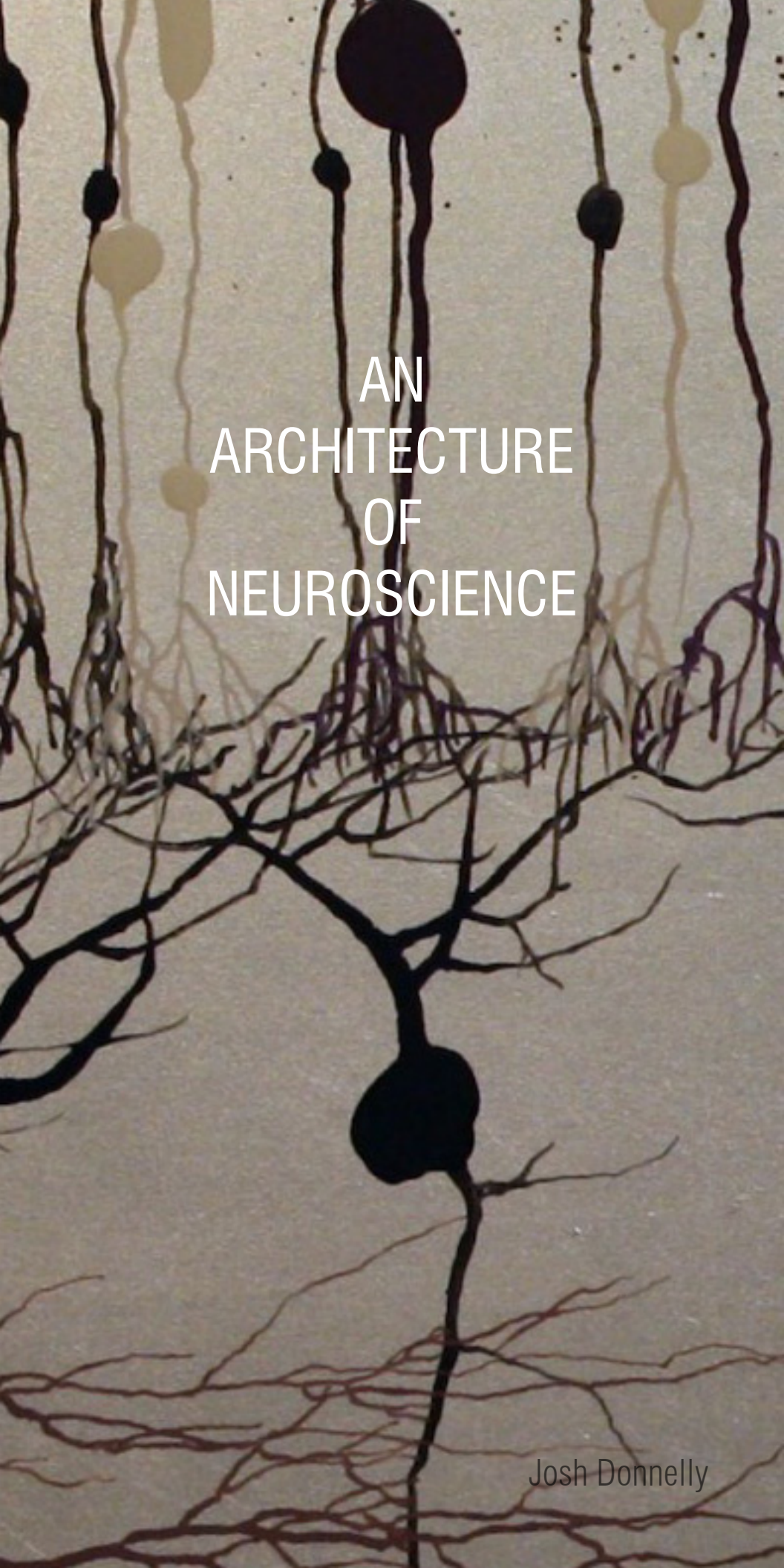


AN ARCHITECTURE OF NEUROSCIENCE

Josh Donnelly

“Why do we feel more comfortable in one space than another?”

“How does the form of an object arouse different emotions in their perceivers?”

“Why are colors within a space able to influence us emotionally?”

“How can ceiling height affect our thought processes?”

“How does the specific arrangement of furniture create a fondness and sense of place within our minds?”

“How does the movement of our eyes influence our perception of a space?”

“How can light within a space affect our sense of alertness?”

“How does our sense of hearing play a role in the spaces we experience?”

Brain and Mind Research Center

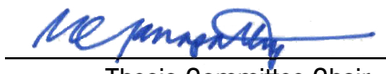
A Design Thesis Submitted to the
Department of Architecture and Landscape Architecture
of North Dakota State University

By

Josh Donnelly

In Partial Fulfillment of the Requirements
for the Degree of
Master of Architecture

Primary Thesis Advisor

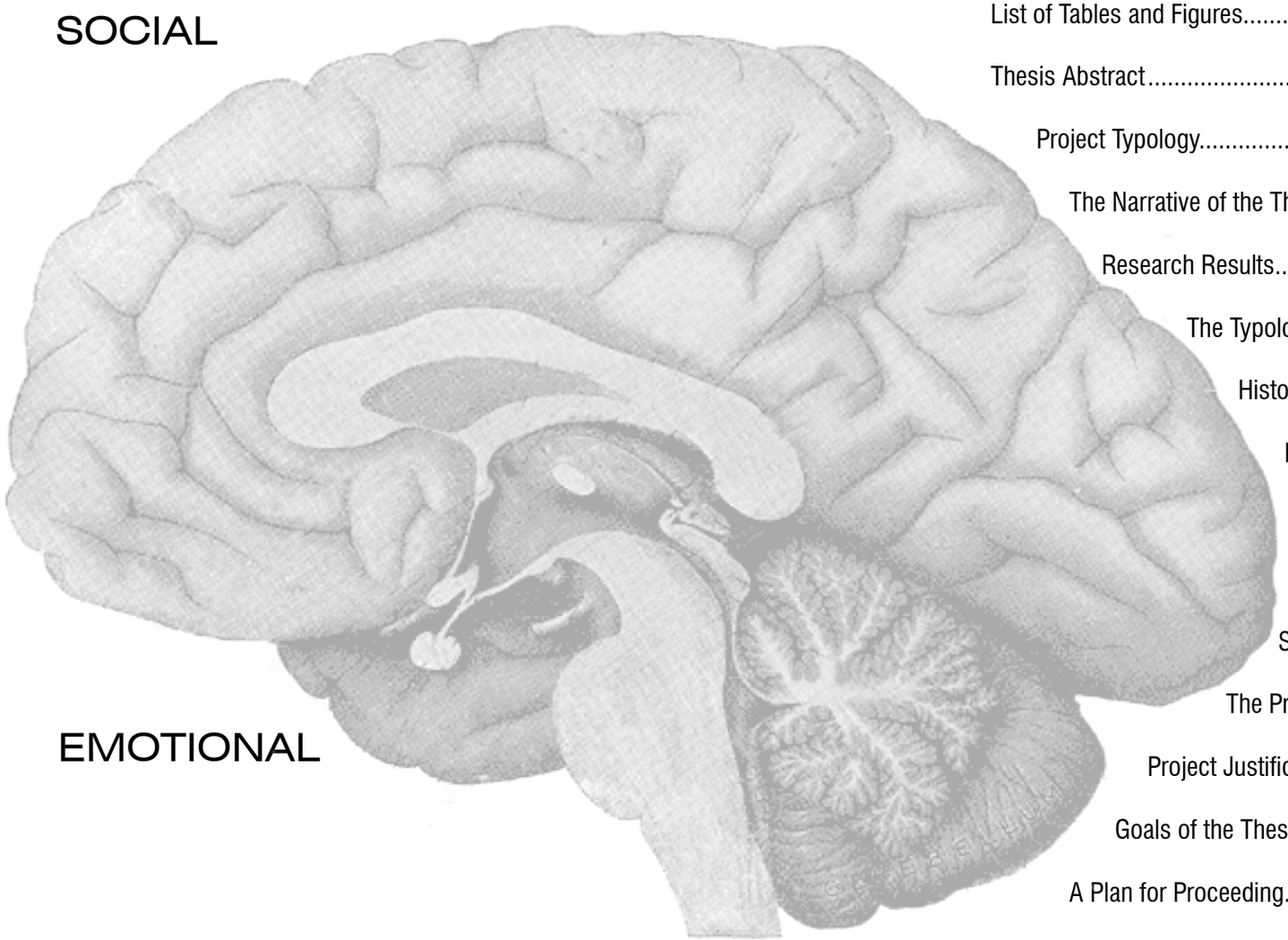


Thesis Committee Chair

May 2015
Fargo, North Dakota

PHYSICAL

SOCIAL



EMOTIONAL

COGNITIVE

Figure 2
Medial Section
(Google Images)

CONTENTS

TABLES AND FIGURES

ABSTRACT

The primary objective of this thesis is to explore how an understanding of neuroscience can influence the human perception of the built environment.

Advancement in the field of neuroscience has allowed for a greater understanding of how we perceive the world at a neurological level. An effort to understand our experience of the built environment has been theorized since the time of Vitruvius. This thesis investigates these relationships through an urban in-fill project in downtown Fargo, North Dakota.

TYPOLOGY

The building typology for this thesis is a research facility. These buildings are important to the advancement of knowledge within society. The specialty of this building is for advancements in the field of neuroscience with an emphasis on treating mental disorders.

The precedents for this typology include state of the art laboratories used for clinical trials of patients as well as past successful research institutes. Other typologies that will be relatable are care centers as this project will go beyond acting as a research center but also a place for those struggling with mental disorders.

PROBLEM STATEMENT

How can a designer incorporate a knowledge base of neuroscience through conscious awareness of the implications their decisions will have on the perceptions of those that will engage the design?

THESIS NARRATIVE

Through this thesis I will investigate the varied perceptions of those engaged in the built environment. There are design strategies that are focused on the effect they will have on individuals. Such examples have become prevalent in healthcare facilities as well as in schools. Jonas Salk created a facility with the help of Louis Kahn based on the idea that this facility would enhance the work of researchers within the facility. Psychological studies have shown the differences that ceiling heights can have on those within a space. Within schools, research has found lower ceilings gave more positive test scores for objective questions while higher ceiling promoted more creative thinking in subjective testing. These are just some of the research example I am interested in pursuing in a holistic design. The goal of this thesis will be in uncovering the key design elements that affect how we perceive a space. Through past research in the field of neuroscience, correlations can be made in how space affects us. This research can provide clues in determining how space is able to influence us at a conscious or subconscious level.

At the core of this thesis is the general connections that can be made with architectural design and neuroscience. I am interested in this idea because I find psychology and neuroscience to be very important in better understanding ourselves. The particular site I have chosen allows for the opportunity to enhance the area as it is an in-fill project. The site also allows for the idea of taking advantage of natural landscape features such as the Red River.

The building typology will allow for community members affected by mental disorders to get treatment from a center that specializes in the research of new methods and techniques that can help the individuals. Our culture takes pride in being at the forefront of research which is why this center will allow for both basic and applied research methods.

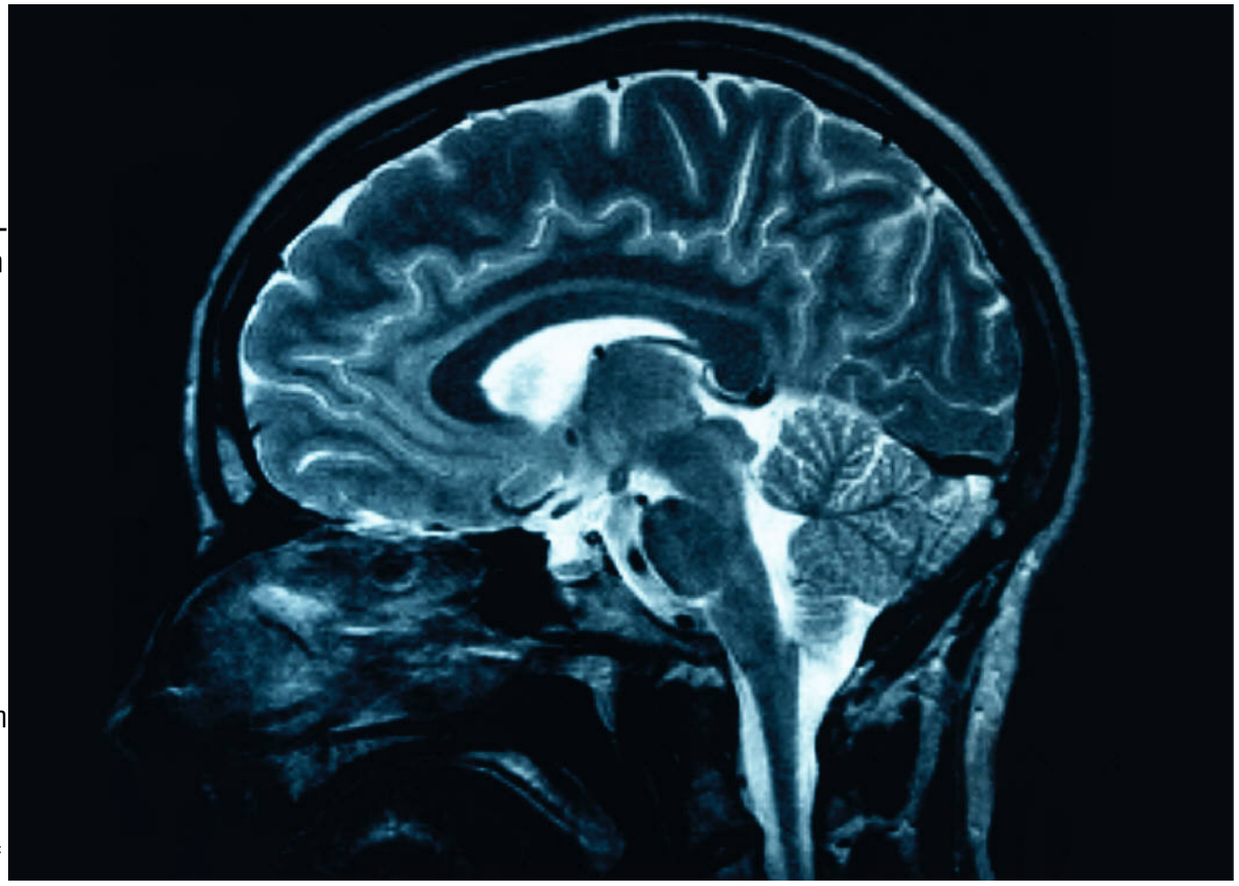
Mental disorders are an issue in all societies, with the advancements in understanding of the brain, new research is able to help more people overcome these disorders. This research center will improve the existing neuropsychiatric research center in Fargo as it will enable more studies to take place in the community. The existing Fargo building is outdated and is in need of a more advanced laboratory for future research breakthroughs.

As a designer we think with the client in mind, how our designs can best suit their needs. I believe that understanding core concepts of how we perceive space can greatly help in our understanding of how to create more meaningful spaces. The environments we design have the ability to improve the emotional well being of those that live within them.

RESEARCH RESULTS

Neuroscience (Hard sciences)

The major influence within the hard sciences is the field of neuroscience. The study of the brain has always been an important part of understanding human behavior. In recent years, leading neuroscientists have uncovered breakthrough research in understanding the reasons we behave in certain ways. By integrating hard sciences into my design decisions, I will have a strong background for making decisions. The distinction between using neuroscience as a guide versus other processes of design will come in the way of viewing design decisions for how they will mentally affect the user.



In recent years the interest level of how neuroscience can improve design has increased. This research first gained ground in 2003 when the Academy of Neuroscience for Architecture was formed. This group includes architects, neuroscientists, behavioral psychologists, and various members of academics that wish to pursue connections between architecture and the human brain. At a recent ANFA convention, topics such as "how to improve the design of therapy rooms for people with post-traumatic stress disorder to how virtual reality can be used to affect mood, and to how the brain's spatial mapping may have influenced the orthogonal design of city layouts"(Berg).

I believe a key role of neuroscience is developing a understanding of individual perception. Our perception of the environment influences our current experiences and memories.

In a journal article, *How the Brian Experiences Architecture* by John Eberhard, the author discusses perception from a scientific standing. Eberhard makes an important distinction for defining perception. He states "How the body relates to a space can be studied independently of what is going on in the mind (e.g., ergonomics), but how the mind engages space has to include the body and the brain of the individual. The action of engaging a space is key to understanding perception. The levels of conscious experience vary as the body is "registering the environmental variables' effects on our nervous system -- heat, light, noise, smells, tactile sensations, and our perception of movement and spatial orientation" (Eberhard). At a deeper level of consciousness we are "simultaneously experiencing space as assembled by our sensory system and combining this experience with memories of places similar to the one we are in" (Eberhard). A architect is able to influence the environmental variables that provide comfort to the user as well as the spatial experience. The second of the two is deeply complex as memories play a role in our current experiences.

Neuroscience allows architects to go beyond designing through behavioral observation as well as methods and goals of a client. It seeks to understand the complexity of human behavior which is the basis of purpose.

Figure 3
(pitt.edu)

Psychology(Social Science)

Psychology is the major social science I have researched for design influence. Psychology searches for answers relating to both mental functions and behaviors. Psychology is the next step beyond biology based neuroscience in linking behavior and mental functions. Those working in the field of psychology approach questions of perception, emotion, attention, intelligence, phenomenology, motivation, brain function, cognition, personality, interpersonal relationships, and behavior. All of these ideas are influential in our experience of the world.

Understanding experience is important in determining how design decisions will impact the individual user. Understanding the mental functions as well as behaviors of the users will be important to my design decisions.

Psychology has many other branches that are important to the typology of this project. Neuropsychology is a more specific field that closely aligns with neuroscience. Neuropsychologists use work done by neuroscientists in order to understand and treat behaviors (Posner). The work of these doctors is important as they mainly work as researchers within research labs and institutions.

Social psychology is another important branch of psychology as it deals with how thoughts and behavior are influenced by others. The three areas of influence being thoughts, feelings and behaviors, are considered measurable psychological matters within social psychology. There should be no doubt that the people around us influence our mental state and behavior.

Figure 4
(filterforge.com)

Social psychology is important as it applies scientific method in determining human behavior. This type of application is similar in the way I would like to use scientific findings in neuroscience.

Psychology is a field that uses empirical data and experimentation to help determine subjective ideas. Through the understanding of psychology it is possible to design in a manner that foresees the personal feelings, tastes, and opinions of those that will experience the design.

We will not be able to find a single correct solution to every design problem through psychology and neuroscience. Even if we had a complete understanding of the biological and psychological motives for behavior, we would not come to a consensus of design. There are too many variables that affect the way we experience space, mainly because of our unique memories of the past. Our perceptions are never constant and continue to adapt to the new situations we encounter. What we can do is find the consistencies of our experience which are based on biological means. Psychology and neuroscience are methods of finding and explaining what is consistent. In order for something to become theory it must be proven consistently. There are ideas rooted in the sciences which show the ability of environment to influence experience. The type of experience to be influenced needs to be understood by the designer. But, first the designer must understand the user's unique experience at a conscious level.

Phenomenology(Philosophy)

Phenomenology is a philosophy that concentrates on human consciousness and the conscious acts that occur. This is done at a level free from scientific method. What connects this philosophy with both neuroscience and psychology is the goal of making the subjective ideas objective. These ideas involving judgement perception and emotion. By taking a looser conceptual approach to experience, a wider range of questions can be reflected upon without limitations of scientific experiment.

Within the field of philosophy, Martin Heidegger and Edmund Husserl have both been influential sources to understanding experience at a philosophical level. Heidegger's work is important as I see it as inspiration to thinking as well as a framework to base future decisions on. One thing that set Heidegger apart from other philosophers was his work was sometimes discussed with architects in mind. His work set the stage for many future architects and theorists. In the series, Thinkers for Architects, the author Adam Sharr claims "when Peter Zumthor waxes lyrical about the atmospheric potential of spaces and materials; when Christian Norberg-Schulz wrote about the spirit of place; when Juhani Pallasmaa writes about The Eyes of the Skin; when Dalibor Vesely argues about the crisis of representation; when Karsten Harries claims ethical parameters for architecture; when Steven Holl discusses phenomena and paints watercolours evoking architectural experiences; all these establishment figures are responding in some way to Heidegger and his notions of dwelling and place" (Sharr 1). These influential figures in the field of architecture all have a role in pursuing the ideas that Heidegger once wrote.

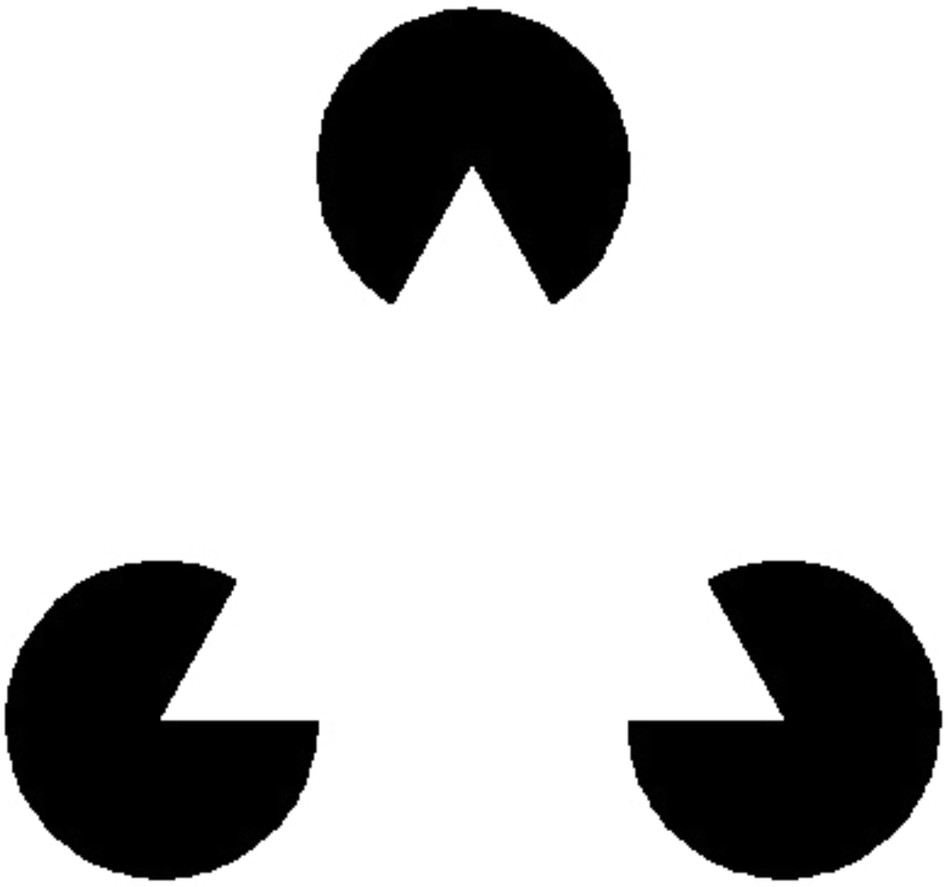


Figure 5
Kanizsa Triangle

The beginnings of Husserl's phenomenology have roots in other philosophies. Influences from other philosophers and psychologists such as Franz Brentano and Carl Stumpf shaped his concepts. The concept of intentionality is one core component of Husserl's work. It is defined as "the power of minds to be about, to represent, or to stand for, things, properties and states of affairs"(Jacob). This concept is important as a basis for how the mind creates representations of the environment.

An even older guiding philosophy is that of metaphysics. This concept acted to determine how individuals understand the world around them. The ideas of the world included existence, space and time, objects and properties, as well as cause and effect. This way of thinking was forever changed with the use of scientific method as means to discovery. The importance of experiment gave validity to the sciences . Philosophy is still important even without the empirical data to back claims. Without it there would not be a basis for exploration. It continues to refine itself, fueling the drive for an understanding of nature.

The role of phenomenology in my thesis allows for an abstract view of experience. This view can be refined by science's use of experimentation. The only way to understand the world is through experience. As a designer, techniques must be developed and only then through their use will they become understood.

Phenomenology(Architectural theory)

The architectural theory of phenomenology plays the closet role in guiding architectural decisions. Architectural Phenomenology is influenced by the philosophy of phenomenology. The understanding of the experience of built space and sensory effects of building materials directly relates to the understanding of the individual user. This is the foundational theory that will guide design decisions for the thesis. To further the ideas built in this theory, I will gather evidence that give evidence and past examples to successful designs.

The two influential architects that I have studied for this movement include Christian Norberg-Schulz and Juhani Pallasmaa. Both of these architects have writings important to the practice of Phenomenology within the field of Architecture.

Another important figure in linking neuroscience to Architecture is John P. Eberhard. In one of his articles titled *Applying Neuroscience to Architecture,* he explains why the challenge of linking the two disciplines is important. Eberhard explains his hypothesis on how cognitive and emotional experience is uniquely created in Thorncrown Chapel. His first states "Our sense of awe is influenced, in part, by having space above our head that is not visible until we move our eyes (and probably our head) upward." He then explains this by using a suggestion by the neurobiologist Semir Zeki stating "raising our eyes upward to see a spire on a cathedral was transformative—it stirs some primal notions of something ethereal."

Figure 6
(shockmd.com)

Eberhard goes on to explain the influence of light in the chapel, "The sensitivity of our suprachiasmatic nuclei (SCN) to light—driving the circadian rhythms—influences our alertness. The play of light and shadow may trigger the SCN to "play with alertness" in a way that we find stimulating." His third observation is the context of the chapel. He explains that the quiet experience within the woods is soothing to the auditory cortex. The degree of soothing is also said to vary depending on the if an individual is accustomed to an urban or rural environment (Eberhard).

These types of observations begin to give biological explanations in how we experience the built environment. When this occurs, design decisions become more than empathetic guesses of a user's experience. We now have means to discover how we experience the world, it just requires the time and observation in linking the physical to the metaphysical.

The architect Norman Koonce once asked about the possibilities one could achieve when collaboration occurred between brain researchers and architects. The question was "What would it mean for architects to move beyond an intuitive and anecdotal rationale in their design? How much better could we serve our clients and the public if we understood how their brains enable perception of their physical environment and generate physiological responses to it?" (Eberhard). These are the types of questions we should be asking in order to further the profession.

Summary of Research Results

All of these areas of research, neuroscience, psychology, phenomenology, play an important role in guiding design decisions. Each areas has its strengths and weaknesses. Science can only prove so much in a given amount of time and can be limited by technology. It requires certain steps to be taken before valid conclusions can be drawn. Philosophy can fall short of proving concepts but is only held back by the imagination.

What is important is combining all of these areas to reach new conclusions which can not be drawn from one area alone. The work of neuroscientists, psychologists, and philosophers all have the ability to influence a related fields work. The key is finding the right fit to each of these ideas.

The overall goal is similar in understanding human behavior and mental processes, there are just multiple ways of defining a conclusion. The evidence from each of these fields exists, there just needs to be better collaboration between the groups and people willing to cross the imaginary boundaries between the hard sciences, soft sciences, and philosophers concepts. The ANFA are guiding design into the right direction as the collaboration between various professionals, especially those outside design, has become a goal at recent seminars held by the group. Speakers from psychology backgrounds have answers to questions that designers may have pondered. If these answers are communicated in a specific context, designers will see the potential of collaborating with other professionals outside the traditional design fields.

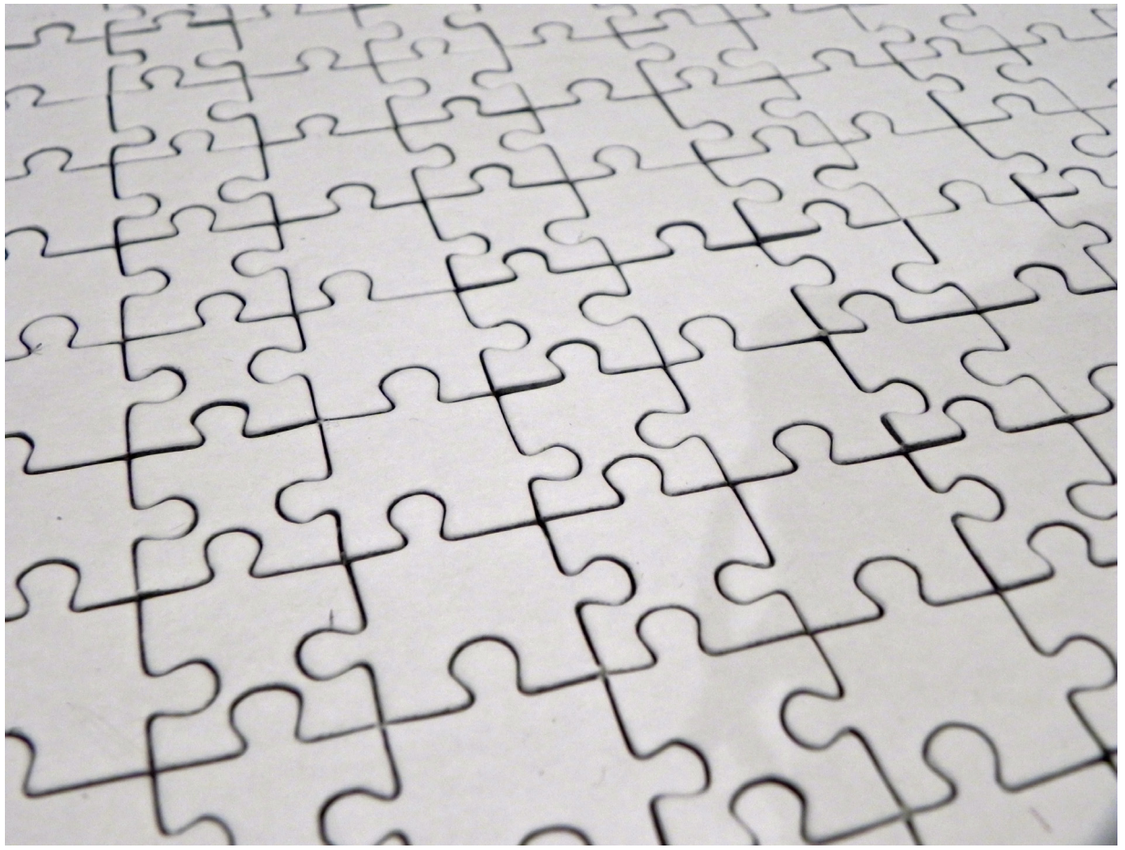


Figure 7
(wikimedia.org)

Architects throughout history have looked to other fields for inspiration and guidance. Architecture in itself is the synthesis of many ideas. Vitruvius was one of the first architects to write about the practice in his book *De architectura*. He spoke on many things that influenced architecture such as astronomy, medicine, and mathematics. His claim for architecture having the qualities of *firmitas, utilitas, and venustas* still influence the purpose of architecture today. Architects design with these ideas in mind on every project as they have a responsibility to create a structure that will not fail, fulfills its purpose, and is aesthetically pleasing. Vitruvius understood the importance of other fields in influencing design. Today there are so many fields of study with great depth that it makes it impossible to be a specialist in another field. Inspiration and guidance can come in many forms which is why the study of other subjects is of importance.

The only way of integrating the vast amount of today's information into a design is to search in the right places. The specialists in each field are our guides to overcoming the gap in applying ideas to the technique of architecture. We must be willing to take these leaps, as many architects are doing, if we want to further our understanding of experiencing the built environment.

Those attending the conferences held by the ANFA are the future to unlocking ways of design that have never been explored in practice.

CASE STUDIES

Youth Mental Health Building

Architects: BVN Architecture
Location: Sydney, Australia
User: University of Sydney, Faculty of Medicine
Type: Brain Research Institute
Project Year: 2010
Project Area: 32,300 sf
Awards: Sulman Architecture Award(2011)

Top Figure 8
Youth Mental Health Building (BVN Architects)

Bottom Figure 9
Youth Mental Health Building (BVN Architects)

Figure 10
Interior
(BVN Architects)

Figure 11
Interior
(BVN Architects)

Figure 12 Site Plan (BVN Architects)

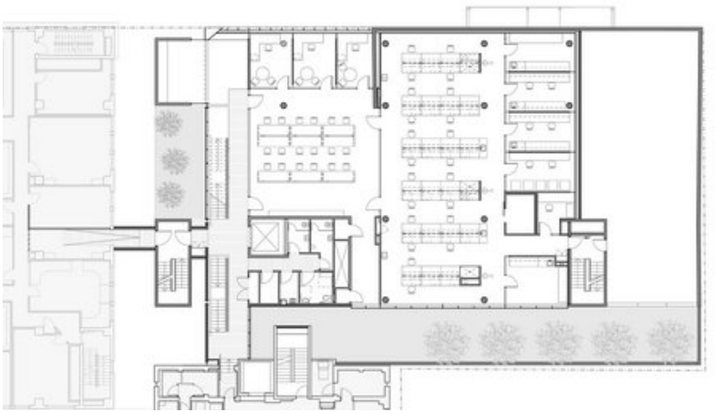


Figure 13 Floor Plan (BVN Architects)

Figure 14 Section (BVN Architects)

ANALYSIS

The Youth Mental Health Building is one of the research buildings found at the Brain and Mind Institute of Australia. This building is considered to be in the public sector. Some critics have stated “the BMRI building succeeds in uniting patients, carers, clinicians and scientists working in the fields of neuroscience and mental health.” The fact that this is a new facility and is also praised for its success makes this a beneficial case for my thesis. One of the unique characteristics of this building includes its integration with existing buildings on the site. The building includes spaces for research as well as areas for patients which makes it flexible in its uses.

This building is unique as it uses glass and steel which stand out from its context it is placed in. The context in itself is also unique as it is found within the Industrial zone of the city. Special considerations were made when designing the interior as the wood finishes were seen to serve as a tactile material thus improving the comfort of those that come in contact with it.

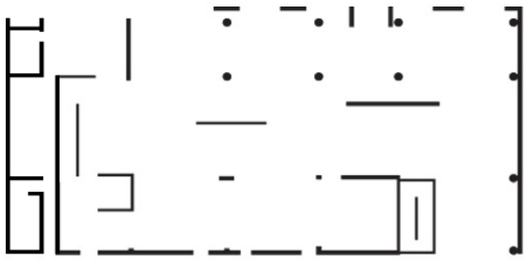


Figure 15
Structural Diagram

Figure 16
Circulation Diagram

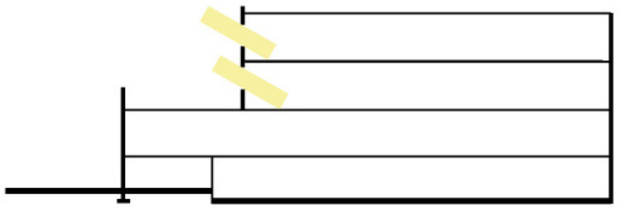


Figure 17
Daylighting Diagram

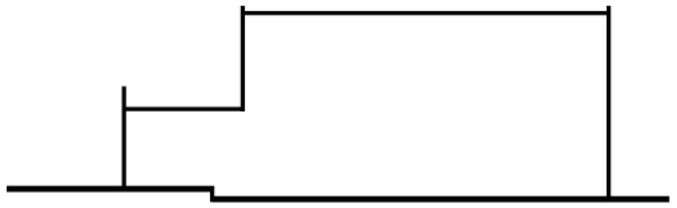


Figure 18
Massing Diagram

METLA Forest Research Centre

Architects: SARC Architects
Location: Joensuu, Finland
User: The Finnish Forest Research Institute
Type: Biological Research Institute
Project Year: 2004
Project Area: 82,340 sf
Awards: Finnish Wood Award(2005)

Top Figure 19
METLA Forest Research Centre (ArchDaily)

Bottom Figure 20
METLA Forest Research Centre (ArchDaily)

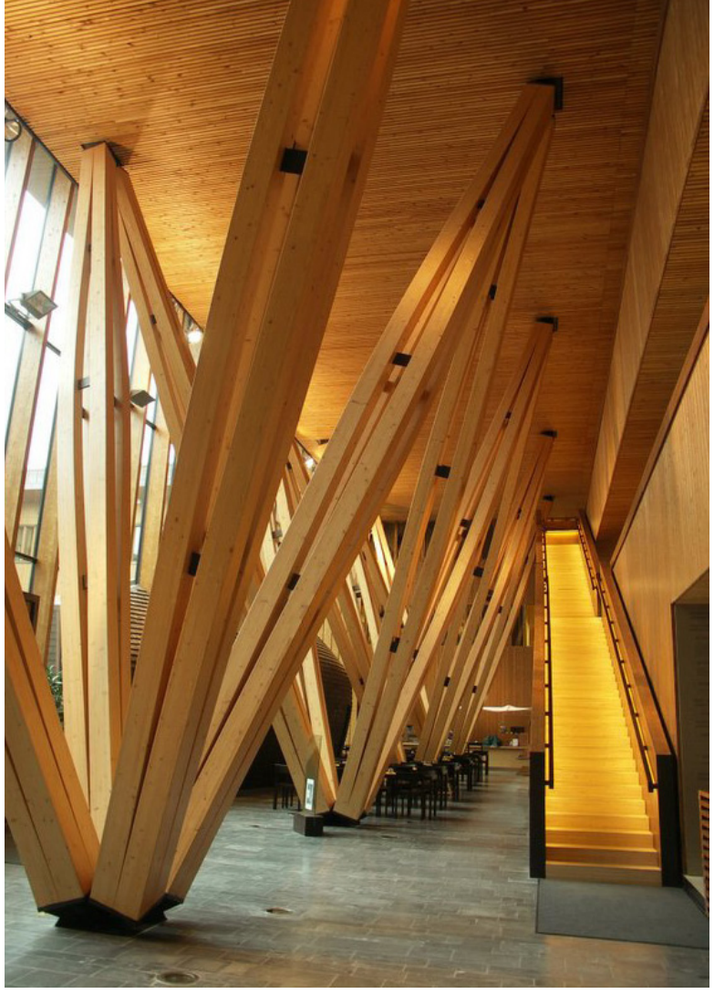


Figure 21
Interior
(ArchDaily)

Figure 22
Interior
(ArchDaily)

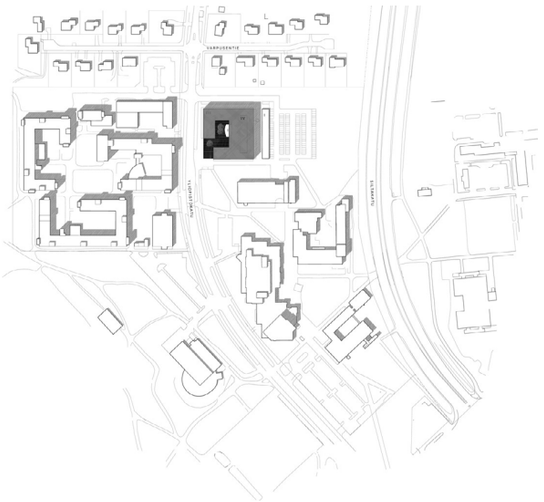


Figure 23
Site Plan
(ArchDaily)

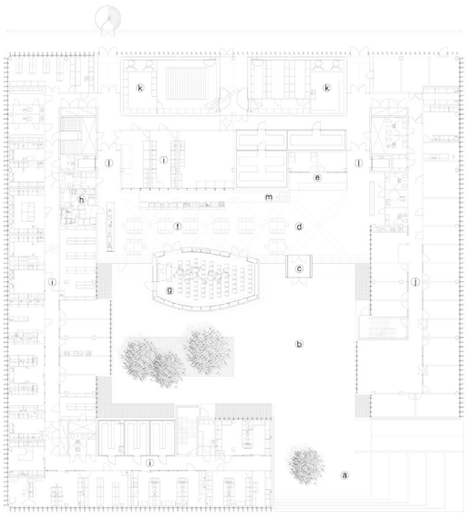


Figure 24
Floor Plan
(ArchDaily)

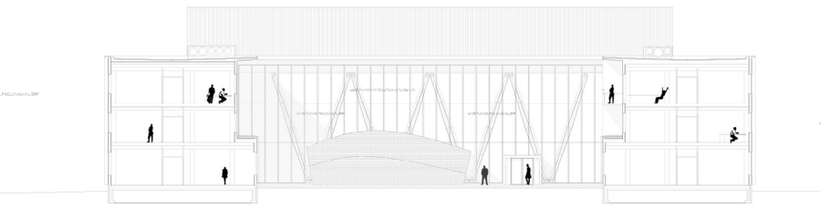


Figure 25
Section
(ArchDaily)

ANALYSIS

The METLA Research institute accommodates over 170 employees. This total also includes researchers that use the facility. The goal of the centre is developing and applying research methods which includes the use of wood as a material. The building is part of the University of Joensuu. The project is known for its unique use of wood as a material. This can be seen in the varied uses among the facade as well as interior finishes.

This building acts as a symbol of the research that is conducted within. One could say that they practice what they preach as the building stands out among others with its use of wood as a primary material. The shape of the building allows for great daylighting opportunities as the double loaded corridor wraps around the central court-yard.

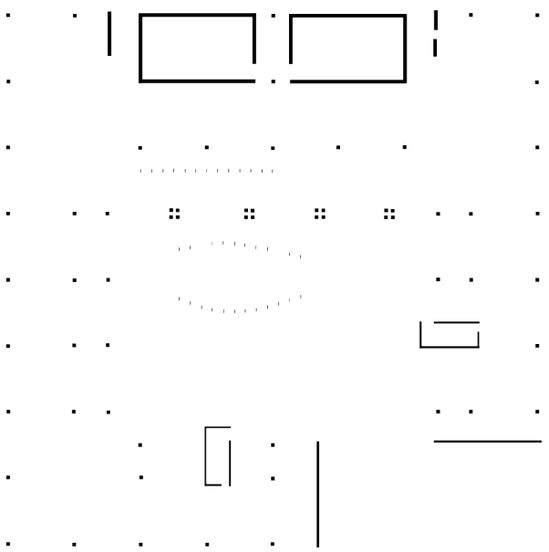


Figure 26
Structural Diagram

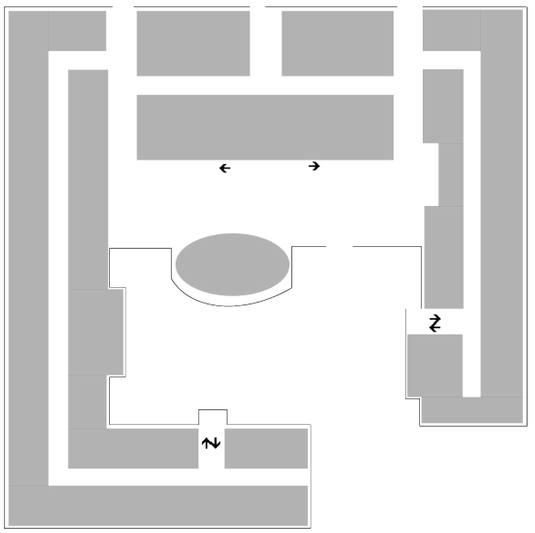


Figure 27
Circulation Diagram

Figure 28
Massing Diagram

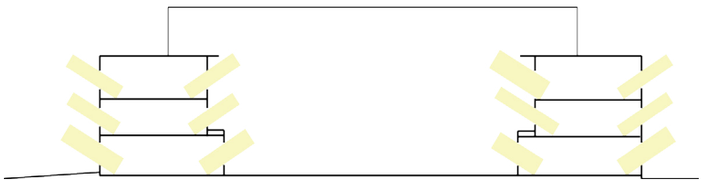


Figure 29
Daylighting Diagram

Salk Institute for Biological Studies

Architect: Louis Kahn
Location: La Jolla, California
User: Salk Institute
Type: Biological Research Institute
Project Year: 1959
Project Area: 290,000 sf
Awards:Twenty-Five-Year Award(1992)

Top Figure 30
Salk Institute
(ArchDaily)

Bottom Figure 31
Salk Institute
(ArchDaily)

Figure 32
Interior
(ArchDaily)

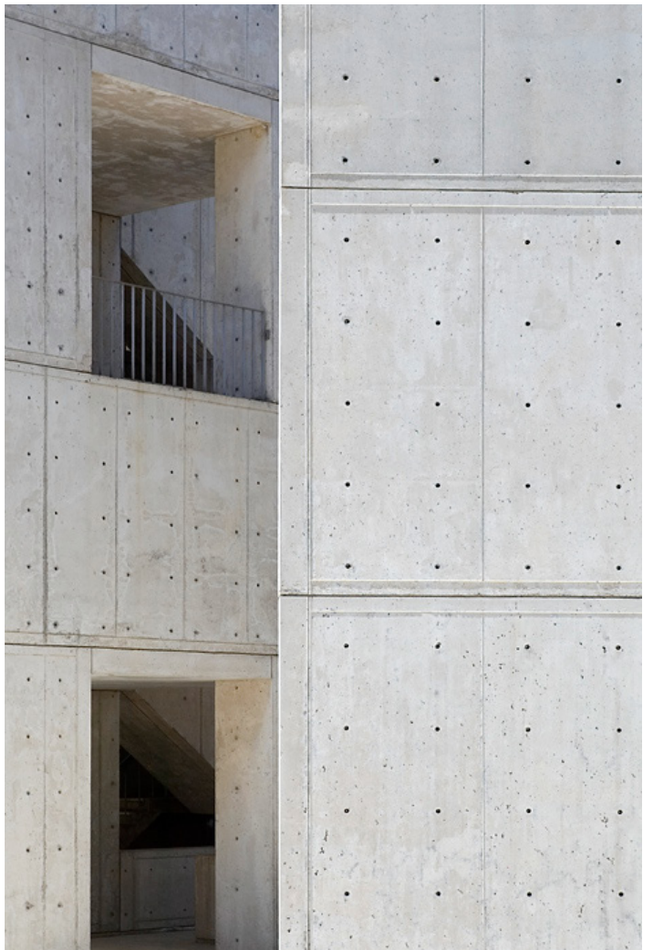


Figure 33
Exterior Detail
(ArchDaily)

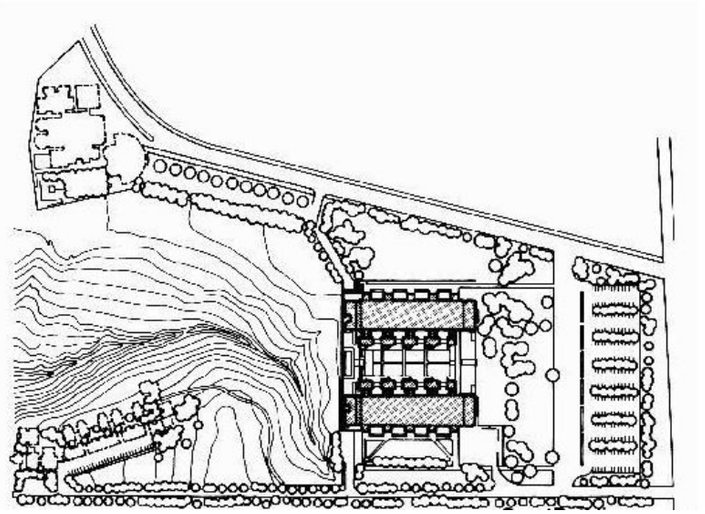


Figure 34
Site Plan
(ArchDaily)

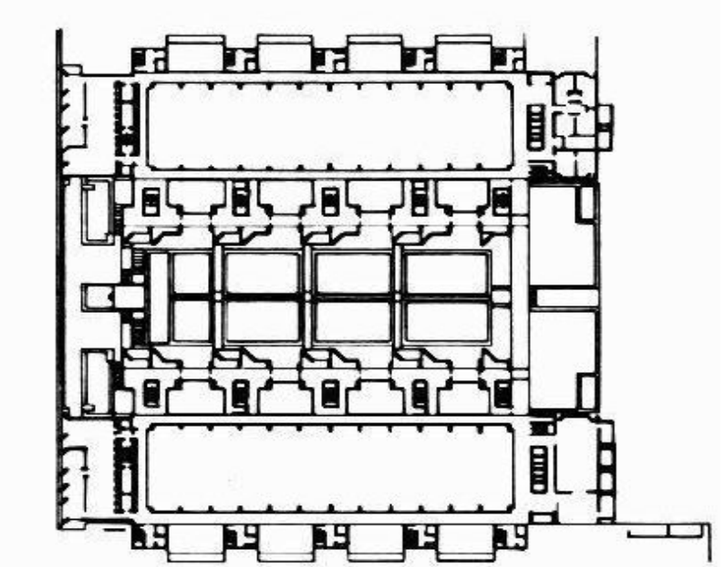


Figure 35
Floor Plan
(ArchDaily)

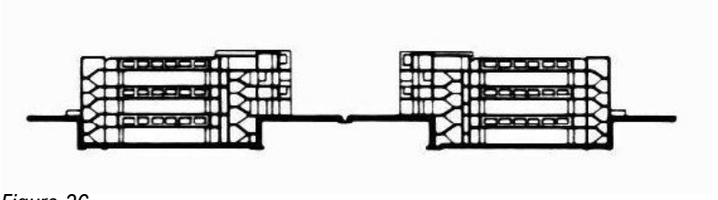


Figure 36
Section
(ArchDaily)

ANALYSIS

The Salk Institute was built by Dr. Jonas Salk who was responsible for the development of the polio vaccine. The users of this building include over 850 scientific staff. These staff include doctorate and graduate students within the field of medicine. Areas of study conducted at Salk include molecular biology and genetics, neuroscience, and plant biology. Salk's goal for this project was to create a "crucible of creativity" (Salk.edu)

This building was built with the client and architect wanting a building able to promote innovative thinking. Both its placement along the shore and daylighting strategies were masterfully done which created a stunning work of Architecture. The material choice was also crucial as the durability and minimal maintenance were both strong design influences.

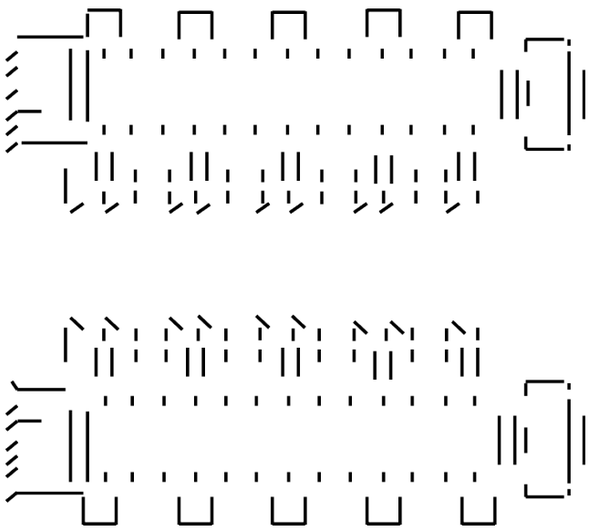


Figure 37
Structural Diagram

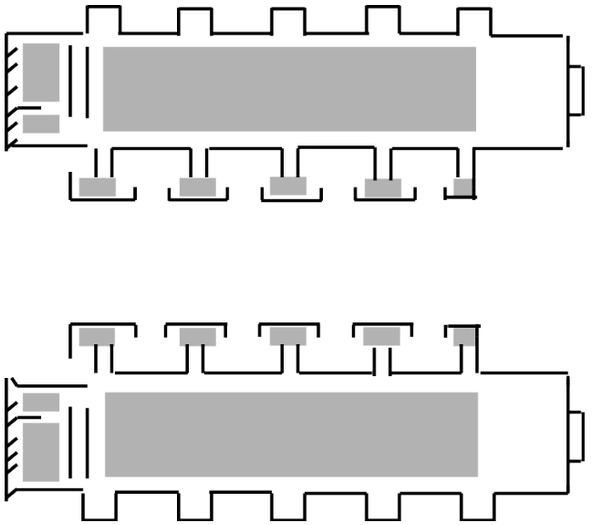


Figure 38
Circulation Diagram

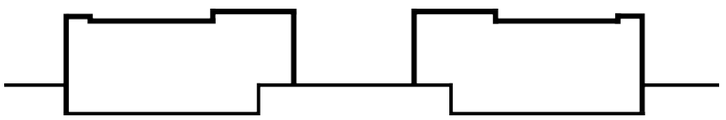


Figure 39
Massing Diagram

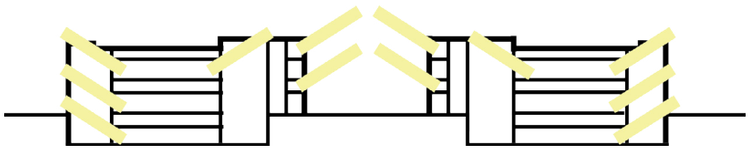


Figure 40
Daylighting Diagram

SUMMARY

All three of the analyzed projects have the function of research in common though the types vary. The priorities of biology, environmental materials and mental health all have different core concepts but the goal of each of the facilities is the advancement of basic and applied theories for their respective research. My unifying idea for the thesis was affected after researching these case studies. I found it more important to focus on a specific area of research for my typology. Because of this I will be able to focus on a more detailed list of needs for the client and users. The case study that changed my perspective the most was the Salk Institute. Jonas Salk was convinced that a well designed facility would improve the research of those working within it. Because of this, Salk hired Louis Kahn to design the facility on a site that was naturally beautiful. Salk also convinced many architects to explore the correlation between neuroscience and architecture. This challenge resulted in a branch of the AIA which I had never heard before but specialize in exploring this topic. The ANFA is the organization that was started after this request and continues to expand research on the subject.

From each case study I was able to take important site characteristics that shaped each facility in a different way.

The mental health building was located in an industrial area and integrates an existing historic building. This is important to my thesis as my site was previously used industrially and has existing buildings that can be reused. The METLA building used context specific materials that were influenced by its surroundings. This use of not only helped the building fit with its context, but also showed off what their researched materials were capable of becoming. Salk institute emphasized the natural landscape feature of the coastline which makes for a great view. The functions of the case studies were similar in typology as they were all research based facilities but varied from small to large scale projects. This change in scale showed which spaces were key components and which spaces were additional as the larger scale could accommodate additional spaces..

All of these cases were involved in some way with a university system which shows the importance of connecting new researchers with the facility to help in gaining real world experience. Because of this I see making accommodations for a NDSU involved facility to be of importance. The cultural importance of these projects are that they show the need for the continuance of a expanded knowledge base within multiple scientific fields.

Figure 41
Salk Institute
(http://blog.sandiego.org)

HISTORICAL CONTEXT

History of Neuroscience

Some of the earliest recorded research began around 4000 B.C. These recordings discussed effects of plants that can alter mental states. Around 400 B.C., a Greek physician named Hippocrates began discussion of the brain. He is notable for stating the brain's importance in sensation and intelligence. His early discussions would influence later philosophers such as Plato who explained the brain as "the seat of mental processes" during his lectures in Athens. As techniques began to improve, medical procedures and experiments were developed to gain a better understanding of the brain. In the 1600's, philosopher Rene Descartes described the pineal gland as the "control center of body and mind"(washington.edu).

In 1755, J.B. LeRoy began treatment of mental illnesses using electroconvulsive therapy. An important case in human behavior occurred in 1848 when Phineas Gage was involved in an accident that caused an iron rod to pierce his brain(washington.edu). Gage survived the injury though his personality was altered after the accident. This case gave evidence that damage to a specific part of the brain can cause specific personality differences.

These early physicians and philosophers paved the way for a way of thinking that questions our behavior.

Figure 42
Hippocrates
(http://opioids.com/

Recent Research and Development

One of the more recent developments in the field of neuroscience occurred with the discovery of the mirror neuron. This discovery was made by the neuropsycholgist, Dr. Giacomo Rizzolatti, of the University of Parma, Italy. His research involved the study of the frontal and premotor cortex. While studying neural motor representation, he found certain neurons would fire when planning a motor movement but would also fired in an observer of the specific movement.

What makes this discovery important in the field of design is a better understanding of others actions. We design for others and it is important to understand how a specific design decision will affect a user's experience. Mirror neurons also open a door to understanding human empathy which is related to emotion. The mirror neuron also gives a physiological base to the common coding theory. This theory describes the link between perceptual representations and motor representations. With the understanding that the brain is involved in changing sensory patterns in our environment into our physical experiences.

Henry Mallgrave describes the importance of mirror neurons in his book *Architecture and Embodiment: The Implications of the New Sciences and Humanities for Design.* Mallgrave discusses the mirror neuron for its ability to give empathy. He states, "mirror neurons, in this sense, connect us with our environment; or rather, they provide us with the means by which we apprehend and form a relationship with our physical surroundings"(Mallgrave 14).

As a means for enhancing our ability to design, Mallgrave also states that "emotional circuits and mirror neurons will never explain all dimensions of the architectural experience, they provide us with important insights into how we encounter and respond to certain materials, spaces, forms, scales, lighting conditions, and creative intentions put forth by the designer"(Mallgrave 14).

Centers for research

Many of the early centers that dealt with those with mental disorders were designed similar to prisons. The conditions of most facilities provided minimal thought for those living within. Patients admitted to the facility were different from most others in society and admittance to a hospital allowed for separation. This way of thinking made the separation of patients from the public seem just as important as improving the patients mental state.

During the enlightenment of the 1700's, many began to see those with mental illness as a disorder and more treatments were applied. Throughout history changing practices and beliefs influenced the techniques used on patients. Much of the research came in experimentation.

In the early 19th century, the idea of a public institution began as a means of care for those with mental disorders. In 1845, a political law known as the Lunacy Act now considered those affected to be seen as patients that needed treatment. State asylums were designed to treat patients exhibiting mental disorders.

Figure 43
One of the earliest buildings designed for individuals with mental disorders
(Wikipedia.org)

With the 20th century came a new way of thinking in psychiatry. Emil Kraeplin promoted a classification of mental disorders including mood disorders. By creating a broader range of disorders, unique treatments could be used based on the symptoms.

In the mid 1900's, sociologist Erving Goffman studied and wrote about the conditions of patients in mental hospitals. His book played a role in the movement of deinstitutionalization of mental patients. In 1961, President Kennedy instructed the National Institute of Mental Health to provide Community Mental Health Centers for those no longer in institutions(Torrey).

Today the research of psychiatrists examines diseases, classifications and treatments(Lyness). Psychiatrists understand the belief that both health and disease are aspects of an individuals adaptation to the environment. The brain also plays an important role as it "organizes an individual's hopes, fears, desires, fantasies and feelings"(Guze 130).

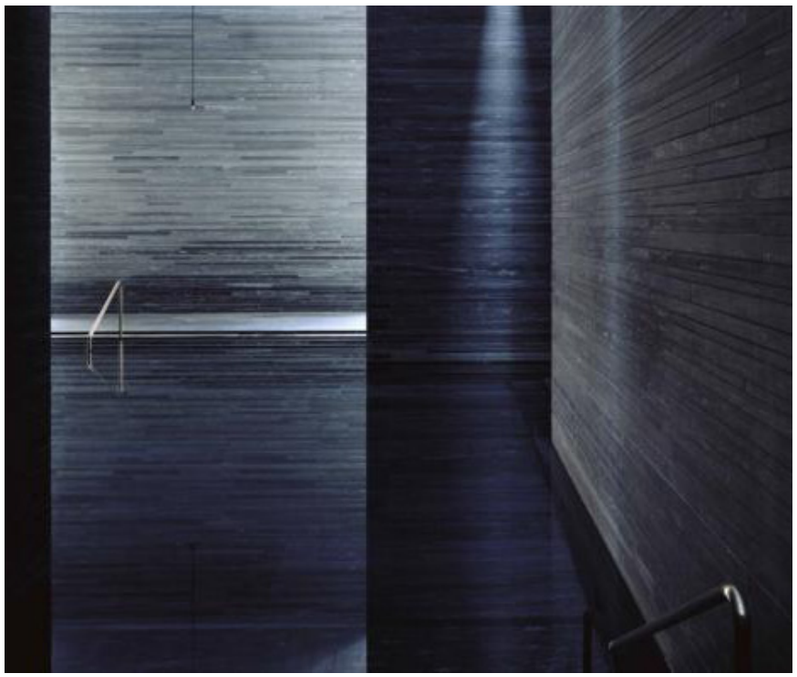
Figure 44
Emil Kraepelin
(gopixpic.

Designing with phenomenology

Edmund Husserl was the early organizer of phenomenology. He set the ground work for experience of the built environment. With the major concept of viewing the world through experience and consciousness, a designer can adapt the ideas into designing for other's experiences. In its founding, phenomenally begins to study things viewed as subjective in a objective manner. These issues include conscious experience of judgments, perceptions, and emotions. In the book *Phenomenology* by Mark Orbe, he explains five fundamentals of phenomenologists. These include:

1. Rejection of objective research for grouping of assumptions called "phenomenological epoche.
2. Observation of daily human behavior provides greatest understanding of nature.
3. People should be explored because they reflect the society they live in.
4. The gathering of conscious experience is greater than the gathering of traditional data.
5. It is about the discovery which requires unique methods different than scientific means.

Future philosophers then began to further develop these concepts. Heidegger even described his views in terms of the environment.



Jonas Salk was one of the early proponents for belief in integrating science with art in order to create a better built environment. At a ceremony for the Salk Institute, Salk stated "By creating an environment that was in itself a work of art it was my hope that the Institute for Biological Studies would inspire the evocation of the art of science. Understanding that science cannot be divorced from art, the full meaning of each and both together will be better appreciated only through understanding their relationship, their relationship to each other and their relationship to man"(Dunlop). This way of thinking was pursued with the help of Louis Kahn during the design of the Salk Institute in California.

These views were adapted by practicing architects such as Peter Zumthor. Zumthor is notable for his attention to materiality and development of character for each space Material is very important to bringing phenomenology into design as it is able to create a unique sensory experience in it's users.

Summary

There is historical evidence showing the impact that the built environment can have on its inhabitants. The development of institutions is one example of changing beliefs in our society. Our understanding of experience now has ground to further develop philosophies such as phenomenology. This understanding through observation of behavior can now be backed with scientific data explaining what was once seen as subjective.

Opposite Page
Figure 45
Bath at Vals by Zumthor
(urbarama.com)

BUILDING PROGRAM

MAJOR ELEMENTS

LOBBY
An accommodating space for visitors and users of the facility

RECEPTION
Space for administration to direct visitor and users

OFFICES
Designated rooms for employees that need private space

RESEARCH LABORATORY
Flexible rooms meeting functional needs of basic and applied research methods

PATIENT ROOMS
Private meeting spaces for individual user and employee interaction

BREAK ROOM
Space allowing employees to feel free from work

CAFETERIA
Space for specific users and employees to eat and relax

CONFERENCE SPACE
Areas for collaboration among employees of the facility

SUPPORT SPACES
Bathrooms for private and public use

STORAGE
For facility maintenance and general resources used by employees

MECHANICAL
Equipment space for building functions

OWNER
The research facility will be owned by Sanford Health, serving as a private nonprofit institute. The current neuroscience facility located at 700 1st Ave S. will be moved to the thesis location to better suit the increase of employees as well as newer technology within the new facility. The owner will expect the current duties of the neuroscience facility to be fulfilled at the new facility.

USERS
The users of this facility will be patients affected by mental disorders. The new research facility will expand the research studies conducted by the older facility, allowing more patients to be helped.

Needs- The patients will need to feel welcome at the facility. Making them feel comfortable in this environment will be the goal. Most research facilities seem to focus only on functional needs of the procedures rather than the people affected by the procedure. The spaces will include public areas for patients and those participating in studies. There will also be a need for private spaces for the patient and practitioner to speak privately. The amount of users at any given time will vary, though the peak hours will be between 8am and 5pm weekly. Some studies may require patients to be monitored beyond this time period for special cases. The mental health issues of the patients will be of concern for the operation of the facility. Special accommodations for ADA compatibility are required to accommodate all users.

EMPLOYEES
The employees of this institute will be research scientists, psychiatrists, clinical practitioners, medical students, administrators and maintenance staff.

Needs- Research scientists will require equipment and spaces dedicated to the basic research in the field of neuroscience, they are responsible for building collective knowledge of the subject. Researchers will also require space for unique studies conducted at the institute. The psychiatrists and other practitioners will be involved with applied research methods and evaluation of patients. Administrators are responsible for overseeing the operations of the clinic. They will require office spaces and a reception space. Maintenance staff will require storage space.

Goals
Provide a facility for research in the field of Neuropsychology. Accommodate needs of those affected by mental disorders.

Desired Efficiency Ratio = 60/40

Unassigned spaces
circulation 22
mechanical 7.5
structure and walls 8.0
public toilets1.5
janitor closets.5
unassigned storage .5
=40%

Facts
Needs of researchers and the existing site.

Concepts
Achieve clients goals through design rooted in neuroscience, psychology and phenomenology.

Needs
Research equipment, and facilities for understanding effect of mental disorders.
26000 sf for spaces + unassigned sf
46 total spaces

Problem
Red River proximity, nearby railroad

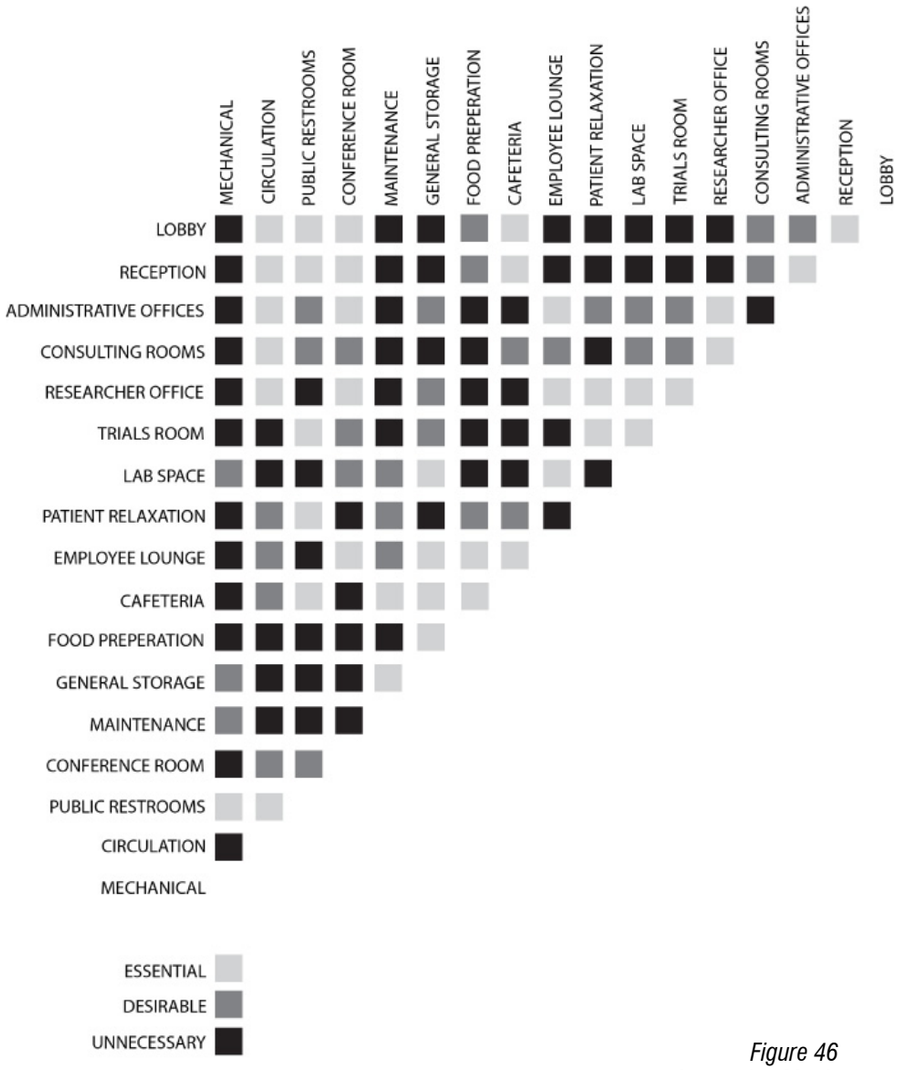


Figure 46
Interaction Matrix

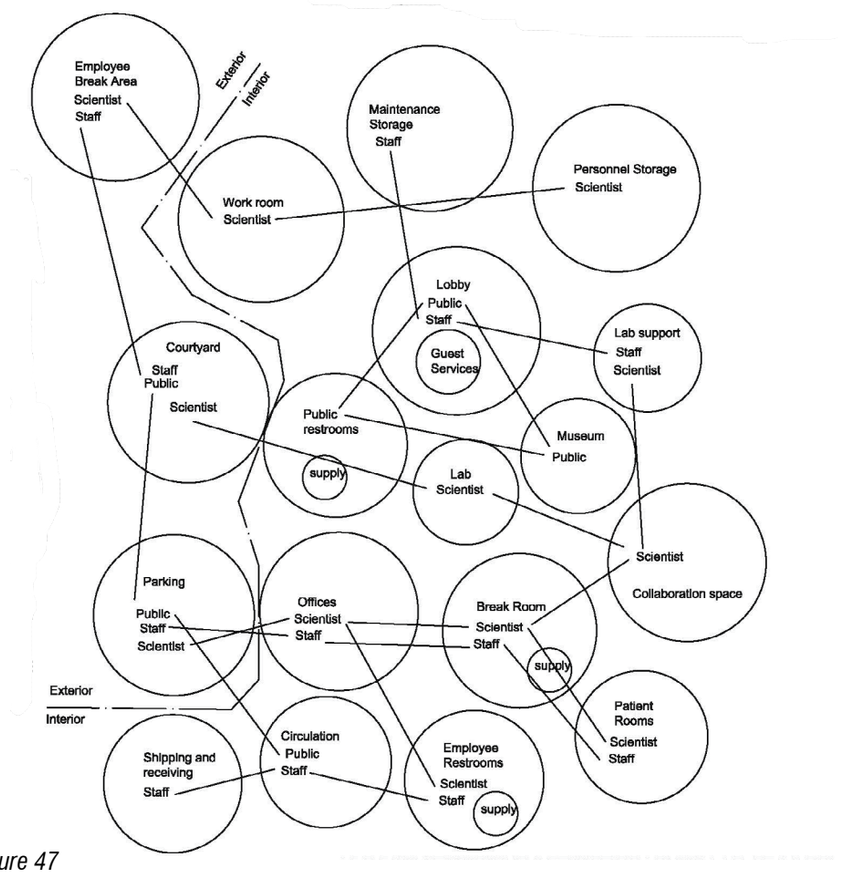


Figure 47
Interaction Net

LOBBY

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 2,500
Square Footage per Occupant:
Maximum Number of Occupants: 30
Circulation Space (as a % of total square footage): 60
Ceiling Height: 20’
Adjacent Spaces: Administrative Offices
Connected Spaces: Reception

HVAC
Desired Room Temperature (degrees F): 66
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 5-10

Acoustics
Sound Level desired in space (in dB): 65
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours): 2
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no):

ADA
ADA Accommodations required: Public access to facility, mobility and other possible needs of all users

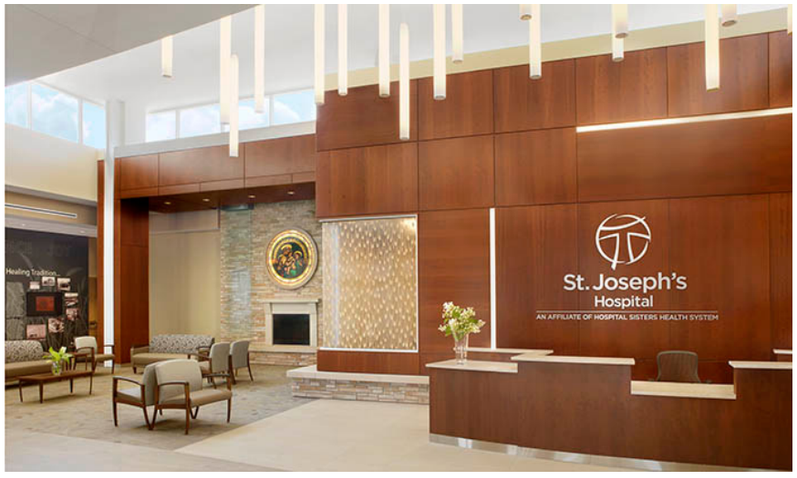


Figure 48 (mccarthy.com)

RECEPTION

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 800
Square Footage per Occupant:
Maximum Number of Occupants: 6
Circulation Space (as a % of total square footage):30
Ceiling Height: 20’
Adjacent Spaces: Administrative Offices
Connected Spaces: Lobby

HVAC
Desired Room Temperature (degrees F): 66
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 5-10

Acoustics
Sound Level desired in space (in dB): 65
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no):

ADA
ADA Accommodations required: Ease of access from lobby, visual and mobility

Figure 49 (massarocorporation.com)

ADMINISTRATIVE OFFICES

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 200(8)
Square Footage per Occupant:
Maximum Number of Occupants: 2
Circulation Space (as a % of total square footage): 20
Ceiling Height: 10’
Adjacent Spaces: Lobby, Reception
Connected Spaces: Circulation

HVAC
Desired Room Temperature (degrees F): 68
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 30-50

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

Figure 50 (roiofficeinteriors.com)

CONSULTING ROOMS

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 300(6)
Square Footage per Occupant:
Maximum Number of Occupants: 2
Circulation Space (as a % of total square footage): 20
Ceiling Height: 10’
Adjacent Spaces: Researcher Office
Connected Spaces: Circulation

HVAC
Desired Room Temperature (degrees F): 68
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 3

Lighting
Lighting Levels required in space (foot candles): 30-50

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: Public usage

Figure 51 (galleryhip.com)

RESEARCHER OFFICE

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 300(10)
Square Footage per Occupant: 150
Maximum Number of Occupants: 2
Circulation Space (as a % of total square footage): 20
Ceiling Height: 10’
Adjacent Spaces: Consulting Room
Connected Spaces: Circulation

HVAC
Desired Room Temperature (degrees F): 68
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 30-50

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

Figure 52 (mutni.com)

CLINICAL TRIALS ROOM

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 600(4)
Square Footage per Occupant:
Maximum Number of Occupants: 8
Circulation Space (as a % of total square footage):
Ceiling Height:
Adjacent Spaces:
Connected Spaces:

HVAC
Desired Room Temperature (degrees F): 68
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 50-50

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: Public usage

Figure 53 (saintmarys.edu)

LAB SPACE

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 2,000(2)
Square Footage per Occupant:
Maximum Number of Occupants: 20
Circulation Space (as a % of total square footage): 20
Ceiling Height: 10’-14’
Adjacent Spaces:
Connected Spaces: Researcher Office

HVAC
Desired Room Temperature (degrees F): 68
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 6

Lighting
Lighting Levels required in space (foot candles): 30-50

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

Figure 54 (Arch Partners)

PATIENT RELAXATION AREA

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 800
Square Footage per Occupant: 100
Maximum Number of Occupants: 8
Circulation Space (as a % of total square footage):40
Ceiling Height: 12’
Adjacent Spaces: Trials Room
Connected Spaces: Circulation

HVAC
Desired Room Temperature (degrees F): 66
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 5-20

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: Public usage

Figure 55 (Daily News Today)

EMPLOYEE LOUNGE

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 1000
Square Footage per Occupant: 100
Maximum Number of Occupants: 10
Circulation Space (as a % of total square footage):30
Ceiling Height: 12’
Adjacent Spaces: Offices, Lab Space
Connected Spaces: Circulation

HVAC
Desired Room Temperature (degrees F): 66
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 5-20

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

Figure 56 (strongproject)

CAFETERIA

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 2,500
Square Footage per Occupant:
Maximum Number of Occupants: 30
Circulation Space (as a % of total square footage): 30
Ceiling Height: 12’
Adjacent Spaces: Employee Lounge
Connected Spaces: Food Prep

HVAC
Desired Room Temperature (degrees F): 68
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 6

Lighting
Lighting Levels required in space (foot candles): 5-20

Acoustics
Sound Level desired in space (in dB):70
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): Yes

ADA
ADA Accommodations required: Public usage

Figure 57 (kahlerslater)

FOOD PREPARATION

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 800
Square Footage per Occupant:
Maximum Number of Occupants: 6
Circulation Space (as a % of total square footage): 20
Ceiling Height: 10’
Adjacent Spaces: Storage
Connected Spaces: Cafeteria

HVAC
Desired Room Temperature (degrees F): 68
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 15

Lighting
Lighting Levels required in space (foot candles): 10-30

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

Figure 58 (Luminns)

GENERAL STORAGE

Spatial Requirements

Total Square Footage: 800(2)
Square Footage per Occupant: 400
Maximum Number of Occupants: 2
Circulation Space (as a % of total square footage): 20
Ceiling Height: 9’
Adjacent Spaces:
Connected Spaces:

HVAC
Desired Room Temperature (degrees F): 61
Desired Room Relative Humidity (in %): 20
No: of Air Changes per hour required: 2

Lighting
Lighting Levels required in space (foot candles): 30-50

Acoustics
Sound Level desired in space (in dB):60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

MAINTENANCE

Spatial Requirements

Total Square Footage: 400
Square Footage per Occupant: 200
Maximum Number of Occupants: 2
Circulation Space (as a % of total square footage): 20
Ceiling Height: 9’
Adjacent Spaces:
Connected Spaces:

HVAC
Desired Room Temperature (degrees F): 61
Desired Room Relative Humidity (in %): 20
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 30-50

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

CONFERENCE ROOM

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 400(2)
Square Footage per Occupant: 30
Maximum Number of Occupants: 12
Circulation Space (as a % of total square footage): 30
Ceiling Height:10’
Adjacent Spaces: Researcher Offices
Connected Spaces: Lab Space

HVAC
Desired Room Temperature (degrees F): 66
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 20-40

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

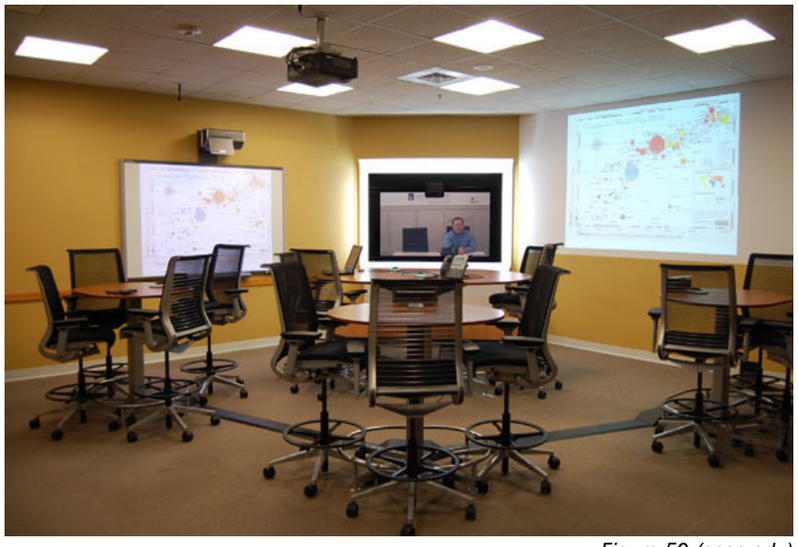


Figure 59 (case.edu)

RESTROOMS

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 500 (Men and womens)(2)
Square Footage per Occupant: 100
Maximum Number of Occupants: 5
Circulation Space (as a % of total square footage): 30
Ceiling Height: 9’
Adjacent Spaces: Reception, Offices
Connected Spaces: Lobby

HVAC
Desired Room Temperature (degrees F): 72
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 15

Lighting
Lighting Levels required in space (foot candles): 7.5-30

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: Public usage

Figure 60 (pixgood.com)

CIRCULATION

Spatial Requirements

Circulation Space (as a % of total square footage):
Ceiling Height: 10’
Adjacent Spaces:
Connected Spaces: Labs, Offices

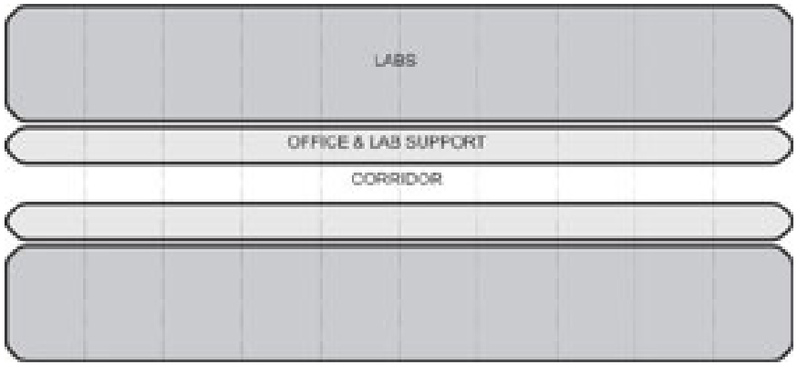
HVAC
Desired Room Temperature (degrees F): 61
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 6

Lighting
Lighting Levels required in space (foot candles): 10-40

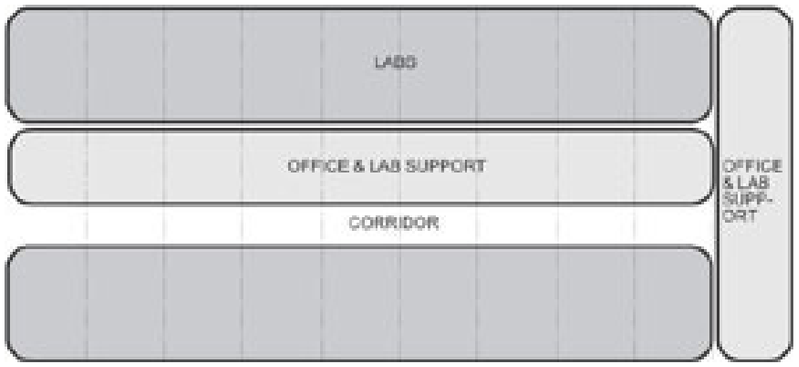
Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type:
Fire Rating of Walls (in hours): 0
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): Yes

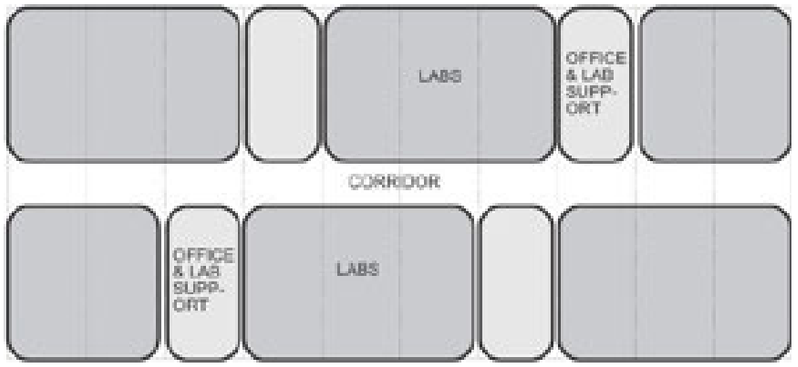
ADA
ADA Accommodations required: Public usage



Offices equally distributed among lab space with single corridor



Offices at center and end with single corridor



Clustered labs and offices with single corridor

Figure 61 (WBDG)

MECHANICAL

Spatial Requirements

Total Square Footage:
Square Footage per Occupant:
Maximum Number of Occupants: 1
Circulation Space (as a % of total square footage): 10
Ceiling Height: 9’
Adjacent Spaces:
Connected Spaces: Maintenance

HVAC
Desired Room Temperature (degrees F): 61
Desired Room Relative Humidity (in %): 20
No: of Air Changes per hour required: 2

Lighting
Lighting Levels required in space (foot candles): 10-30

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours):
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: No

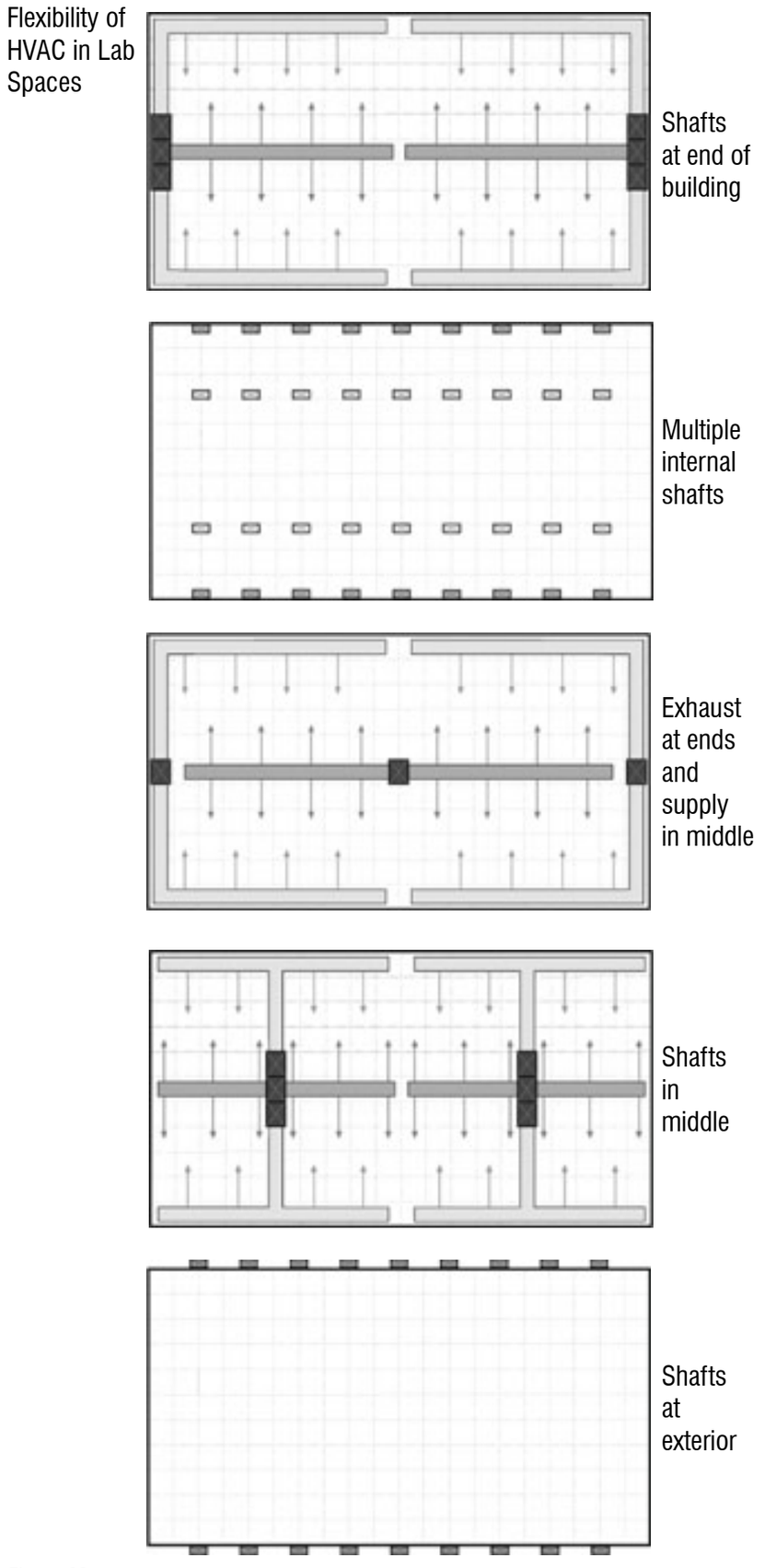


Figure 62 (WBDG)

OUTDOOR GARDEN SPACE

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 2,400
Square Footage per Occupant: 120
Maximum Number of Occupants: 20
Circulation Space (as a % of total square footage): 40
Ceiling Height:N/A
Adjacent Spaces: Offices
Connected Spaces: Employee Break, Patient Relaxation

HVAC
Desired Room Temperature (degrees F): N/A
Desired Room Relative Humidity (in %): N/A
No: of Air Changes per hour required: N/A

Lighting
Lighting Levels required in space (foot candles): N/A

Acoustics
Sound Level desired in space (in dB):70
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours):
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): N/A

ADA
ADA Accommodations required: Public usage

Figure 63 (John Offenbach)

INDOOR GARDEN SPACE

Function
Form
Economy
Time

Spatial Requirements

Total Square Footage: 800(2)
Square Footage per Occupant: 100
Maximum Number of Occupants: 8
Circulation Space (as a % of total square footage): 40
Ceiling Height: 12’
Adjacent Spaces: Trials Room
Connected Spaces: Patient Relaxation

HVAC
Desired Room Temperature (degrees F): 66
Desired Room Relative Humidity (in %): 30-40
No: of Air Changes per hour required: 4

Lighting
Lighting Levels required in space (foot candles): 5-20

Acoustics
Sound Level desired in space (in dB): 60
Reverberation Time required for space (in seconds):

Fire Safety
Occupancy Type: B
Fire Rating of Walls (in hours):
Fire Rating of Doors (in hours):
Exterior Egress required (yes or no): No

ADA
ADA Accommodations required: Public usage

Figure 64 (Juliana Freitas)

SITE ANALYSIS

SITE NARRATIVE

This particular site is of interest to me because of the proximity to the Red River and downtown area. The river as a natural landscape feature can be empathized as a key component of the facility. The existing buildings also give an opportunity for adaptive reuse and have historic value that can be preserved. The site is in the vicinity of a major transportation link and Sanford Clinic which the project will have ties to.

The site is currently occupied by Mid-America Steel Company. The complex was first started in 1905 and was known as Fargo Foundry Company. The first building on the site was used as a manufacture and repair shop for farming equipment. Some of the products the foundry manufactured included a press for flax, irrigation sprinklers, and sprayers for crops(NDSU Archives). Around 1970, the foundry began to change into a steel fabrication company and changed it's name to Mid America Steel. The original facility was 11,000 square feet and now operates as a 11 acre complex (Simonson).

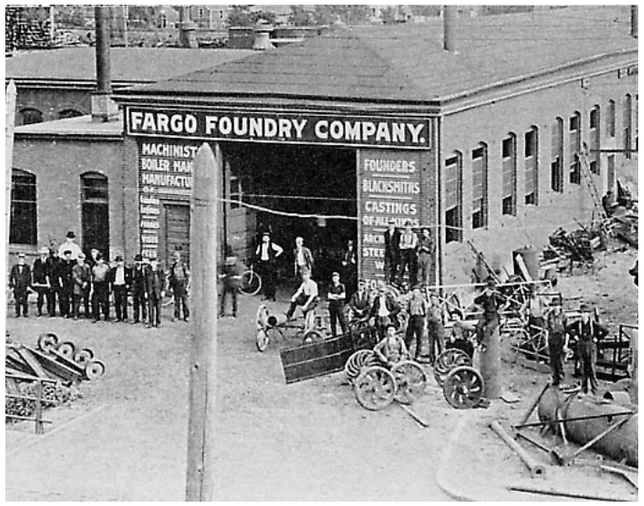


Figure 65 (http://library.ndsu.edu)

Planning officials for the city of Fargo have targeted the industrial block containing Mid America Steel as a potential site for expanding the renaissance zone. A majority of buildings in the district are commercial which makes the industrial complex seem out of place. A recent article in Prairie Business magazine stated the owners of Mid America Steel would be willing to move their complex if the move would be paid for.

Figure 66 South view of site (Author)

Issues of this site include a feel of separation from downtown Fargo because of its previous use as an industrial site. The railroad also runs near the site which will create a noise issue. The proximity to the Red River will be of concern as the flood level will push construction further inland. Another challenge will be connection to the site with a border of the river and a busy street.

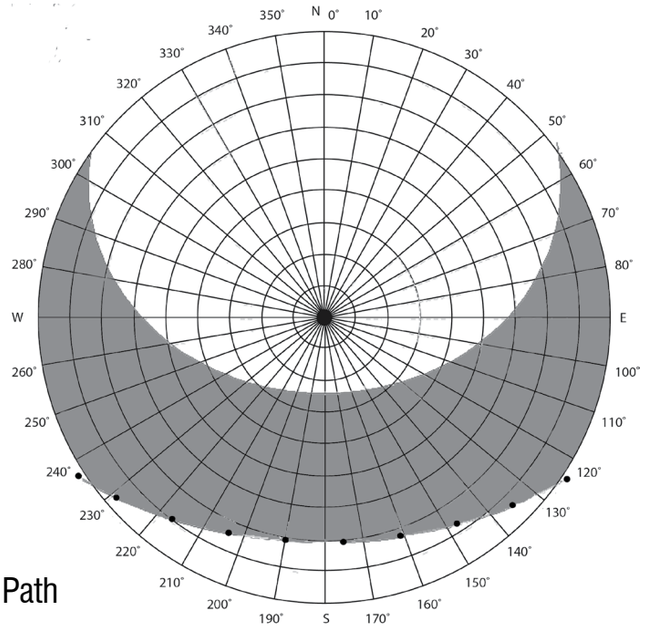
BUILT FEATURES

The buildings on this site consist of steel framed and masonry construction. The current office building is the oldest building which was built in 1905. Other steel building uses consist of steel assembly, miscellaneous shops, and storage. The steel framed buildings are built for functional purpose only. The office building has potential for adaptive re-use.

Figure 67 Storage Building, (Author)

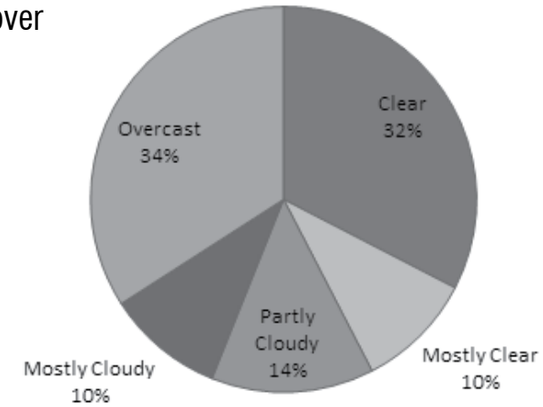
Figure 68 Structural Shop, (Author)

LIGHT



Sun Path

Cloud Cover



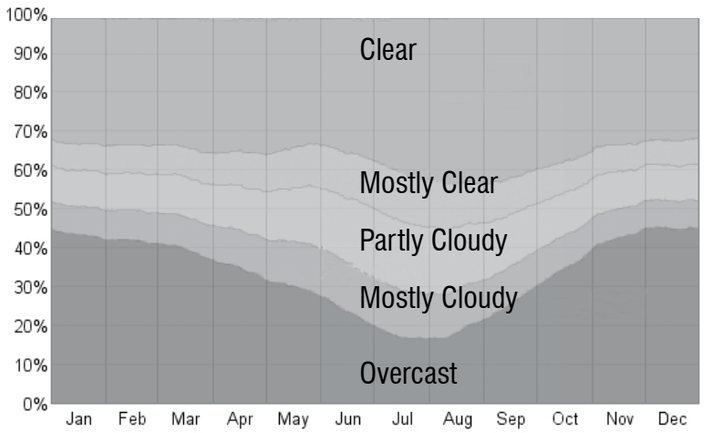


Figure 69, Sun and cloud diagrams

VEGETATION

The majority of the vegetation occurs in clusters near the river edge. These deciduous trees are a result of proximity to the water. The row of trees along the northern edge of the site creates a noise and visual barrier to the site. This is important in its current use as a majority of the site is used for steel storage. There are only a few coniferous trees located south of the railroad track. The trees along the rivers edge are mature, reaching approximate heights of 80 feet. The site is mainly gravel with pockets of natural grass around steel storage areas.

Figure 70 South view into site (Author)

Inventory

Ash- The majority tree type, along eastern edge of site, create buffer between river and site.

Poplar- Along northern edge of site, buffer NP Ave and site. Planted for visual buffer to site.

Evergreen- Five located south of tracks near the SE corner of site, approximately 50' tall.

Natural Grass- Found minimally throughout the site.

Patterns- Change in color and loss of leaves annually

Color Range- Dark to light green, variations of orange and red

Figure 71 Aerial (GoogleMaps)

HUMAN CHARACTERISTICS

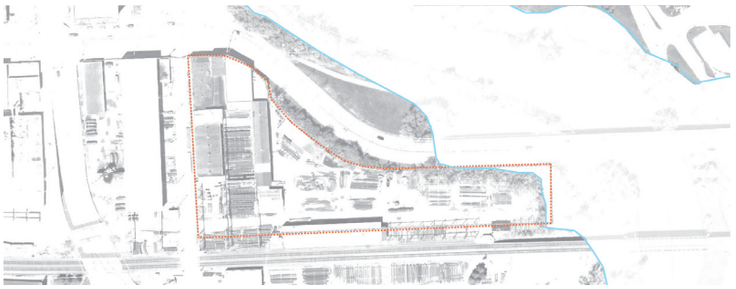
The current use of the site is industrial manufacturing. This includes fabrication of structural steel and other metal fabrications. There are five major buildings dedicated to specific functions of the company. Activity involving the transport of these materials occurs through the use of the nearby railroad. The northern edge of the site has administrative offices used for managing the company. The entire site has been influenced by human use. It is crowded with different types of steel. Pavement occurs along the railroad track and west edge of

Figure 72
Activity on site
(Author)

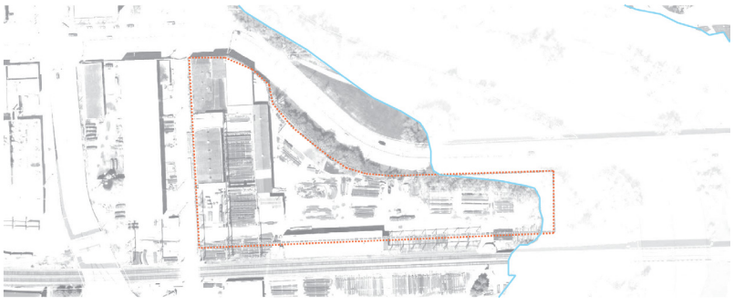
WATER

The Red River dividing Fargo and Moorhead creates a unique challenge to the design of this project. The possibility of flooding reduces the area for possible building locations without the use of unique solutions. The solution to this issue will be to embrace the natural possibility of flooding instead of go to great length in diverting flood water and changing the site's character.

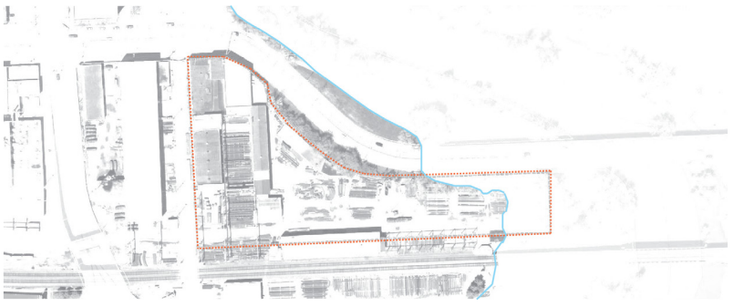
Flood Levels



25 FT



30 FT



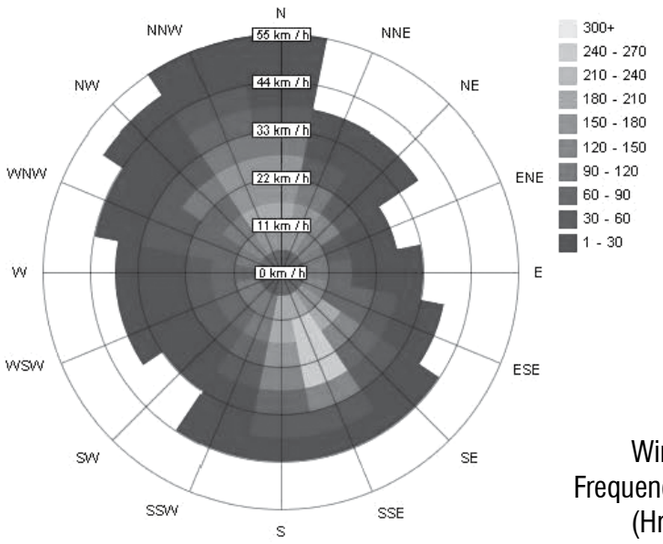
35 FT

40 FT

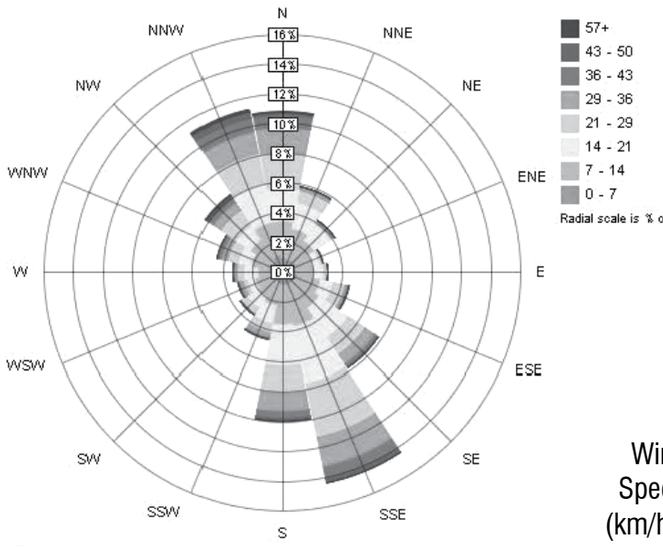
Figure 73 (Source: City of Fargo, Interactive Flood Stage Map)

WIND

The current layout of the site includes buildings along the northwest edge which help to block the winter winds. Winter wind is undesirable as it create an even colder feeling. Summer winds are mainly concentrated from the southeast and are desirable as they create a cooling effect in hot temperatures. The best technique to control wind is by creating a barrier against winter winds. In the summer, outdoor spaces should orient to take advantage of southeast breezes.

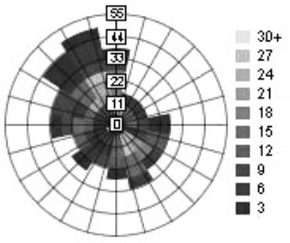


Wind Frequency (Hrs)

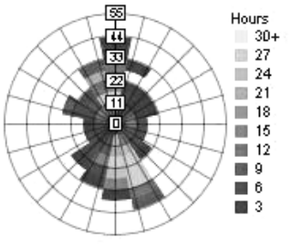


Wind Speed (km/hr)

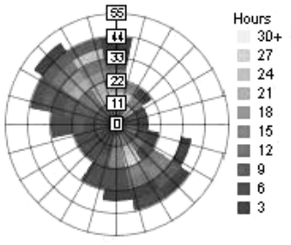
Figure 74 Wind diagrams



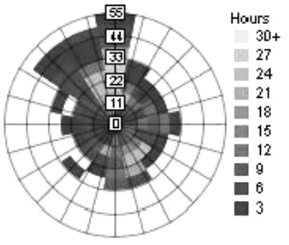
January



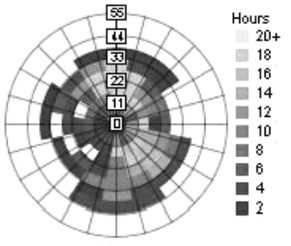
February



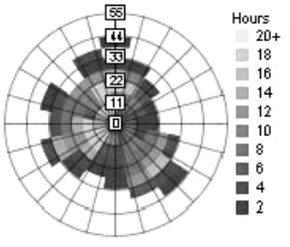
March



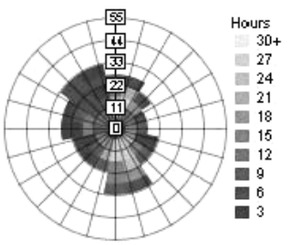
April



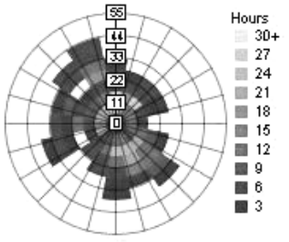
May



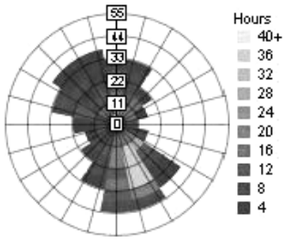
June



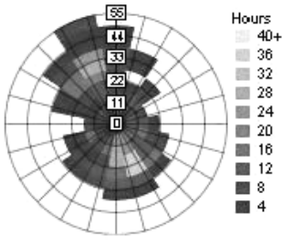
July



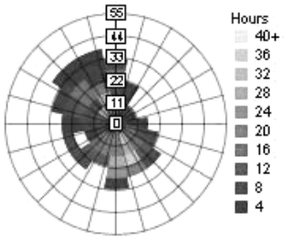
August



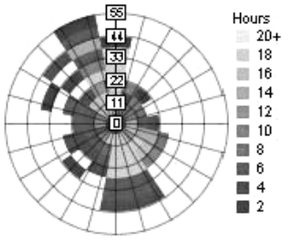
September



October



November



December

Figure 74
Wind diagrams

SOILS

Soil Name: Aquerts, clayey

	USDA Texture	Liquid Limit(%)	Plasticity Index
0-8 in	Silty clay loam, silty clay	54-86	27-40
8-21 in	Silty clay, clay	54-82	29-44
21-41 in	Silty clay, clay	51-82	29-44
41-60 in	Clay loam, silty clay, clay	40-78	20-44

Figure 75 Soils

DISTRESS

The current facility has outgrown the site as much of the materials are packed together. The current site is 12 acres. During a site walkthrough, one of the employees suggested a future site be at least 30 acres. This compressed area is not suitable for the current functions. The site is gravel which makes for muddy conditions. Storage of steel materials in the open can cause rust and deterioration, affecting the soil around them.

Figure 76 (Author)

WATER TABLE

The annual minimum soil depth to water table in the Fargo region is 0-25cm from the surface.

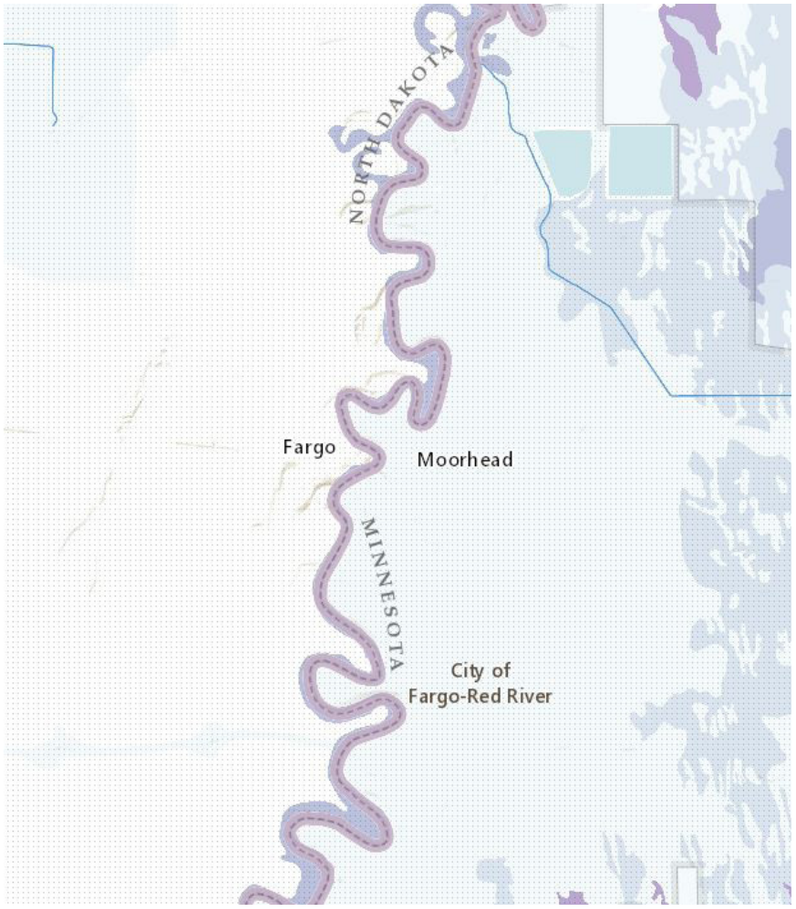


Figure 77 (USGS Maps)

UTILITIES

Sewer, water, and gas lines below NP Ave center line. Tie in location suggested by civil engineer once building location is determined. Manhole located within site along centerline of service street(seen in site photos). Fire hydrant also located along service street.

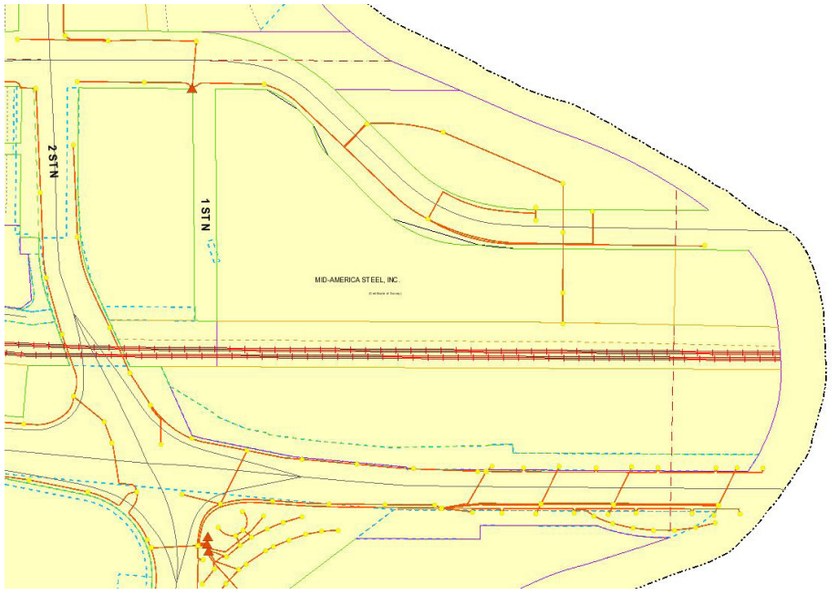


Figure 78, Fargo GIS Map, (CityofFargo.com)

SITE CHARACTER

The fact that the use of the site remains involved in steel is a testament of progress and importance as a building material. This site has been consistently used from as early as 1905 to present day. Its location along the railroad is crucial in its operation. The historic masonry buildings give it character in showing its long history and purpose. The building along the north edge of the site provides details of its use with the words “STRUCTURAL SHOP” embedded into the masonry wall as well as the dates “1905” and 1935.”

Figure 79 (Author)

TRAFFIC PATTERNS

One of the major design considerations for this site includes a nearby railroad that runs along the south side of the site. A private access street runs along the west border of the site which is used by employees of Mid-America Steel.

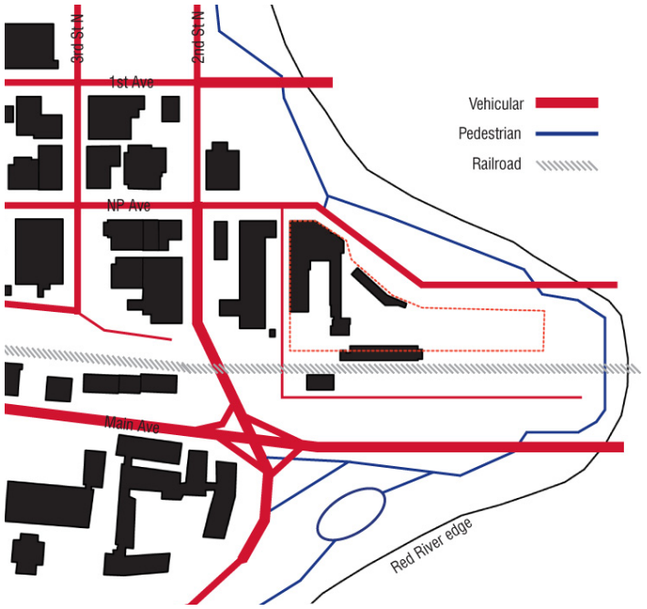


Figure 80

Main Ave and 2nd street are both major vehicle paths while NP Ave is less condensed. The bike path that runs along the Red River gives opportunities to connect with an existing pedestrian path.

TOPOGRAPHY

The site drains toward the Red River as this is where its greatest change in slope occurs. The area around the buildings has been graded to allow construction and there placement is a product of flooding. Parking is a relatively flat surface. The slope of the entire buildable site is between five and ten percent. The unpaved surface requires greater slope to avoid pooling of water and continual drainage. The only paved surfaces occur along the railroad track along the service street west of the site. Steeper slope occurs along sides of railroad track.

Figure 81

VISUAL FORM

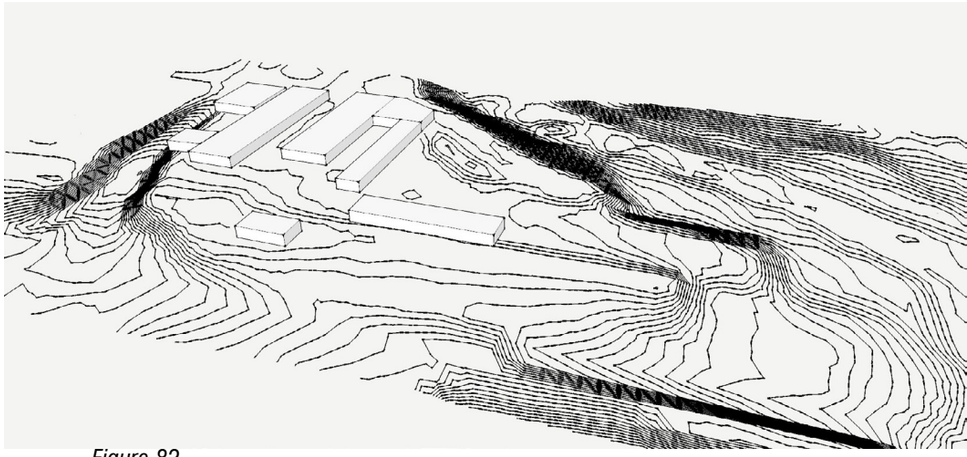


Figure 82

The terrain of the site can be seen from the Main Ave bridge. The river banks create a slope toward the water. This slope is very gradual compared to most areas around the river. The site seems like a plateau as most areas around it slope downward. The overall complex is flanked by a wall allowing vehicle traffic to pass under the bridge.

VIEWS INTO SITE

North Views from Street

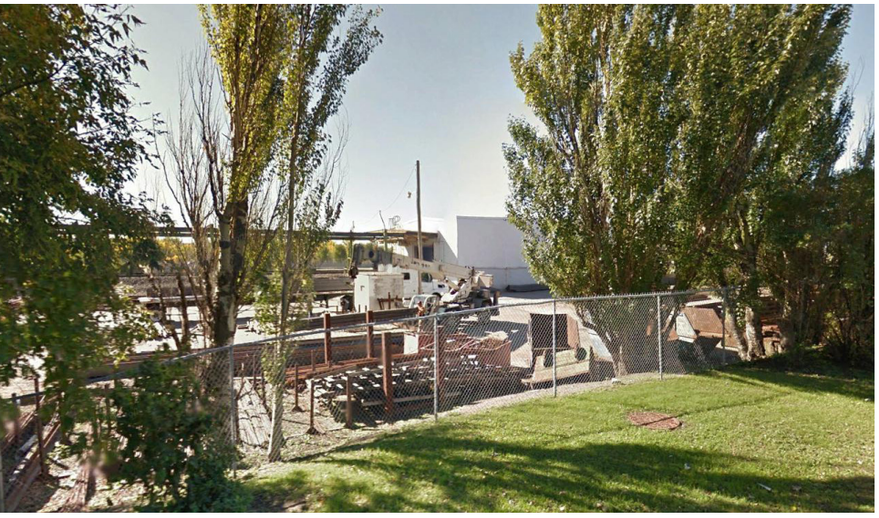
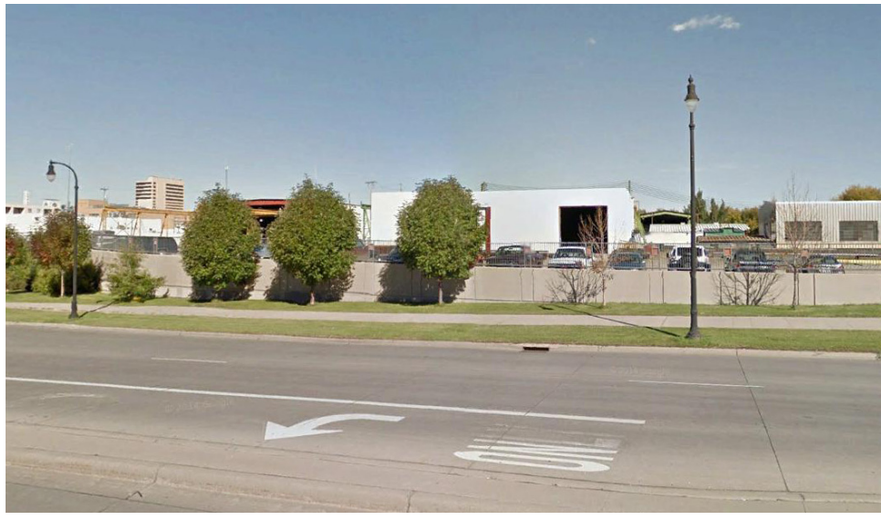


Figure 83 North Views (GoogleMaps)

South Views from Street



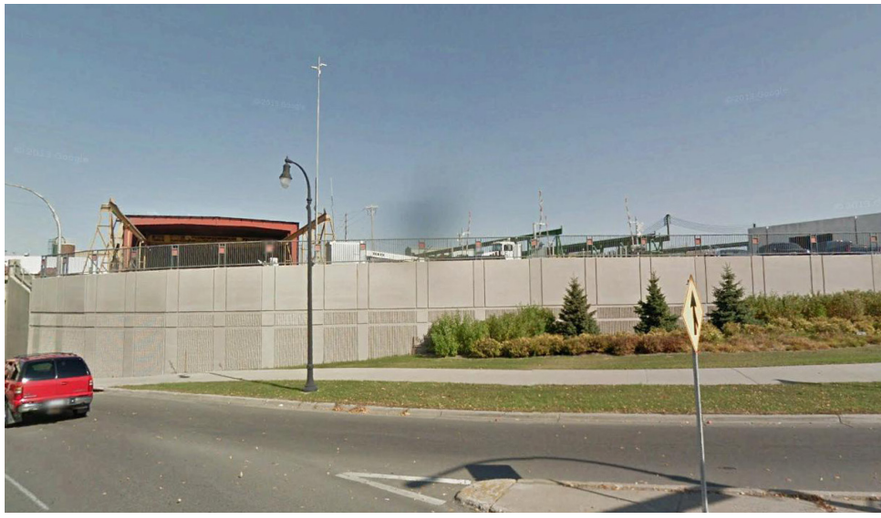


Figure 84 South Views (GoogleMaps)

MAPS

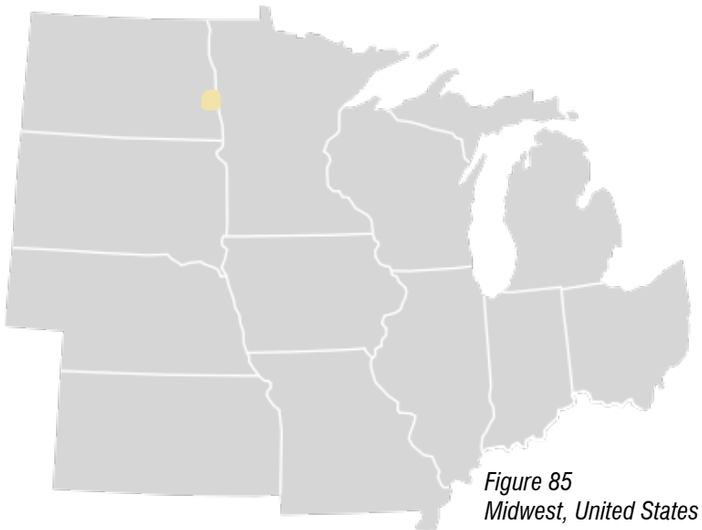


Figure 85
Midwest, United States

SITE INFORMATION
Views- Red River, downtown Fargo
Landmarks- Hjomkost Center
Gross Area - 13 Acres
City Bus Terminal - One block west
Location - NP Ave. and 2nd St. N

Figure 86
Downtown Aerial (Bing Maps)

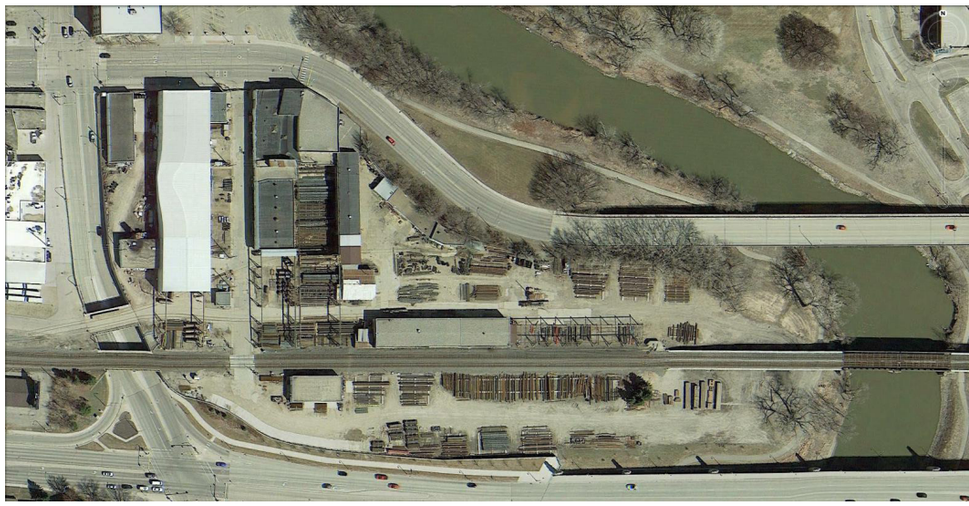


Figure 87
Mid America Steel Site (Google Maps)

Figure 88
Site Aerial (Bing Maps)

PHOTOGRID

Figure 89

Photos were taken at each intersection along the grid(shown as blue dot). Each picture was taken in all four cardinal directions.

POINT A

NORTH

EAST

SOUTH

WEST

Figure 90

POINT B

NORTH

EAST

SOUTH

WEST

Figure 91

POINT C

NORTH

EAST

SOUTH

Figure 92

WEST

POINT D

NORTH

EAST

Figure 93

SIMILAR TO VANTAGE POINT C

SOUTH

SIMILAR TO VANTAGE POINT E

WEST

POINT E

NORTH

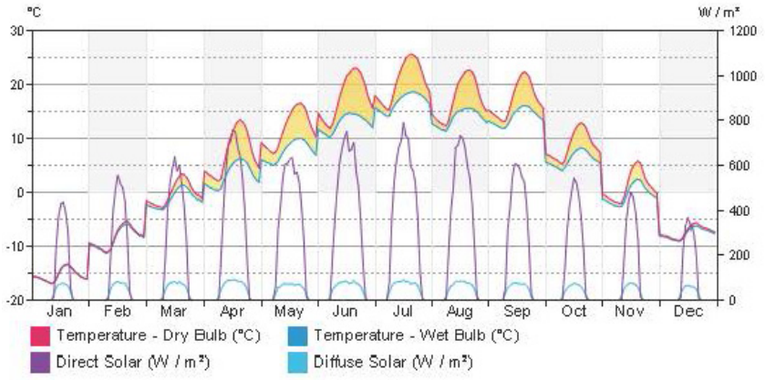
EAST

SOUTH

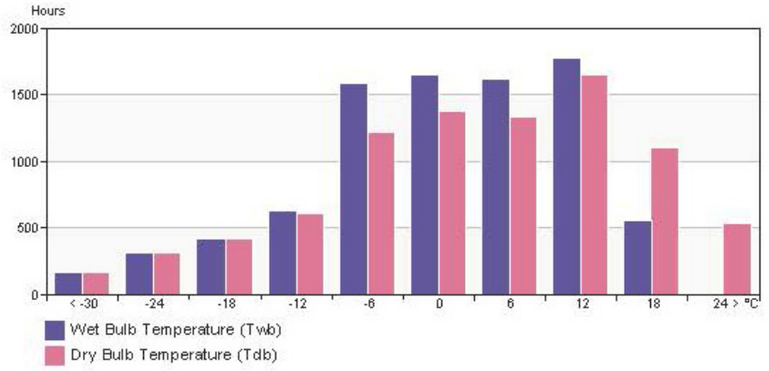
Figure 94

WEST

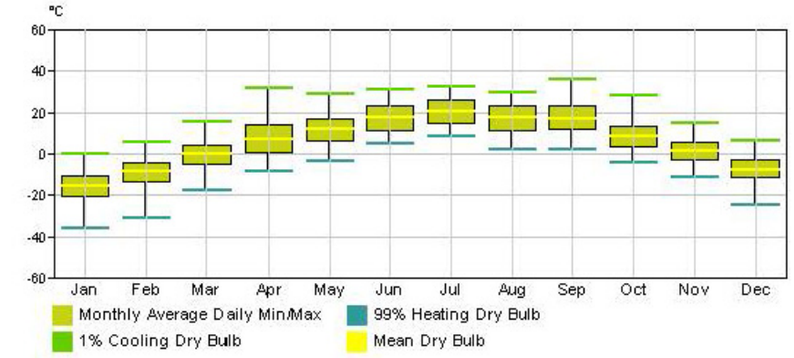
CLIMATE DATA



Diurnal Weather Average

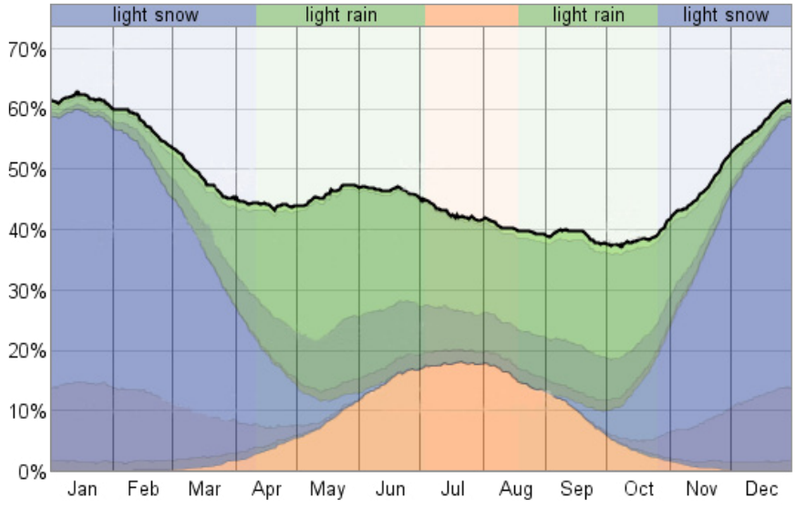


Temperature Bins

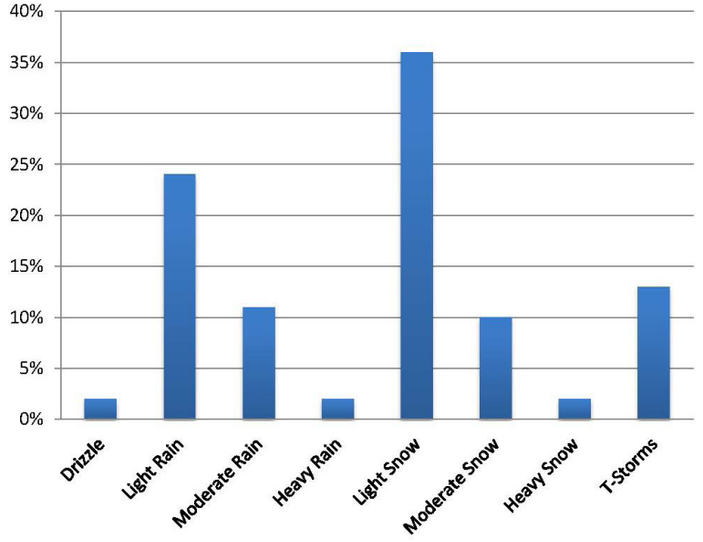


Temperature Design Data

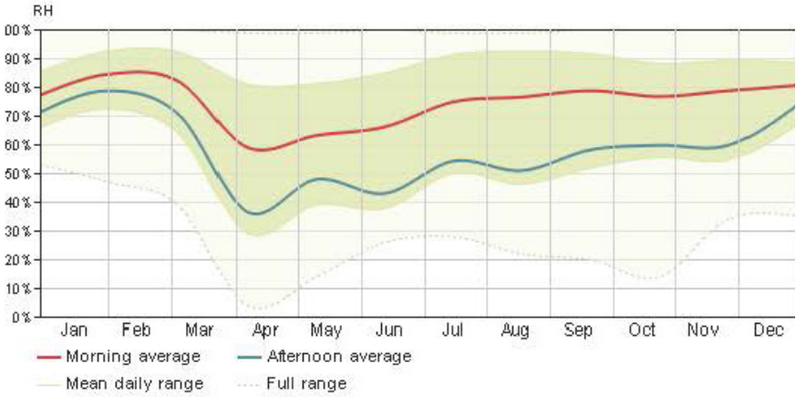
Figure 95



Annual Precipitation



Annual Precipitation Types



Annual Humidity

Figure 96

PROJECT EMPHASIS

The emphasis on this project will be the conscious design decisions that are made to affect the users and employees at a neurological level. Most of these decisions will occur in the design of the elements these users will interact with the most. Most of these elements will be within the interior of the spaces as certain elements will create different perception in individuals. Detailing of elements people will come into contact with include stair railings and furniture. The material choice of these elements can have a large role in the perception of the space. Wood is a material that has a sense of warmth while steel is seen as cold. This type of perception has to do with the way these materials are produced. This can be from the reason that trees are from natural origins while steel is manufactured at a more refined level. This type of interaction will be explored at a deeper level to better understand why a user will experience a space in a certain way.

Areas of interest and emphasis:

1. Developing a sense of neurological based design will be a priority to understanding and implementing design strategies.

2. I will look to examine the methods used to treat certain types of mental disorders as part of the needs of the typology.

3. Historic preservation of the existing buildings will be an area of interest as well as emphasizing the site's positive features.

4. Creating a context sensitive building will be of interest as this is important in creating a building of community importance.

PROJECT JUSTIFICATION

Personal

This project is important to me because I see an understanding of neurology in the field of design becoming more prevalent in the future. There is irrefutable evidence that our environment plays a role in our lives at a psychological level. I am a strong proponent of user based design in seeking how the design will impact a user. The way we design these environments should be based on the potential influences they will have on those experiencing them. I have always had an interest in psychology, especially understanding why people do the things they do. Neuroscience is able to provide biological reasons for human behavior, beyond observational studies. With the advances in neuroscience, I see this as an important foundation to evidence based design.

Society

The particular design typology of a neuroscience research center is important to society as mental disorders affect a large amount of the population. Those affected by these disorders can find comfort in knowing others suffer from the same issues and there is currently help in finding the cause of the issues. This facility will serve as a resource in advancing an understanding of mental disorders as well as a place to help those currently affected by them.

Applicability as Thesis

In undertaking this design project, I will show possession and ability to create a holistic design. As a student nearing completion of a Master's Degree in Architecture, I will want to show comfort in multiple design stages. These stages will include everything from predesign to fully realized design elements of the project.

The design of a health facility will be challenging in types of users. The typology will be concerned with both public users and employees of the facility. This choice is important as user various user interaction will be important in exploring design elements. An employee of the facility will have a unique view in using the building while a patient may be a first time user.

The choice of site is also important to challenging and showing problem solving abilities that designers must use. The Mid-America Steel site provides unique challenges in past usage, flood risk, and nearby railroad traffic. These challenges will have unique solutions that other sites may not. Past usage shows the ability to choose preservation as a important factor as well as site remediation.

PROJECT GOALS

The physical goals of my project include designing a welcoming center for those affected by mental disorders. The center will promote the importance of research within the field of Neuroscience. In 2011, the European Psychiatric Association stated “There is considerable evidence that various psychiatric conditions can be prevented through the implementation of effective evidence-based interventions.”

This research center will include the resources to intervene with those affected by different mental disorders. In a study by the National Institute of Mental Health, researchers found that “mental disorders are common throughout the United States, affecting tens of millions of people each year, and that overall, only about half of those affected receive treatment.”

It is my goal to provide a facility that is able to improve the mental health of those affected by mental disorders within the community. Beyond the goal of the center’s operations, I will provide an urban in-fill project to downtown Fargo. This will enhance the area and promote the importance of urban in-fill and renovation in the field of Architecture.

The goals of my theoretical research include studying and understanding five areas created by the Academy of Neuroscience for Architecture. These goals are listed as an understanding of the following brain systems:

- “Sensation and Perception(how do we see, hear, smell, taste, etc.?)
- Learning and Memory(how do we store and recall our sensory experiences?)
- Decision making (how do we evaluate the potential consequences of our actions?)
- Emotion and affect (how do we become fearful or excited? Or what makes us feel happy or sad?)
- Movement (how do we interact with our environment and navigate through it?)”

(Eberhard, Applying Neuroscience to Architecture)

Understanding these core concepts will help in developing a project that will influence the future user’s perceptions.

Social

The social goals of this project are to improve the public’s perception on the chosen site and also increase their awareness of treatments for mental disorders. By designing a facility for an urban in-fill site, the perception of the site will become more positive.

Academic

The academic goals for this project are fulfilling the holistic design of an architectural thesis. After completing this project I will have completed the requirements of the program and will acquire a masters degree. This will be one step closer to becoming a licensed professional.

Professional

The professional goal is to become more experienced working on a project that covers a wide range of duties an architect may experience in the professional world. The more experience I gain, the easier it will be when encountering similar issues in my future career.

Personal

My personal goal for this thesis is to become more familiar with how two of my favorite fields of study can influence each other. Psychology has always been a subject I am interested in and through this project I will be able to explore it further while becoming more familiar with architectural design.

PLAN FOR PROCEEDING

Research Direction

The following five areas will be of focus during the majority of the research phase.

1. Unifying Idea- I will continue to find reputable resources that have explored the relationships between neuroscience and the design of architecture. These resources will give evidence to the future design decisions I will need to make.

2. Typology- The case study research will play the largest role in design decision relating to the specific typology. Additional resources have been found with needs of research facilities.

3. Historical context- This research will be conducted during the site and context phase. Resources from the NDSU depository will be valuable in researching the history of the site.

4. Site Analysis- Site climate data will be collected that will inform design decisions through online sources such as NOAA. The USGS website will help with determining soil capacities of the site.

5. Programmatic Requirements- Case studies and information on research facilities will be useful in examining the program requirements.

Design Methodology

The approach I will take will be a Mixed Method, Quantitative/Qualitative method. This method will more specifically be the Concurrent Transformative Strategy.

The steps to this strategy are:

a.The strategy will be guided by the theoretical premise/unifying
idea.
b. Implementation:
i. Both quantitative and qualitative data will be gathered
concurrently.
c. Priority will be assigned by the requirements of the theoretical
premise/unifying idea.
d. Integration of the data will occur at several stages in the process
of the research and will depend on the requirements of the
examination of the theoretical premise.
e. Analyzing, interpreting, and reporting of results will occur
throughout the research process.
f. It will be presented in both text and graphics.

Process Documentation Goal

The methods I will use to document early process information will be through sketchbooks and sketch pads. All physical information will be scanned to digital storage. This process will take place once the use of digital modeling becomes more of a priority.

Types of process media include:

- Sketches
- Diagrams
- Narrative Writing
- Photos
- Physical and digital modeling

Once complete the process will be shared through the NDSU digital archives. Allowing future students access to the media.

WORK SCHEDULE

ID	Task Name	Duration	Start	Finish
1	Project Documentation	89 days	Tue 1/13/15	Fri 5/15/15
2	Context Analysis	8 days	Tue 1/13/15	Thu 1/22/15
3	Spatial Mapping	10 days	Thu 1/22/15	Wed 2/4/15
4	Passive System Development	6 days	Wed 1/28/15	Wed 2/4/15
5	Active System Development	6 days	Wed 1/28/15	Wed 2/4/15
6	Structural Concept	8 days	Thu 2/5/15	Mon 2/16/15
7	Floor Plan Development	10 days	Mon 2/9/15	Fri 2/20/15
8	Envelope Development	12 days	Mon 2/16/15	Tue 3/3/15
9	Material Developmet	10 days	Tue 2/24/15	Mon 3/9/15
10	Midterm Review	5 days	Mon 3/9/15	Fri 3/13/15
11	Review Revisions	10 days	Fri 3/13/15	Thu 3/26/15
12	Renderings	20 days	Thu 3/26/15	Wed 4/22/15
13	Energy Analysis	10 days	Fri 4/3/15	Thu 4/16/15
14	Presentation Layout	10 days	Thu 4/16/15	Wed 4/29/15
15	Plotting boards	1 day	Mon 4/20/15	Mon 4/20/15
16	Build Physical Model	10 days	Mon 4/13/15	Fri 4/24/15
17	Final Digital Form Due	1 day	Thu 4/23/15	Thu 4/23/15
18	Install Exhibit	1 day	Mon 4/27/15	Mon 4/27/15
19	Final Thesis Reviews	6 days	Thu 4/30/15	Thu 5/7/15
20	Final Documenation Due to Instructor	1 day	Mon 5/11/15	Mon 5/11/15
21	Thesis Documentation Due	1 day	Sat 5/16/15	Sat 5/16/15

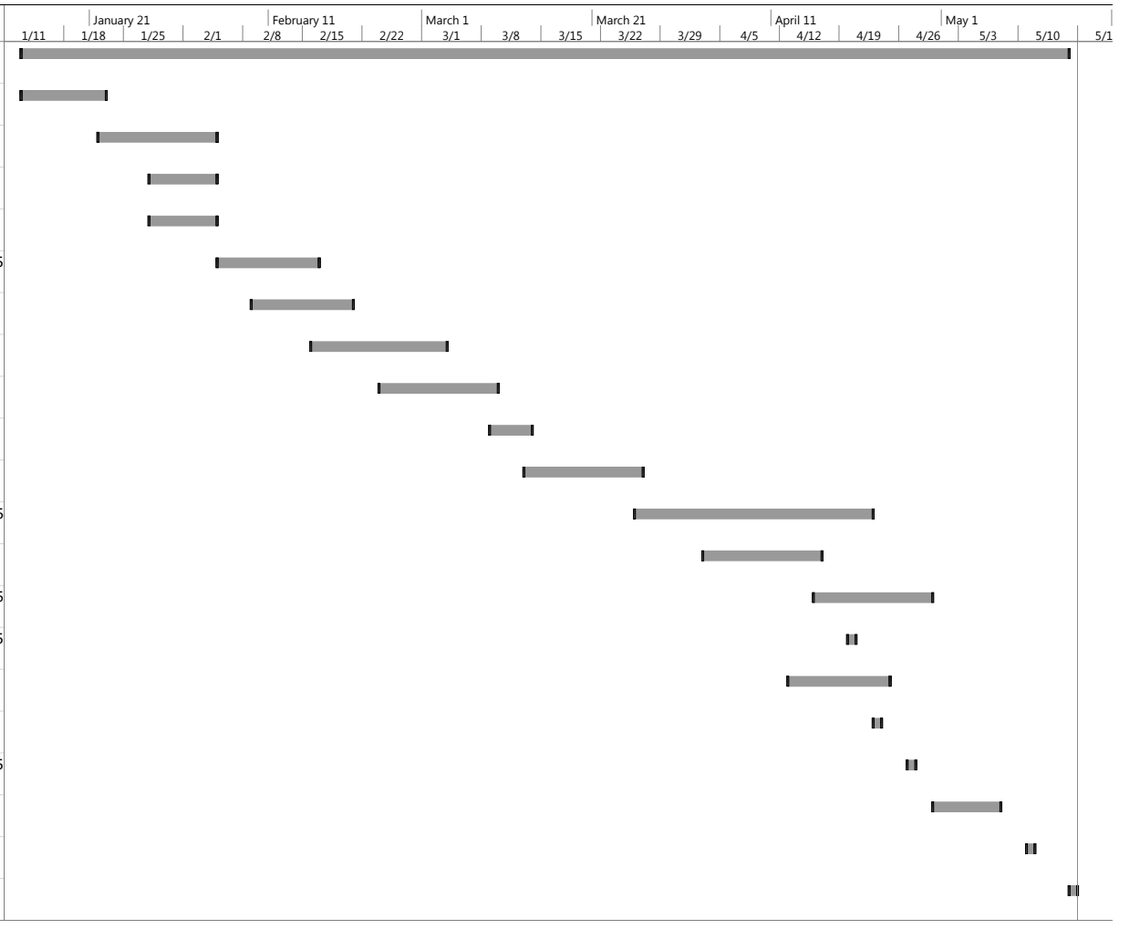


Figure 97

PROCESS DOCUMENTATION

DECISION MAKING PROCESS

WEEK 1-2

The process throughout the design phase involved a weekly schedule beginning with spatial ideation. This two week process included hand sketching and Sketchup modeling of spaces found in the program. These spaces began with organization based on an adjacency matrix with further adjustments based on special needs for the space. These needs included interior conditions outlined in the program as well as ideas that would meet ideas of the theoretical premise such as views to nature, natural daylighting, collaboration, and way-finidng. The need for collaboration in the facility called for the addition of an auditorium space. This would allow for speakers to share information with researchers as well as opportunities to educate community members on mental health issues.

WEEK 3

Once the spatial organization was developed, week three began the influence of the site. Spaces were oriented along NP ave. with a long axis along the east of the site to take advantage of office views toward the Red River. The existing building was also taken into account to re-use its masonry facade and influence further decisions. Spaces were shifted to create a micro climate courtyard facing south, using the building as protection from cold Northwest winds. Other considerations were reviewed such as parking requirments, setbacks, and zoning.

WEEK 4

The schematic design phase began in week four and included a presentation to the studio section. Progress of the weeks prior were presented using diagrams, plans, and isometric drawings. A Revit model was created during the initial weeks of design as the best way to convey construction drawings such as plans and elevations. Another reason for designing a Revit model was for future design renderings with the ability to use the Cloud. Ordering principles were also expored to help tie building elements together.

WEEK 5-9

In week five, design development began. Using both Sketchup and Revit for the same thing became an un-necessary step and Sketchup was chosen to further the design modeling of the project. The Sketchup model was further along at this stage and Maxwell Render became the option for creating final renderings. The design development stage continued throughout until week nine. During this four week process, the Sketchup model was further developed and detailed. The goal of this detailing was to create a model that could be used for all final drawings and images. With a detailed model, more complicated types of drawings could be created. These types of drawings can be used to convey more information than conventional plans and sections. Also, these drawings would then have the option of being rendered through Maxwell. A mid-term presentation was created in week nine with all ideas up to that point.

WEEK 10-11

The following two weeks were used as time to adjust anything that came up during mid-term critiques. Some of the adjustments included detailing of existing building character and site detailing. I also began the process of cleaning up the Sketchup model of any extra lines and surfaces.

WEEK 12-15

The next four weeks were used as time to create scenes within the sketchup model that would be used in the final presentation. These included plans, section-perspectives, elevations, and renderings. Separate model files were created to focus on each plan and section rendering. This made it easier to control lighting above the section cut in the model and also work around a software issue in Maxwell Render. Furniture and other elements were added from Sketchup's 3D Warehouse to create a more detailed isometric plan. After the model was fully detailed, materials were chosen from the Maxwell database and added to element surfaces within the model.

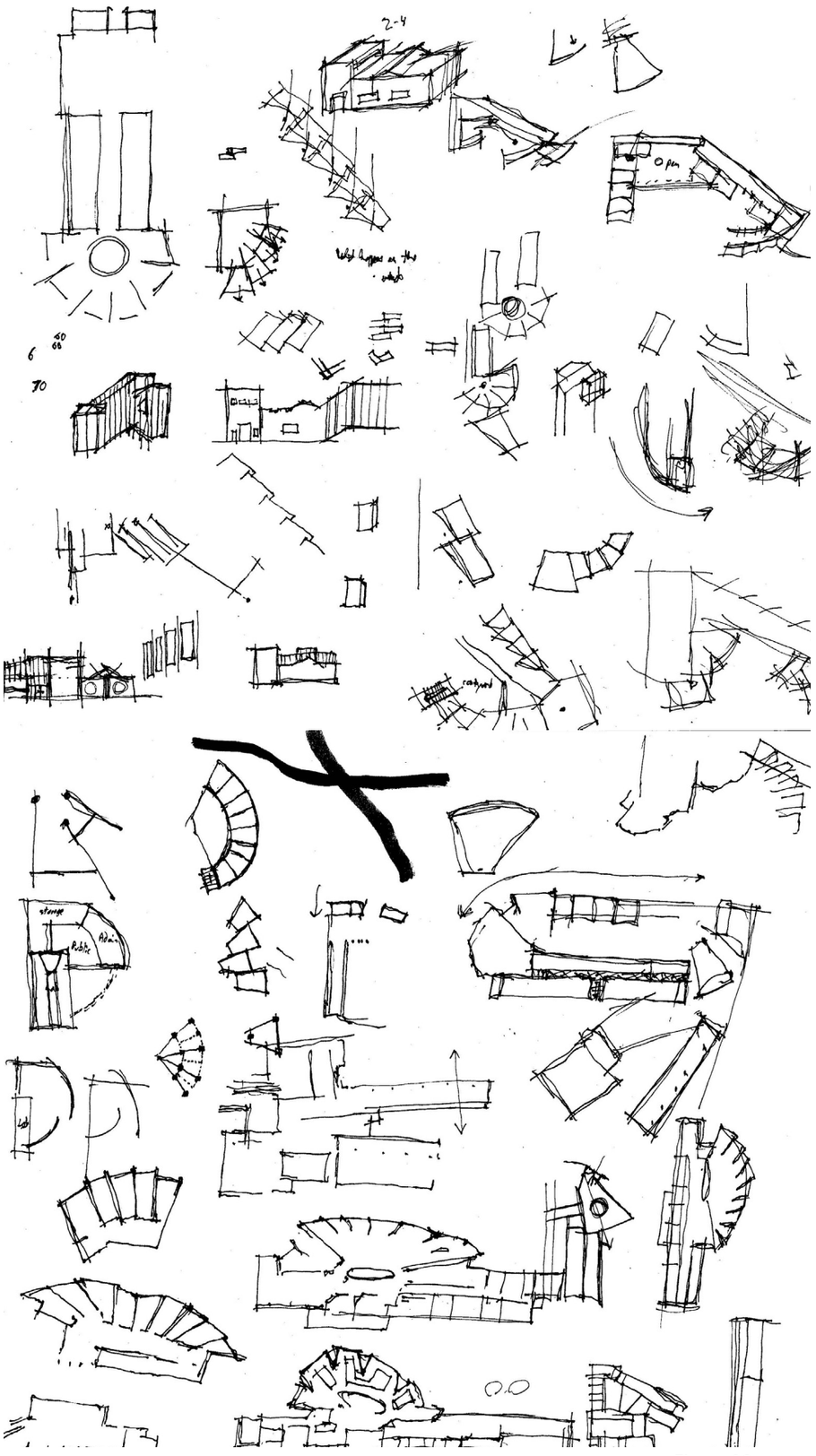
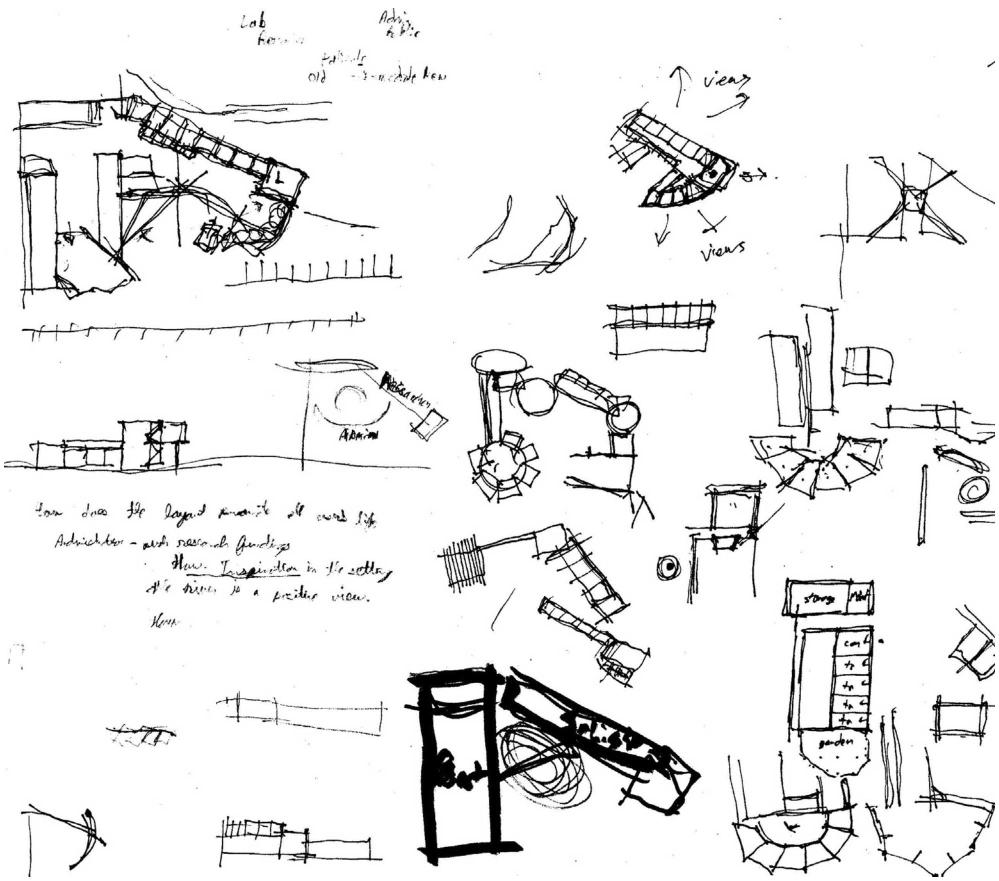
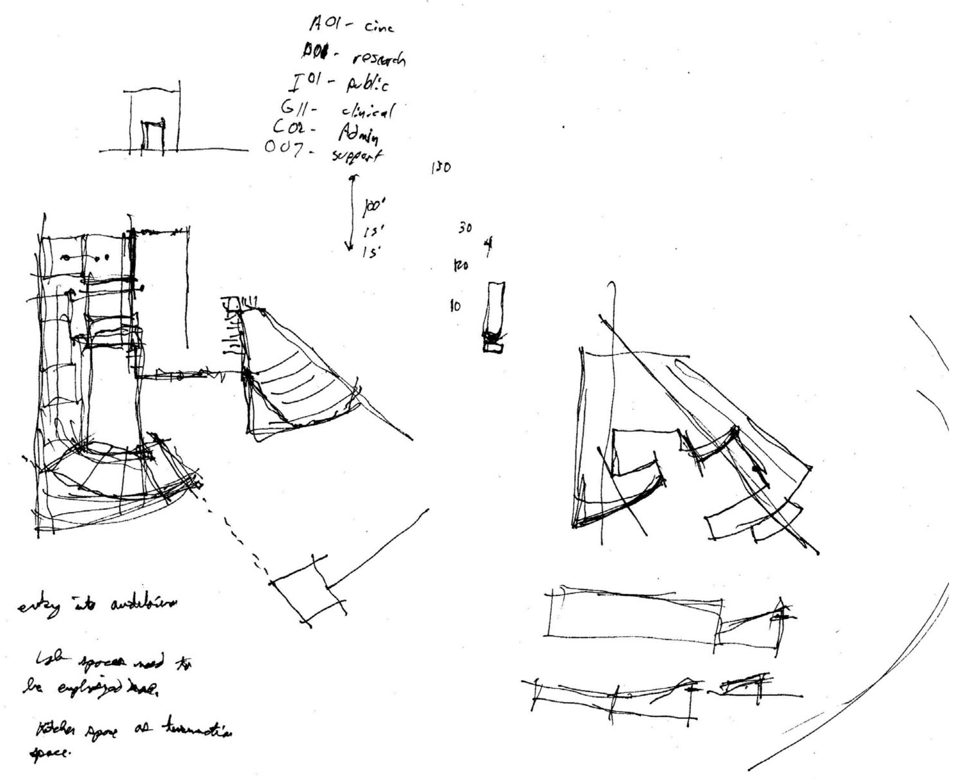
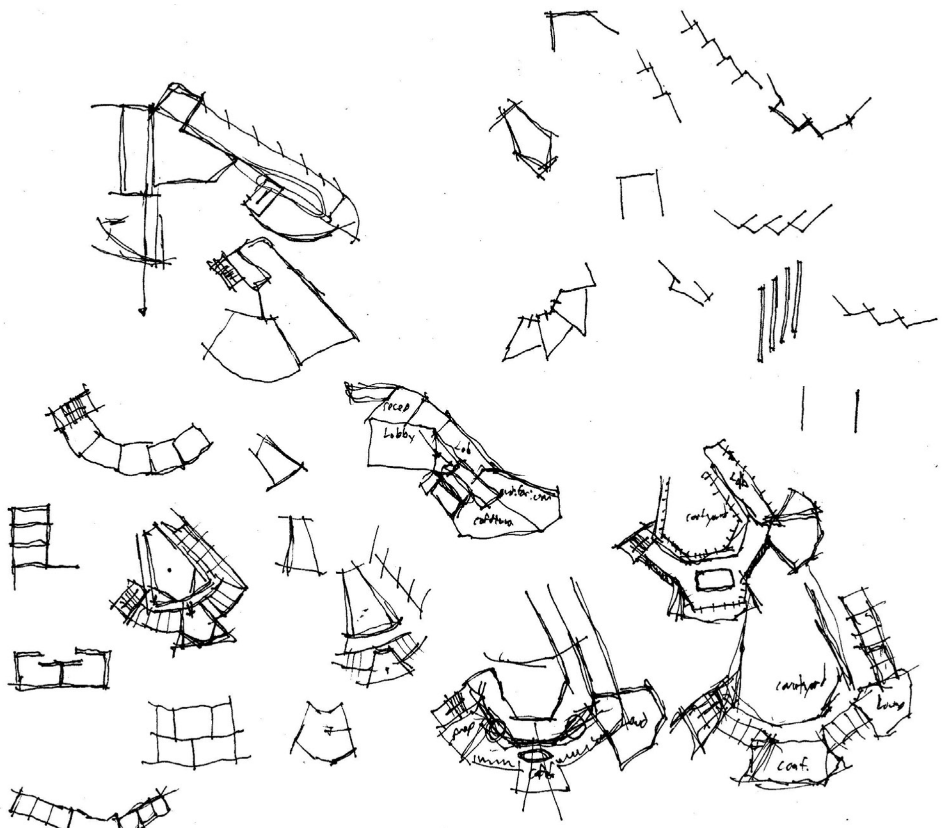


Figure 98

Alvar Aalto Influence
Axis for way-finding and daylight penetration
Create rhythm along NP Ave. facade
Protect courtyard from NW winds
Hierarchy with main entry addition
Views for each office
Maintain historical masonry character
Endpoints of axis grounded with masonry
Corridor views into courtyard


views
views
garden


A01 - cine
I01 - public
G11 - clinical
C02 - Admin
007 - support
entry into auditorium
Lab spaces need to be emphasized.
Kitchen space as transition space.


Lobby
courtyard
conf.

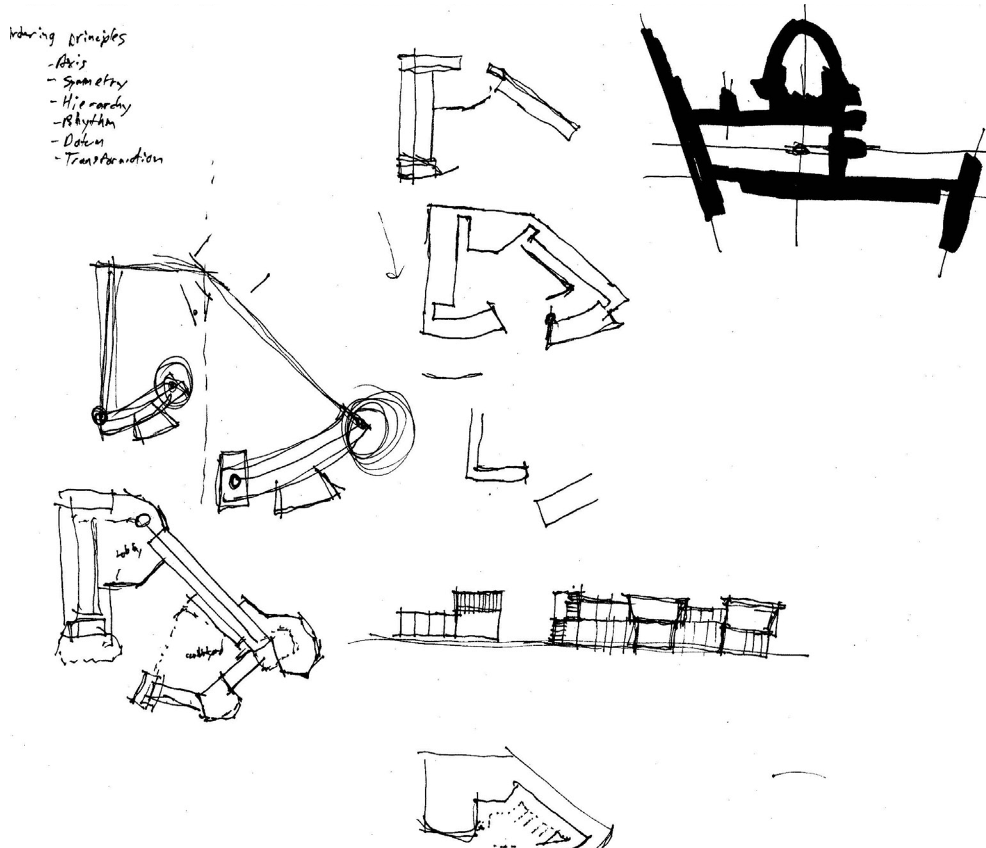
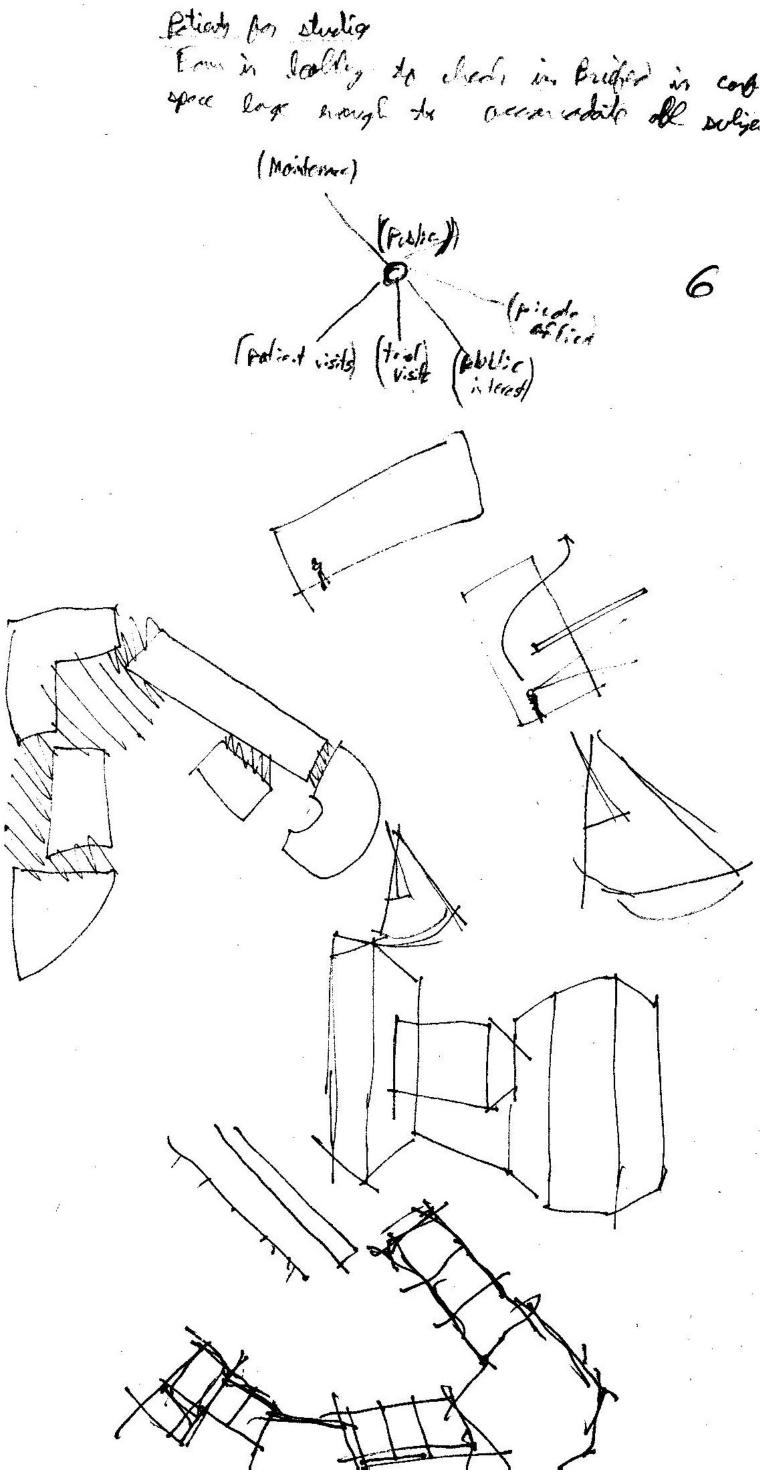
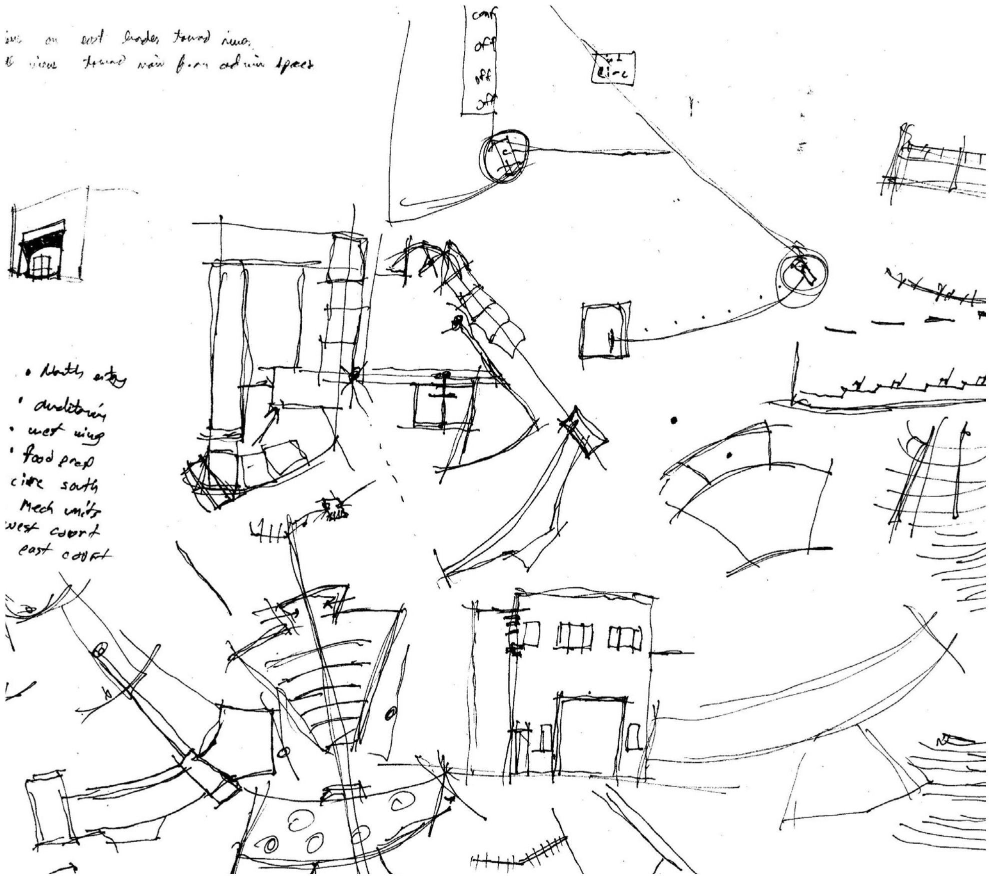

Ordering principles
- Axis
- Symmetry
- Hierarchy
- Rhythm
- Datum
- Transformation
lobby

Figure 98


(Maintenance)
(Public)
(Patient visits)
6


north entry
auditorium
west wing
food prep
circ south
mech units
west court
east court

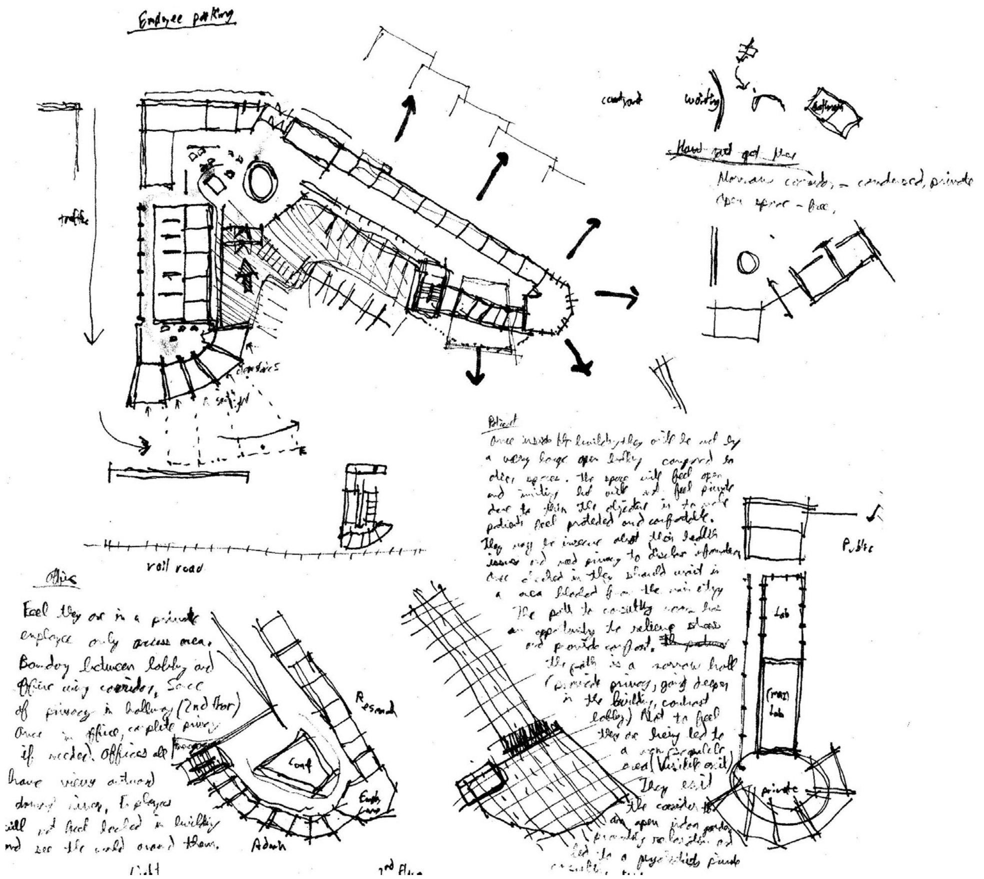
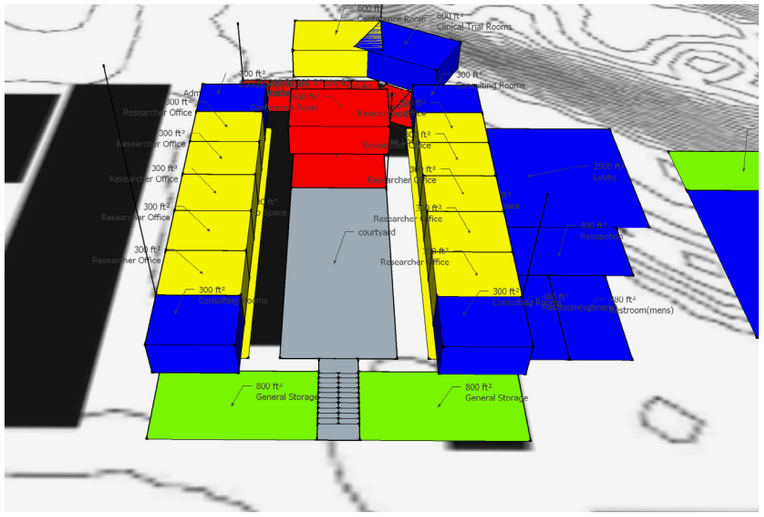
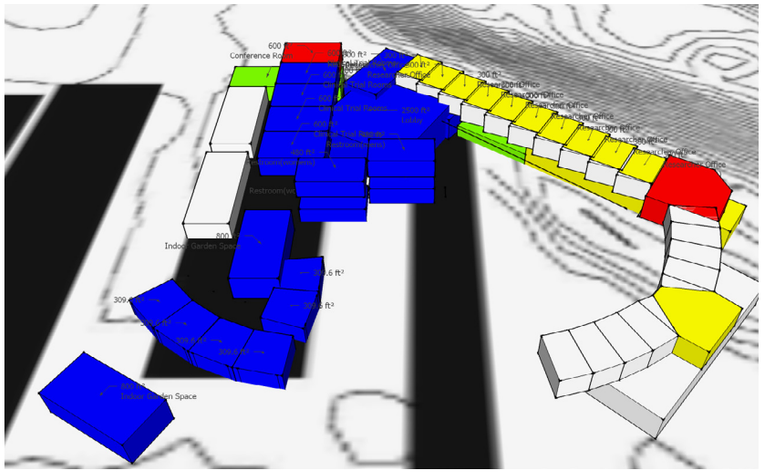
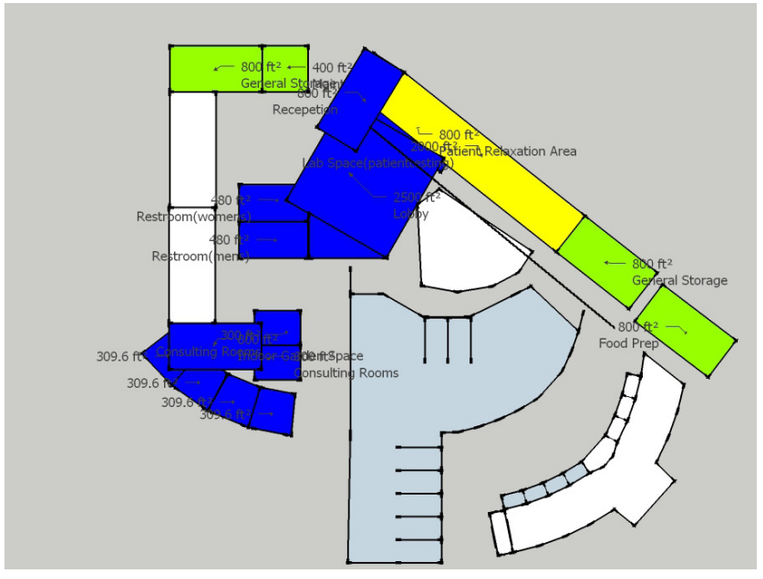
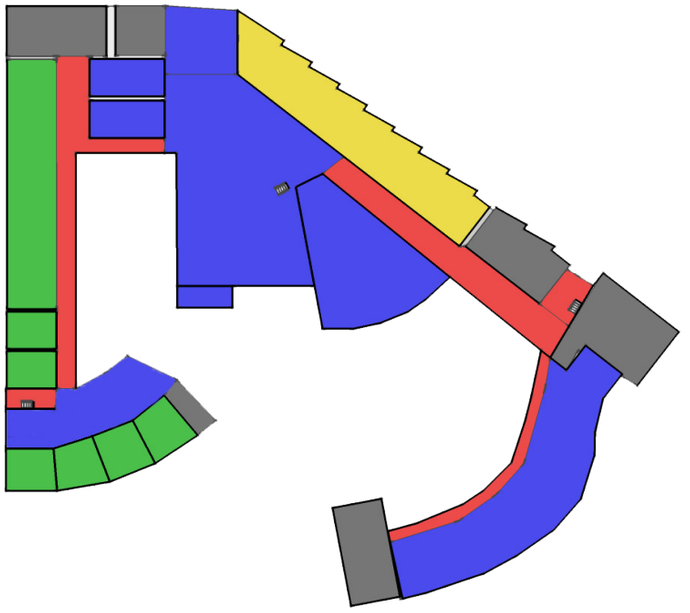

Employee parking
traffic
rail road
Public
Admin

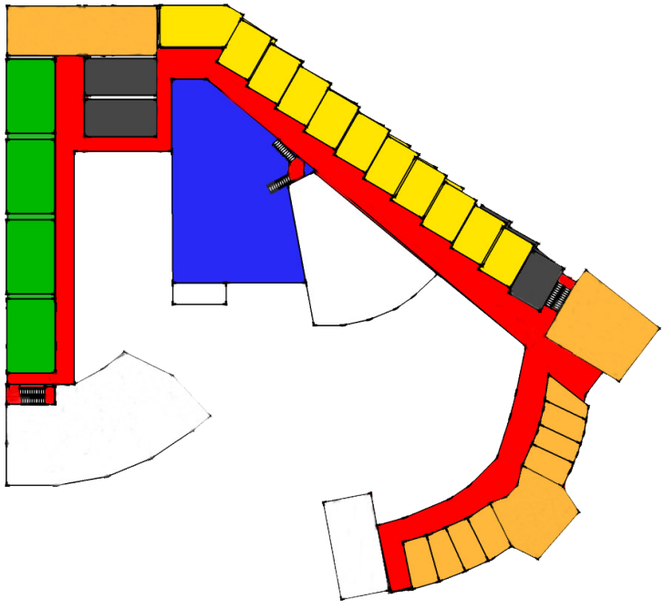
Figure 98







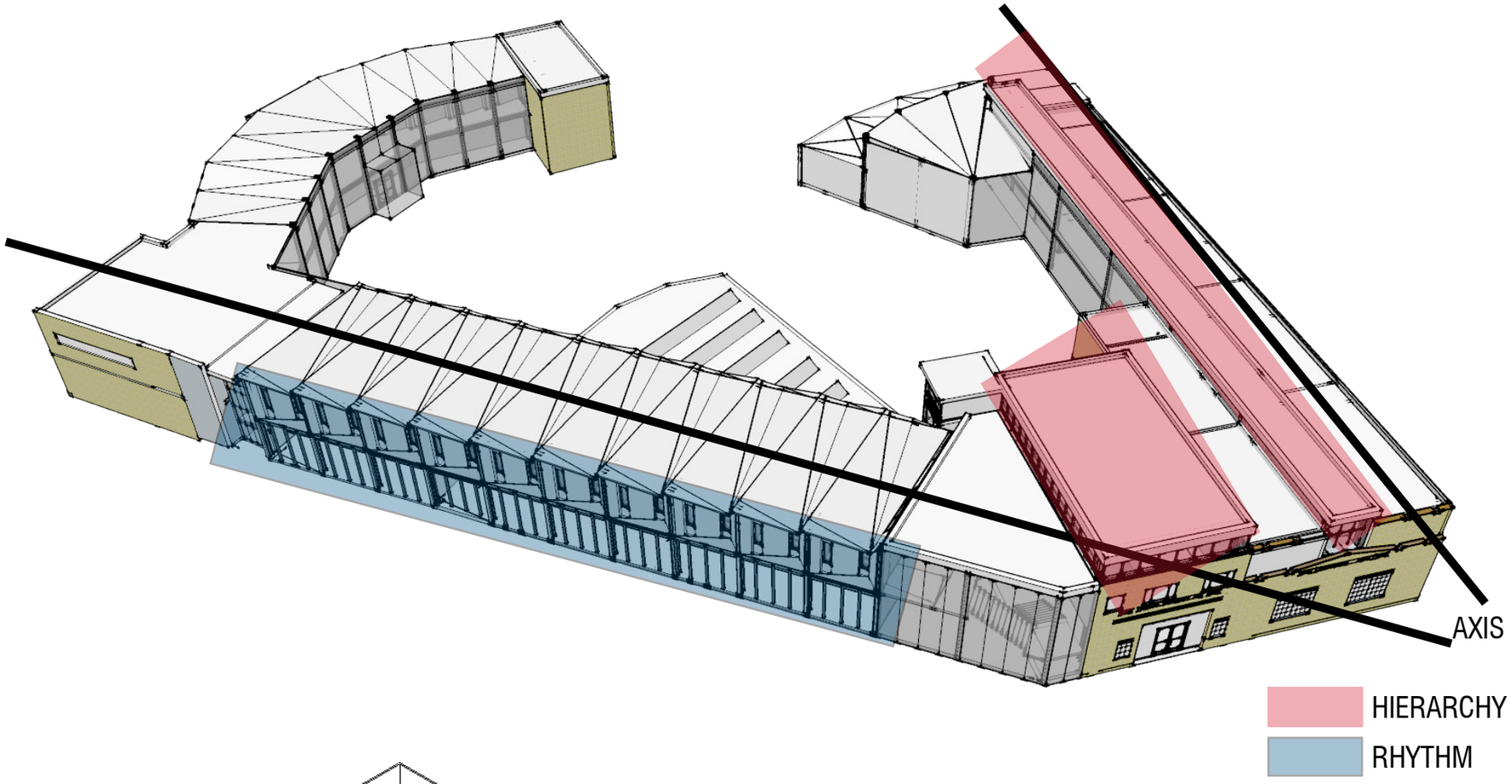


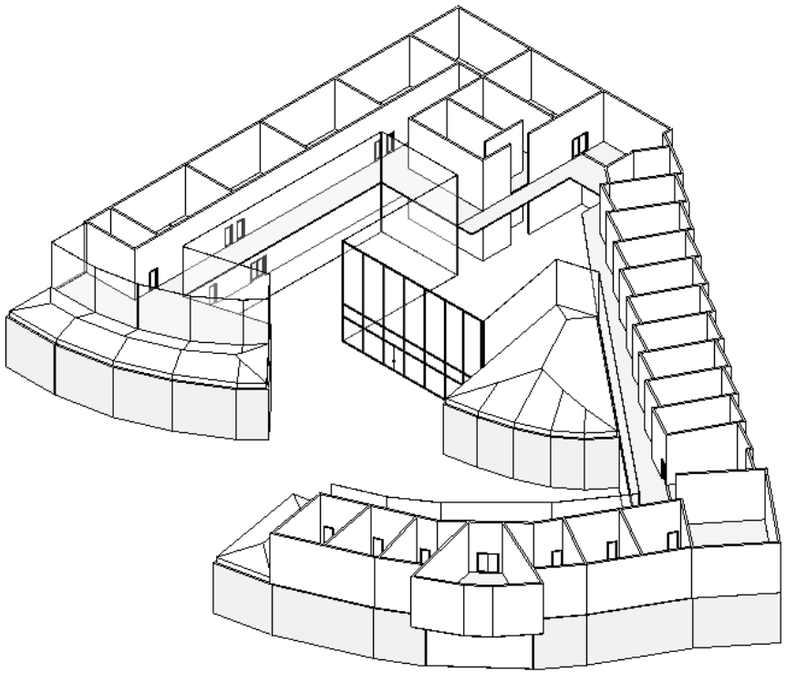


Activity Grouping

Figure 99

ORDERING PRINCIPLES





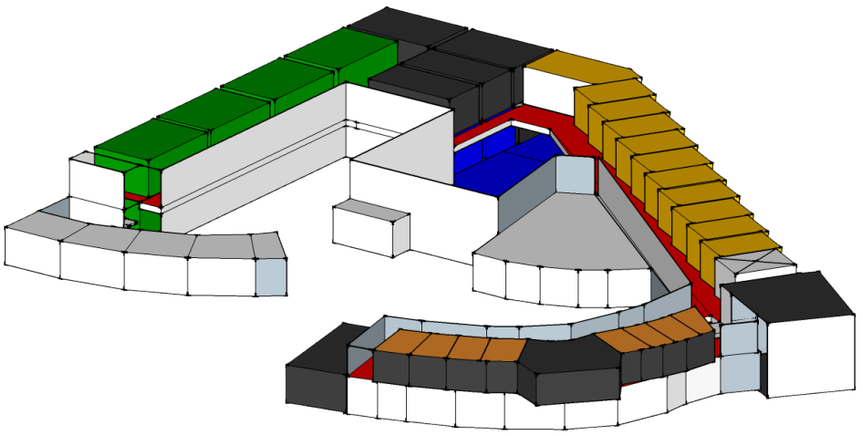
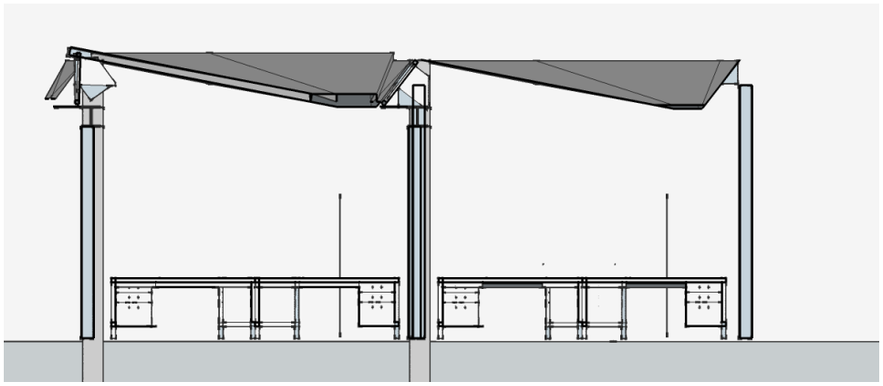
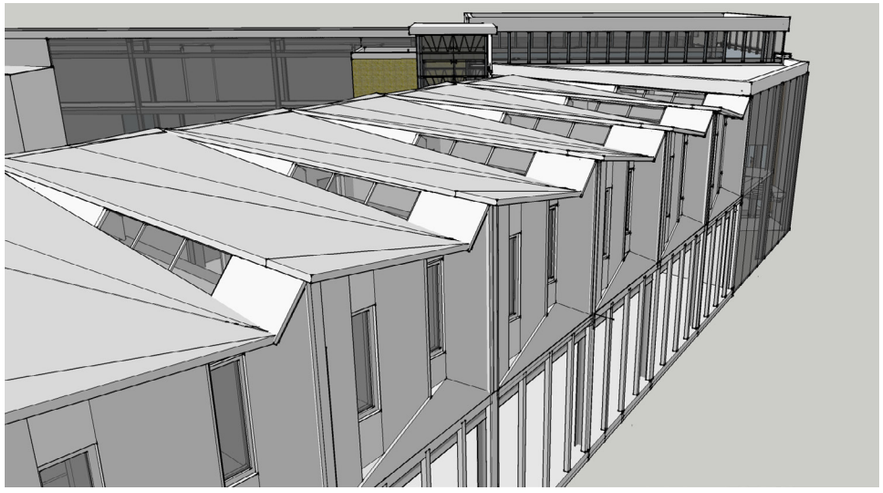
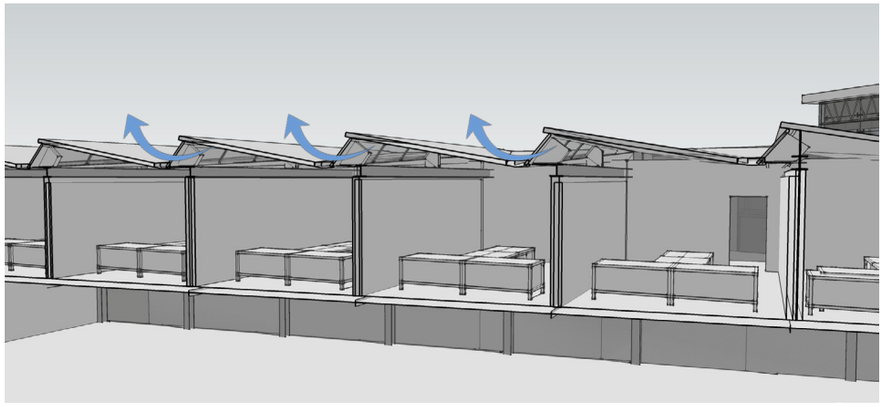
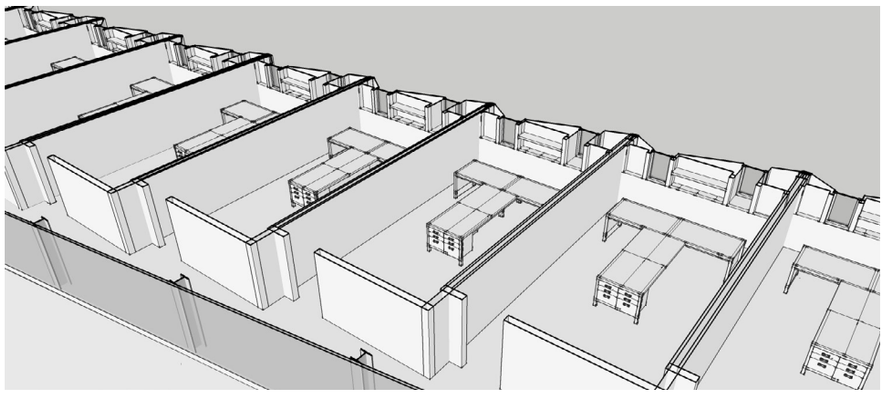


Figure 99










1905 FARGO FOUNDRY CO 1928
1905 STRUCTURAL SHOP 1930


1905 FARGO FOUNDRY CO 1928
1905 STRUCTURAL SHOP 1930

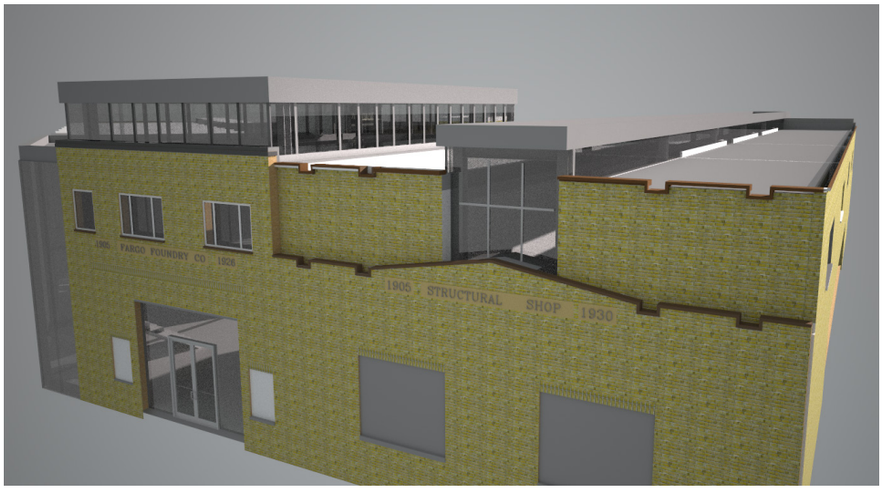
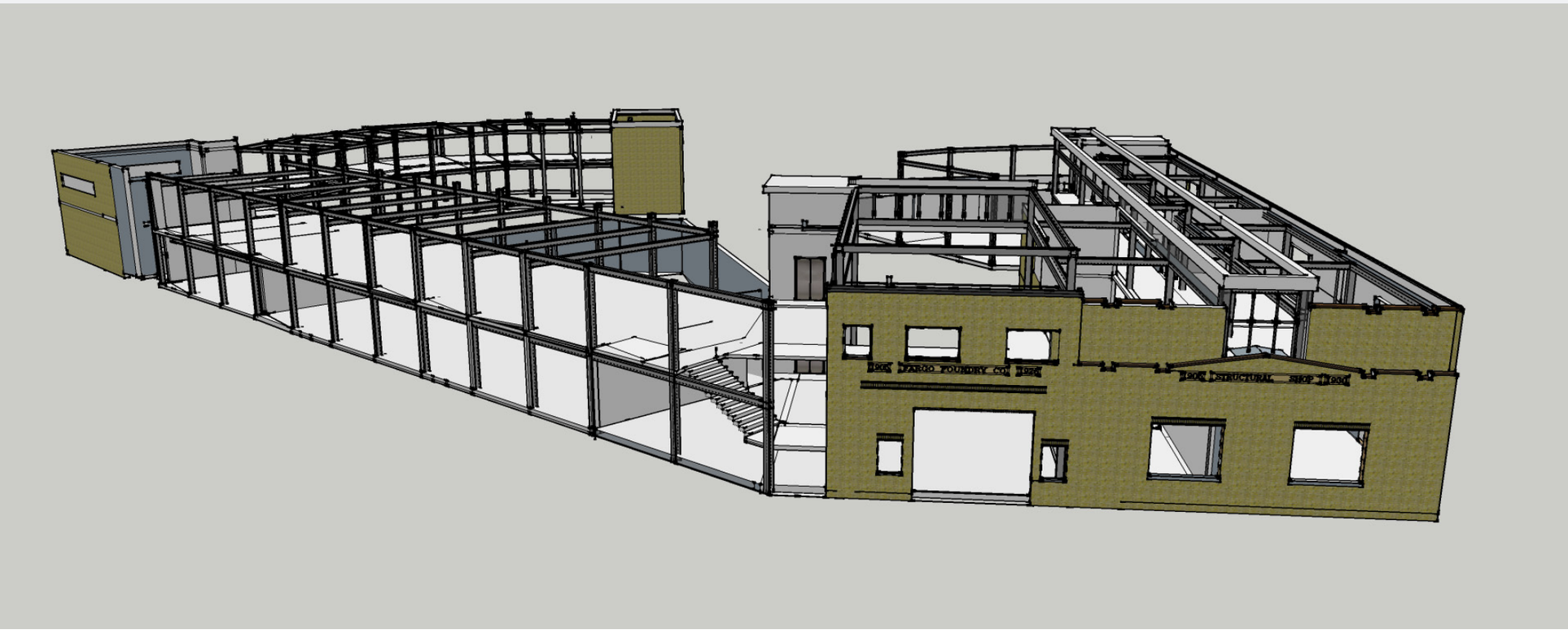

1905 FARGO FOUNDRY CO 1928
1905 STRUCTURAL SHOP 1930

Figure 99



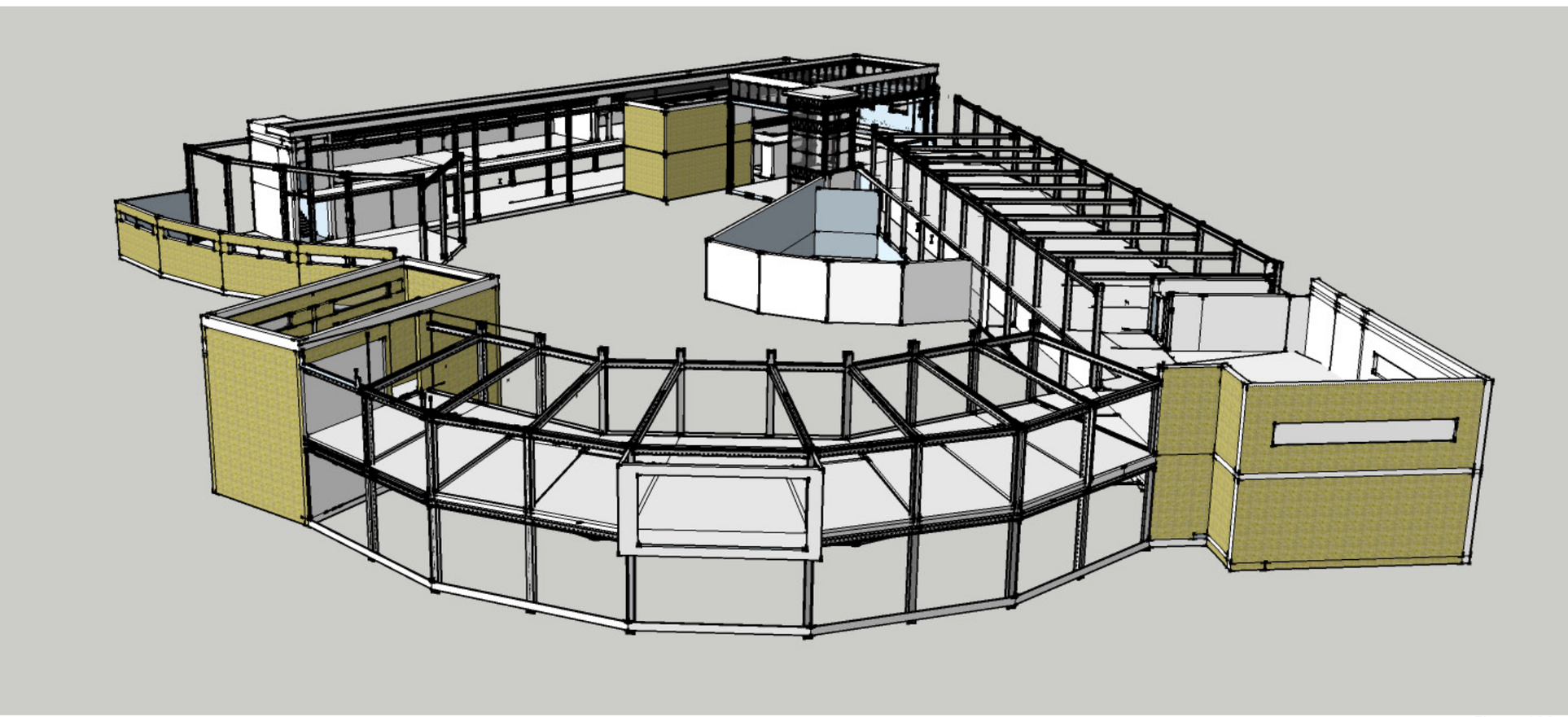


Figure 100

PROJECT SOLUTION

AN ARCHITECTURE OF NEUROSCIENCE

There is no question that the environment we live in affects our emotions, health, and development of memories. As a designer, how can we use the study of the brain to better understand how to build a better environment for its inhabitants?

Explaining how we experience the world is still much unknown, though neuroscientists have conducted studies that can indirectly help an architect design a environment. Some of the major concepts that influence our experience of a space include; exposure to natural light, views to nature, materiality, way finding, and physiological comfort. These concepts act on our current awareness of an environment through the senses. Our experience being our current awareness at a given time with the added influence of our past memories. Throughout the design process these concepts were explored to better understand how a user may experience a building at a neurological level.

To explore this idea, a Mental Health and Research Center was designed. This typology closely relates with the unifying idea of environmental influence. A study described clinically categorized types of mental illnesses as a result of environmental stresses. The same study also suggested community development as the best course for "a delivery mechanism for a range of explicit and implicit mental health programs. This project would provide opportunity for those in the Fargo community to better understand mental illness and help to bring an awareness to the subject.

Figure 101

MATERIALITY

FARGO, NORTH DAKOTA

VIEWS TO NATURE

Figure 101

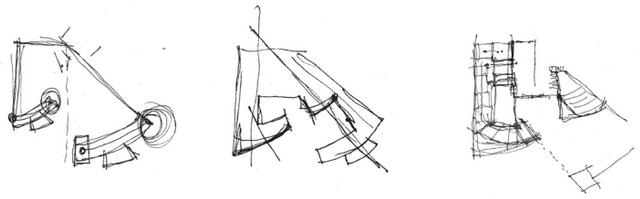
NORTH

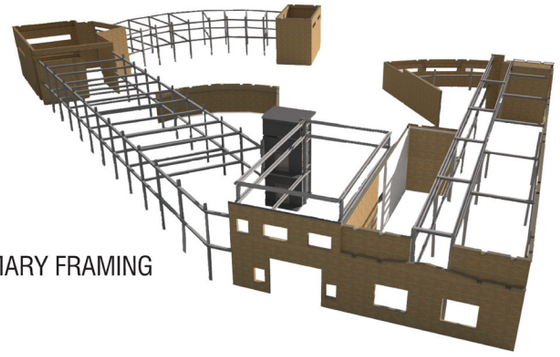
SOUTH

EAST

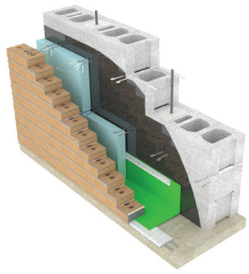
Figure 101

NODES FOR CIRCULATION (WAY FINDING)

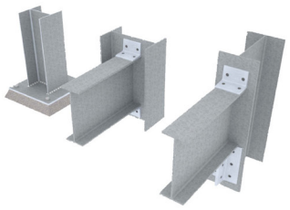




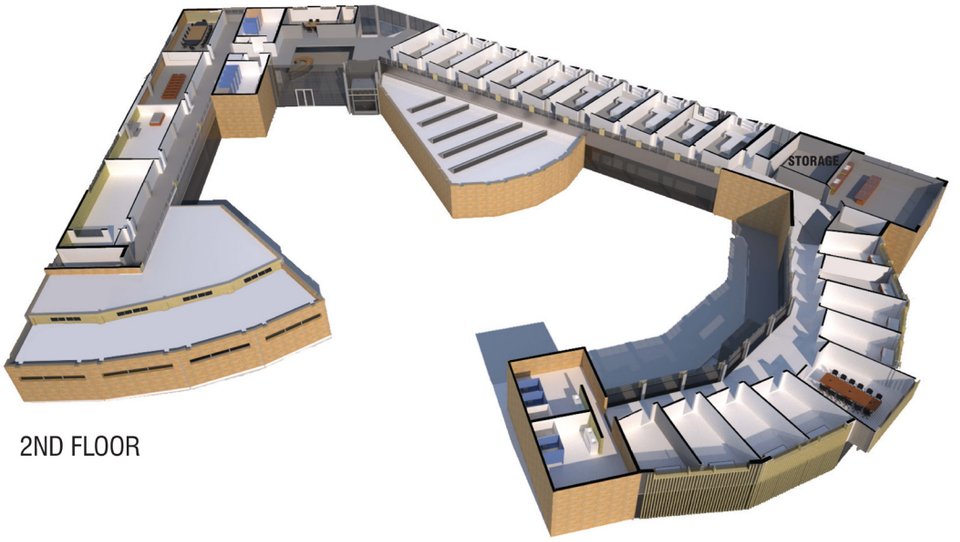
PRIMARY FRAMING



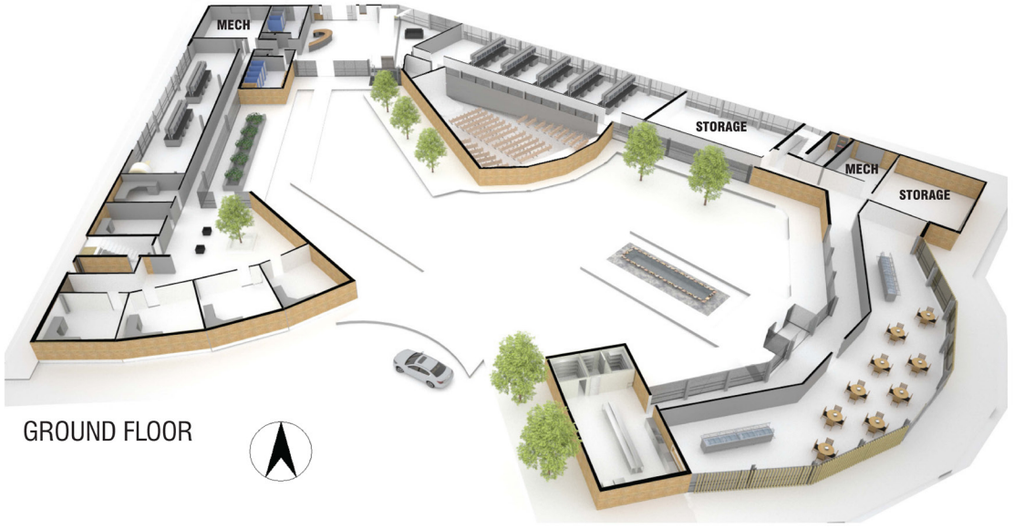
BRICK W/ CMU BACKUP



MAJOR CONNECTIONS



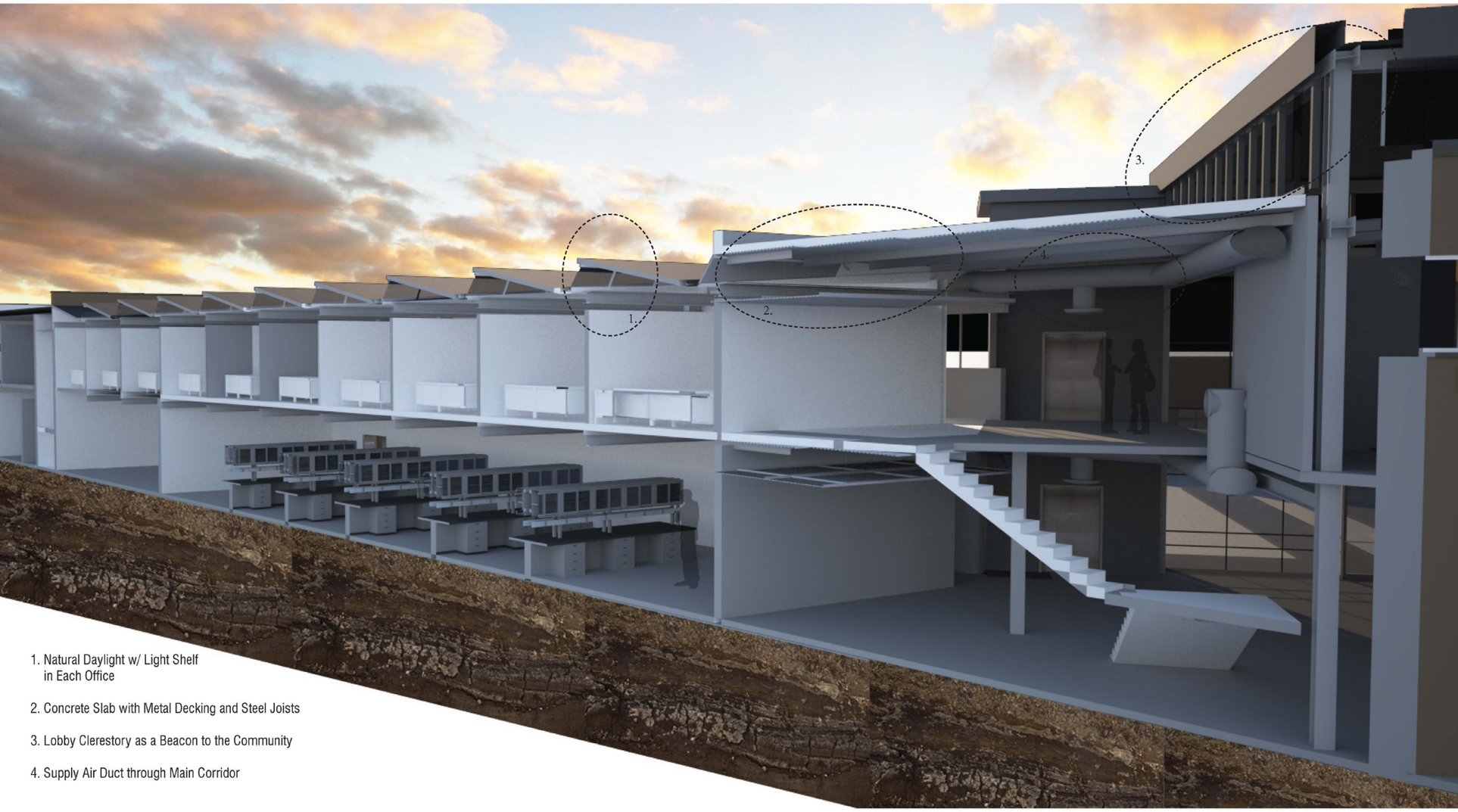
2ND FLOOR



GROUND FLOOR

Figure 101

NATURAL LIGHT



1. Natural Daylight w/ Light Shelf in Each Office

2. Concrete Slab with Metal Decking and Steel Joists

3. Lobby Clerestory as a Beacon to the Community

4. Supply Air Duct through Main Corridor

Figure 101

An Architecture of Neuroscience
ARCH 772 Design Thesis
Josh Donnelly
Primary Thesis Advisor: Ganapathy Mahalingam
SketchUp, AutoCAD, Illustrator, InDesign, Photoshop, Maxwell Render

1. Clerestory Along Corridor Influenced by Existing Site Gantry

2. Second Floor Addition Sensitive to Historical Character

3. Views to Courtyard

Figure 101

PERFORMANCE ANALYSIS

RESPONSE TO SITE

Major design considerations from the site included views to the river, natural light, wind, railroad noise, flooding, access, and vegetation. The first consideration and major reason for the site was emphasizing views toward the Red River. The views at the Salk Institute are said to influence researchers in a positive way. This same idea was used when framing views along the east axis of the building.

The next influence was natural light. Lighting throughout the building was achieved with narrow axis allowing for more light penetration as well as clerestories and skylights.

Wind was blocked at the northwest corner by the incorporation of the existing masonry building. This protection allows for a micro climate environment along the inner south area of the building.

Parking was placed far enough away from the building and in a way to buffer noise and the view of the railroad track.

The placement of the building was chosen to stay outside of the one-hundred year flood line.

Access to the site is along the west edge of the building which maintains the existing traffic pattern onto the site.

Vegetation on the site was placed within the courtyard area as well as around the perimeter of the building and parking area. The views into the courtyard from the corridors was a decision based on improved emotional health of those with views to vegetation.

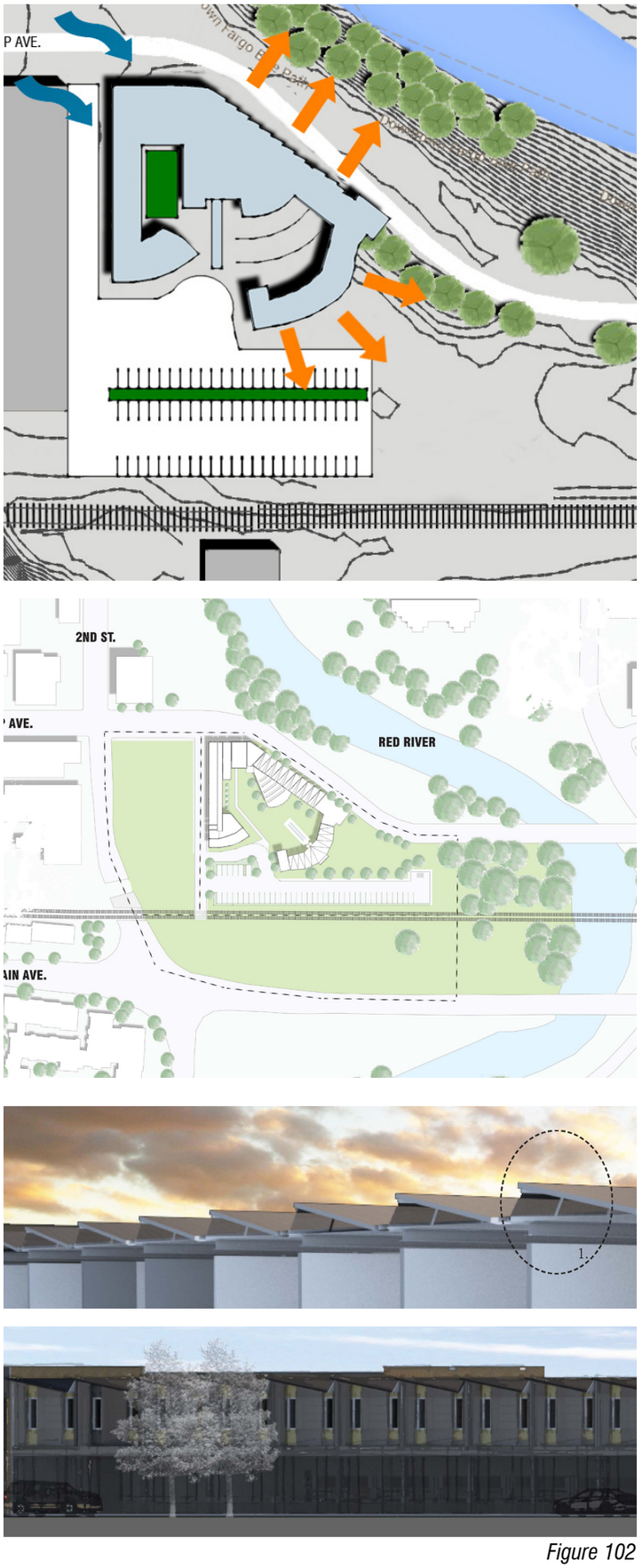


Figure 102

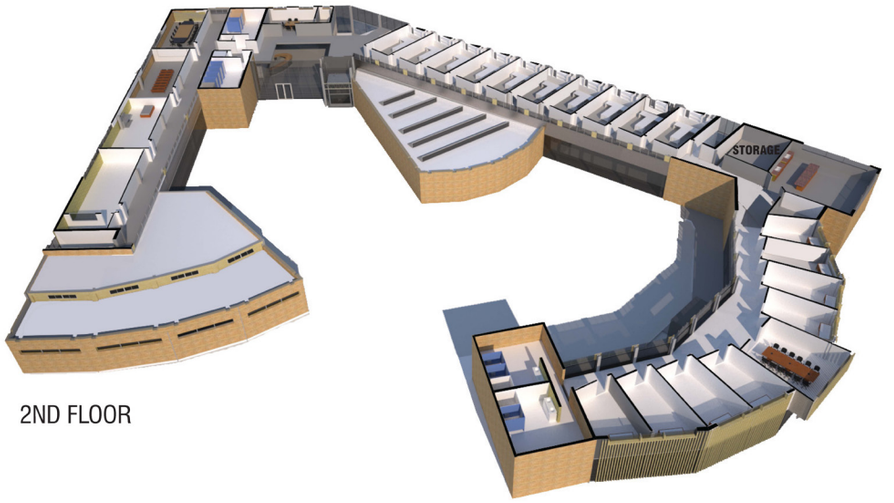
RESPONSE TO RESEARCH AND PROGRAM

The only addition to the building program was the auditorium space. All other spaces outlined in the program were accommodated for in the final design. The original building plan outlined one set of public rest rooms which would only work well with a centralized organization. Since the building was informed by an axis, another set of rest rooms was added at the end of the south wing for employee use.

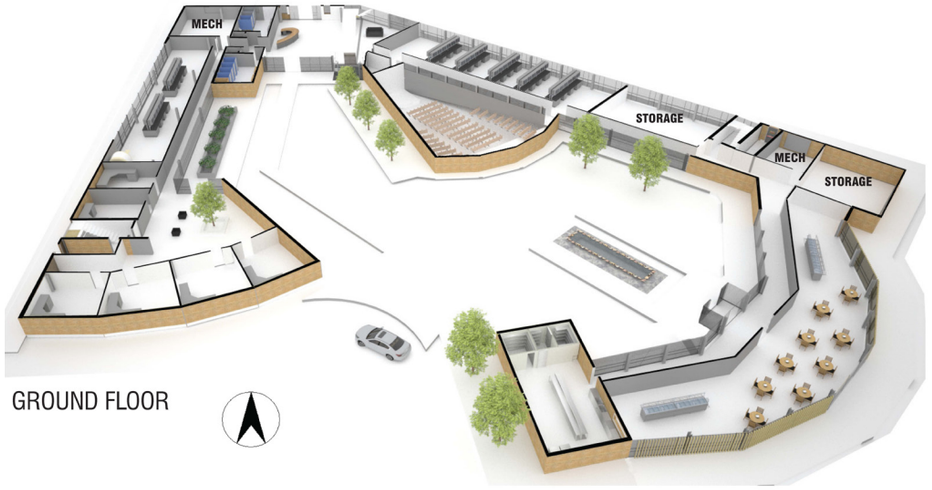
The program also outlined two indoor garden spaces. This became unnecessary as the building became more narrow, allowing easy access and views to a larger exterior courtyard. Only one indoor green space was created in the smaller waiting area outside the psychiatrist offices. This waiting area needed to be calming to those within it while maintaining a level of privacy. Because of this need, windows to the courtyard were avoided to create privacy with the indoor garden creating a sense of calm.

The adjacency matrix, individual room temperature, lighting, and humidity were combined during spatial ideation. Room agencies took precedence over indoor environmental clustering. Control of the indoor environment could be eased with similar clustering but views and adjacency become more important in creating a better experience for the user. Building systems may become more complicated but sacrifice of views and way-finding was not an option.

The office spaces which full time users will inhabit the majority of the time were all able to have views out to either the Red River or Main Avenue bridge. Other shared space such as corridors were able to have views to the central courtyard.



2ND FLOOR



GROUND FLOOR

Figure 103

RESPONSE TO GOALS AND EMPHASIS

Goals and project emphasis included:

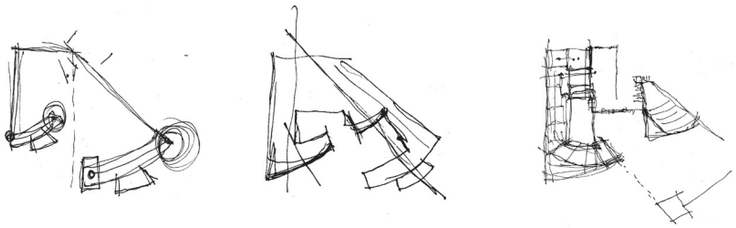
- Developing a sense of neurological based design will be a priority to understanding and implementing design strategies.

- Historic preservation of the existing buildings will be an area of interest as well as emphasizing the site's positive features.

- Creating a context sensitive building will be of interest as this is important in creating a building of community importance.

The first goal was developing a base of knowledge to draw from for design decisions. This was done through readings such as *Brain Landscape* and *The Architect's Brain.* Most of the readings had some easily related techniques to be integrated into architectural design such as use of day lighting, way-finding, views, and ease of collaboration. These ideas are all things that were integrated during the different phases of the project. Creating a easily navigable building lends itself to nodes and axis. Collaboration between users occurs during the organization of spaces in adjacency studies. Day lighting can be achieved through clerestories, skylights, and light shelves. The view from each space is developed during spatial ideation and used to frame certain exterior landscapes such as the river and courtyard. Other ideas were in the from of a hypothesis made by the author, giving neuroscientists a direction to pursue.

The historical character of the site was maintained by keeping the Northwest facade and carrying out similar detailing of the cornice line throughout other areas of the building. Masonry was important to creating nodes at the end of each axis and maintaining the historic downtown character of Fargo.



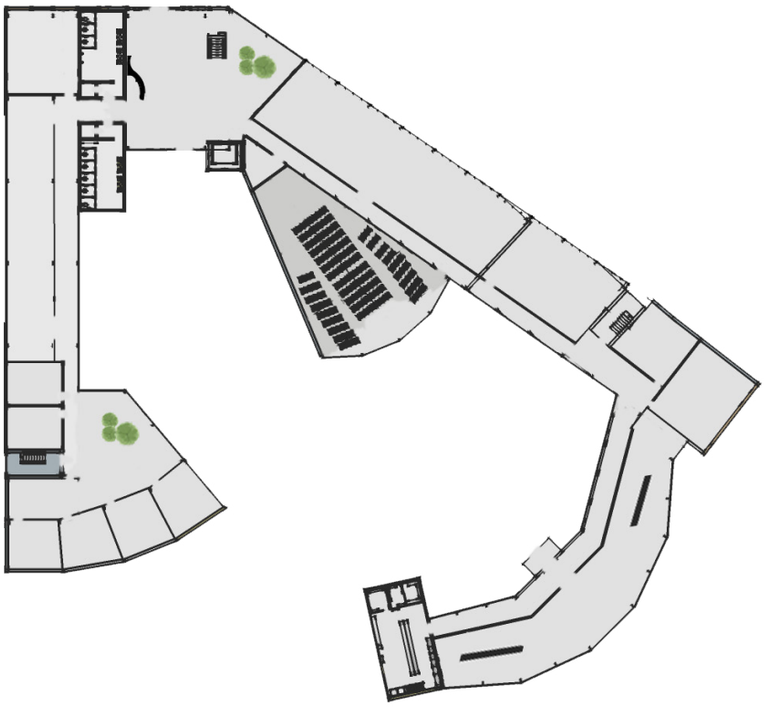


Figure 104


AN ARCHITECTURE OF
NORTH
SOUTH
EAST
NATURAL LIGHT
MATERIALITY
FARGO, NORTH DAKOTA
VIEWS TO NATURE
NODES FOR CIRCULATION (WAY FINDING)
PRIMARY FRAMING
2ND FLOOR
BRICK W/ CMU BACKUP
MAJOR CONNECTIONS
GROUND FLOOR

Figure 105

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STUDIO EXPERIENCE

INSTRUCTOR	STUDIO	PROJECTS
Booker Fall 2011	Arch 271	Tea House Boathouse
Vorderbruggen Spring 2012	Arch 272	Dance Studio Dwelling
Martens Fall 2012	Arch 371	Retreat Center Mortuary
Crutchfield Spring 2013	Arch 372	Desert Hotel Folk Art Museum
Faulkner Fall 2013	Arch 471	Highrise
Martens Spring 2014	Arch 472	Adaptive Re-use School
Mahalingam Fall 2014	Arch 771	Specification Research

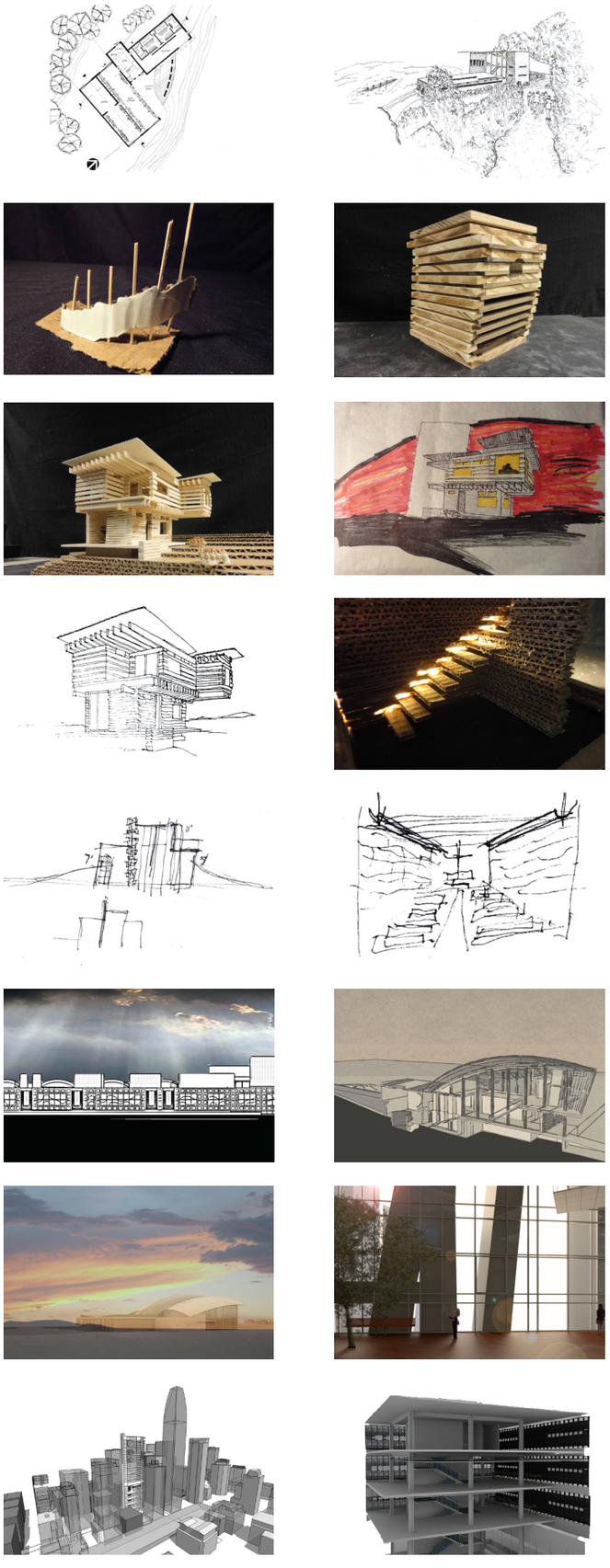

Figure 106
Previous Studio Work

ABOUT

Figure 107

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