balcony is partially surrounded by the home, allowing only one side to be influenced by wind and external noise. Providing a tranquil environment for the occupant to escape to throughout the day.

Each of these design considerations impact the overall quality of the acoustical environment within the home, my goal throughout this house was to introduce an acoustical environment that supports all forms of behavior.



S E C O N D | L E V E L

Stress can have high amounts of impact on our well being, so I designed 3 spaces on the second level that induce a sense of mindfulness and relaxation, in hopes of creating space that reduces stress levels in children and adults.

The first space is a loft area with a built-in reading and study space, for comfort and quietness. The second space is a patio that separates the loft and the bedroom. It faces the North, giving the occupants the opportunity to keep a watchful eye on the exterior environment. The placement of this space between the two rooms reduces wind flow and exterior noise interruption. The third space is a bedroom. In the bedroom it was important to include a separated restroom space and bath. There is a skylight placed directly above the bathing area.

Mindfulness can be practiced in any of these three personal spaces.

The stairwell and loft reside on the East side of the home, inversely the Master Bedroom resides in the West portion of the home. This orientation allows the sun to illuminate the master suite in a gentle nonabrasive manner. Movement from the bedroom to the stairway and loft is linear, following the pitch of the roof and the pull of the morning light.

TAKE NOTICE: The second level patio space faces directly towards the community walking space, providing a direct view of the space below to secure the neighborhoods shared spaces.

KEEP ACTIVE: The loft space on the second level provides enough space for the resident to workout.

KEEP LEARNING: The loft space also provides a secluded area that could be designed as an interior office, or meditation space.



Design Conclusions



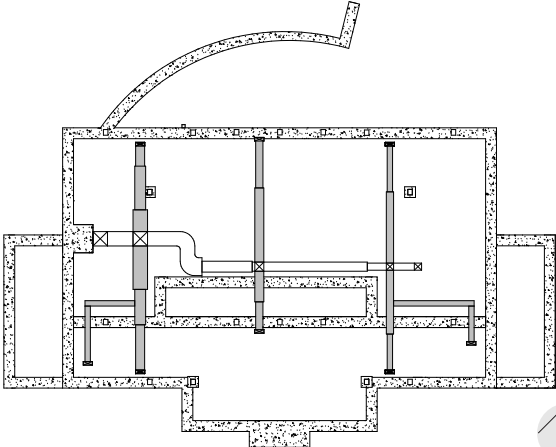
D E S I G N | C O N C L U S I O N

Designing for well-being and health is an attainable solution that nudges user towards more positive behaviors. This is done by providing a range of stimuli that increases the likelihood of behavioral changes. Designers can implement quantitative design tactics that stimulate our well-being by incorporating some of the design guidelines that are stated previously.

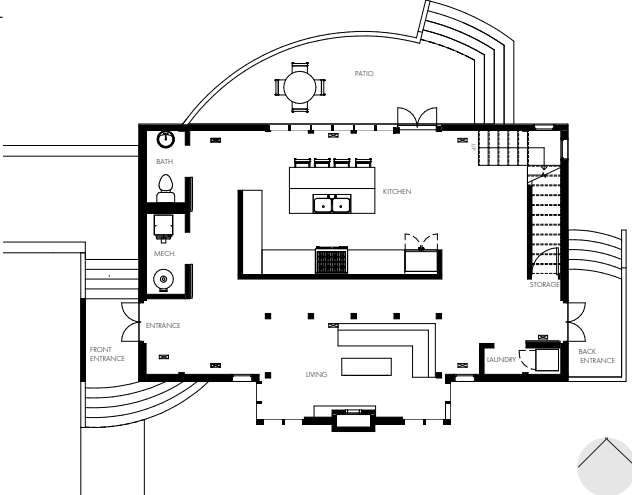
Architects possess the opportunity to manipulate form, space, materiality and environmental factors to influence our relationships with others and our environment. This mitigation of resources creates interactive settings, moments of pleasure and strategic circulation to better insure our physical health. Using design tactics, architects “provide opportunities to improve our sense of well-being, enrich our lives, make our lives healthier and more pleasurable” (Steemers P.17). These pleasurable moments are difficult to record on a quantitative scale, yet the moments happen all the time often without recognition. The effect these small moments can have on one individual mitigate into an orchestra of many moments of delight that support the five ways of well-being.

H V A C | P L A N

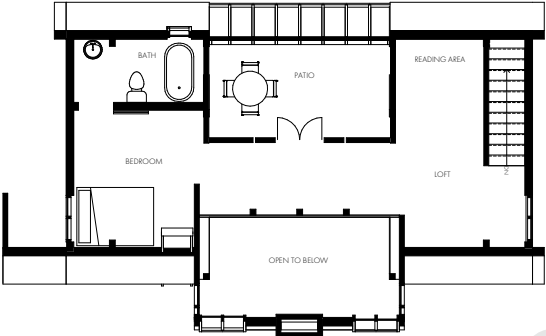
Floor Plans



F I R S T | L E V E L

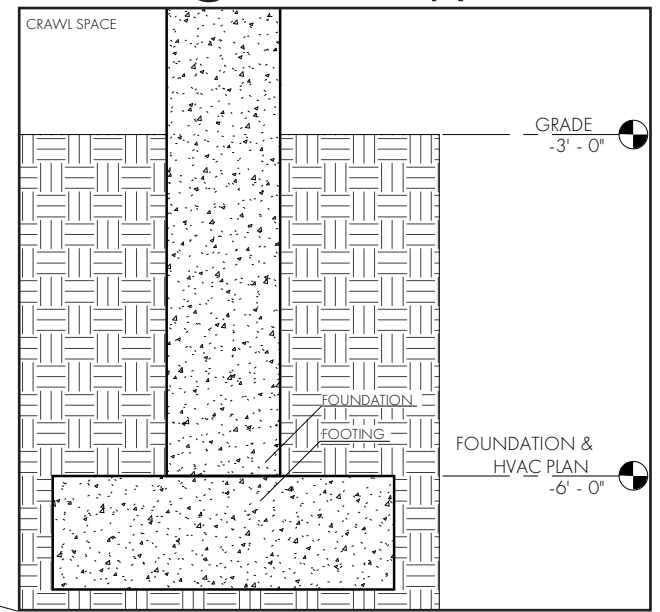
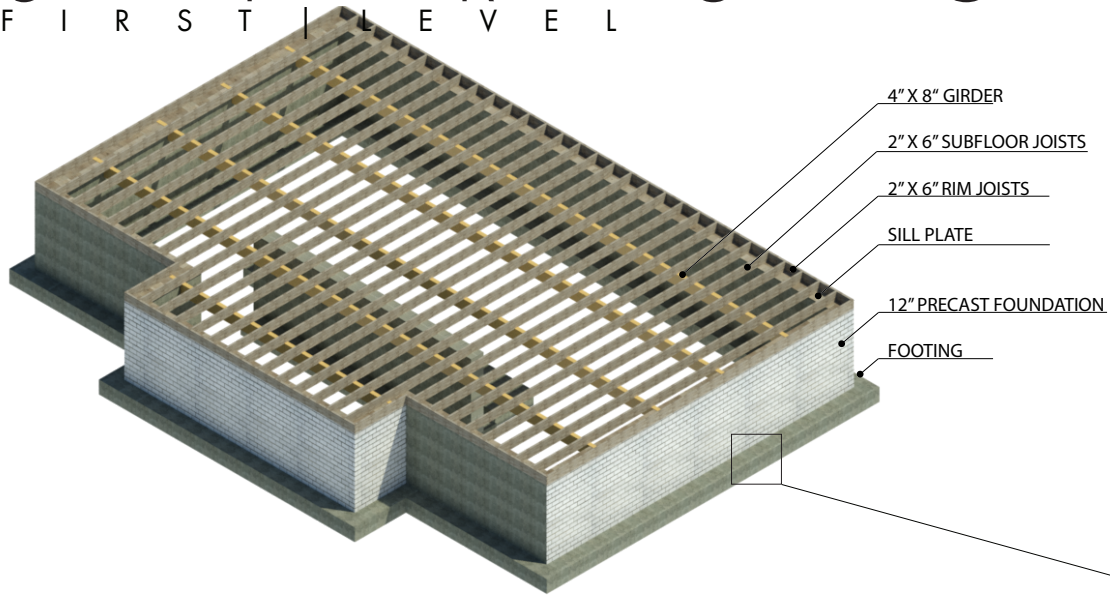


S E C O N D | L E V E L

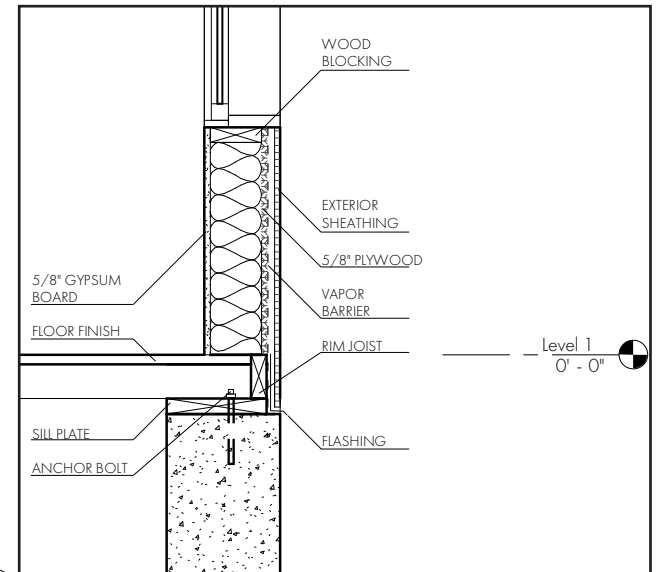
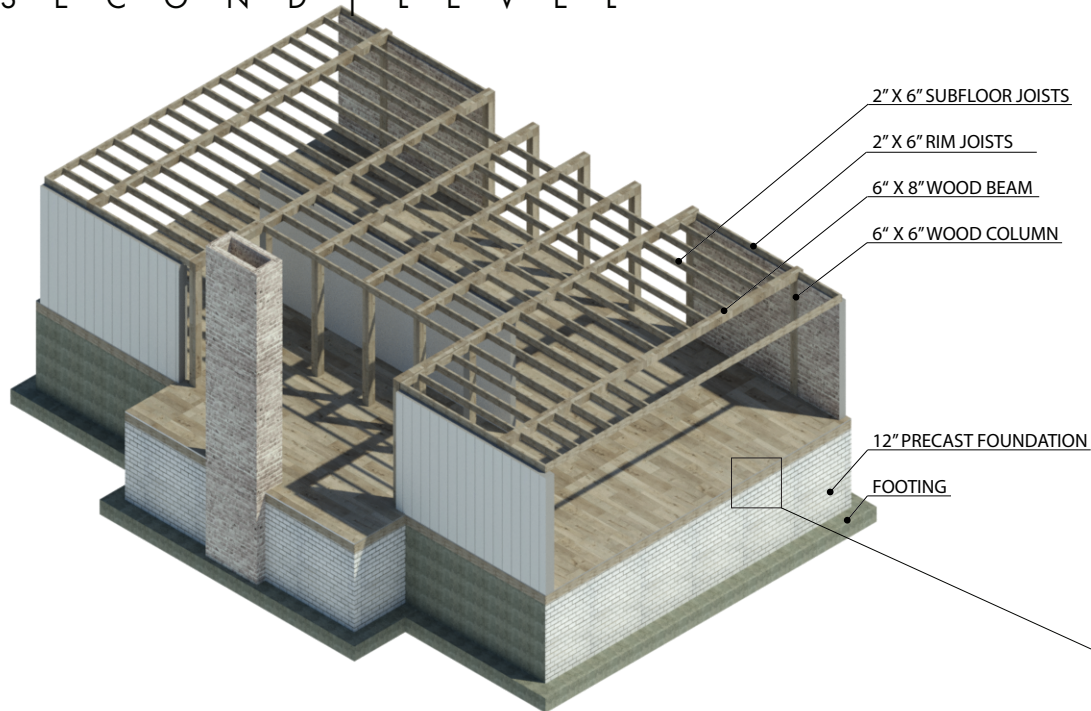


S T R U C T U R E

F I R S T | L E V E L

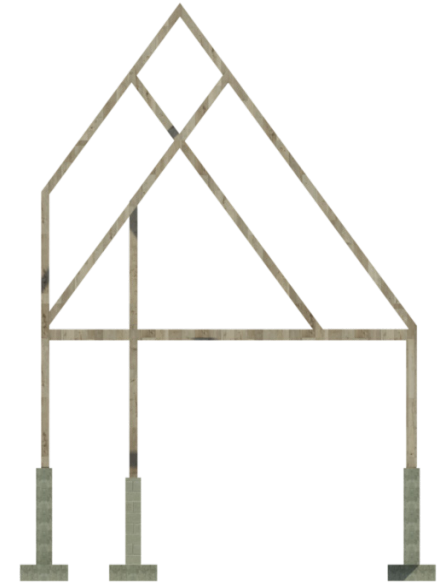


S E C O N D | L E V E L



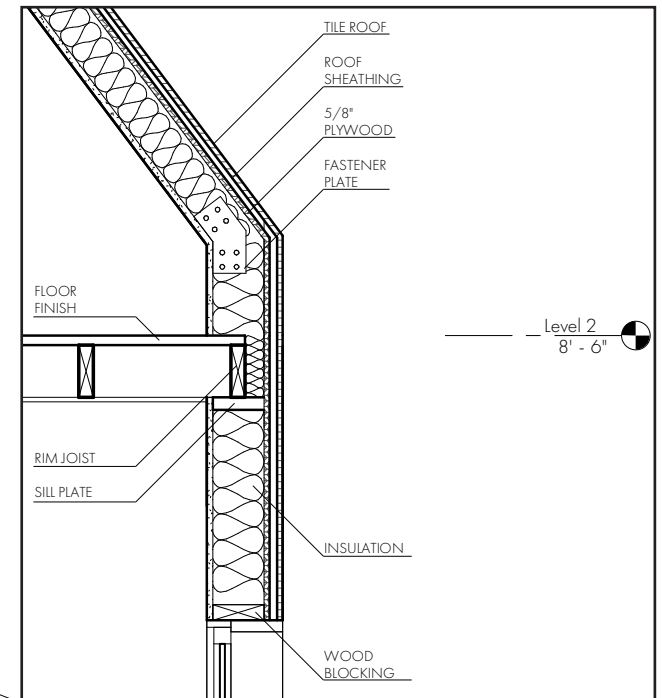
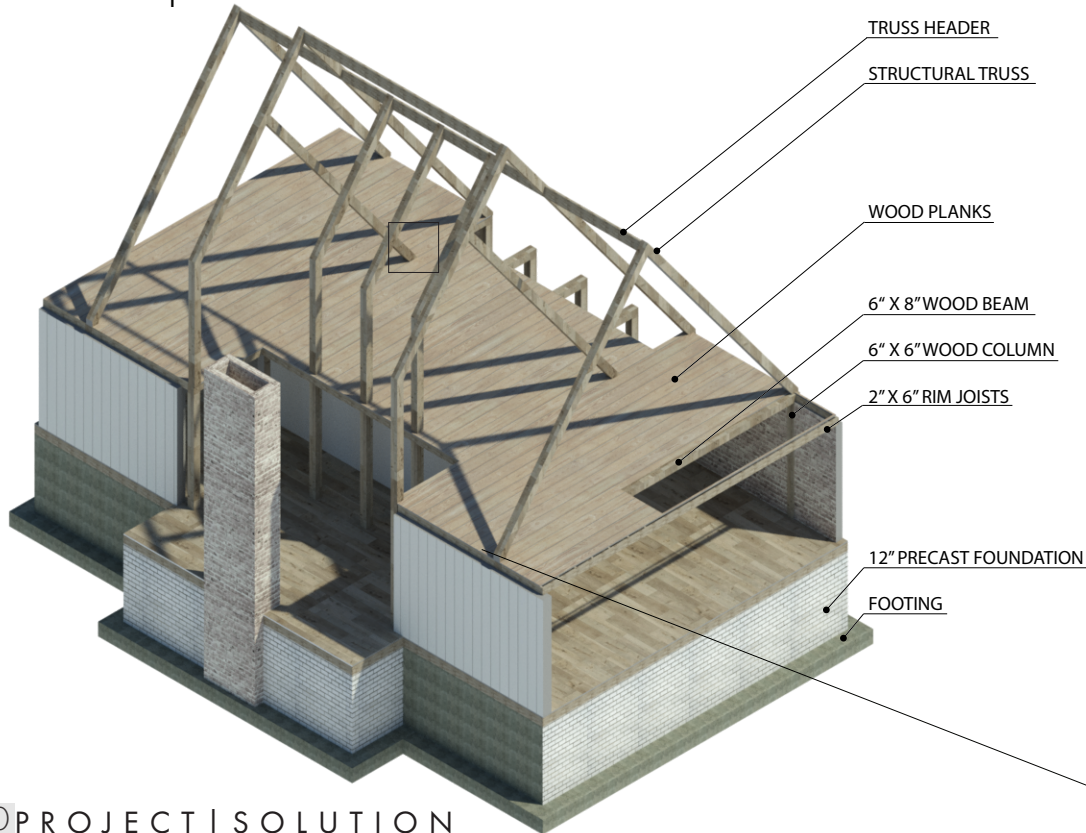
This home is built on a strip foundation. The reason I chose this type of foundation is because of the necessity of having a crawl space below the home for the hanging HVAC systems. Beyond the strip foundation the home has a simple wood structure, combining wood columns, joists and beams to compliment the overall design. The structural trusses, shown in the image to the right, that make up the second levels roof line create a unique shape that pulls the eye from one side of the upper level to the next, while the base of these trusses allows the first level to have a decorative beam ceiling.

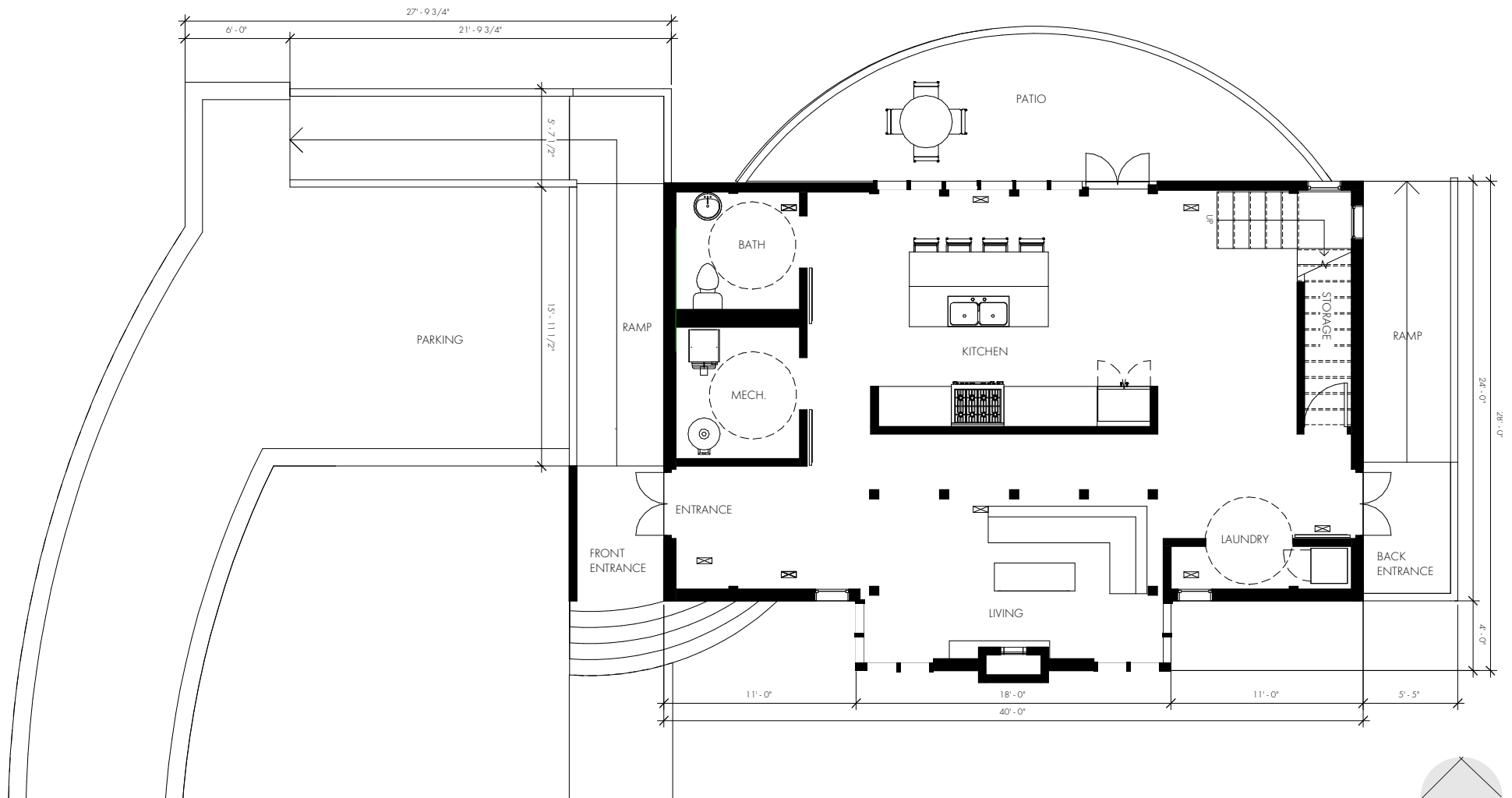
The preceding and following images represent the structural connection of the building system.

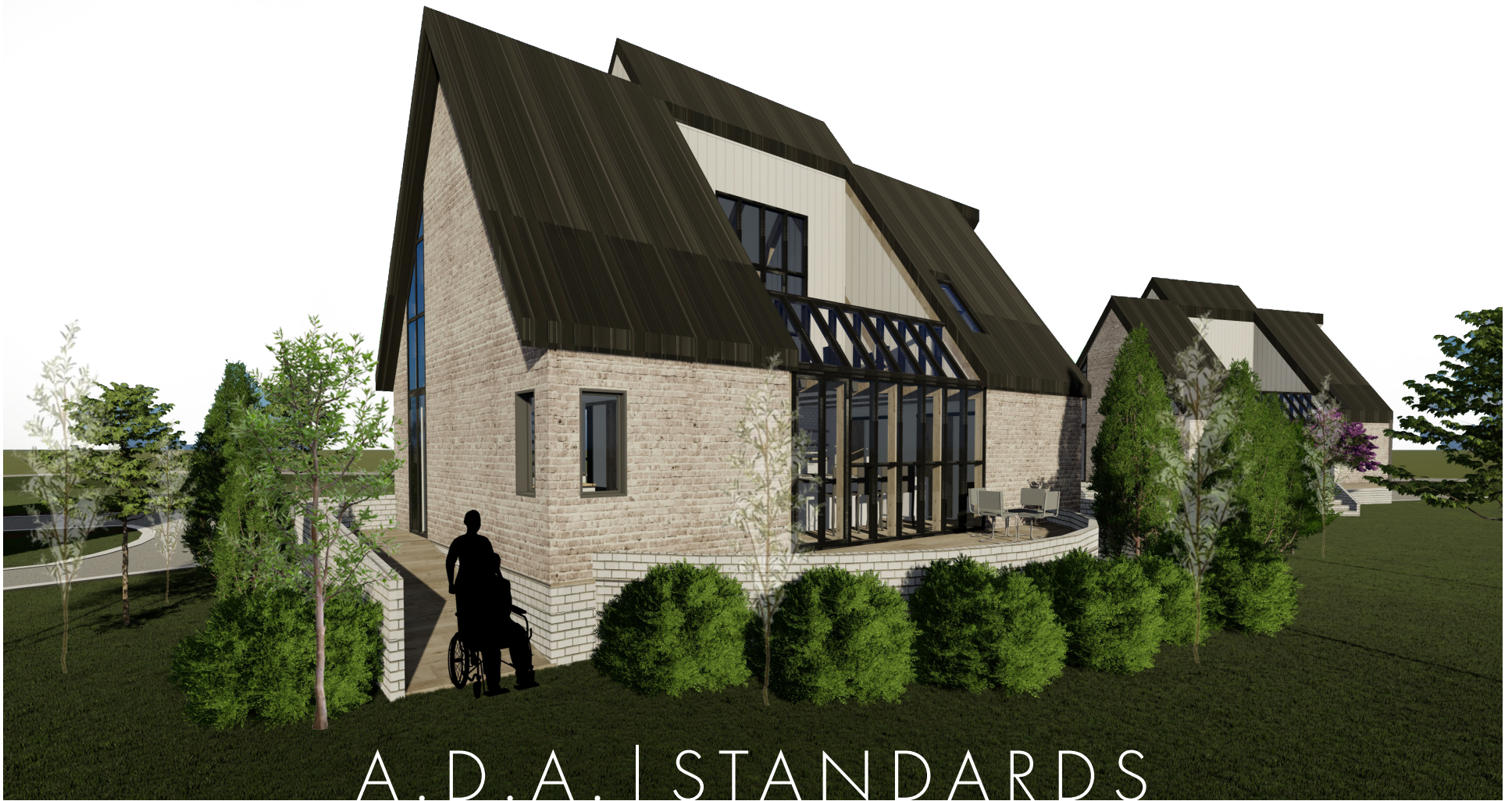


STRUCTURAL | TRUSSES

ROOF | CONNECTION







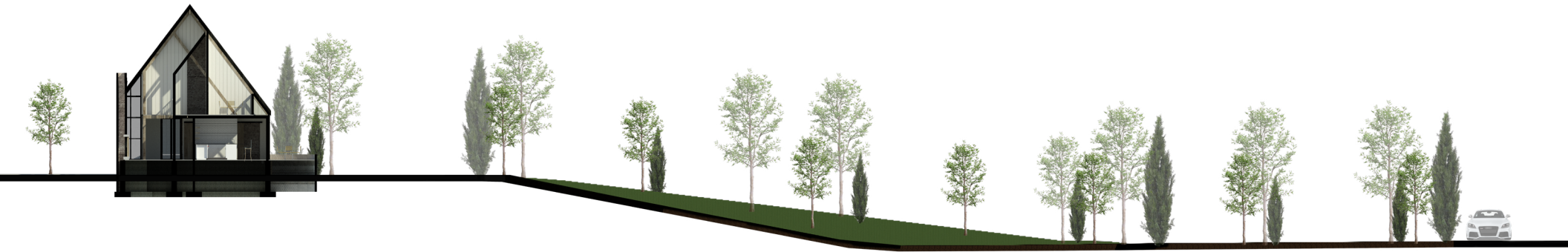
A.D.A. | STANDARDS

I designed a modified home to work with someone who is wheelchair bound or has trouble walking up stairs to the home. It is important to consider all people with all forms of abilities while designing residential units. This design modifies the main and back entrance, placing a ramp at each end of the home. The main ramp is close to the parking space and the parking space allocated enough room for a wheelchair bound home owner to be able to get into the front door with ease. Another modification would be the patio outside of the kitchen. This patio will now be completely surrounded by the foundation wall, providing more space for the homeowner to roam. The landscaping surrounding the patio must reside lower than the foundation wall, allowing the resident an unobstructed view of the path below.

Within all homes, the window sills reside at two feet high, a good height for those sitting, to see out the window. There were also some modifications to the sizes of the mechanical, first level restroom, laundry room and kitchen in hopes of achieving obtainably space to allow a wheelchair bound resident to feel comfortable and less crowded while moving within their home.

Design Development

PERFORMANCE ANALYSIS: RESPONSE TO GOALS AND PROJECT EMPHASIS



S I T E | S E C T I O N

THESIS | GOALS - RECAP

DESIGN SOCIAL ENVIRONMENTS

Determine the qualities of a social living environment and establish guidelines that will aide in the successfulness of the interior and exterior social environment.

CONNECT PSYCHOLOGY TO ARCHITECTURE

This connection initiates a positive reflection of the design strategies. By researching more about how spaces influence psychology, I can schematically design a living space that will initiate a positive connection between the built environment and the resident's biophysical well-being.

DESIGN AN INTERCONNECTED RESIDENTIAL AREA

Connect the environment, the design, and the biophysical response to initiate a relationship between space and psychology. If the relationship between these three elements is healthy and stimulating, this means my design is successful.

CREATE A SEAMLESS ENVIRONMENT

It is important to develop a design strategy that links the interior to the exterior and vise versa, so an overall understanding of landscape design is important. This will enable my design to tie the environment to the built space while working to connect people to the exterior environment.



WEST | ELEVATION

SOUTH | ELEVATION



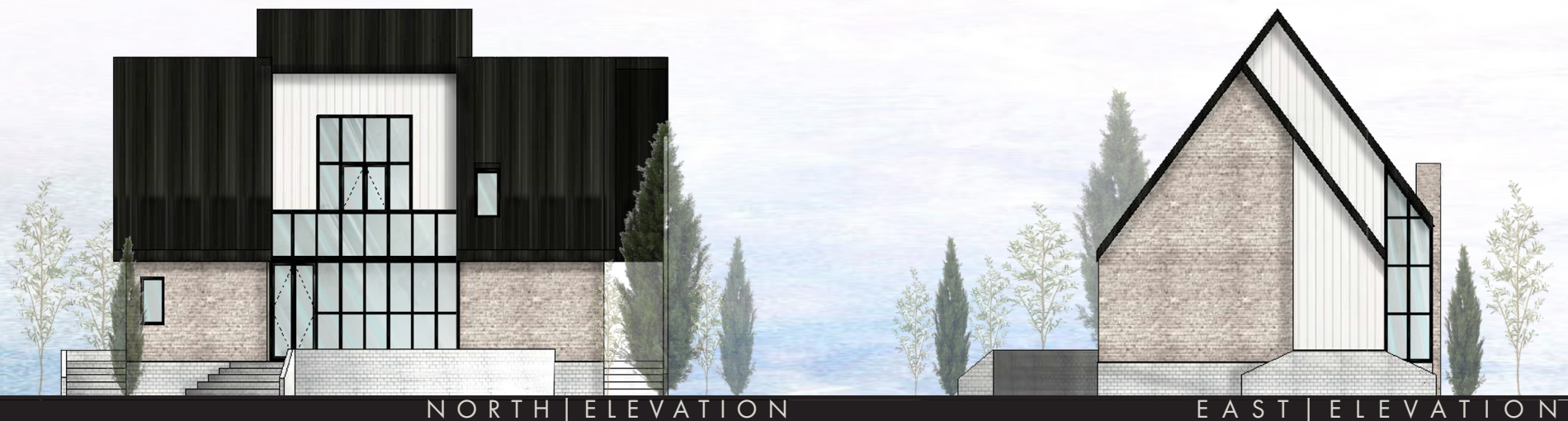
By focusing on the 5 strategies of well being, I designed in a way that successfully met my thesis goals.

My first goal was to **DESIGN SOCIAL ENVIRONMENTS**, I succeeded in doing so by focusing on the elements of **CONNECTION**. Social environments thrive in a designed space that is mean for interaction to occur, as we previously stated, interior spaces such as the living room and kitchen and exterior spaces such as the walking path, community garden and patio spaces all are designed for connections and moments of pro-social experience to occur.

My second goal was to **CONNECT PSYCHOLOGY TO ARCHITECTURE**, I established this connection through analysis of literature articles reviewed in pages (38-45). The basis of this information concluded my views on the relevance between architecture and psychology through physical and mental means.

My third goal was to **DESIGN AN INTERCONNECTED RESIDENTIAL AREA**, Interconnected is the main point of this goal, how can I design a residential area where neighbors will feel connected and open to sharing their environments? This goal was successfully presented through my focus on **CONNECTION**, **TAKING NOTICE**, **KEEPING ACTIVE**, and **GIVING**. Each of these elements of well being practice pro - social behaviors, tying communities together from the exterior to the interior.

My last goal was to **CREATE A SEAMLESS ENVIRONMENT**, The seamless environment led me to design with my eyes open to the possibilities of a climate like in Moorhead, MN. Patios were placed on the first and second level, landscape design implemented spaces that feel personal yet public while allowing the resident a space to be active and stay healthy through walking and gardening. This is generally a difficult climate to work with, but designing for an interior that translates to the exterior was successfully established through thoughtful consideration of the needs of those living in Minnesota.



Similarly to my thesis goals, the project emphasis was innately successful, as my entire project was surrounded by the goal of designing for the success of these three elements:

1. THE DEVELOPMENT OF A RESIDENTIAL COMMUNITY
2. THE GREEN SPACE
3. THE STIMULATING LIVING ENVIRONMENT

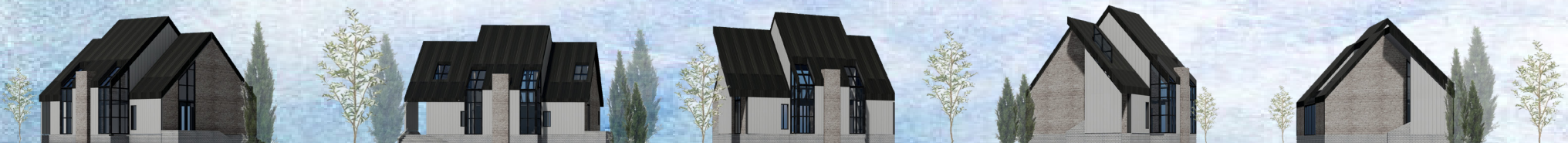


This residential community creates a home for the residents even in a time of their life where they may not be able to afford to buy a house. This community allows those who are going through a transitional period the grace to be able to live in a well designed home, experience the benefits of having a yard right outside the back door, all while creating a community between the five residential units through shared use of outdoor community spaces. This design is intended to make people feel comfortable and warm. Feel as though they have a space to invite family to during the holidays. All while feeling they are established and successful even when they may be unable to buy a home themselves.

This design is stimulating. It introduces the resident to an environment that is not generally obtainable in the Fargo, Moorhead area. An environment that successfully connects the living space to the rest of the home, an environment that designs for home cooked meals, that provide the resident with the opportunity to share moments of love and connection between those making the meal and those receiving the meal. This interior environment supports privacy through the design of a second level that intimately responds to the beauty of a bedroom and the importance of being able to take a bubble bath, or lay in bed, and look at the night sky.

This design is green. With thoughtful consideration of the impact the climate of Moorhead, this design achieves lowered necessity for electric heating, due to the placement of a wood fireplace. Lowered necessity for electric lighting, due to the bilateral daylighting throughout the entirety of the home. While also lowering the necessity for air conditioning, through proper placement of operable windows which will achieve the stack effect by pulling cool air throughout the living room up to the second level and out the windows above the patio.

This design supports physical moments. A narrow stairwell met by a large sky-lighted window, a long corridor that follows the peak of the roof, bilateral daylighting that introduces plentiful moments for the sun to penetrate the home throughout the day, with a linearity that pulls it all together to form a cohesive design balanced by a 3 to 4 scale. This design was thought out from the moment the site was established and the foundation was measured.



S I T E | E L E V .

D E S I G N | C O N C L U S I O N

Extensive research of literary articles such as, "Architecture for Well Being and Health", by Koen Steemers and scientific studies of the WELL building institute have guided me toward the re-imagination of the standards set for architectural design: These standards will aide in the achievement of spaces that initiate moments of connection between individuals.

They will establish boundaries to include space for physical activity, while also allowing controlled space that supports deep thought. They will work to seamlessly connect humans to the outdoor environment. These design standards work to create space that impacts the occupant in a biophysical manner - further influencing each occupant to experience their day by day tasks in a new light.

There is an innate connection between architecture and psychology. We, as designers, are responsible to manipulate that connection to benefit the mental wellbeing of those experiencing the environment.

Design Development

PERFORMANCE ANALYSIS: CRITIQUE OF APPLIED RESEARCH METHODS

The research methods used throughout this thesis were successful in providing me with the information necessary to establish a relationship between Architectural design and Psychology. I focused my research towards two forms of analysis, quantitative and qualitative.

Studying the WELL Living lab in Rochester, MN led me to quantitative conditions (such as thermal comfort, acoustical conditions and lighting conditions) and how those type of conditions can impact the occupant and how they feel about their environment and the rest of their day. They did this study by setting up a controlled office space that tampered with the conditions listed above. Each week a new "scene" (refer to page 38 for an in depth explanation of scenes) was introduced, and the office workers would respond to how they felt about the scene and how they felt about the rest of their day in a daily questionnaire. In conclusion this article justified my study by stating, "The built environment can impact occupants' comfort and satisfaction, mood, health and well-being, and performance. To optimize the built environment for occupants, we must begin to understand the interactive impact of environmental conditions on occupant outcomes" (Jamrozik P.197) The impact that design factors can have on our emotional well being is definite, that is why these elements of design comfort and satisfaction were thoroughly considered throughout this project.

The second article that led my research was "Architecture for Well Being and Health" by Koen Steemers. This was an important article because it led me to my qualitative analysis of the five ways to well being. Those five conditions (refer to page 76 for an in depth explanation) led me to design and orient the spaces throughout my home in a way that benefits the mental well being of the residents. This approach led me to a successful design solution yet a critique I would have of the entire process is the legitimacy of the 5 ways and how they may impact residents differently. For example, some people are more influenced through connection to others whereas some people would rather not have those connections. Also, some residents may not be interested in being outdoors or gardening and those are two elements to my design that would indeed further the connection the resident feels with their neighbors. It is difficult to design for all personality types, yet the 5 ways to well being are justifiable a general sequence of design standards that, if the occupant is willing to participate, would help the occupant create relationships and lead a healthy lifestyle.

In finality, designing for well being is only meant to nudge the user towards more positive behaviors and lifestyle choices. It provides the resident with a range of stimuli that INCREASES the likelihood of behavioral changes, but does not FORCE them upon all residents, due to the reality that everyone has different likes/ dislikes and goals.

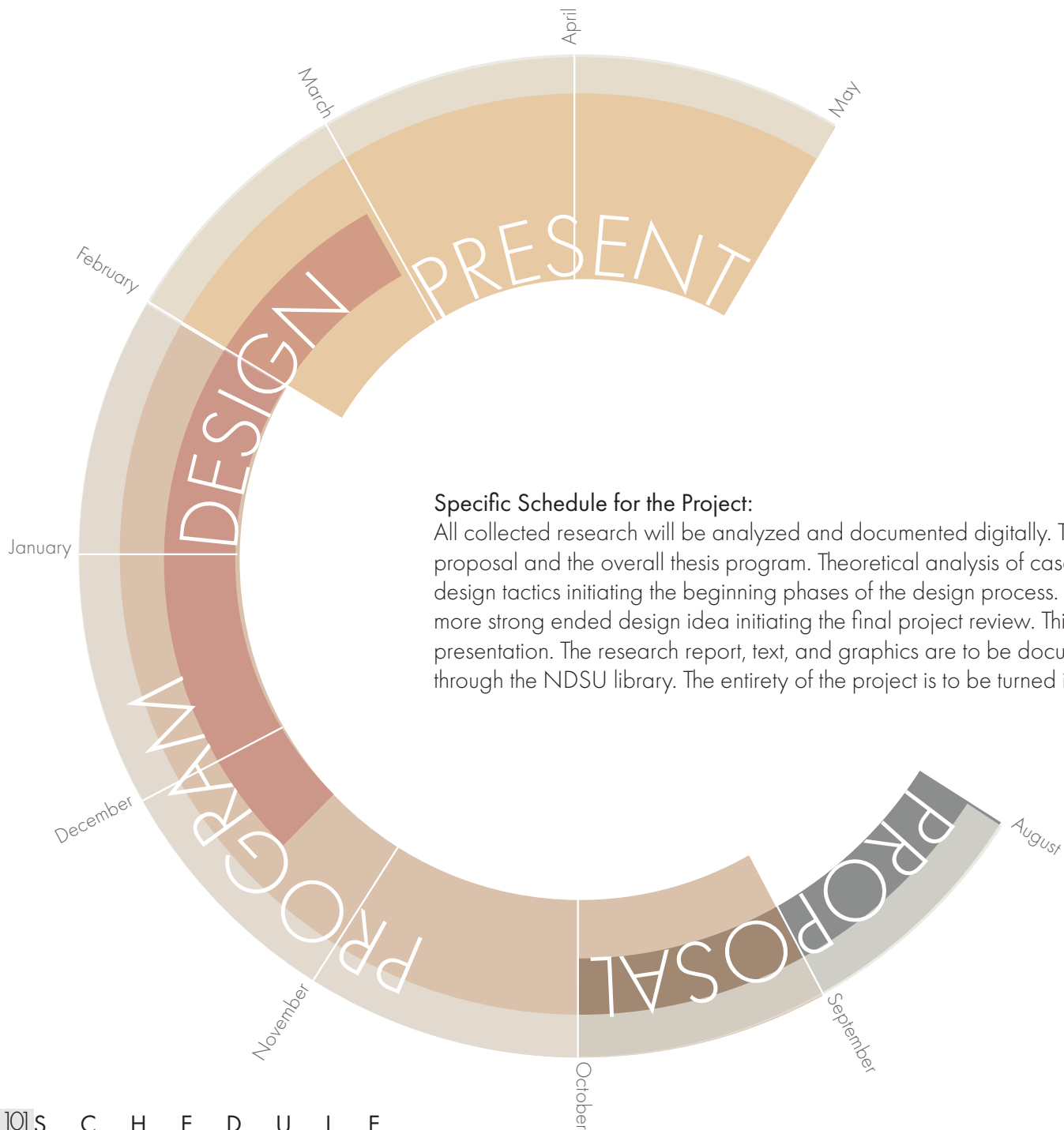
In finality, these articles led me to learn and acknowledge that architects have a unique position in the world that allows them to manipulate form, space, materiality and environmental factors to influence our relationships with others and our environment. Architects "provide opportunities to improve our sense of well-being, enrich our lives, make our lives healthier and more pleasurable" (Steemers P.17). These pleasurable moments are difficult to record on a quantitative scale, yet the moments happen all the time often without recognition. The effect these small moments can have on one individual mitigate into an orchestra of many moments of delight that support the five ways of well-being.

Final Thoughts...

This thesis guided me to the realization that being an architect is a responsibility extending far beyond the design of cohesive buildings...

Being an architect is a timeless commitment to designing space that impacts each client's psychological well-being and health.

This recognition is priceless.



Specific Schedule for the Project:

All collected research will be analyzed and documented digitally. This digital documentation will aid in the thesis proposal and the overall thesis program. Theoretical analysis of case studies will guide sketches and interpretive design tactics initiating the beginning phases of the design process. This design process will then formulate into a more strong ended design idea initiating the final project review. This will be documented in an oral and digital presentation. The research report, text, and graphics are to be documented in a thesis book available digitally through the NDSU library. The entirety of the project is to be turned in May, 2020.

A P P E N D I X



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Ellard, C., & Montgomery, C. (2011). Testing! Testing! A psychological study on cityspaces and how they affect our bodies and minds. Retrieved September 20, 2019

Jackson, R. J., & Kochitzky, C. (n.d.). Creating A Healthy Environment: The Impact of the Built Environment on Public Health. Sprawl Watch. Retrieved September 14, 2019

Articles:

<https://www.archdaily.com>

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Scientific Journals:

Studio Experience

2nd year:

Fall 2016

Professor: Cindy Urness

Project: Tea House

Typology: Commercial/Site Planning

Project: Montessori School

Typology: Commercial

Spring 2017

Professor: Charlotte Greub

Project: Performing Arts Center

Typology: Commercial

Project: Dwelling Marfa, TX

Typology: Residential/Town Planning

3rd year:

Fall 2017

Professor: Paul Gleye

Wood Project: Mixed-use Center

Typology: Commercial/ Mixed-use

Brick Project: Fargo Visitors Center

Typology: Commercial

Spring 2018

Professor: Mike Christenson

Steel Project: Office Space, Chicago, IL

Typology: Commercial

Concrete Project: Student Mixed-use Space, Chicago, IL

Typology : Mixed-use Student Center

4th year

Fall 2018

Professor: Bakr Aly Ahmed

Project: Delta Highrise: Miami, FL

Typology: Mixed-use High Rise

Spring 2019

Professor: Mark Barnhouse

Project: Marvin Windows Competition

Typology: Residential

Project: Sponge City Landscape Design, Miami FL

Typology: Urban Design/City Planning

Jenna Rose Bardwell

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