

Healing with Colors

through architecture

A Design Thesis by Sydney M. Garcia



Healing with Colors
A Design Thesis submitted to the
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by
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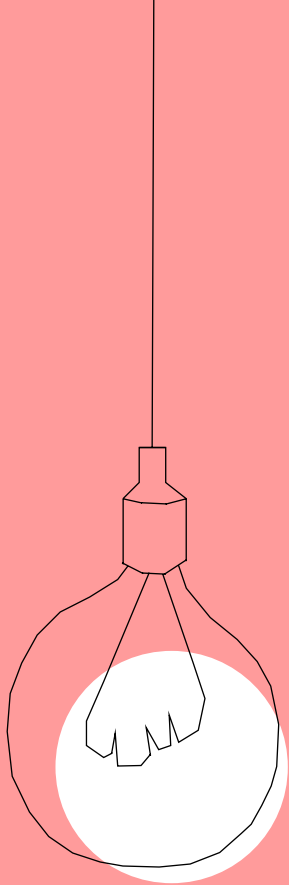


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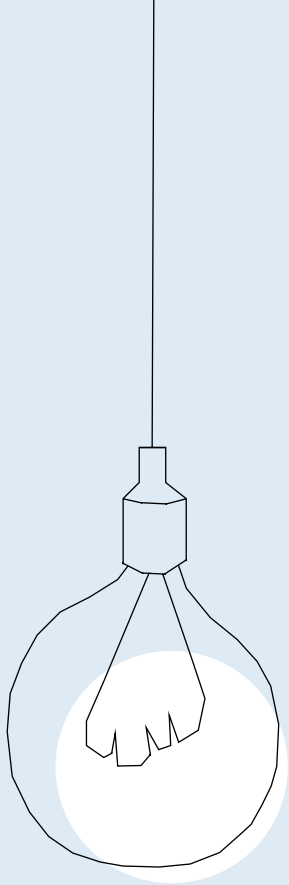
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Thesis Proposal

Thesis Abstract

This study focuses on the relationship between color frequency and healing the human body. There is evidence that color has been implemented as a healing process through therapy, dating back to thousands of years ago. I want to discover an alternative way of healing that is effective and reliable. Not only do I want to show people that they can effectively heal their bodies and minds, I also want to educate them on why it is so important and how easy it can be to practice at home.

Through research and experimentation, I will discover a connection between brain activity and physiological responses to color. I will use this information to apply colors to healing methods in alternative medicine practices. The color therapy results can then be implemented by designers and artists as a healing tool for essentially anyone. Considering this method is noninvasive and completely natural, anyone can benefit from it. The complexity depends on the severity of the issue, and I will design a solution that this is beneficial for everyone. A proposed design for a Health and Healing Center will provide a safe place of healing, learning, and loving. The center will focus on aiding mentally and physically ill individuals. Color therapy is a main element in the healing design and will be implemented in all healing processes at the center.

Typology: Health and Healing Center

Site: Moorhead, MN

The Narrative of the Theoretical Aspect

In my thesis research, I will discover how colors can heal the body and mind. The premise for this research project came from my aspiration of designing a healing center that strays from conventional medical practices that are so commonly practiced here in the West. The word healing derives from the Anglo-Saxon word *haelen*, which means to make whole (Online Etymology Dictionary, 2019). The health and Healing Center will regard it as a harmony or balance of the mind, body, and soul. To be an all-inclusive facility, some practices will use conventional practices, additionally. There will be trained medical professionals, and other professionals in the Healing field, that are knowledgeable in natural healing as well as conventional. In a span of 5 years, there has been an increase in the use of mind-body therapy among adults in the U.S. The therapies included deep breathing exercise, meditation, yoga, acupuncture, massage therapy and naturotherapy.

People are becoming more interested in this new concept of alternative healing, and I want to be a part of educating others about the benefits it entails. I am hoping to use this prerequisite information in addition to my own discoveries to find a design solution to health problems. In this project I am focusing more intently on color healing, or chromotherapy, to determine what colors can relate to a healing process of a specific ailment. I will uncover the beauty that comes from natural healing and teach people conductive methods that work. I want to help people permanently heal their bodies and minds instead of using chemicals for a temporary fix. I think that once it is evident of how capable humans really are, people will be more receptive to new ideas and trying new things. This healing center will serve as a gateway to new ideas and natural solutions, by teaching, learning, and practicing.

Project Typology

The project typology includes a Health and Healing Center that provides all you need for mindful healing. My goal is to design a facility that can heal or alleviate most illnesses relating to the mind, body, and spirit. The range of means is wide, but can be categorized into one of two main objectives described below:

Mind

The mind is typically where illnesses and diseases start. Giving in to extreme emotions and reactions, creating negative thought patterns, these are just examples of how that energy starts being thrown off balance. Creating spaces in the Healing Center to quiet the mind and ease neutrality is highly important.

Body

The off balances mentioned that are caused by the mind, start to appear physically in the body. These can look like cramps, sores, tiredness, and can go as far as cancer or stroke if not properly taken care of. Letting energy free flow through the body is the next important design aspect.

Soul

The soul also needs healing and balance to sustain life. The soul can be attuned in any space of the Healing Center. It is the constant variable throughout the facility (and universe!)

Major Project Elements

To promote the spiritual, physical, and social aspects of the theoretical premise, the design proposal features the following spaces:

Thermal Bath

Tearoom

- The “spiritual” design aspect
- Devoted to moderate and intense chromotherapy usage
- The tearoom is used for special tea ceremonies
- The thermal bath is a dark place used for intense healing and chromotherapy

Sauna

Yoga Studio

- The “physical” and “social” design aspects
- A large area for yoga sessions of a large size or with large movements
- The sauna is a place to physically release energy through perspiration. It is secluded in the woods, a place that people tend to gather in

The goal is to use the facility as a whole as each space influences the next. Although some spaces are listed under spiritual, they also will have slight instances of physical and social aspects too. This is true for every space in the Healing Center.

Occupant/Client Description

Occupant Groups

Office Employees	1-4 total
Teachers/Instructors	1-5 total
Students/Guests	10-20 total*

Considerations

Healthcare:

- Parking
- Safe and private rooms
- Outdoor spaces

Naturopathy:

- Parking
- Safe and private rooms
- Outdoor spaces
- Large group space/flexible room
- Seclusion from noise

* these numbers vary depending on happening events and staff

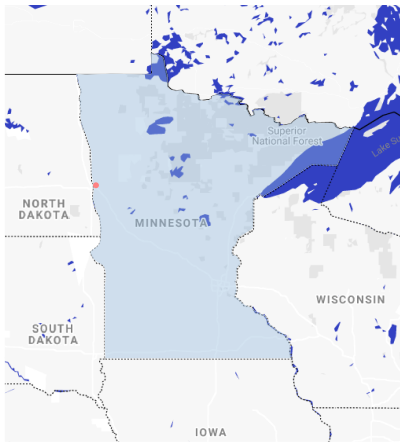


Figure 1. Regional Map.

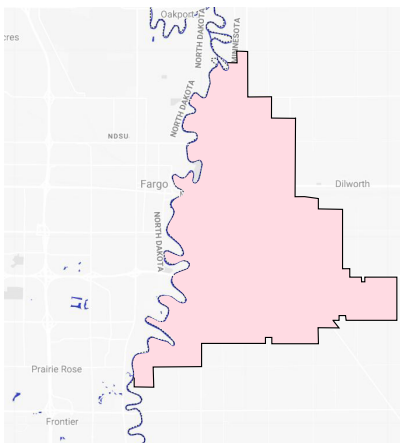


Figure 2. City Map.

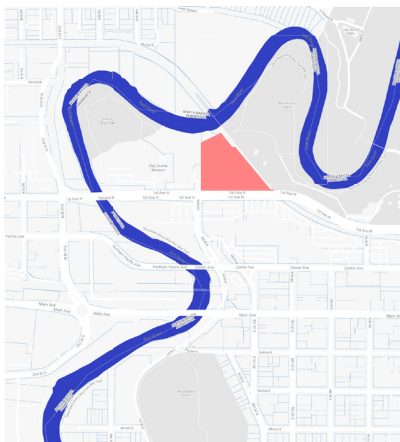


Figure 3. Site Map.

Moorhead, Minnesota
Clay County

The City

The project site is located in Moorhead, MN, near the Red River on a parcel that spans about 237,000 square feet. It is within a mile of the state border that separates North Dakota from Minnesota. Moorhead currently has a population of approximately 43,000 residents, although its limits often merge into Fargo, ND which has a population of approximately 125,000 residents. The population and culture of this area are rapidly changing due to the increase of development in downtown Fargo and Moorhead.

The Site

The site currently houses two apartment buildings that offer low-income and senior living units for rent. It is tucked away, off of a main road which will allow easy access to the site while still providing shelter from the traffic and pollution. Nearby is the Red River and its contrasting parks, along with a historic center and shopping centers. This site is in the perfect location to balance the valuable connections with nature and man.



Figure 4. Site Photograph.

The Project Emphasis

1. A place of healing and balance of the mind, body, and spirit.

I want to design a safe place where people can come to heal, in any way they need. Everything from a quiet place for meditation, to managing chronic pain with the help of a professional, this center will have every service. It is important to note the distinction between healing and curing, as these are two very different things. People can be healed even if they are not cured. For example, those with a chronic disease can learn to live in peace with their condition or pain. Contrarily, people may be cured but not healed, such as a breast cancer survivor could feel anger and grief for her loss (What Is a Healing Environment?).

2. A connection to nature, earth, and water.

Connecting with nature and other walks of life is a main goal of this project. Taking care of a living organism is beneficial to the building design and the patients and occupants of the building, too. The plants will help clean the air and bring life to the facility while teaching about the beauty of life itself. Outside of the design, the facility will also provide other nature-connection opportunities through retreats and group exercises. The Red River provides the element of water, which reminds us to self-reflect frequently, as that is a major step in healing. The water also provides a calming effect to the site. The old river combined with the matured trees create a sacred feeling in this nestled site.

3. A place for health and wellness

Health and wellness are a main factor of the facility, even extending to people who do not need additional healthcare assistance. With the flexible spaces, many people will be welcomed to enjoy the facility for different functions. Comfort is a large constituent for health and wellness, so making the facility feel like home and easy to navigate is a main design goal.

Goals of the Thesis Project

Theoretical, physical, and social goals for the thesis project:

1. **[physical]** I want to help people naturally heal their bodies and minds instead of using chemicals for a temporary fix.
2. **[theoretical]** Answer the question of how colors can naturally heal human illnesses through their frequencies.
3. **[social]** Establish a place of balance and harmony within the community.
4. **[social]** Educate guests and patients on the benefits and practices of naturopathy and the lasting results it has. The next step would be to teach them how they can do it on their own.
5. **[theoretical]** I want to further my own knowledge on natural healing and spiritual influences as I create this project.
6. **[theoretical/physical]** Learn the construction and architectural aspects of specific healing spaces.
7. **[theoretical]** Learn how to mix modern medicine with natural medicine to benefit others.

A Plan for Proceeding

Definition of a Research Direction

The purpose of this research project is to validate the understanding of the natural connection formed between neurological responses and the properties of colored lights. The spaces we occupy everyday have a lasting impact on our overall health and well-being, so it is important to me as a designer, to use my knowledge to design spaces of healing. This process can be manipulated throughout our built environments with this prior knowledge of connection between neurological responses and frequencies of colored light. Implementing these established connections in our design work will bring a perception of substance back to the design world. If designers have a goal to provoke a specific neurological response, architecture will take on a whole new meaning of relevance and influence.

Design Methodology

This research project studies human subjects, data analysis, and correlational strategies in fulfillment. The human subject study consists of immersing each participant in a bath of colored lights, while an EEG headset records the responsive brain activity into the software. Data collected from the study will contribute in providing elements of quantitative data. Consideration of the human responses in addition to the quantitative data collected will provide a way of effectively determining how architecture can aide in the healing process from sickness and disease. Analyzing the brain activity in response to color frequencies will open a new world of design and healing. The collaboration of these aspects will allow validation of the study as a predominant form of scientific investigation.

The main research strategy I am practicing is the experimental method. This requires training for working with human subjects and an approval from the Institutional Review Board (IRB). Once both were acquired, I was able to start the design and construction of a design booth. The purpose of the booth is to eliminate any unwanted stimulation that might affect the participant during the study. Eliminating as much external stimulation will provide a neutral environment to gather the most accurate results.

The design booth is constructed of a wooden 2x4 frame and finished with 1/2" gypsum board. The booth stands at approximately 6-feet in height and 3.5-feet in width. The booth was constructed and located in our second-floor studio of renaissance hall. The booth is partially supported by a table in the front, which will also provide comfort for the participants as they can sit and rest during the study. Inside, the booth is laced with sheer white cloth to conceal the edges of the gypsum board and wood. The study will need to be actively monitored, so the back is fixed with an adjustable, sheer curtain.

The colored lights were emanated from a pair of LED light bulbs, labeled Smart LED Light Bulbs by Tweek. These bulbs were selected because of their high 100-Wattage power, and their ability to connect to a smart device wirelessly. The bulbs were mounted towards the front of the booth, on opposite sides. I connected the light bulb devices over Wi-Fi to my smart phone via the SmartLife application, which allowed me to easily control the colors for the duration of the study.

The electroencephalogram equipment and software were found online and purchased from Open Source Brain-Computer Interfaces (OpenBCI). This product started out as a Kickstarter idea and expanded from its success. The headset and electrodes are 3D printed products that work directly with the cyton board. The cyton board is attached to the headset and contains 16 biopotential input channels and wireless communication Bluetooth. The biopotential input channels are where the electrodes connect to the board for recording. The cyton board connects wirelessly to the ganglion dongle which is inserted in my laptop as the sessions are running and recording through the OpenBCI program. When the program is running, there is a layout option where you can customize the system control panel to view graphs and charts you want during the session. The system control panel digitally produces the brain wave activity in terms of frequencies and amplitudes that is being gathered. The system control panel layout is how I controlled the data streaming on my laptop. There are six options of charts to use in the system control panel, but I used the four that were most essential to my research: time series chart, fast Fourier transform plot, head plot, and.

band power. I did not use the accelerometer and networking charts, as they weren't necessary to actively monitor.

For the study, each participant is asked to wear the EEG headset on their head, which consists of (8) dry electrodes that are made adjustable for each person. The electrodes are a vital piece of equipment as they are stimulated by active nerve cells, so it is important for them to touch the scalp directly for accurate results. The nerve cells produce electrical signals which are transmitted by the electrodes in the form of brain waves, which are then transferred to the system control panel in the form of charts and graphs. With a concise understanding of the brain waves (Canavero 2015), I was able to locate the electrodes on the scalp.

There are 16 sites of for electrodes with an additional 3 centrally located sites that read z, for zero, which provide extra stability, with no electrode connection. The systematic understanding of the brain chart, in terms of an alpha-numeric order, will provide a simple way to connect where electrode activity is stimulated. This is made possible with the understanding of the brain maps which provide an overview of what activity occurs in the corresponding brain region. This foresight will help in forming connections during the study.

The study will be executed over the duration of two weeks and tested 30 individual participants. Each participant will fill out a corresponding survey questionnaire and study consent form that outlined the procedures and safety precautions for the study. Once the form is completed, the EEG headset will be mounted on the head and adjusted as needed. Before beginning each experiment, I will perform a test and impedance check to ensure each electrode was working and reading properly. As they adjust to a comfortable position in the booth, I will explain what was about to occur and added the corresponding alpha-numeric code to their survey sheet for later analysis. During the study, the OpenBCI program will be running on my laptop as I control the smart light bulbs from my phone. Each colored light will be emanated for approximately 90 seconds, for a thorough analysis. Once the testing is complete, the participant can remove the headset and that will end the session.

Once the data is collected, I will analyze it in a wave reading software program to produce graphs and analysis that I can compare. I will compare the results of individuals depending on their survey questions. If the results are at all similar, that means that the colored lights are successful, and everyone reacts the same way. From there I will be able to correlate them to certain disease and illnesses to implement it in an architectural healing design.

Documentation of the Design Process

Medium for Design Investigation:

Investigation computer design software

- Autocad
- Revit

Representation computer design software

- Adobe Illustrator
- Adobe InDesign
- Adobe Photoshop
- *Hand sketching and modeling

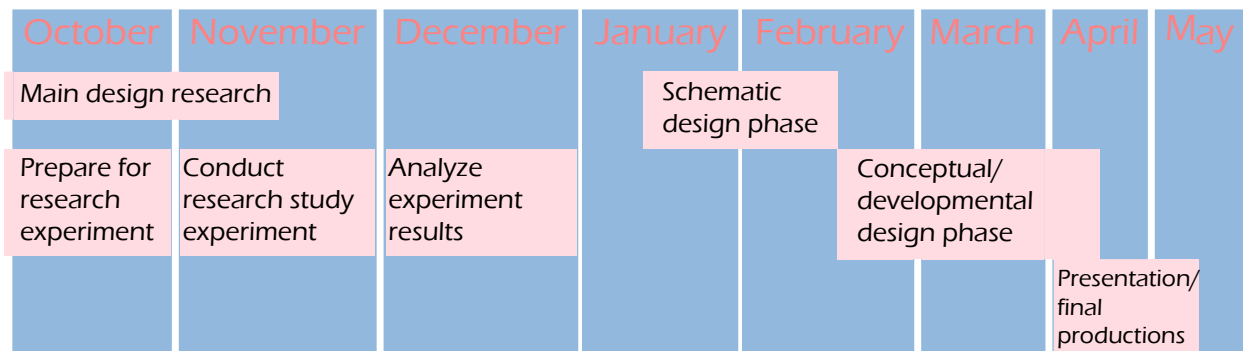
Design Preservation Methods:

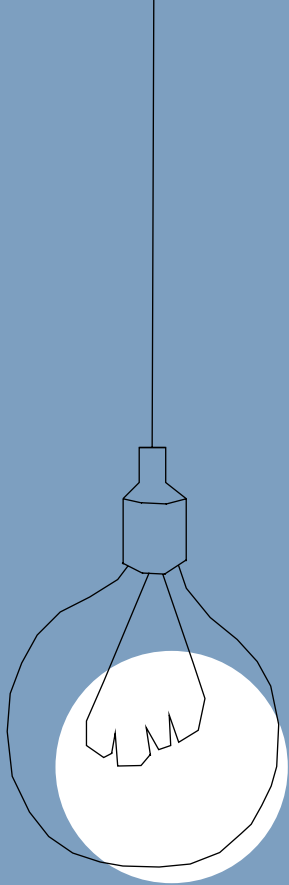
- Feedback from advisors, mentors, and classmates
- Documentation of research
- Computer files backed up continuously as work and research progresses
- Thesis documents updated and fulfilled to as schedule calls

Publication of Material:

- NDSU Institutional Repository
- Printed soft cover book format

Establish a Specific Schedule or Work Plan





Thesis Research

Results from Theoretical Premise

Philosophical Framework + Strategies

The philosophical framework for this research is positivism-postpositivism because reality can be objectively described or measured. Positivism assumes that objectivity can be achieved through research and (in postpositivism) it is presumed as a goal. Positivism is what inspired the modifications and accommodations made in the research process, thus adding the experimental and correlational strategies, both of which will be implemented in my research process. In areas of design that involve people's responses to a particular setting, this is the recommended tradition to follow for the best results. Experimental strategies create a real-life setting where the study focuses on physical variables. Correlational studies are seeking to describe the relationship between the key variables. There is a focus on patterns that are naturally occurring which are set to be measured by specific variables (Groat & Wang, 2013). These two strategies will work together in producing results that solidify the relationship between healing and colored environments.

There are four quality standards within a Postpositivist System of Inquiry: the truth value through internal validity, applicability through external validity, consistency through reliability, and neutrality through objectivity. It is highly important that the quality standards are met, to ensure accuracy in the final research results. The internal validity comes from truthful representations of the object of study. The external validity is achieved through the results being applicable to the larger world, once the results are analyzed. The research should be valuable to multiple people and contribute to our society. The consistency in measurements or findings of the experiment helps ensure how reliable the results are. It should be safe to assume that the same results would be produced if the study were to be conducted under the same conditions at a different time.

Theoretical Framework + Tactics

The experimental study will involve the use of an electroencephalogram (EEG) headset and software recording system. The headset consists of electrodes that digitally record the brain waves that are produced in response to stimuli. For accurate results, the experimental study takes place within a design booth to eliminate any unwanted, external stimulation. The EEG equipment is a vital

part to this research as it is able to record and provide valid neurological information that responds to colored-light environments. The correlational study will discover a relationship between the data's analysis conclusion of the brain waves in response to color with specified alternative healing practices.

This interrelationship explores a cross-disciplinary study between architecture and neuroscience, and how together they can design better environments for our future. The experimental study's analysis will provide substantial quantitative data to provide an intentional impact. If there is a connection, this validates the opportunity for designers to schematically implement colored lights to induce an intentional response. Humans naturally respond to the frequencies of colored lights; this biophysical response will take architecture from its established physical realm, to an entirely new perspective in the behavioral realm. The goal of this thesis research project is to validate the understanding of the natural connection formed between neurological responses and the properties of colored lights. This analogy can guide designers, medical professionals, and essentially any individual to creating a better future and way of living. This research will provide a reliable and natural way of healing and living in our everyday lives.

Literature Reviews

In fulfillment of this research, two pieces of literature were carefully reviewed for full comprehension of the premise. The first, *The Principles of Light and Color: The Healing Power of Color*, Edwin Babbitt outlined the formation of the concept of color therapy. In his work, Babbitt established a viable theory of healing through properties of color that was successfully implemented in the medical world. A lot of the points that Babbitt conceived were supported by newer research on the theories of chromotherapy that I found in *Color Medicine*, my second source of literature review. I was able to fill in the blanks by putting the truths of these two literacy pieces together. In *Color Medicine*, Charles Klotsche provides scientific evidence of Babbitt's theories which validates and expands them. He goes even further and forms more connections we have with colors, which accentuates the spiritual side of the science, and solidifies the synchronicities of life. Each review has a unique impact on the project, influencing it in a special way.

The Principles of Light and Color: The Healing Power of Color

The Principles of Light and Color: The Healing Power of Color, was written originally by Edwin D. Babbitt and published in 1878. For all his life, Babbitt was endlessly learning, teaching, and writing. It wasn't until later in his life that he put his hard work into establishing this concept of color healing. It only took him a year or two to have established this profound new world in the health industry. I read a version of Babbitt's work that is edited by Faber Birren, who brilliantly highlighted Babbitt's main objectives and eliminated the parts that fell off topic for a comprehensive understanding.

Babbitt understood the importance of learning the basics of the properties of light and color, before diving into the scientific realm of the subject. He knew that in order to make his work a viable scientific study, he must learn the chemical and therapeutic potencies of light, color, and other fine forces, as well as their connection to the physical and psychological realms. He gave a preface of explaining the color wheel and the relationships colors have with one another. How primary colors produce secondary colors and every color in between is important to know because creating a mixture of opposing properties can be either harmonious or disastrous.

Babbitt thoroughly explained the functionality of the working atom, which I was pleasantly surprised is a strong influence on how colors work within the human body. Simply put, he explained the thermal, 'warm' colors (red, orange, and yellow) to be of positive energy, and; the electric, 'cool' colors (green, blue, violet) to be of negative energy. Each color is said to vibrate at it's own unique rate, or frequency, and they are constantly moving through the torrents of the atom, until they reach harmony. Truthfully, Babbitt's specific inquiry's on this concept are rather questionable, but I found viable evidence that proves it true in examples in later chapters.

Once these premises were covered, he began putting their truths to the test by creating what he called **Materia Medica**. Basically, it is a medical standard that implements color + light therapy on ill patients. This is preceded by a thorough examination of each colored light- each one consists of the individual healing powers (including aspects to caution) and several real life

cases where it was implemented. I also appreciated his connections of colors to aspects in nature, such as minerals and plants. In other studies on the subject, I found this prior information to be quite valuable.

Babbitt described each colored light and explained the healing properties associated with it. He also described several cases to where that particular colored light was successfully executed on a patient. For some colors, he even lists foods and minerals that are also associated with the color and certain illnesses. The first color analyzed was red. It has been used as a stimulant, especially in the arterial blood and nerves. It has been associated with healing chronic conditions and ones that have been dormant for some time. Red is on the far end of the visible spectrum, making it a very powerful color, and to use with caution and not excessively.

Next was yellow and orange, known to stimulate the nerves, mostly around the stomach and digestive area. Babbitt compared these colors of yellow and orange to be laxatives, purgatives, cholagogues (liver and bile stimulation), diuretics (kidney stimulation), emmenagogues (uterus stimulation), diaphoretics (skin and vascular glands stimulation), rubefacients (skin and blood stimulation). Just like the other thermal color of red, yellow and orange are to be cautioned of over excitedness as well. If the body is already excited from something else, such as an ailment, yellow could worsen it.

Blue and violet are in the electrical contracting frequencies, which are piercing and soothing to essentially every system in the body that are overcome with inflammation or nervous conditions. Blue is the harmonizing color to red, which means it counteracts it. If the arterial blood faces inflammatory conditions, blue would be used to subside the effects. When blue is paired with pure sunlight, it becomes an even powerful force. The cooling, electrical properties of blue mixed with the healing properties of sunlight make it a unique pair. This combination is especially valuable to issues related to the head, as they aren't too harsh like the thermal colors. Pure, white sunlight alone is of course the most powerful of all, as every color in the spectrum is produced within. Without sunlight we wouldn't have life at all, but too much can also be extremely harmful.

A fascinating part of Babbitt's studies comes in the next part of the book where he explains the instruments that he designed himself, to optimize the healing properties of light and color. Starting with the chromolume, moving onto the chromo-disc, and ending with the chromo-lens. Each instrument has its own special features and uses, but all are intended for healing practices of color therapy. The chromolume is the most valuable due to the scale of the product, and vast array of knowledge that went into detailing it. It is essentially a window meant to cover the entire span of the body, with sections and portions sized to be interchangeable of colored panes. The idea is to have a corresponding color shine directly onto it corresponding area of body. This way multiple things can be healed at once without interrupting the healing process of other organ.

The next instrument Babbitt designed is called the chromo-disc. This product is much smaller in size and easier to handle. The objective is to direct the light at a concentrated area, with greater intensity. This means that it is intended for ailments of smaller scales, such as a tumor or a birthmark. The interchangeable lens on one end is only a few inches in diameter is where the light is released upon the skin. The light is filtered through on the other end that is made of metal and opens to about 15 inches in diameter.

The last instrument mentioned in the book, was his creation called the chromo lens. This is the simplest of the three instruments, in terms of creation and use. It is simply clear glass of any color and to be filled with a liquid. The liquid is then charged through the container it's in, the chromo lens, when sitting out in direct sunlight. The liquid is to then be digested or applied topically. The products are less scientifically regarded as they go, but interesting nonetheless. These products and parts of these products were for sale by Dr. Babbitt from his town of New York City.

Following this, Babbitt explains the focal ideas of refraction, reflection, absorption, transparency and polarization, and how these concepts have an impact on the different ways we perceive color. Polarization is arguably the causing factor that many of the listed reactions listed occur. Each has its own properties but they are all closely related. In my opinion, this would have been a good basis for a more comprehensive understanding, but the information is valued regardless of outline. The physics of refraction is the

preliminary guide in understanding how light produces color, just think of a prism. Each color is produced within the prism when flooded with light, and the reason the colors can be distinguished is because they vibrate at different rates.

Here, it was important to the author to clear up any misconceptions believed about reflection. Every reflection of light is the result of a **chemical repulsion**. This is true because regarding light, we are concerning atoms and molecules, not matter and masses. Often times, it is believed these substances, such as light or iron get absorbed, when really they are just reflected by themselves. Opposing reflection is absorption, which often get confused- not in logistics, but in what is occurring. Absorption occurs in substance that contain a special **chemical affinity**. The affinity attracts rays of light to the substance in which it resides, to hide or dilute the color. It could be thought that all colors are always being emanated, but the color that is visible is the only color that is being reflected while the rest are absorbed. When understanding absorption, the prior knowledge of color relations is useful because when one sees the color orange, it is more or less red and yellow being emanated at different variances, not actually a true orange.

When Babbitt was explaining polarization, his prior information about the working atom became very helpful. He had a great way of testing the polarity of a substance, where he used 2 crystals, the first as the polarizer and the second as the analyzer, which the analyzer shows the changes from the polarizer. When reverting back to the atom, the spirillae that circulate are constantly moving to it's polarity, or opposite end. Rays that are polarized are the combinations of color that was produced by refraction. This completes the full circle that connects all these theories of physics.

The fascinating concept of Odic force is the next thing Babbitt introduced it in this text. He explains the principality of the subject and describes its connection with man and nature. The prior knowledge regarding the law of polarity is what helped me understand this complex phenomenon. The Odic force was conceived by Baron Reichenbach, who states that only a certain, special type of person can see this force. It is such a hard occurrence to describe, but it is basically the light or aura that emits from a living force. Odic lights only appears when objects are under the influence of the fine

forces (i.e. magnetism, electricity, light, heat, etc) although they can affect essentially any object. It is often paired with clairvoyance, but really those who are clairvoyant can literally see these forces that we cannot.

The section previously discussed was concerning the relationship of man with nature. The book then concludes with the opposing point, of how the greatest realms to explore are not in nature but in our own minds, perhaps even beyond that infinite, as it combines both worlds into a deeper meaning. There are colored lights far more vibrant and plentiful than the ones we experience everyday, but these colors are hidden beyond, in a realm in which we don't consciously live. Beyond this, it proves that there are universes within universes which live no where but within our own perceptions. Anyone can access this and expand their mind, but it takes practice and is something to work at. It is believe that everyone is born with this 'power' and since it is not regularly practiced, it fades and becomes dull to even nonexistent.

With these Odic forces of light emanating at a much lower (and harder to see) frequency, Babbitt believes them to have an even more powerful healing properties than the original colored lights we normally see. Clairvoyance can penetrate through the entirety of any substance, or matter, where normally these vibrations just penetrate the surface. These 'powers' can be acquired through meditation and practice, and once they are gained, they can be transferred to other people. Refer back to the law of polarity, and recall how a negative force connects with a positive force. Babbitt explains several cases where people who have these clairvoyant powers can merely touch, or just be in presence of someone, who needs intense healing and uses their power to help.

Color Medicine: The Secrets of Color/Vibrational Healing

Color Medicine: The Secrets of Color/Vibrational Healing, was written by Charles Klotsche and published in 1992. His interest in chromotherapy started with an interest in the physical and energy bodies and the subtle-energy fields surrounding. He sought to understand the science behind energy and how that can relate it contemporary disease. Along the way, Klotsche discovered the effect colors have on the energy, or light in this case, and expanded his investigations even further as he concisely explained throughout his book. The other source of inspiration came to him when he started analyzing the trends of modern medicine. More specifically, it was the lack of instruction of how the body works. He feared this important information slipping in society as a whole, so he created the 49th Vibrational Technique in hopes of creating a method of natural healing.

The first chapter illustrates the scientific methods that establish the energy fields behind chromotherapy. Understanding Newton's theories on light and color, and his prism experiment are the basis for this unique healing method of chromotherapy. The prim(s) provide the seven colors of the visible spectrum. Goethe's theory contrasted this and added the physics of refraction and dispersion to also have the ability to create colors, but they are able to do so with the use of light and darkness. Alone, refraction cannot create colors.

When the prism is contrasted with light, seven colors emanate with each their own unique oscillation, or wavelength to distinguish them. Red is at the end of the spectrum, containing the longest wavelength within our visible spectrum, opposed by violet at the other end. Light and color rays can be distinguished by their wavelength and frequency, under the laws of physics. The wavelengths are measurements of space, and frequency is the measurement of time. When the rays accelerate, the oscillations are then shortened.

Following these renowned theories, was Klotsche's explanation of absorption and reflection. The understanding of how objects receive color is significant to the following analysis. He started by explaining how the absolute colors

of black and white are actually polarities of light and darkness. This correlates with Newton's statement of light contains all colors, therefore black is the absence of light. Analyzing these functions in black and white and their distribution of heat will help grasp a better concept of

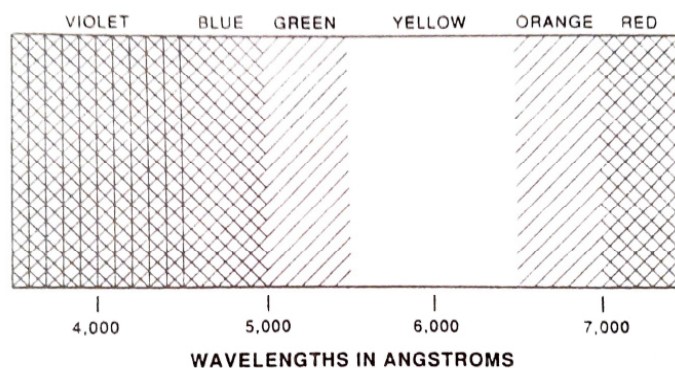


Figure 5. The Visible Spectrum (from Klotsche, 1992).

these reactions. The concept of polarities is soon realized in everything. Black is the total absorption of color while white is the total reflection. It is because of this absorptive and reflective relationship that some colors are warm while others are cool. As shown in figure 5, the violet end has shorter oscillations which allows it to tune toward white lights, while red on the other end with bigger oscillations tunes into the black lights. This means electric colors are reflective while thermal colors are absorptive.

The concept that energy and matter are dual expressions of the universe, a theory discovered by Einstein. Matter (m) that is accelerated by the speed of light (c^2) becomes dematerialized energy (E). What this means is that any materials of substance found in nature is energy. The colors we see are simply wavelengths and oscillations, but once these are combined with a source of light, the energy conducive to healing is produced to be applied to the impaired organs or bodily systems. Since every organ within is made of matter, it is safe to conclude that each organ has an energy that vibrates at its own rate. The objective is to match a vibration of colored light with that of the healthy organ to bring it back into harmony if it has fallen out.

The visible spectrum is very narrow in terms of frequency. This means there are several other energetic fields that are sensed in ways other than vision. All organisms, cells and atoms are existing as energy which forms a unique vibration. Energy is categorized as either positive, negative, or neutral. Similarly, colors are categorized as thermal red (positive), electric blue (negative), and neutral green. Thermal colors are known for their

stimulating effects, blue for its sedating effects, and green for neutrality. Using colors accordingly, they create a perfect balance in harmony. The vibrations of colors can work as an opposing force to establish harmony once again.

A detail in Klotsche’s work that I appreciated was his extraction of colors from the visible spectrum. There are seven rainbow colors: red, orange, yellow, green, blue, indigo, and violet. He took it a step further and used these colors to create five additional colors for a total of twelve healing colors. The original seven are heavily correlated to the seven chakras aligned down the spinal cord, highlighting concentrated bodies of energy. The five additional colors can also be regarded similar to the minor chakras in the body. How these are related to chromotherapy is explained further in later chapters of his book.

The author gives an opposing analogy on the primary colors, where he claims them to be red, green, and violet. They are otherwise regarded as red, yellow, and blue, as in Babbitt’s work. The reasoning behind this is sound, as it also aligns with that of the individual colors. Red, green, and violet are aligned with the three main chakras- red and violet on farthest ends and green directly in the middle. Furthermore, when these colors are perfectly matched up, they emanate a clear white light. Anyone can be trained to sense energies in our atmosphere and all around us, that we cannot physically see within our visible spectrum. It is easier to think of in terms of our two bodies: the physical body which can perceive the five senses and our etheric body, or aura, which is a higher energy from our physical body.

POLARITIES		
Expression	Corresponding Opposites (poles)	
	Physically Receptive (sedative, minus pole)	Physically Reactive (stimulative, plus pole)
Color	Blue (fast waves)	Red (slow waves)
Magnetism	North-seeking pole	South-seeking pole
Electricity	Electric negative	Electric positive
Bioelectricity	Bioelectric positive	Bioelectric negative
Gender	Female	Male
pH Value	Sedation by alkalinity (pH above 7)	Stimulation by acidity (pH under 7)
Chinese symbolism	Yin	Yang
Element	Oxygen	Hydrogen
Music	Slow rhythm	Fast rhythm

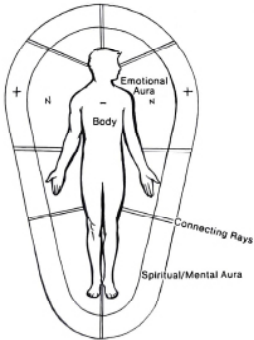


Figure 6. Polarities and the Ideal Aura (from Klotsche, 1992).

All material objects, plants, animals, and people carry an aura with them,

but only few are trained to see it. Most everyone can feel the energy, though. The aura protects the physical body and emanates feelings and emotions that are reflecting within. An aura can extend about 3 feet from the physical body, but even within this is even deeper layers. The first layer that emanates about 2 centimeters from the body is the portion of the aura that develops and sustains the physical body.

Understanding the law of polarity explains the relationship of these two bodies, as shown in figure 35. Polarities, or positive and negative energies, are evident within all matter that's existing in the universe. From this perspective, it is impossible to have a positive without a negative. Polarity is what makes existence possible within a three-dimensional world. The polarities that interrelate between these two bodies needs to create a complete balance consistently, or disease will start to form. This means that the energy, or in this case the light, must flow freely between in attempt to create harmony.

Understanding how to interpret the aura is the next step once acquiring the ability to physically see it. The physical body is a reflection of the aura, allowing it to tell the condition of the body and everything we hold within. A perfect aura would theoretically be white as all the colors would be in balance, but mostly it changes colors often according to small or large imbalances being experienced within. These imbalances can stem from emotions or organs.

The body should be thought of as a working whole, not by individual parts and sections. This means there is a polarity between the mind, body, and emotions. In this instance, the mental thought patterns we entertain are the positive body, our emotions and self-expressions are the neutral body of peace, leaving our physical body of the body's organs as a negative body. As each body of energy effects, the next, harmony will create a healthy working organism.

The last chapters of the book list different techniques and methods on how to implement chromotherapy. A highly regarded aspect is the list of 123 major illnesses and a color schedule designed to correlate with a healing color. The newer analysis and application methods of chromotherapy has a substantial influence on the contents of this design research.

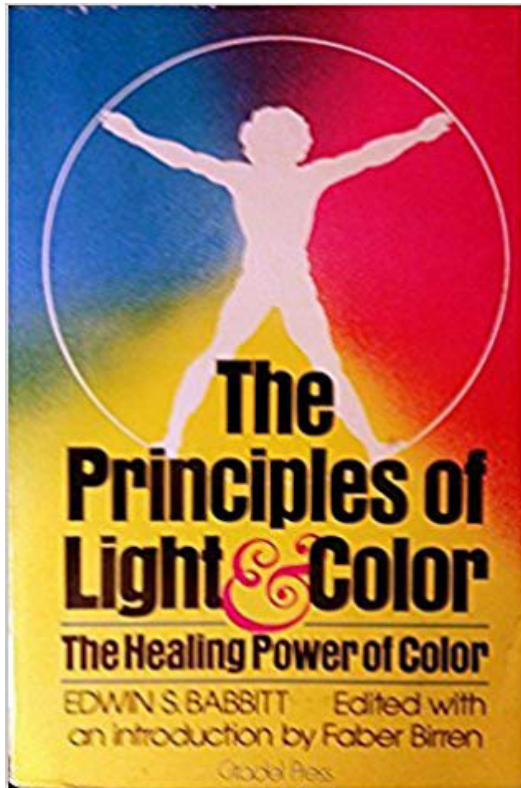


Figure 7. The Principles of Light & Color (from Babbitt & Birren, 1967).

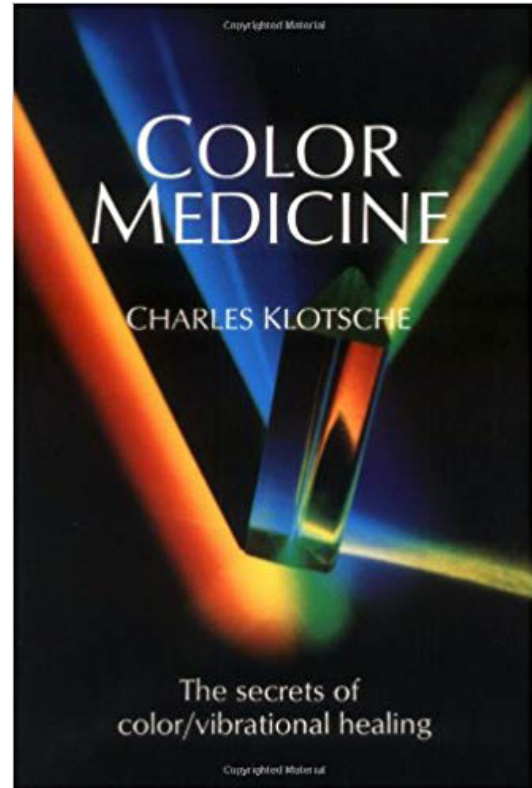


Figure 8. Color Medicine (from Klotzsch, 1992).

Summary

The first literature review served as a solid basis of valuable information that I was able to fully analyze by the works of the second, more recent, literature review I sourced. By simultaneously referencing Charles Klotsche's work in *Color Medicine*, I was able to comprehend Edwin Babbitt's works in *The Principles of Light & Color*, more deeply. Klotsche's work was simple and to the point, where Babbitt expanded on everything and gave real life scenarios. Edwin Babbitt conducted an extraordinary array of deep, timeless knowledge at such an early era.

When Babbitt explains the colored lights in their distinctive sections, the information is displayed at random and inconsistently, which made it hard to follow and make comparisons at times. He acknowledges how contradicting the colors are, and that is something I have made a goal to correct and thoroughly establish in my research conclusions. It was from this source that I determined what colors to use for my experimental research study. When Klotsche explained the distinctive colors, he gave a more concise explanation. This allowed me a good point of reference of what Babbitt was explaining, when I reread some of his chapters. I appreciated the way he grouped the colors and explained their powers, and the fact he used all 12 colors instead of the ordinary 7. Although they had their differences in color meanings, they could agree upon the influence of physics, regarding specifically the law of polarity. They both plainly stated that red is of the thermal category due to its long wavelength, and blue is electric due to its short wavelength. The vibrational rates also coincided between both texts due to its scientific prevalence.

The premise of physics and science that Babbitt expands from became even more relevant the deeper the book read, which made me question the outline, but valued, nonetheless. In *Color Medicine*, the theories of science and physics are presented as a preface which made a world of difference when comprehending the concept of chromotherapy. The theories related to physics regarding the thermal and electrical powers of red and blue were consistent between both texts. By examining the chart of polarities simultaneously with the diagram provided by Klotsche, I was able to

understand the relationship between all bodies of energy. This knowledge is reciprocated through all walks of life and every energetic field out there in existence. This acquired information lead me create more conclusions within Babbitt's workings that helped with the overall comprehension of the topic.

The three instruments created in response to the theories Babbitt acquired were extremely impressive for the time in which they were designed. Although we have easier ways of executing chromotherapy now with electrical power, the layout of the chromolume is still relevant today. He formulated the best way to implement the colors upon the body. The philosophy behind the chromo lens and charging water has been replicated in other spiritual practices. Overall, this portion of the book will not inspire the proposed research.

The part that I learned the most from *The Principles of Light & Color*, was much to my surprise, the Odic Forces. The seemingly simple concept of colors and light brings us to a much greater reality that exists beyond this realm. It connects us to a higher power and gives hope that something greater is out there, or rather, within us all. When this concept was first introduced, I was highly skeptical to its relevance to chromotherapy, and the science behind it, but it was also a concept I was unfamiliar with before. Prior to this research, I have heavily explored the realms of clairvoyance and psychic powers, and through this research I was able to determine a true explanation behind it. Not only did it solidify the knowledge I already acquired from this book, it also deepened it and made connections to my prior beliefs regarding higher powers and spirituality. This unexpected connection renewed my passion and curiosity regarding both neuroscience and the higher forces.

Typological & Precedent Research

I selected the following case studies for precedent research with careful consideration. I looked specifically at the following characteristics to ensure the analysis is conducive to my research project:

1. Typology

I looked specifically for healing or treatment healthcare facilities. The studies I found all include typologies that provide everything the patients (or building occupants) might need in the duration of their stay. Through these I can analyze building function and circulation.

2. Building Context

I would like for my site to have outdoor functions as much as indoor, but the challenge comes from inner city locations. I looked for cases with similar challenges, to find a design solution through analyzation.

3. Environmental Impact

I looked for projects that kept sustainability and simplicity as major design elements in designing and choosing materials for the project.

Precedent research cases:

Psychopedagogical Medical Center | Osona, Spain

Navyas | Bengaluru, India

Wellness and Spa Lone | Rovinj, Croatia



Figure 9. Psychopedagogical Medical Center (from Comas-Pont arquitectos, 2017).

Psychopedagogical Medical Center

Comas-Pont arquitectos

Typology: Medical Facilities

Location: Vic, Spain

Size: 17,836 sf

Distinguishing Characteristics

The Psychopedagogical Medical Center combines services for both addiction and mental health patients. The building is composed of 6 meter wide modules, allowing it to be sustainable in terms of efficiency. It is also economically sustainable in its use of high efficiency energy systems. One of the features adapts the energy demand according to the people using the building and the weather outside. There is vegetation planted throughout the center that creates a passive bioclimatic system, that the patients get to care for as part of their therapy process.

Project Elements

The Psychopedagogical Medical Center sits right outside of the main healthcare facilities of the city, allowing the size of the facility to be more intimate and small. The center is situated mostly on the ground level for easier mobility of the patients, where the following spaces are connected by ramps:

- Main information desk
- Greenhouses
- Therapy rooms
- Group rooms
- Kitchen/lounge
- Medical/examination rooms

Research Findings

Precedent Study Similarities

This case study relates to the following case studies in the fact it is a health facility that services specific illnesses.

Precedent Study Specialties

This case study is unique in its sustainable design. It uses ordinary design methods to successfully create an unordinary medical center. The interior is finished differently than typical medical facilities, which I think could greatly benefit the patients and facility itself.

Site Responses

Environmentally, the building design features several sustainable methods and materials that will contribute to the efficiency and reliability in the longevity of the center. There are several greenhouses and gardens throughout the facility.

Socially, the design has several common spaces for people to use. The open flowing layout gives a good sense of community and safety as patients can easily navigate through the building.

Culturally, this building typology is good for any community to have. It shows that the citizens' wellbeing is of high importance, which is conducive to any healthy community.

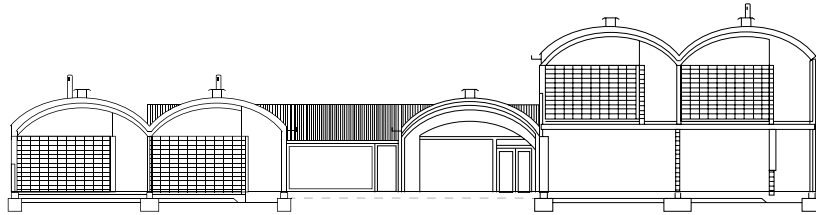


Figure 10. Psychopedagogical Section Cut (Modified from Comas-Pont arquitectos, 2017).

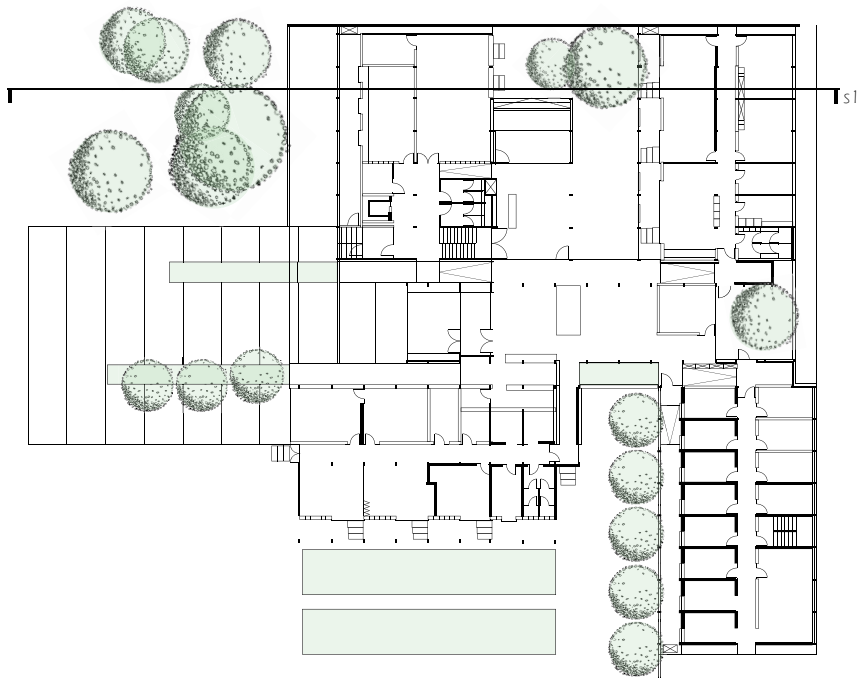


Figure 11. Psychopedagogical Site Plan (Modified from Comas-Pont arquitectos, 2017).



Figure 13. Psychopedagogical Garden (from Comas-Pont arquitectos, 2017).

Structure

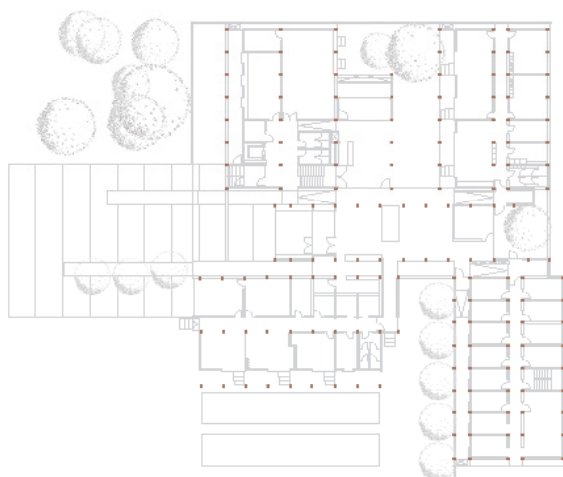


Figure 13. Psychopedagogical Structure Plan (Modified from Comas-Pont arquitectos, 2017).

Circulation



Figure 14. Psychopedagogical Circulation Plan (Modified from Comas-Pont arquitectos, 2017).

Massing & Geometry



Figure 15. Psychopedagogical Massing & Geometry (Modified from Comas-Pont arquitectos, 2017).

Hierarchy



Figure 16. Psychopedagogical Hierarchy Plan (Modified from Comas-Pont arquitectos, 2017).

Analysis and Conclusion

Structurally, the design follows a 6-meter wide module plan which produces a simple gridded column structure. This is a light-weight wooden structure due to the small scale of the design.

Natural light is easily let in to each space of the center due to the precise arrangement of the modules. The greenhouses and thermal walls are placed in correspondence with this to produce the most vegetation.

The *massing* of this building is a direct result of the layout of the modules. It is a very simple and evenly-balanced building in plan and elevation which allows for easy mobility throughout the facility.

The Psychopedagogical Medical Center is a great case to study sustainable design elements, and how to successfully implement them into a healthcare type of facility. It showcases sustainable materials as a main design element. I have taken inspiration from this project and building layout because it narrows down on a specific type of healing. This is beneficial to me because there are design elements that were created specifically for the patients of the facility that are similar to my project idea.



Figure 17. Navyas at Night (from Cadence Architects, 2018).

Navyas: Cadence Architects

Typology: Healthcare Center
Location: Bengaluru, India
Size: Unknown

Distinguishing Characteristics

The Navyas Healthcare Center is designed as a naturopathy center with a yoga hall, situated on a tight site in a noisy, busy area. The irony of the site is the first distinguishing characteristic, along with the sacred Cannon Ball tree that came with the site, too. These two characteristics, the noise and sacred tree, are what inspired most of the design. Another distinguishing characteristic is the noise wall that was design to integrate nature and plants in a beautiful way. Another distinguishing characteristic to note is the column free yoga space on the top-floor terrace.

Project Elements

F I R S T F L O O R	Reception	S E C O N D F L O O R	Lobby	S H O W E R	Shower
	Consultancy		Lab room		Steam chamber
	Restrooms		Gym/Physiotherapy		Men's massage
	Collection room		Restrooms		Change room
	Back office and administration		Children's Therapy		Men's hydrotherapy
	Dispensary		Women's massage		Men's enema
	Cafe/kitchen		Women's enema		Conference room
	Storage		Women's hydrotherapy		
T H I R D F L O O R	Lobby	F O U R T H F L O O R	Lobby	Y O G A H A L L	Lobby
	Double room		Yoga studio		Yoga studio
	Restrooms		Changing room		Changing room
	Dining area		Spa		Spa
	Lounge area		Lockers		Lockers
	Reading area		Restrooms		Restrooms
			Shower		Shower
			Yoga Hall		Yoga Hall

Research Findings

Precedent Study Similarities

This case study relates to the following case studies in the fact it is a healthcare facility, nature and plants are heavily influenced in the design, and that passive systems are implemented as a design method.

Precedent Study Specialties

This case study is unique in the solutions to design challenges, permitted by the site. Learning how they solved these problems will benefit my own project site analysis.

This site was restricting which made for a good design. The noise wall has a beautiful aesthetic when mixed with the plants, and it is effective at eliminating the noise. The designers decided to not only leave the tree, but incorporate it into the design itself.

Site Responses

Environmentally, the building features a jali screen that has several purposes: noise reduction, light filtration, and a living skin. The medical plants provide therapeutic purposes, cleaner air, and a softer environment to heal in.

Socially, the design has several areas for community gatherings such as the yoga studio and hall, the gym, cafe, and lounge areas. This is a great place to come with others or alone, to not feel alone. This is a sacred place of healing and community.

Culturally, this center brings a new culture to the community in which it thrives. This center is all for the people it serves which can leave a lasting impact.

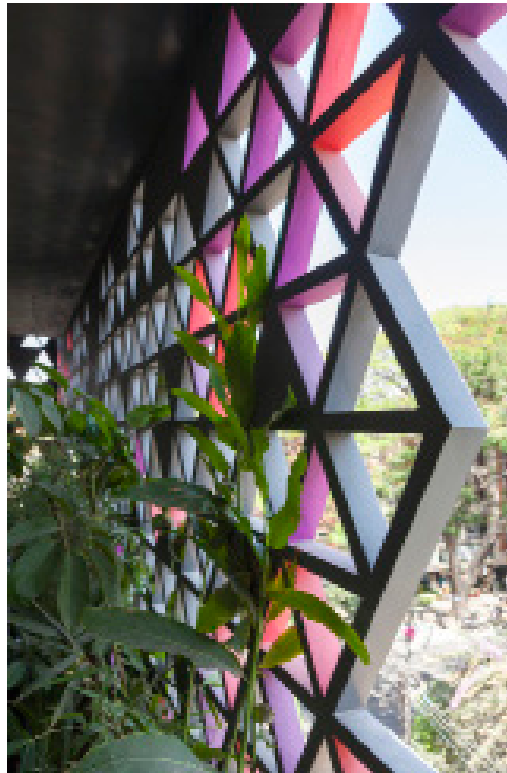


Figure 18. Living Skin (from Cadence Architects, 2018).

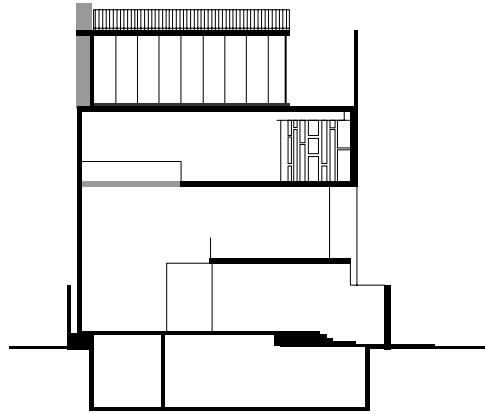


Figure 19. Navyas Section Cut (Modified from Cadence Architects, 2018).

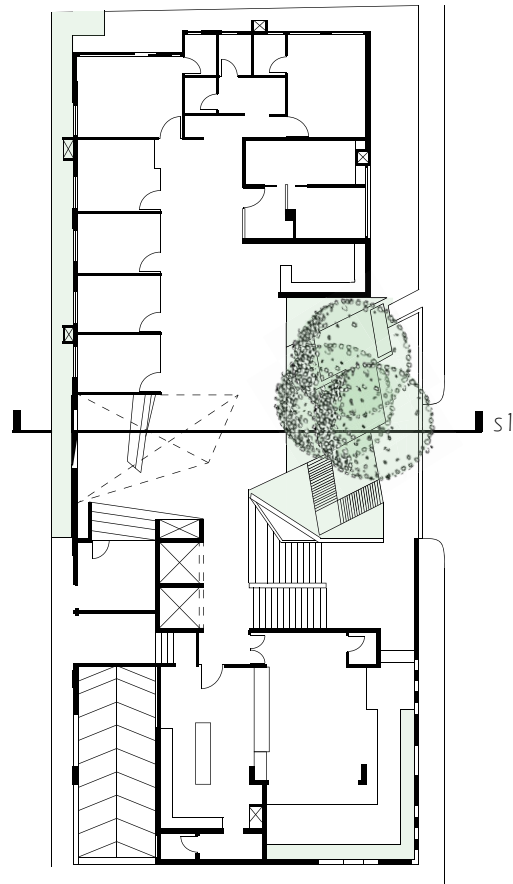


Figure 20. Navyas Site Plan (Modified from Cadence Architects, 2018).



Figure 21-24. Navyas Circulation Plans (Modified from Cadence Architects, 2018).



Figure 25-28. Navyas Hierarchy Plans (Modified from Cadence Architects, 2018).

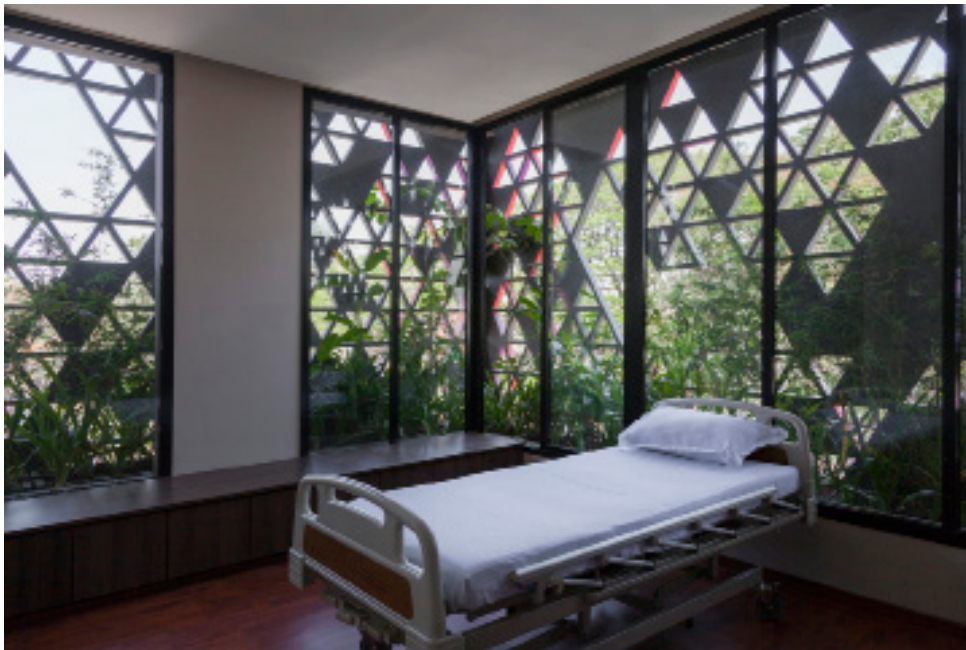


Figure 29. Examination Room (Cadence Architects, 2018).

Analysis and Conclusion

Structurally, the design follows an organic pattern of light steel-column construction. This allows for large spans of open space which was beneficial for the yoga hall on the top floor.

Natural light is diffused into the spaces by a living skin that covers the buildings facades. The skin was constructed out of a jali screen and medicinal plants. Not only does it diffuse the natural light, but it also blocks some noise and CO2 pollution coming up, off of the busy street below. The *massing* of this building is a simple block. It is organic but small enough that it is still easy to navigate through. The layout was mostly inspired by the Cannon Ball tree previously mentioned, and the commotion of the busy street.

Navyas was a very informative case to study. I think the most beneficial aspect I took from it was studying the solution it came up with for the tight space. I was torn about choosing a rural or urban site and this case helped me sort out some of the concerns and decide. I was worried about losing touch with nature in choosing an urban site, but the living skin is a great solution and inspiration. Also, as urban site is substantially easier to access for more people than an rural retreat.

Wellness and Spa Lone: Studio 92

Typology: Spa

Location: Rovinj, Croatia

Size: Approximately 14,000 sf

Distinguishing Characteristics

The Wellness and Spa Lone is a one-of-a-kind place. The thought and detail incorporated is prevalent throughout and plays an important role in the overall building success. For example, most materials were chosen in black and white tones to emphasize the texture once paired with a colored light. The design features a simple, linear layout that connects the building's various functions solely on the ground floor. The spa is also part of a hotel, called Hotel Lone, which was the first design hotel in Croatia. With that, the spa is luxurious with fine materials and finishes selected in its contemporary design, which were ultimately inspired by the existing hotel.

Project Elements

Although the hotel spans over several floors, the spa is situated on the ground floor. This provides a welcoming and secure feeling to the building and its occupants. The ground floor consists of the following spaces:

- Reception desk
- Indoor pool
- Treatment rooms
- Saunas
- Relaxing/lounge area
- Fitness room
- Locker rooms
- Hydro-massage pool
- Vitality bar
- Beauty room
- Staff area

Research Findings

Precedent Study Similarities

This case study relates to the following case studies in the fact it is a healthcare facility, and specifically with the Psychopedagogical Medical Center as they both are situated on the ground floor. This quality seems to be a beneficial characteristic that positively affects the wellbeing of the patients and the other building occupants.

Precedent Study Specialties

This case study is unique in the functions of the building. It is different than common healthcare facilities and yet it is closely related to the type of building typology I'd like to design for my thesis project. The specific elements and features will produce good results, as it is more than just a spa. The healing elements are so natural and simple.

Site Responses

Socially, most of the spaces in this facility are for multiple people to use at once.

For example, the saunas, spa, and hydromassage pool. This brings a close intimacy between the people experiencing which will benefit their overall health.

Culturally, this center brings a new culture to the community in which it thrives. This center is all for the people it serves which can leave a lasting impact. The existing hotel will bring new people in already with its luxurious style.

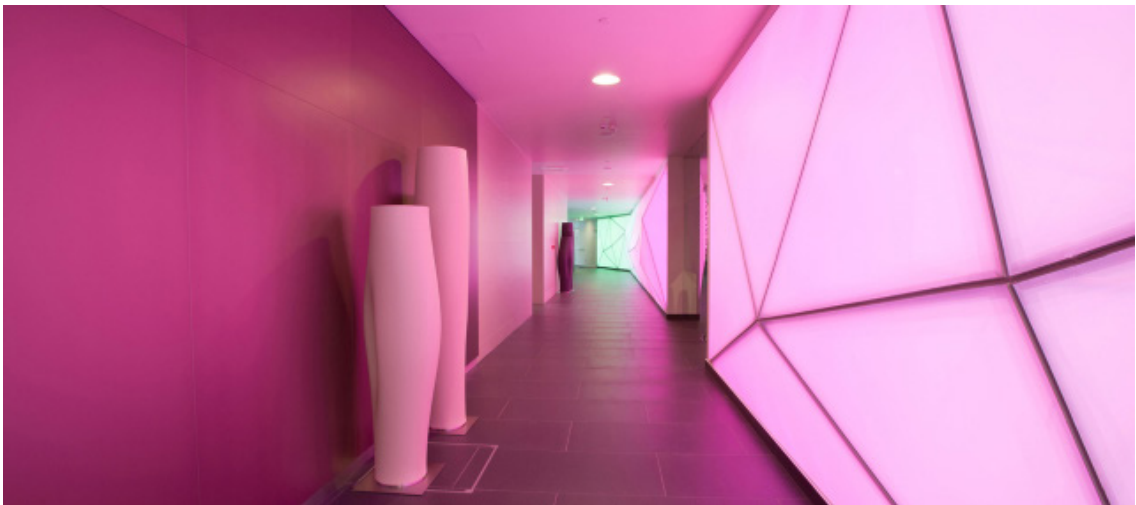


Figure 30. Wellness Spa Corridor (from Studio 92, 2018).

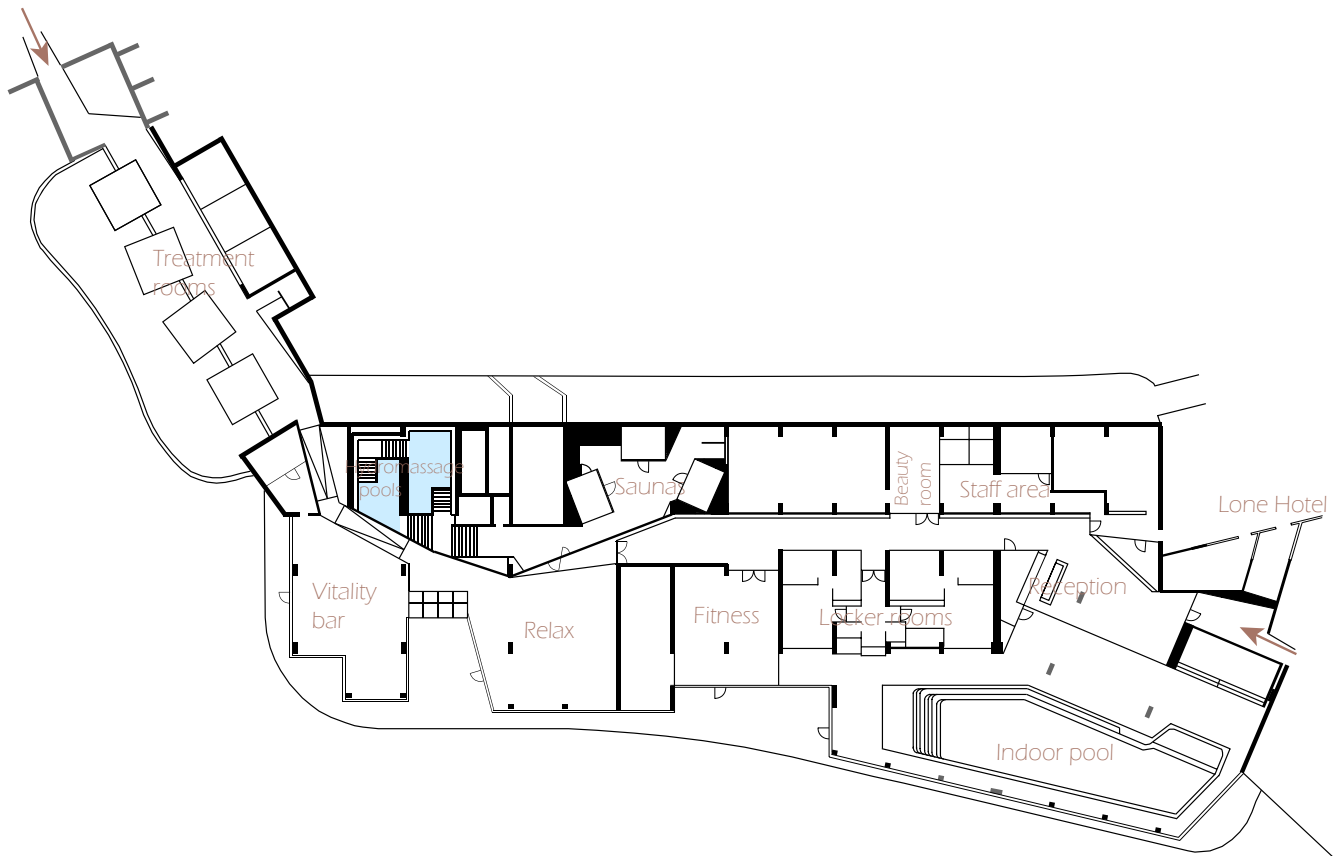


Figure 31. Spa Ground Floor (modified from Studio 92, 2018).

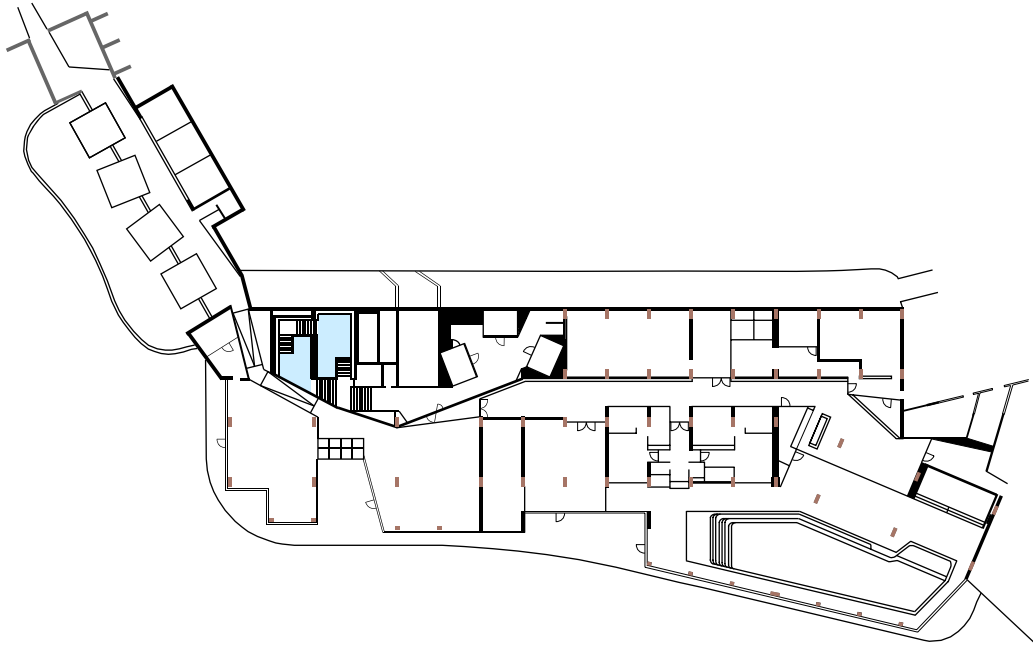


Figure 32. Spa Structural Plan (modified from Studio 92, 2018).

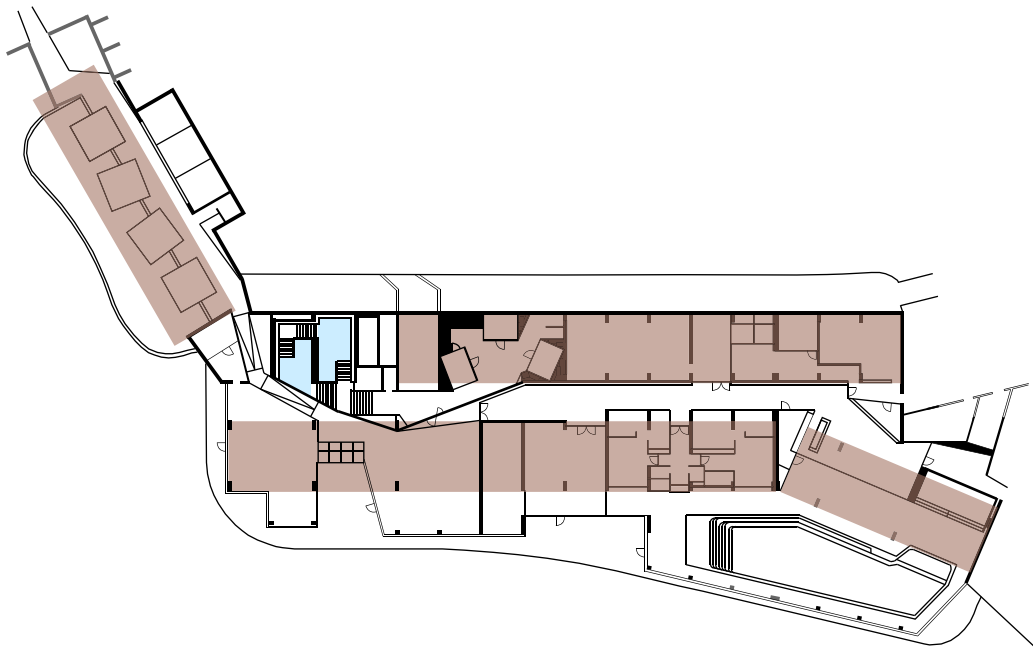


Figure 33. Spa Massing & Geometry Analysis (modified from Studio 92, 2018).

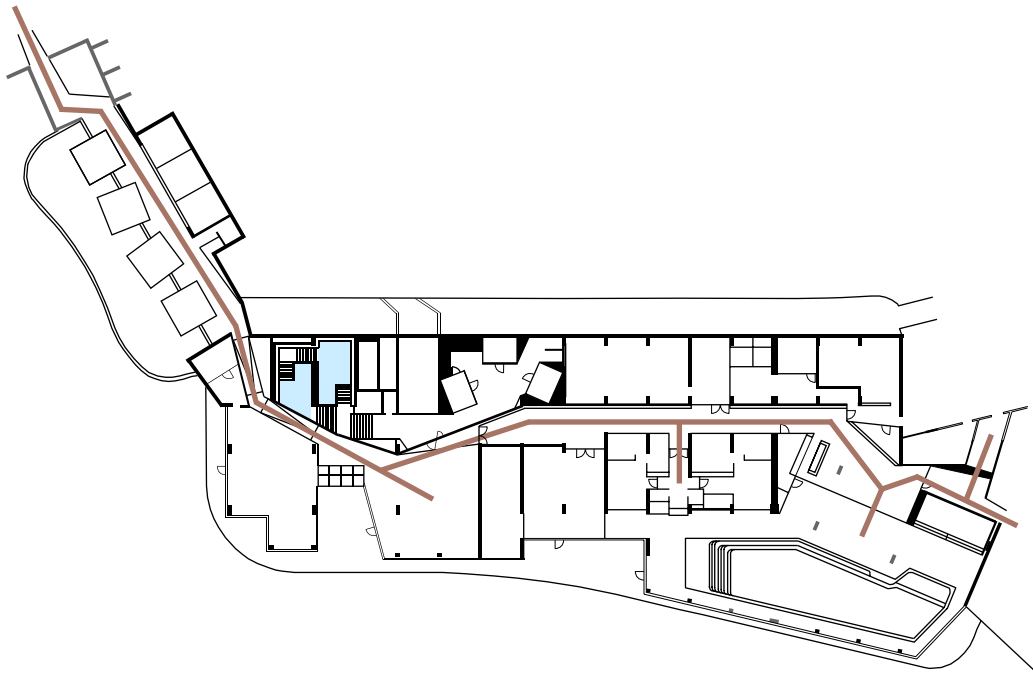


Figure 34. Spa Circulation Plan (modified from Studio 92, 2018).

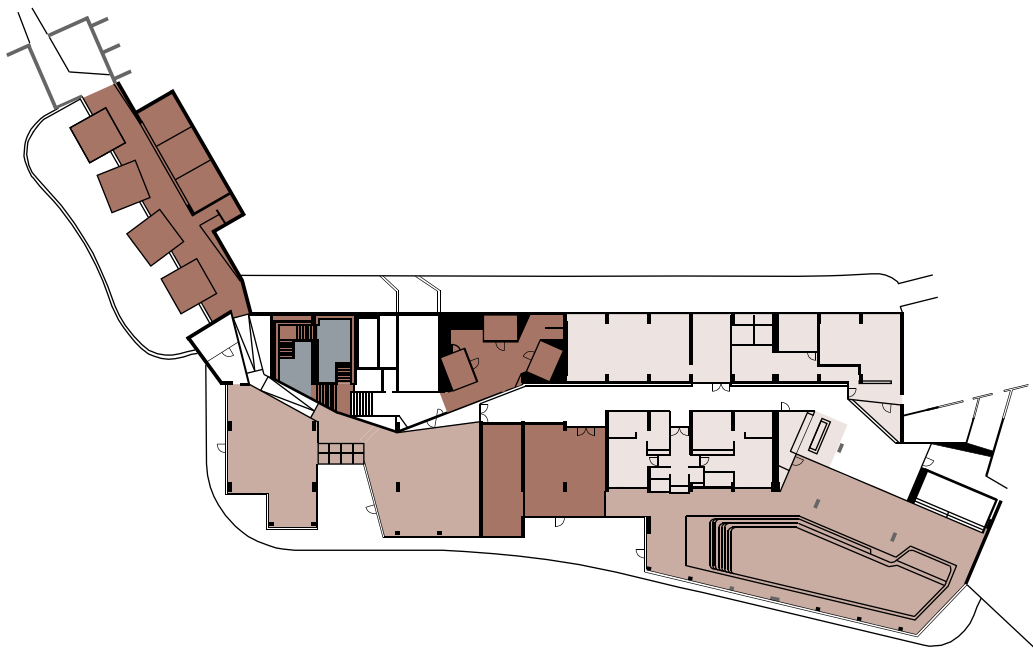


Figure 35. Spa Hierarchy Analysis (modified from Studio 92, 2018).



Figure 36. Spa Treatment Room (from Studio 92, 2018).

Analysis and Conclusion

Structurally, the design follows an simple gridded structure. The building is probably designed with a wood structure given the low height and simple forms.

Natural light is welcomed into the treatment rooms by large windows facing the exterior courtyard. They are angled individually to allow in the most amount of daylight as possible.

The **massing** of this building is a simple block. It is organic linear as the **circulation** diagram analysis shows that the spaces are situated along the center circulation path. This allows for easy navigation through the facility. The opposing main doors allow easy and secure access for different areas in the building.

Wellness and Spa Lone was the most informative case study I analyzed. I like the simple functionality of the building and the spaces incorporated are inspiring to my design project. I like the way it uses luxurious materials and then emphasizes their beauty with color and light. The subtly way they introduced chromotherapy is a nice introduction to the study, but I am hoping to use it as a more prominent design characteristic.

Typological Research Summary

Each of the case studies previously mentioned were thoughtfully chosen for further analysis. I looked specifically for healthcare type of facilities, and the ones that narrowed in on specific treatments were of high regard. This was prevalent in two of the three studies I looked at, and in my analysis I concluded that this is overall beneficial to the facility and the users because of the intimacy and security they provide. Each project I studied inspired me in their own ways that I will be able to carryout in my own project.

Although the [Psychopedagogical Medical Center](#) was a great tool to use for implementing sustainable design methods and materials, it did it at the cost of building aesthetic and comfortability. It seems the only comfortable feature is the ground floor circulation. Other than that, the building interior seems unfinished and not very welcoming to the sensitive patients that will be the main occupants. This center also stuck out to me due to the location being right outside of the main medical center in the area, which could be a great feature to the center.

[Navyas](#) was the only case I studied that was situated upon several levels. I thought that would compromise the intimacy I am trying to achieve, but it surprised me in the fact that it doesn't change a thing. I learned a lot through the busy, urban site, too. I wanted a site that was easy and fast to reach, but I thought that would interfere with the projects goal of being quiet and serene. Navyas implemented beautiful design solutions to eliminate the noise and pollution of a busy area, and they even incorporated nature and plants to help in doing so.

The [Wellness and Spa Lone](#) I chose specifically because it implemented chromotherapy into it's design. Although it was a subtle introduction to the fascinating realm, it showed me what types of spaces could stand to be in a facility that offers chromotherapy as a treatment option.

Each study brought it's own inspiration and together I will use my analysis to inform the main design decisions regarding my project. The thing that each study valued the most was the comfortability of the users, because most of them are going through something detrimental. These cases give me a clear indication of what I want my building program to look like and how I want my project to function.

Project Justification

The research practices of chromotherapy will unify my passion for architecture with my interest in alternative medicine. I have always been intrigued by alternative methods of healing, and chromotherapy is a realm that is not as well-known as other methods such as meditation or aromatherapy. Completing a project of this typology will provide a cohesive premise for the type of work that I would like to pursue following my academic career, into my professional career. Acquiring substantial knowledge in this field will help in preparation for guiding my future in the design field and exhibit my strongest qualities.

In the growing world of health and science, alternative medicine is making a strong comeback from its primary roots in the ancient times. People are becoming more aware of the choices made regarding our bodies and overall health. We are now able to advance these alternative methods of medicine and healing by influencing old methods with our new science. Solidifying a method such as color therapy will impact the future of science and healing through architectural design.

In academia, this research project has implemented the unfamiliar field of neuroscience with our well-known field of architecture. The collaboration of these aspects will allow validation of the study as a predominant form of scientific investigation. Analyzing the brain activity in response to color frequencies will open a new world of design and healing.

Historical, Social & Cultural Context

Everyone practices chromotherapy theoretically every day, without even realizing it. Without it, we would be dead along with every other living organism. Sunlight is a practice of chromotherapy, arguably the most important color, and simply basking in its rays can do so much for our health. Sunlight is vital to all walks of life, and the strongest color on the spectrum as it contains every color within its rays. This is familiar to most individuals, especially those living in cold and dark climates as they realize how vital the sunlight is to our bodies when the skin starts to turn waxy and gray in color.

Chromotherapy is an alternative medicinal method that has been practiced for several thousands of years to date. There are instances that date back to ancient texts discovered in China, Greece, India, and Egypt although nothing of medical or historical implications were fully documented (Garala, 2009). Aside from colored light, there is a long history based on colors individually, without the additional use of light. While I think there is some important facts worth noting behind the properties of colors themselves, light is ultimately the healing factor.

The first instances of chromotherapy are indicated in the Grecian temples where they started with pure sunlight and slowly discovered a significance in the use of individual colors, too. There are geographical remnants and evidence of healing in recovered recordings that suggest the light and color practices were used in addition to the use of opiates. Opiates were ingested to deepen the patients sleep and hallucinations, thought to bring them closer to the gods/healing. The earliest cases are fascinating for many reasons, the first being the depth of knowledge they already obtained before teaching this practice. The priests and priestesses understood the importance of the intricate layers of healing and took on the responsibility of accumulating this knowledge and practice, as well as relating it. This meant to practice other methods such as healthy eating, exercise, hydrotherapy, aromatherapy, in a simultaneous way to deepen the healing properties (Roseman-Halsband, 2018).

There is evidence of color diagnosis and medical protocols found in the bible of Traditional Chinese Medicine, a book written over 2000 years ago, with information that is still relevant today. The Chinese people found inspiration and curiosity in nature as they knew there was a significance in the colors they were observing, growing all around. Herbs and vegetables were a significant variable in their healing methods, either to be ingested or applied directly on the skin (Roseman-Halsband, 2018). They were really close in their theory as plants survive off of sunlight and photosynthesis.

In Egypt there was another color practice called gem healing, which required gemstones of certain colors to be ground up and placed in water that is then charged by the sun's electricity (Roseman-Halsband, 2018). As time evolved, there were flaws found in this practice as some gemstones and minerals are found to be toxic, or even deadly. There is evidence of colored rooms in the Egyptian temples, in the Roman hospitals and mental institutions, and more recently in daily practices in America and Europe since the late 18th Century.

Doctor Edwin Babbitt formulated his own protocol after he extensively studied other cases executed physicians, that were mostly practiced naturally, at home through colored windowpanes. That was before electricity was created, which is a fascinating aspect given the advancement of knowledge in topics of chemistry and color to create a viable method of healing such as chromotherapy. Babbitt's protocol was more objective and methodical as it required patients to complete a series of strict tasks.

In more recent times, chromotherapy has been implemented in various ways in healthcare facilities and wellness centers. There have been several instances where light is incorporated into yoga and meditation practices, as well as in saunas and flotation spas to bring the patients to a deeper level of healing by mixing complementary, alternative medicinal methods. Through this research I hope to discover a reliable method as on track with Babbitt's studies and theories to conclude with sound results.

To maintain a healthy body and mind, they must be tended with care every day. Often times, we only seek assistance when we notice drastic changes

in ourselves, but ideally these problems should be addressed right away. The body should be regarded as a whole, not by individual parts and pieces. Mental disorders are the leading cause of illness and disability on a worldwide scale, yet most countries do not even mandate a mental health policy or program. In the United States today, 46% of adults will experience a form of mental illness at least once in their lifetime (Kapil 2019). As science has evolved, we are beginning to understand the underlying connection between mental and physical disorders.

There is not conclusive evidence as to why, but there are similarities in other characteristics. Trying to elevate these opposing factors is a daunting task due to the sensitivity of the close relationship they obtain (Sartorius 2007). This research works to cover a wide range of common illnesses experienced by people worldwide. People who are hurting and healing, often find solace in each other which helps the process. Bringing this type of healing to a new community will help bring people together for a wholesome reason.

Site Analysis

100 3rd Street N | Moorhead, MN 56560

Parcel ID: 58.575.2215

Owner: Park View Terrace II LP

Zoning: Downtown Mixed Use

Zoning Code: MU1

Parcel Sq Ft: 237,119

Calculated Acres: 5.44



Figure 37. National Map.

The Red River is located adjacent to my site and serves as a major aspect of the Fargo/Moorhead area. The river almost acts as a layer of protection, outlining the site. Not only does the river outline the two cities, it also creates several activities for locals and tourists year-round. It serves more as a link between the cities (and states), than as a border. The river creates a varying topography that allows a feeling of serenity and calmness, which balances the busy road bordering the South. Due to the prime location, there is heavy traffic on the double lane road, 1st Avenue North. Additionally, there are railroad tracks that are constantly in use near the site as well.

Currently, the site houses one of two low-income and senior housing. The buildings were constructed in 1976 and are experiencing internal structure failures along with other mechanical issues that have resulted in costly renovations. The second building is on a separate parcel just to the West of the site and will be left untouched. Other than the building, there is a small parking lot and a forest of matured trees. The trees also serve as a protection barrier from the busy road and traffic pollution.

The Heritage Hjemkomst Interpretive Center is located adjacent to the site as well. Between the wrapping river and the heritage center, this site has a special feeling that will be carried into the design itself. Across the busy street of 1st Avenue, the abandoned Moorhead Mall sits almost entirely vacant and the American Crystal Sugar Corporate Office. This area has an interesting array of building typologies, many of which are expected to boom in the next few years.

A little further South is Moorhead's downtown, which mostly consists of shopping and eating areas. These attractions allure various types of people, bringing a welcoming sense of community. To the West is Fargo's Downtown which is expanding even faster, bringing new people to this area all the time. There are activities happening constantly, year-round between the local businesses to get people working, creating, and living together.



Figure 38. Site & Neighboring Sites.



Figure 39. Site.

Views or Vistas: Existing Grids

Being in close proximity to the river, the site and surrounding areas do not exactly follow a grid pattern, but the flow of the river. The neighborhoods surrounding the river on both sides eventually turn into a grid pattern. This is beginning to occur as seen on the West portion of the figure below.

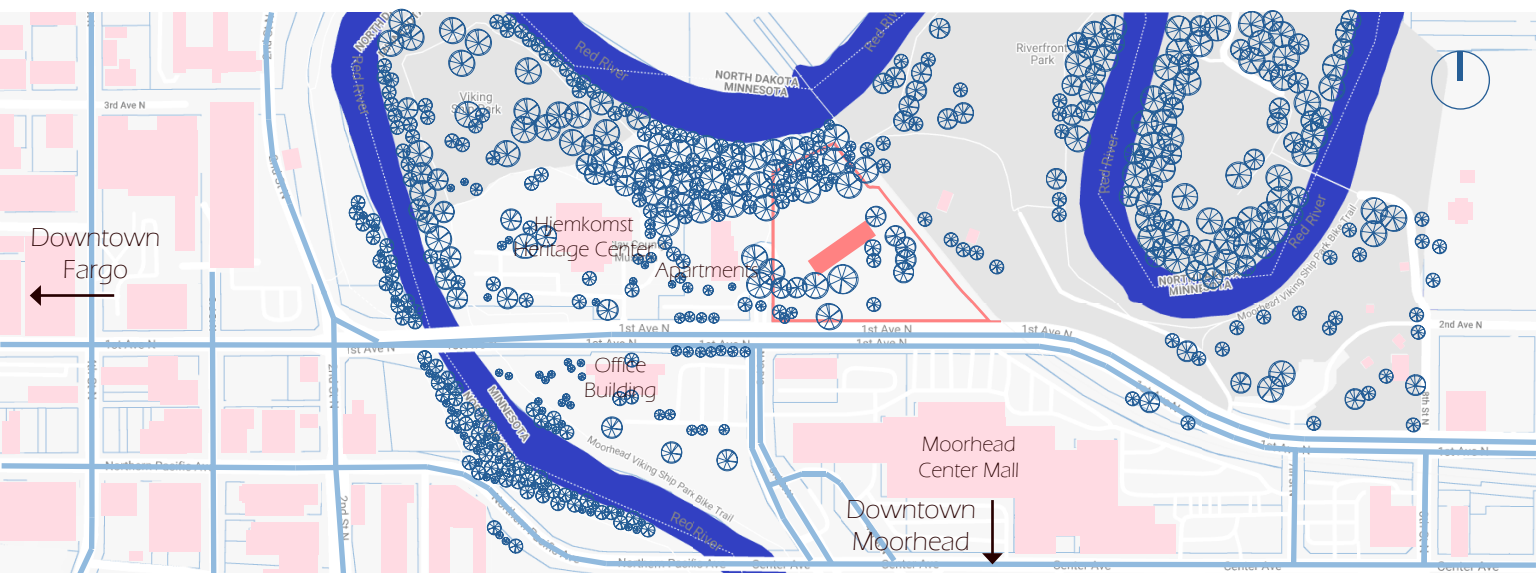


Figure 40. Existing Grids in Plan View.

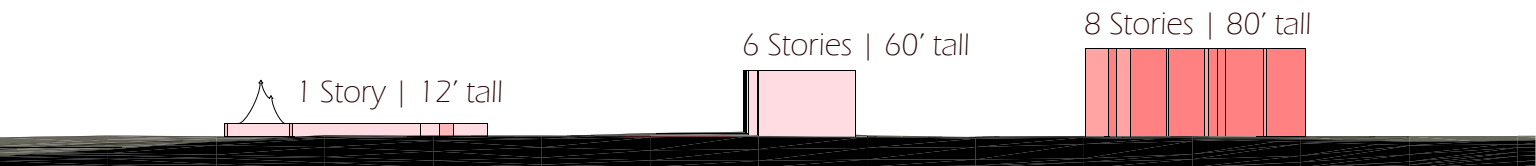


Figure 41. Existing Grids in Section.
*Vegetation not shown

Views or Vistas: Shade and Shadows

March 21st | Spring Equinox



June 21st | Summer Solstice



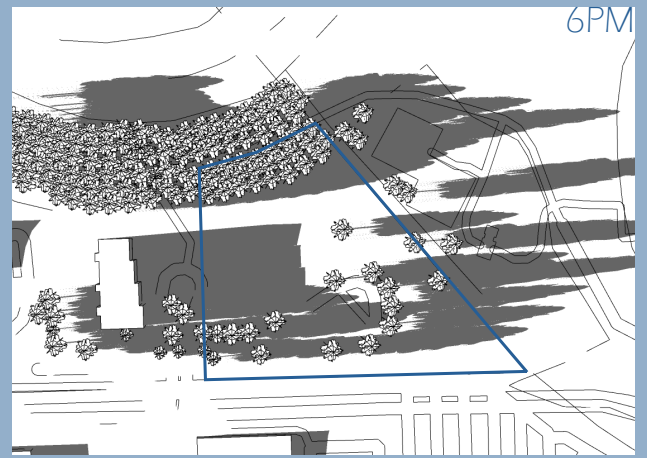


Figure 42-45. Spring Shadows.

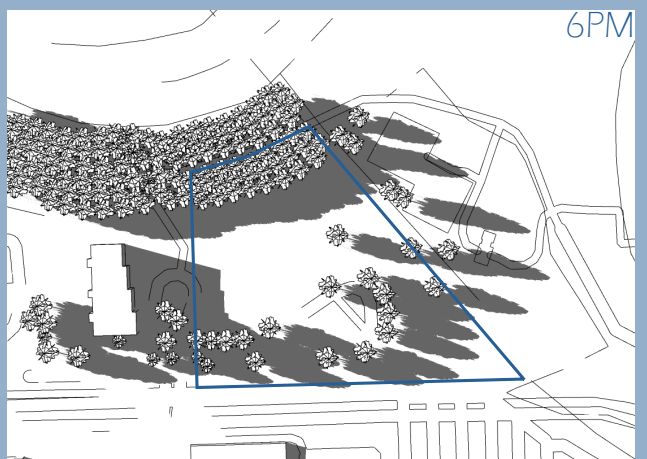
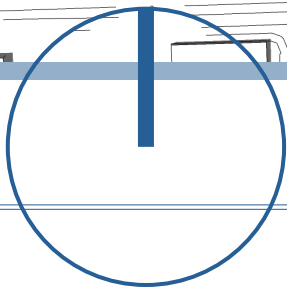
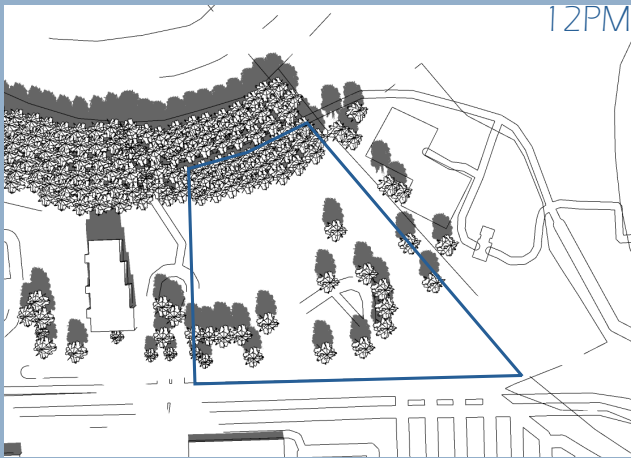


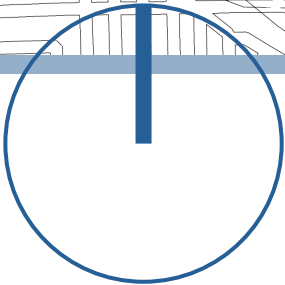
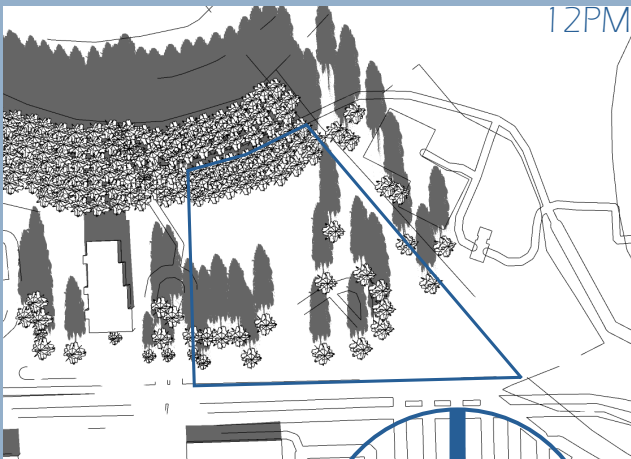
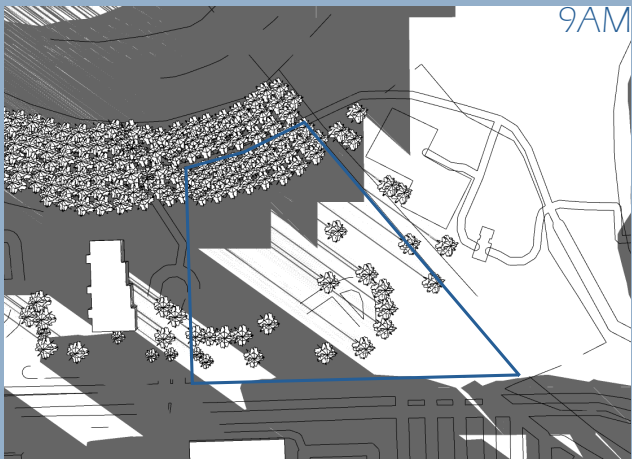
Figure 46-49. Summer Shadows.



September 21st | Fall Equinox



September 21st | Fall Equinox



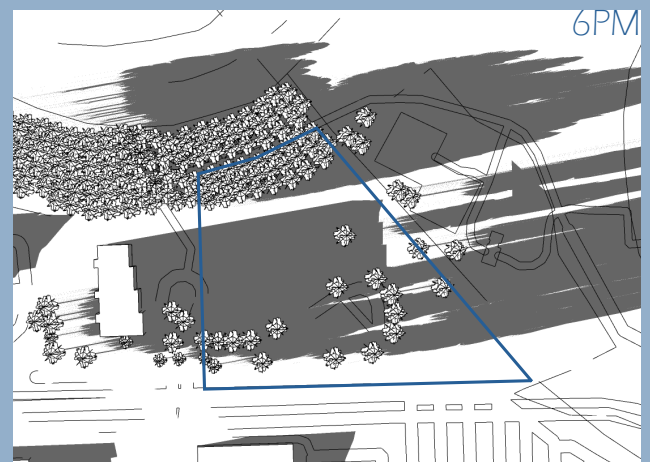
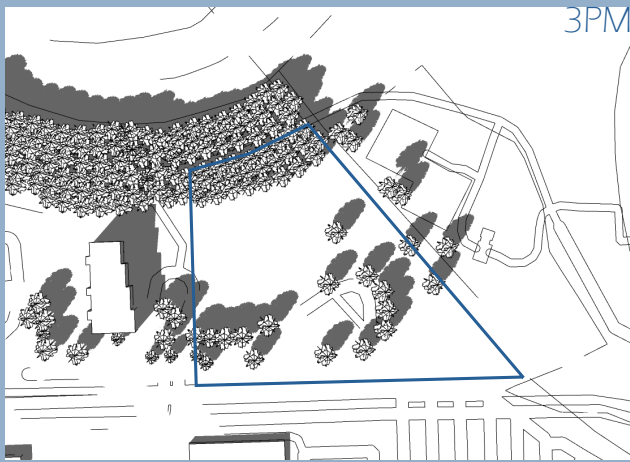


Figure 50-53. Fall Shadows.

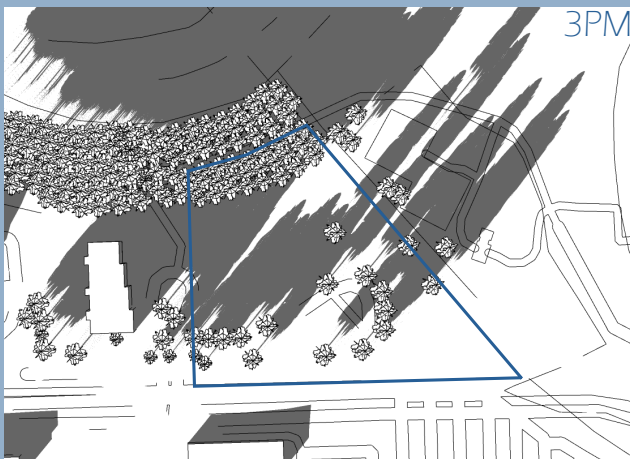


Figure 54-57. Winter Shadows.

Conclusion and Analysis

In analyzing the shadow diagrams, it is clear that the site is typically about half shaded, and half open to direct sunlight throughout the year. The exceptions of course, are in the winter months and at night. The trees on the site provide ample shade, but even more importantly they are located to block the noise and pollution from the busy nearby road. The topography ensures that there is plenty of sunlight to feed the building and design.

Human Characteristics, Distress, & Site Character: Existing Building

The site currently houses one of two apartment buildings of the Park View Terrace LP. The other building is on the adjacent site to the West. These are low-income and senior living apartments that have been around since the 70's. Both buildings are failing in their structures and other interior mechanical systems. In the last 2 years, the building on my site has had several repairs and failed a fire inspection. Due to the poor condition of the buildings, they will not last much longer without costing hundreds of thousands of dollars in repairs and renovations. The building on my site is set to be demolished for a new design and building typology for this thesis project.



Figure 58. Building on Site.

Building Information:

Commercial Building Sq Ft: 12,387

Commercial Building Gross Sq Ft: 99,879

Story Height: 8

Number of Units: 120

Human Characteristics, Distress, & Site Character: Neighboring Sites

Also tucked into the rivers curves is the Hjemkomst Historic Heritage Center and an apartment building. The Moorhead Center Mall and the Crystal Sugar Company are the neighboring sites to the south. These unique typologies have been a staple to this community for years. The growing downtown communities of both Fargo and Moorhead also greatly influence this site with their close proximities.

The river itself is what provides the most activities for the local community, year-round. The parks and forested land that infill's the rivers banks provide trails for biking and walking in the summer, and cross-country skiing and biking in the winter. The topography provides hills for sledding in the winter and playing catch in the summer. The river can be canoed down in the summer months, but the water is too dirty for swimming or fishing. Throughout the trails there are various spots to picnic or hammock, and there's outdoor tennis courts.

With the various outdoor activities readily available, this site will help encourage the visitors and patients to enjoy outside more. Nature is a major design aspect for my project so these features of the site will be very beneficial. The already high pedestrian activity will also help display this new design for the local community, and the location is prime for both towns.



Figure 59. Hjemkomst Center.



Figure 60. American Sugar Company.

Soil Classifications for Moorhead, Minnesota:

Plastic silt

Non-plastic clay

Plastic or organic clay

These types of soils are weak and generally not ideal for tall building structures. Silt retains water and moisture which causes draining issues. This climate accumulates a lot of moisture with the snow in winter months. The cold temperature and water retainment are a bad mixture for a building foundation. Clay can also retain high levels of moisture, but this soil is known to move around which puts pressure on the building foundation.

Vehicular Traffic

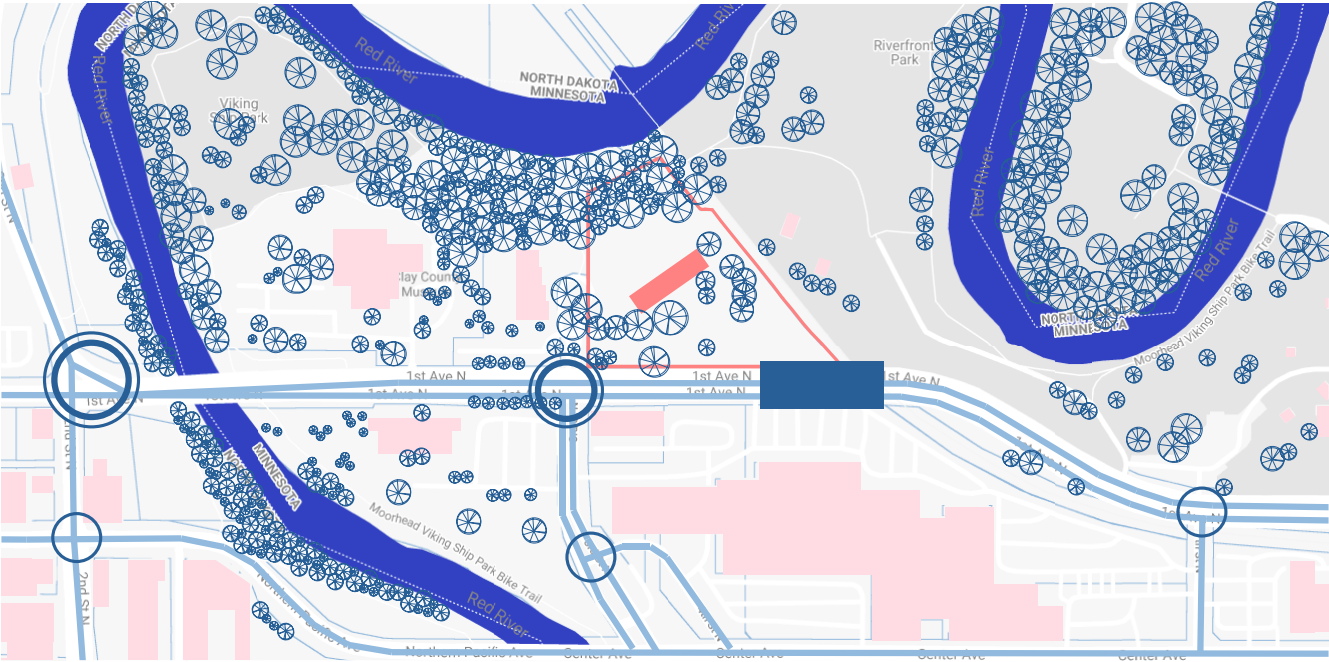


Figure 61. Traffic Flow Site Analysis.

- Key:
- Busy Intersections
 - Moderately Busy Intersections
 - Vehicular roads

The Red River dictates the flow of streets and neighborhoods surrounding my site. The Southern border of the site is lined with the busy road of 1st Avenue North. This road connects Fargo to Moorhead, which a lot of people need to commute between every day. Approaching the site from the West, 1st Ave. starts to widen into 2 lanes of traffic on each side separated by a turning lane in between, making it even busier.

The site map indicates the main intersections surrounding my site and traces the main roads in light blue. The traffic is fairly consistent by day, but it varies by hour, shown in the figure below. With few stops and traffic lights, there is not much congestion in this area. There is a dark blue rectangle locating the malls extended parking lot which in turn creates an underpass for the traffic below.

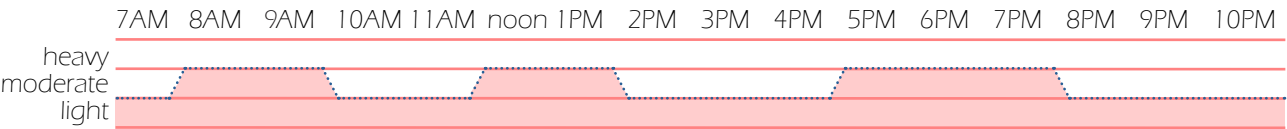


Figure 62. Hourly Traffic Flow Patterns.

Pedestrian Traffic

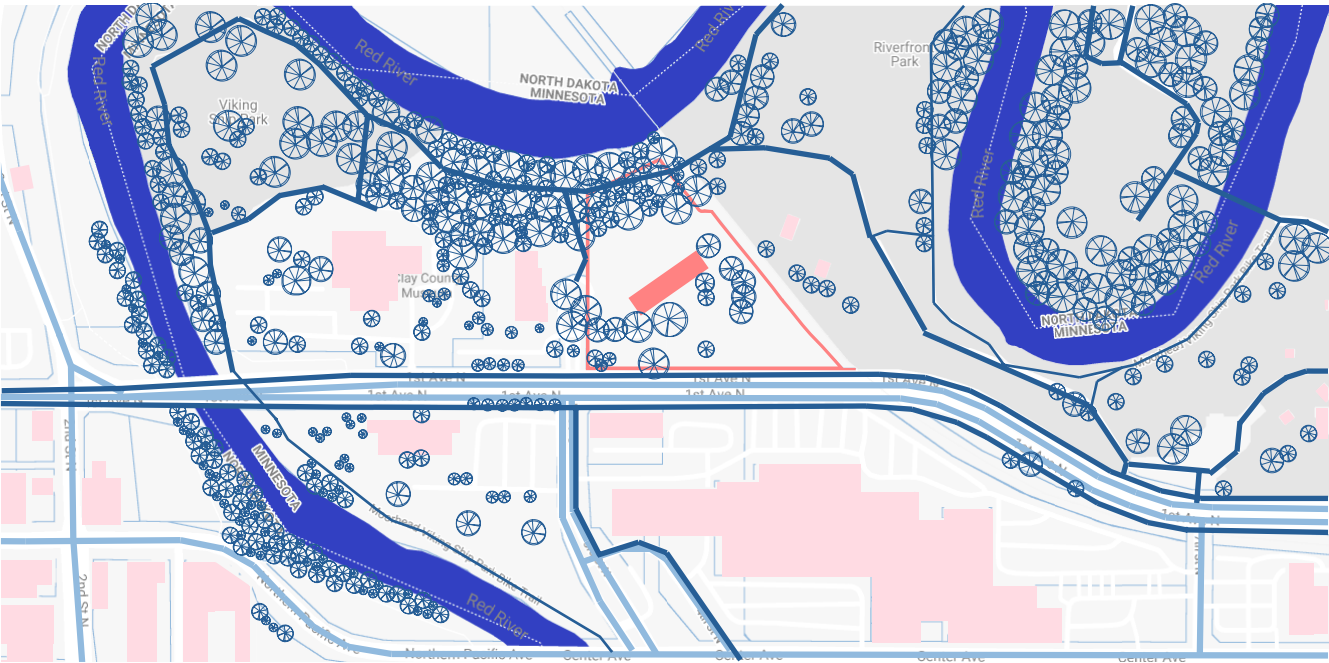


Figure 63. Pedestrian Flow Site Analysis.

- Key:
- Pedestrian pathways
 - Bike trail

This area has much more pedestrian traffic compared to vehicular traffic. The river provides several opportunities for outside activities with its trails for walking and biking, shown in figure x, because of the water setback levels. Figure x, shown below, is regarding the pedestrian traffic that coincides with the roads. It is very similar compared to the vehicular traffic as well. The site sees more pedestrian traffic along the river trails, but that pertains mostly to people enjoying leisure time.

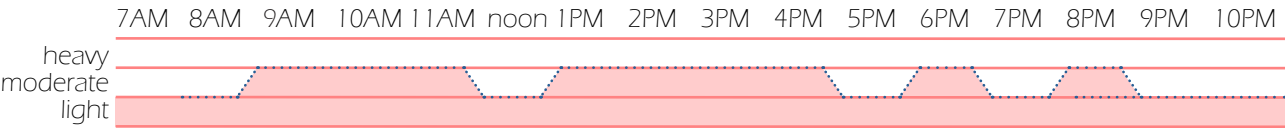


Figure 64. Hourly Pedestrian Flow Patterns.

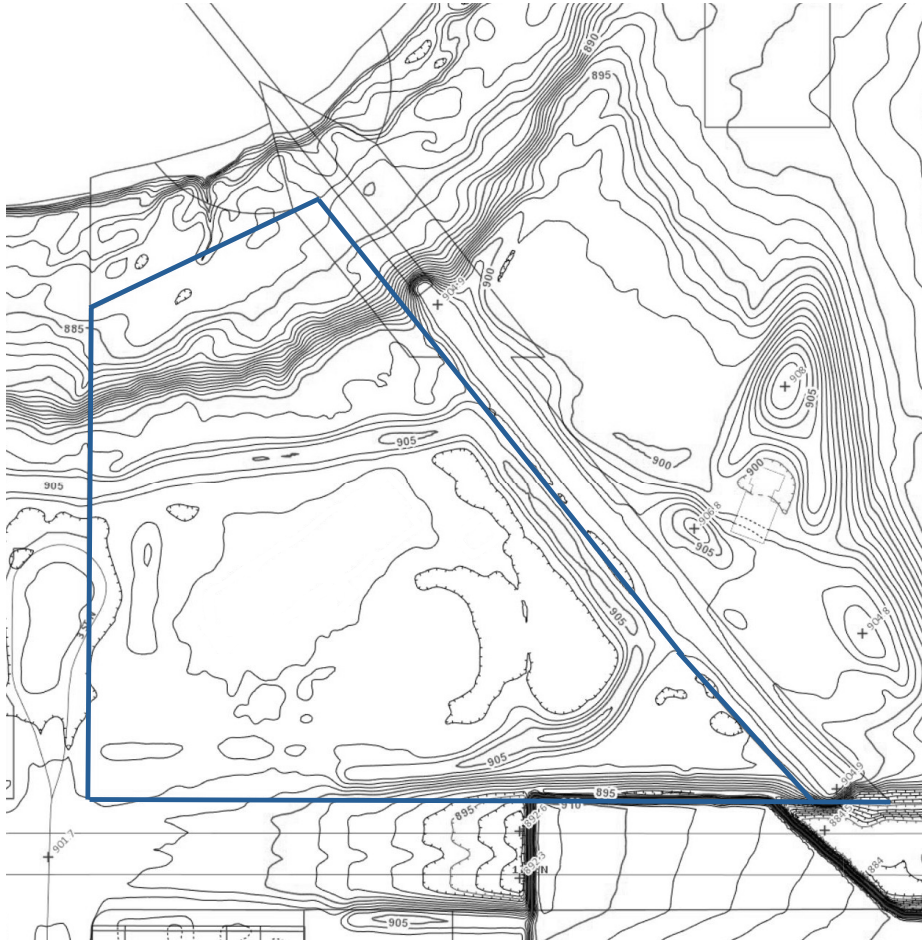


Figure 65. Contours.

Unlike the rest of the Fargo/Moorhead area, this site has many contours due to the Red river. On site, there is a manmade dike that was made to prevent flood waters from reaching the building. In the winter, the snow accumulates on the river and then once it melts in the spring, it usually causes a flood watch for this area.

This site is a rare exception to the usual topography in the area. Locals often complain about the flat terrain of F/M which, in turn, makes the winters even colder with the free flowing, high winds. This site does not face most of these issues due to its varying slopes and cluster of trees. The site also should not have any issues with water drainage as it all runs off into the river.

Base Map

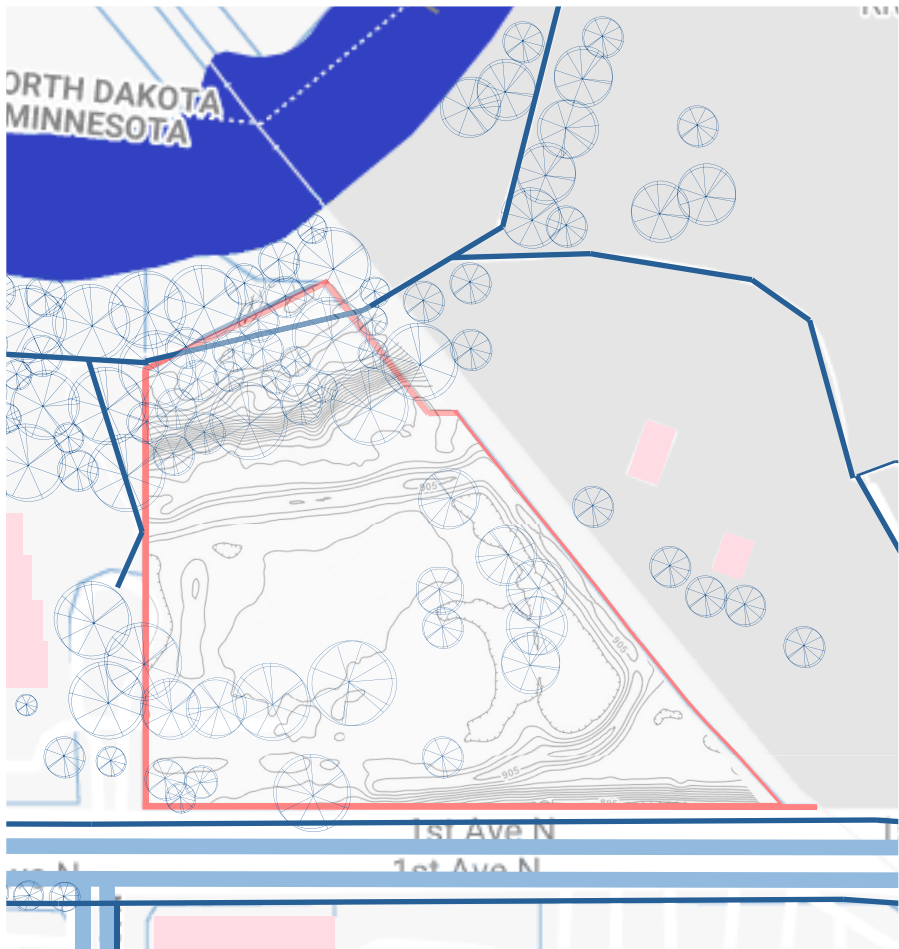


Figure 66. Base Map.

- Key:
- Contours
 - Parcel outline
 - Vehicular roads
 - Pedestrian/bike pathways
 - Existing buildings
 - River
 - General vegetative cover

Site Reconnaissance: Cardinal Directions



Figure 67-70. Four Cardinal Directions.

Climate Data: Temperature & Daylight

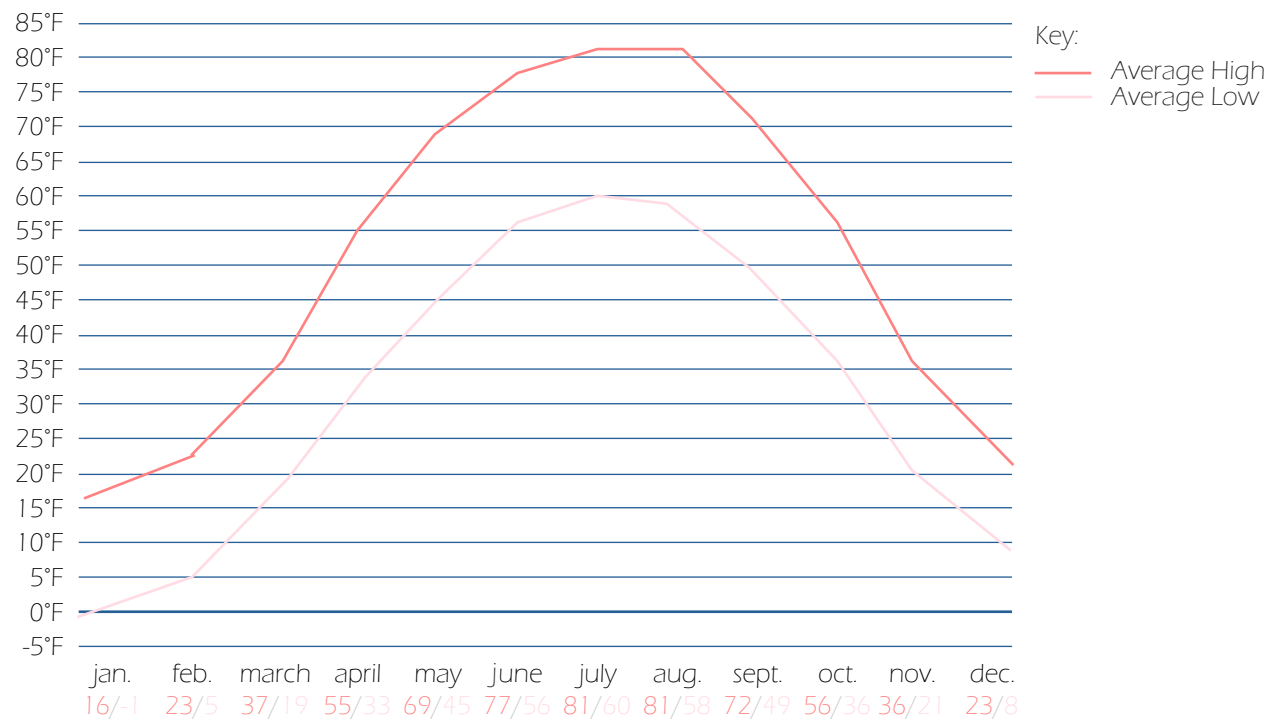


Figure 71. Average Temperature Graph.

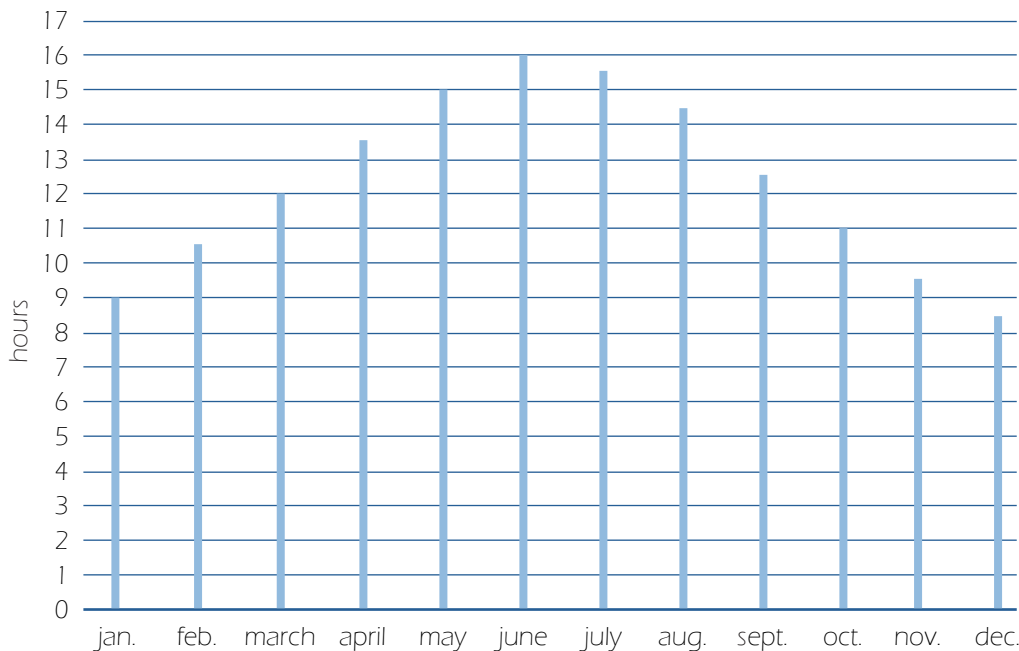
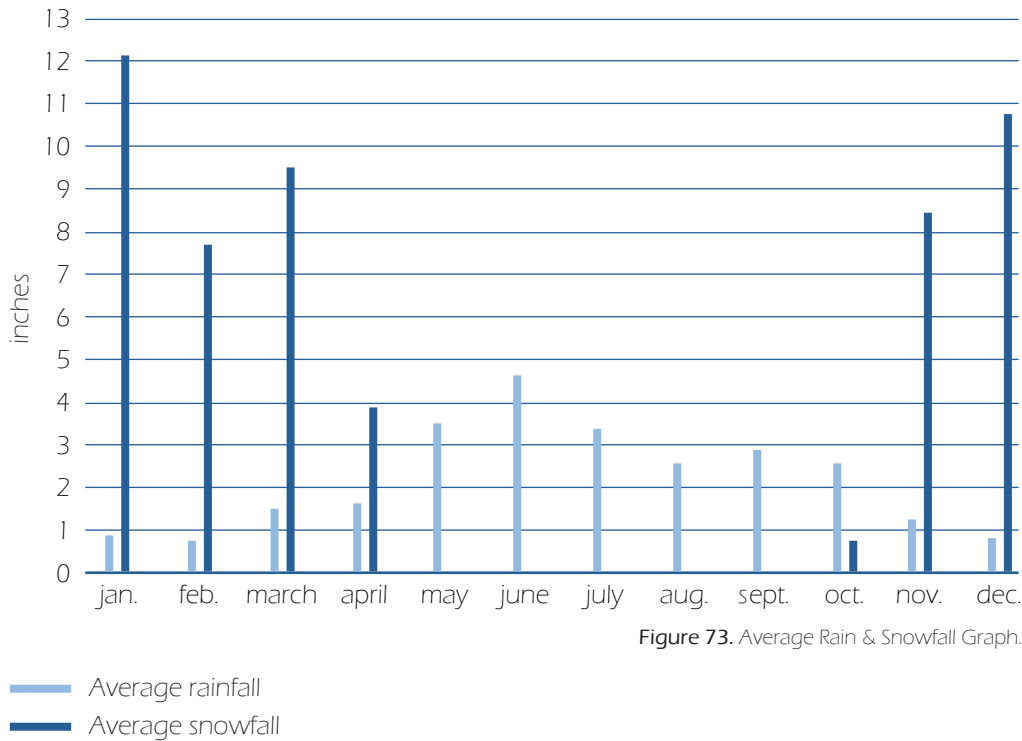


Figure 72. Average Daylight Graph.

Climate Data: Rain & Snow



The temperatures in Moorhead see both extreme ends. In the winter it is dark, cold, and wet, in the summer its hot and humid. Each graph is almost exactly symmetrical when cut in half. This area of the nation is known for its significant snowfall during the winters which accumulates a lot of moisture in the ground and air. The site will need to be designed to drain properly and add on the weight of snow accumulation. The design will need to feature details of wall insulation and moisture barriers to keep the elements out and materials protected.

Climate Data: Wind Rose

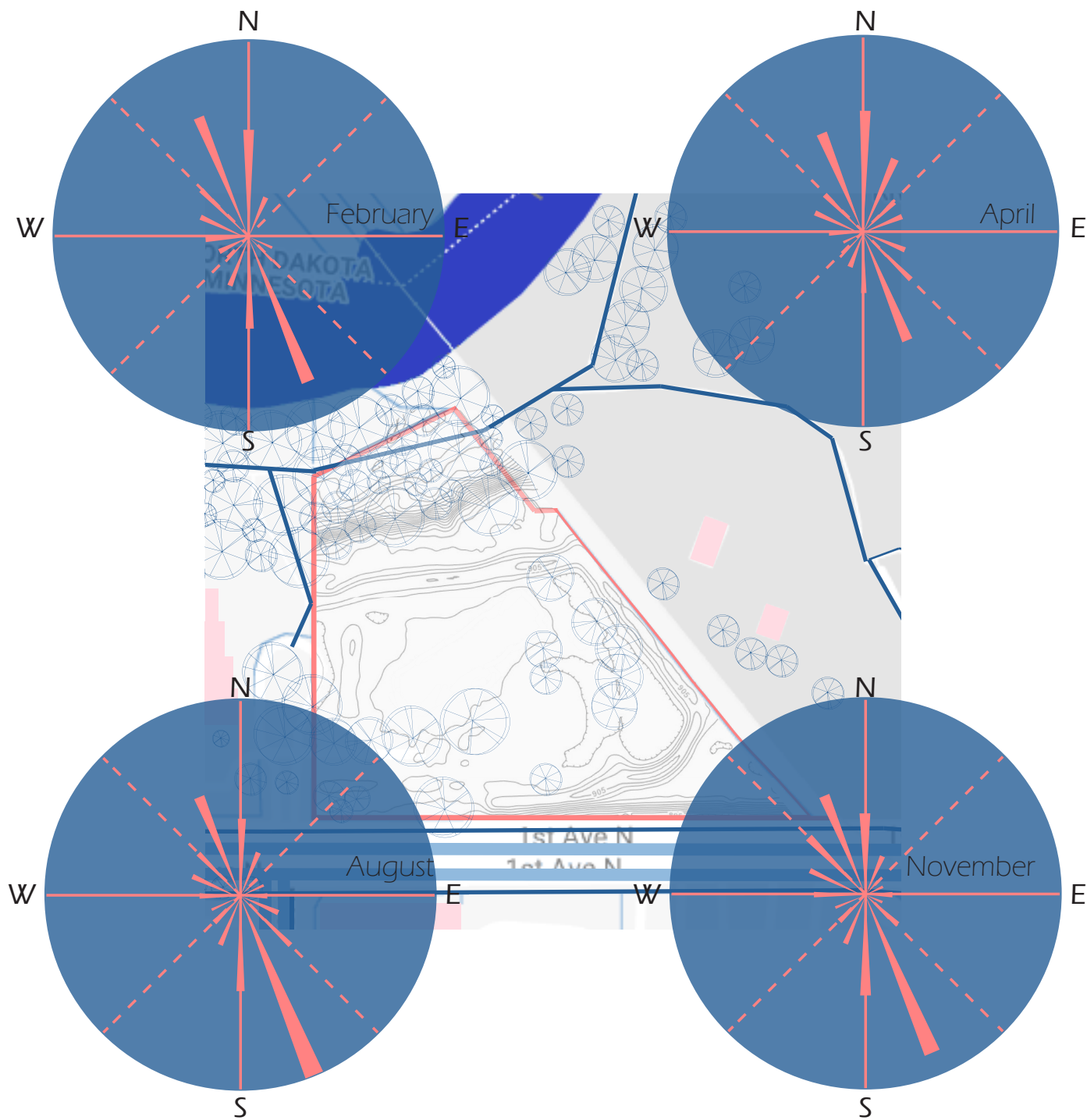


Figure 74-77. Wind Patterns.

Similar to snowfall, this region is also known for its frigid winter winds. The flat terrain enhances the wind, but this project's site has mature trees that ensure some protection. Throughout the year, the wind mostly comes from the South East direction, but in the winter, it also comes from the directly opposing North East direction. The wind is fairly similar through the year for the most part, the winters are just harder with the additional frigid temperatures.

Performance Criteria

This healing center is used by members and patients as needed, and open to the public during the hours listed below. The facility is not used much outside of that time except for special occasions or events. The Healing Center has 24-hour security monitoring.

The facility is open to the public: Monday - Friday 7AM - 9PM
Weekends 9AM - 9PM

The building total spans over about 5,000sf. The spaces within are scaled approximately shown on the following interaction diagram, with exact details configured later on.

Interaction Matrix

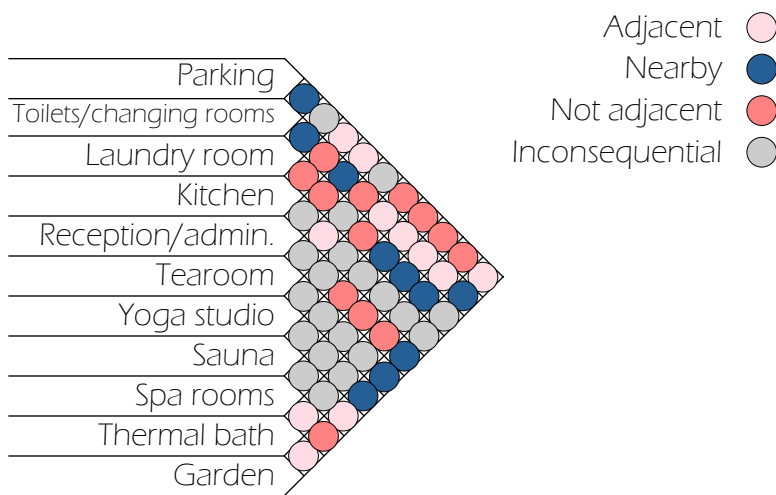


Figure 78. Interaction Matrix.

The interaction matrix above shows the relationships of the spaces that constitute the healing center. From this list, it is easy to conclude that the spaces are free-flowing and work best as a whole rather than in sections. The main exclusion from that is regarding the safety and security of some patients. The common spaces do a great job of mediating the high activity areas from the areas of tranquility for the best building efficiency.

Interaction Net

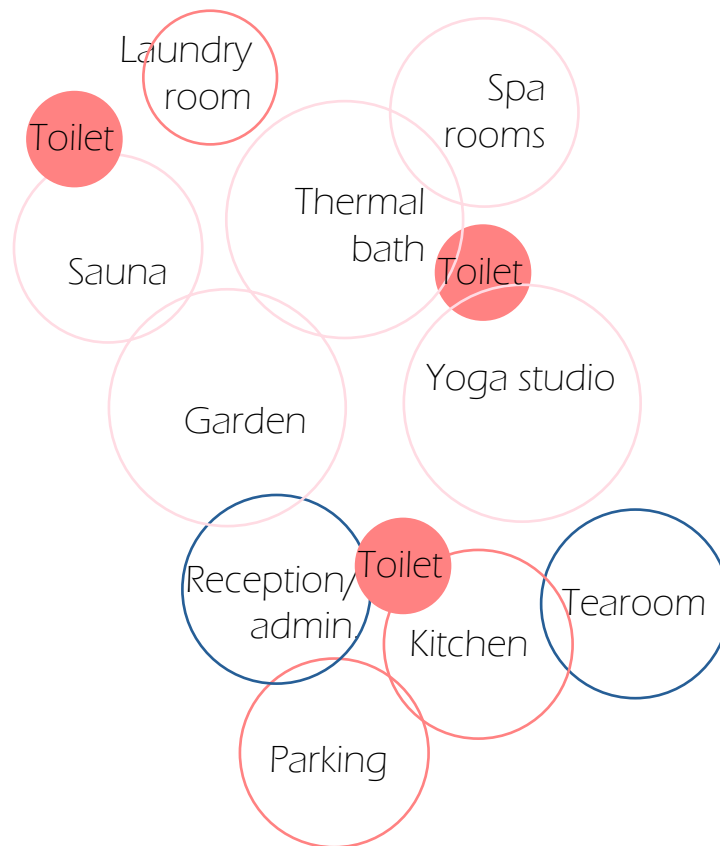
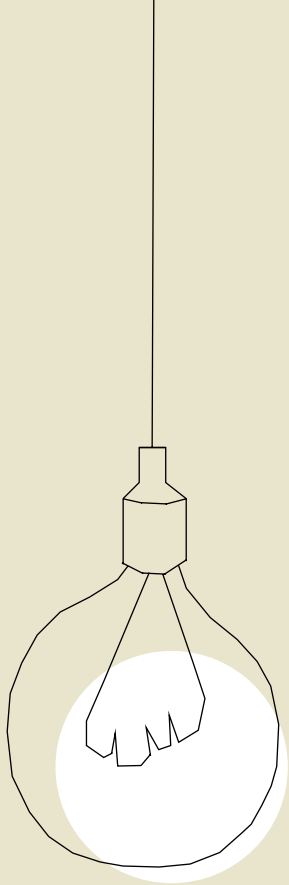


Figure 79. Interaction Net.

The interaction net above shows the relationships of the spaces that constitute the healing center. This allows greater insight to the overall flow and functionality of the facility, expanded from the interaction matrix on the previous page. The focal point is the outdoor area that also contains a garden. Most of the major spaces are focused around this point to highlight the beauty and synchronicities of nature. This also allows significant natural lighting and healing for the building. This also shows the separation of spaces that were previously explained.



Design Solution



Figure 80. Exterior Perspective.

In response to the thesis question of, 'what role does architecture play in facilitating healing environments?' I designed a Health Center where the main aspect is the implementation of chromoheapy. The term chromotherapy can be defined as using the energy produced by colored lights to bring the body back to balance. The Health Center is a rather small facility, containing the main spaces of an indoor spa pool with additional massage rooms within, a yoga studio, a tearoom, a sauna, and an outdoor garden. The listed spaces allow for various activities to take place and share the common feature of LED lighting where the users can control the color based on their reason for visiting the center. Each of the spaces share the focus of restoring balance to the mind, body and soul, but each does so in their own way. The guests will have premeditated guidance as to how to apply, and other details beforehand. Some spaces are intensive while others are moderate, but the main intention is to provide the guests full access and control based on their individual needs.



Figure 81. Site Image.

The site is nestled in a little nook off of the Red River in downtown Moorhead, Minnesota, adjacent to a mid-rise apartment building and public tennis courts. It is also near the Hjemkomst center and Moorhead Center Mall, so this area sees a lot of traffic. I chose the site due to its location between the downtowns of Fargo and Moorhead. The neighborhood is nice and friendly, and a place I have personally grown to love and call home the last few years. I think that the people in this area would be open and welcoming a facility like this into their hometown. The site is easily accessible by foot, bike, car, or even public transportation as there are several bus stops in the area with the mall being so close in proximity. There are several other things to do around this area too, like canoe along the river or visit local shops and botiques.

The site provides an inexplicable feeling of scaredness. I think it is a combination of the grown, mature trees paired with the river as this is a true reflection of what I wanted to create through my architectural design. These strong elements of earth and water are exactly what are being expressed in the Healing Center: reflection, grounding, and restoration.

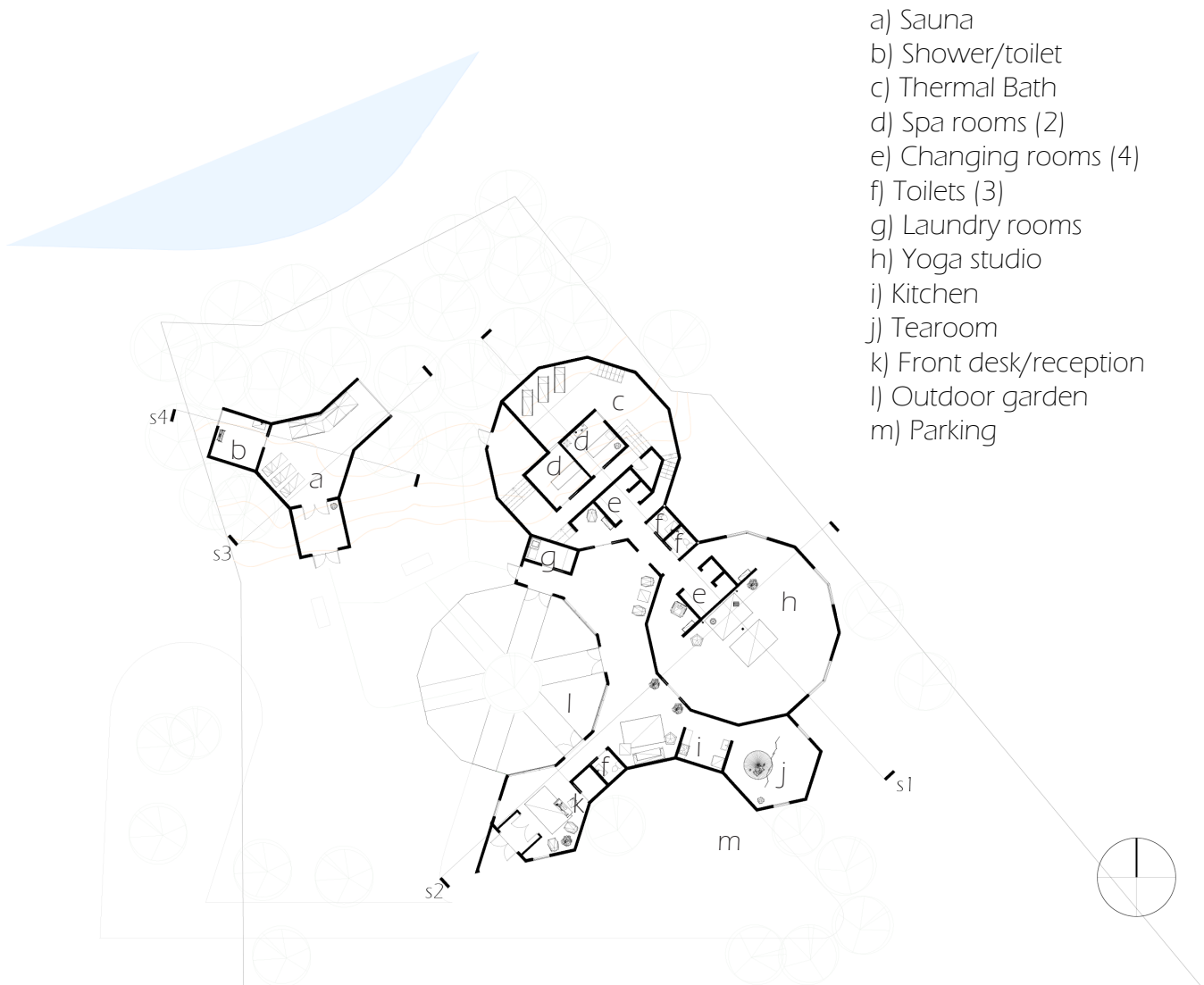


Figure 82. Ground Floor Plan.

First Floor

The Health Center is approximately 5,000sf, designed upon a single level which gives the facility an intimate, secure feeling. The more intimate the space, the deeper into the trees that space lays. This is also true for the intensity of chromotherapy being practiced within that spaces as well. Although some spaces ensure hierarchy over others, each unit is essential to the overall success of the working building.

a) The sauna is nestled among the river trees, secluded from the rest of the world, and building. The intensity of chromotherapy applied in this space varies for a few reasons. The sauna is unique because it is a secluded structure and takes more effort to get to, yet it is beautiful with the open view of the river. It is positioned toward the river in a way that promotes privacy and full beauty and people can still occupy the site.

b) The sauna structure features a spacious shower room and toilet on the West side.

c) A space designed to resemble a cave, the thermal bath holds a deep energy and is close to the earth and water. In the Egyptian Temples, the spaces within were basically caves, and thought of as the most sacred spaces. This space is used to practice intensive chromotherapy and release heavy blockages held within. The pool is simple and shallow, with lounge chairs elevated in the back so more time can be spent here. The temperature of the room and the temperature of the water ideally match and are close to the temperature of the human body. In doing this, most senses are deprived, directing intense healing on the colored light. This is a space that allows deep healing through restoration and contemplation.

d) Located directly within the thermal bath are two intimate spa rooms that each feature a single massage table for full body massages and other spa treatments. This space also allows intense chromotherapy practice.

e & f) There are 2 changing rooms in the thermal bath and 2 in the yoga studio, covering either side of the main toilets. The sauna features a larger restroom with a shower. Each toilet (3) in the facility is a one stall room for privacy and comfort.

g) The laundry room to wash and store towels and other cloth items for the sauna and thermal bath.

h) The yoga studio provides a light energy with the open space, hardwood floors, and large, open windows. The open space allows for large yoga classes or space for the interactive yoga classes that require more movement. The intensity of chromotherapy changes with the intensity of the type of yoga class being practiced and probably the time of day.

i) A small kitchen to prepare tea and other simple food items. There will be no extensive cooking prepared in this kitchen. The kitchen features a stove oven, microwave, and refrigerator-freezer.

j) The tearoom features a simple design that allows flexibility of the space, to adapt to the event taking place. The space is often used for casual lounging during the day and ceremonial purposes at night. The intensity of chromotherapy changes with the events being held.

k) Mirroring the tearoom, the main entrance opens directly into the front desk and reception area. There is a small office behind the front desk.

l) In the outdoor garden courtyard, the doors directed pathways that turned into a grid. The inner pieces are for lounging and sitting, and the outer pieces are planted with flowers. Having an outdoor space was the most important design element as the best way to practice chromotherapy is through pure sunlight. Sunlight is the oldest form and, the pure light that gives life to every living thing. Pure sunlight also contains healing energies in other spectrums that we cant see with our eyes, but can feel with our bodies.

m) There is a small parking lot on the south side of the site with a sidewalk that leads directly to the front doors and the outdoor garden.

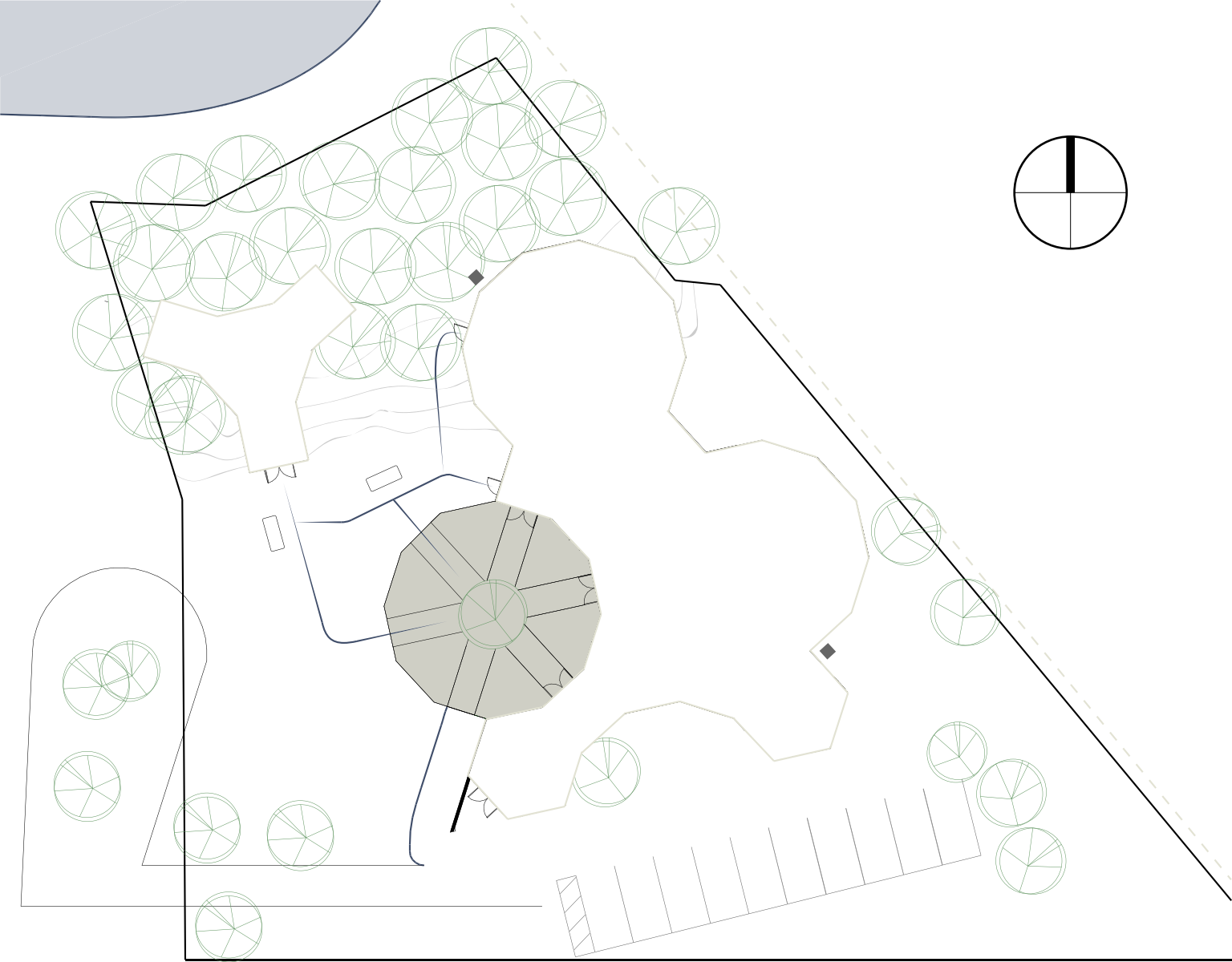


Figure 83. Site Plan with Building Footprint.

- Site boundary
- Building footprint
- Walking pathways
- Parking spaces
- Outdoor garden / courtyard
- Outdoor converter (HVAC)

The site plan with contours and the building footprint. This shows the parking lot and pathways through the garden and site that connect the main building to the sauna. Also shown on this plan are the HVAC outdoor converters (2).



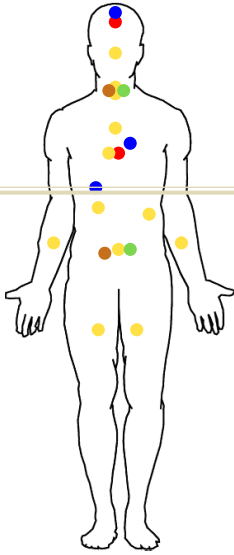


Figure 85. Human figure outline.

The five colors indicated on the Floor Plan are reciprocated here on the human figure outline.

They represent areas of the body that can benefit from the specified color. Showing these along with the upcoming colored rooms helps connect the information together, although there are more colors and far more illnesses to be attended than presented.

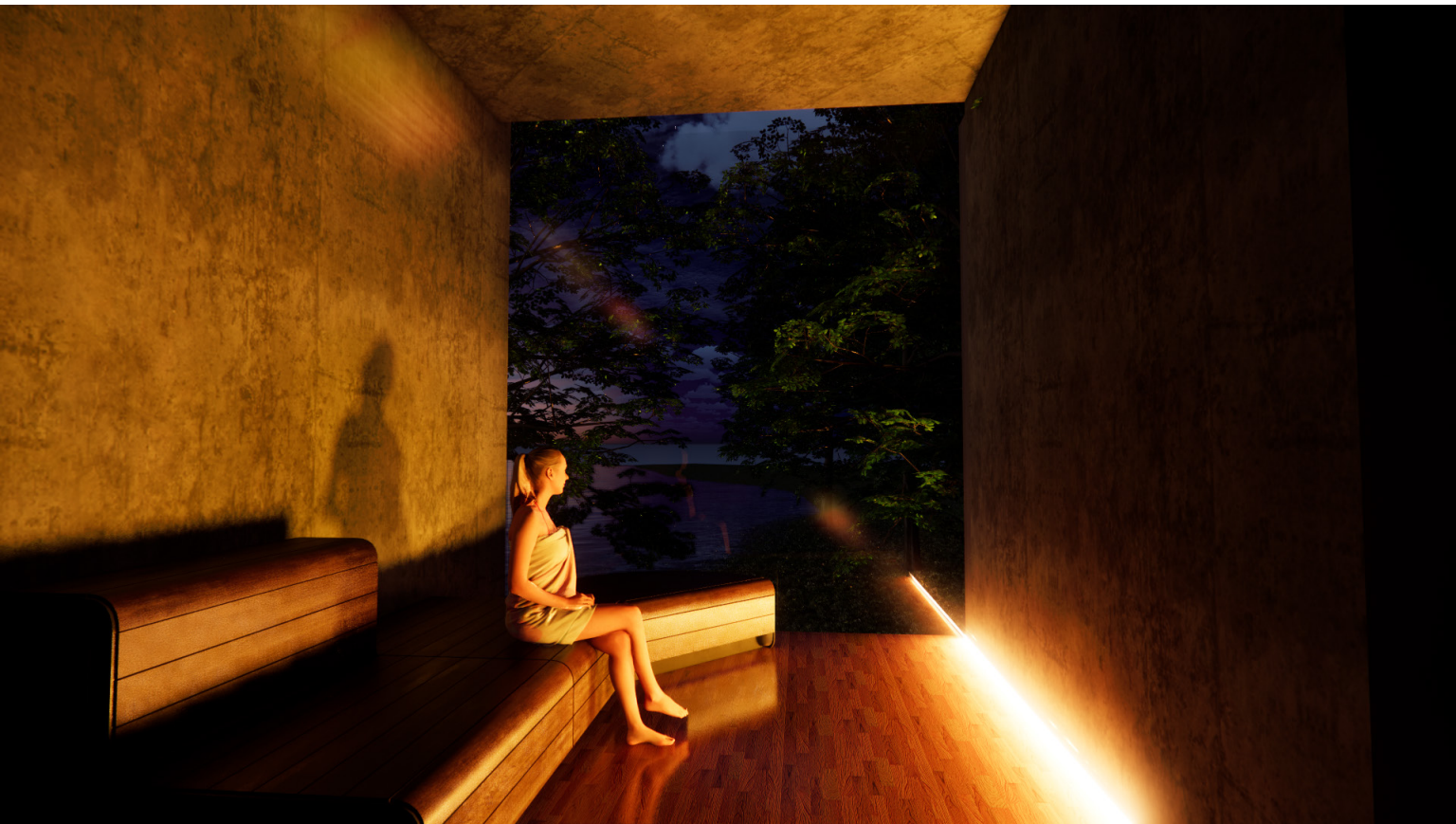


Figure 86. Sauna interior rendering.

Sauna

Nestled among the river trees is a sauna, secluded from the rest of the world. This space is where the intensity of chromotherapy varies the most, and is heavily controlled by the users.



Figure 87. Massage room interior rendering.

Private Spa Room

The Health Center includes two intimate spa rooms that each feature a single massage table for full body massages and other spa treatments while practicing intensive chromotherapy.

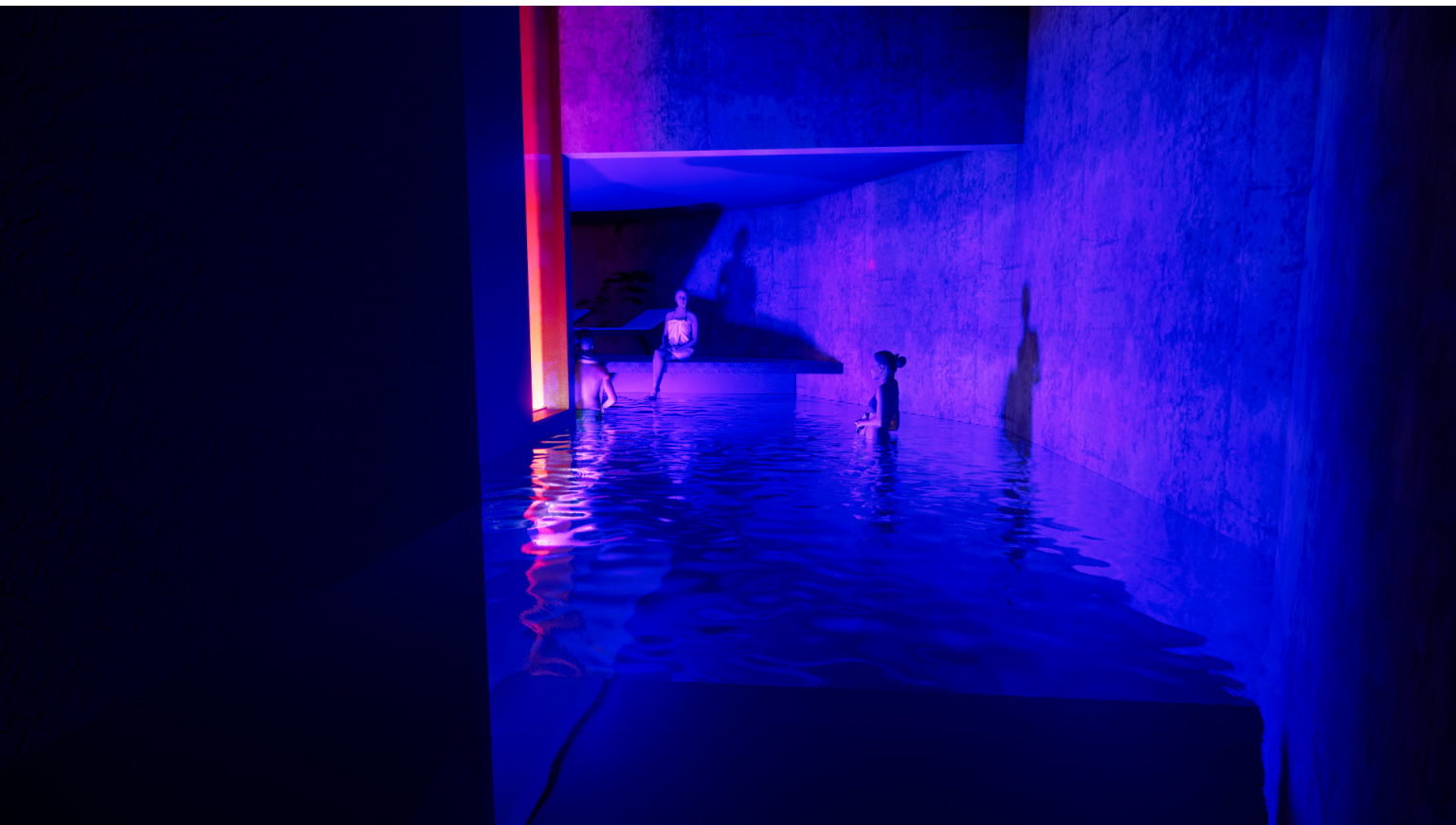


Figure 88. Thermal bath interior rendering.

Thermal Bath

A dark place that holds a deep energy and is close to the earth, the thermal bath is a place to practice intensive chromotherapy and release heavy blockages held within. The pool is simple and shallow, with lounge chairs elevated in the back for extra comfort.



Yoga Studio

The yoga studio provides a light energy with the open space, hardwood floors, and large windows. The open space allows for large yoga classes and space for the interactive yoga classes. The intensity of chromotherapy changes with the class types.

Figure 89. Yoga studio interior rendering.

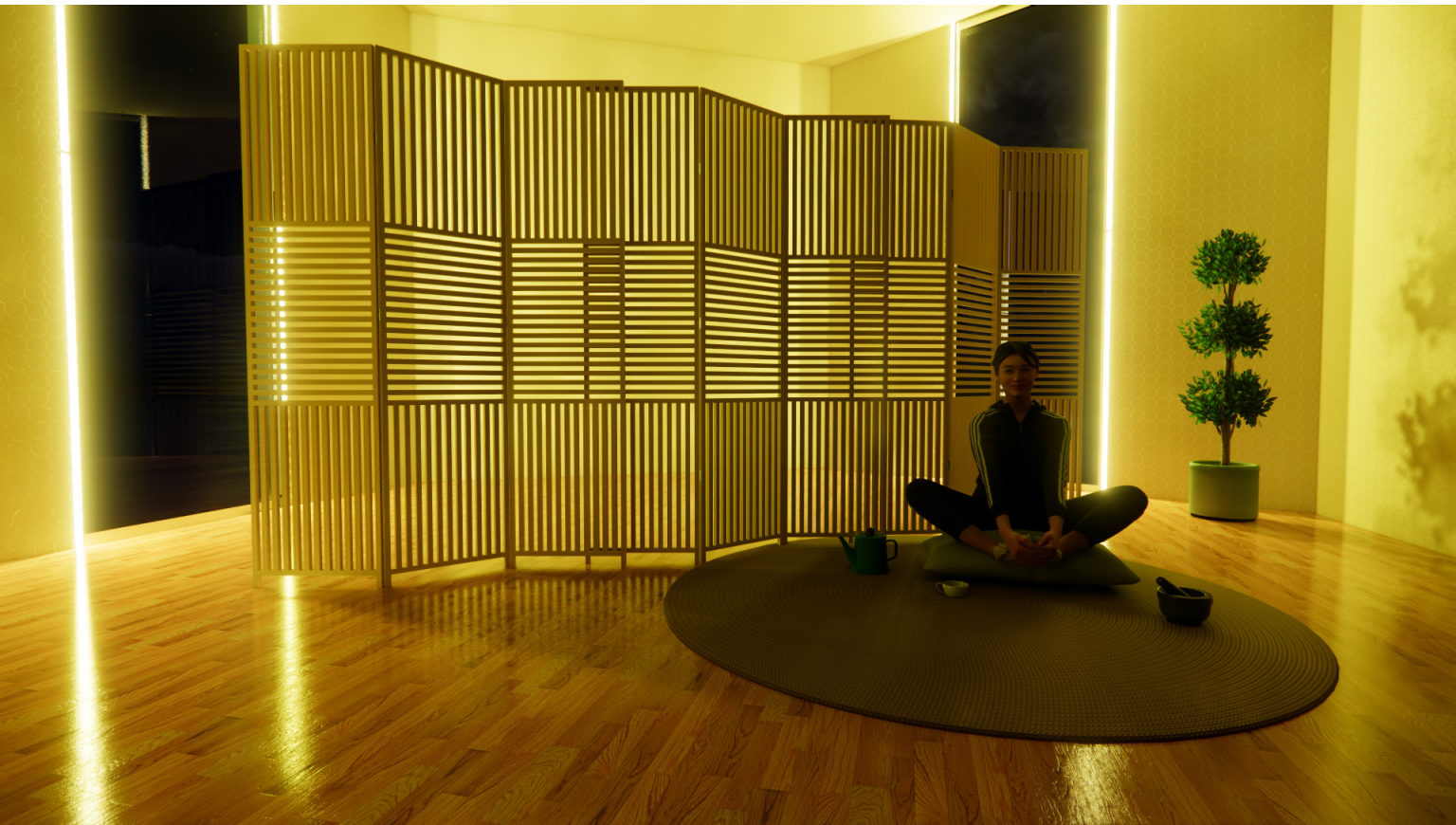


Figure 90. Tearoom interior rendering.

Tearoom

The tea room features a simple design that allows flexibility of the space, to adapt to the event taking place. The space is often used for casual lounging during the day and ceremonial purposes at night. The intensity of chromotherapy changes with the events.



Figure 91. Yoga studio interior rendering (daytime).



Figure 92. Tearoom interior rendering (daytime).

The spaces are designed with a strictly neutral color palette. This allows the colored lights to reflect their true colors and provide accurate results of chromotherapy. Above is 2 renderings of interior spaces during the daytime, to show the neutral interiors.

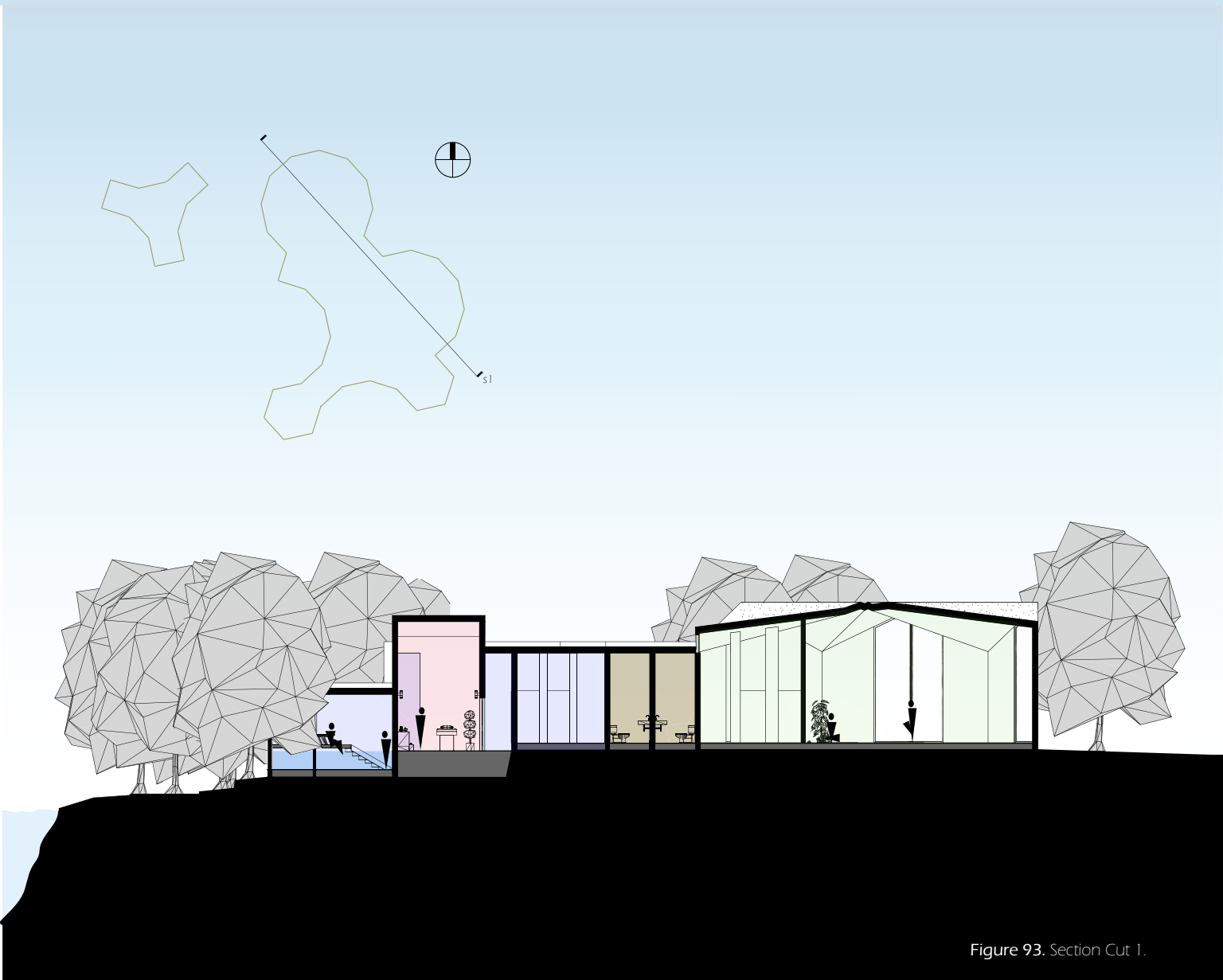


Figure 93. Section Cut 1.

This section cut highlights the varying roof and topography lines. The folded plate structure above the yoga studio can be seen along with the way the spa rooms are situated within the thermal bath. The changing rooms and the way they connect 2 main spaces and mirror each other can be seen here too.

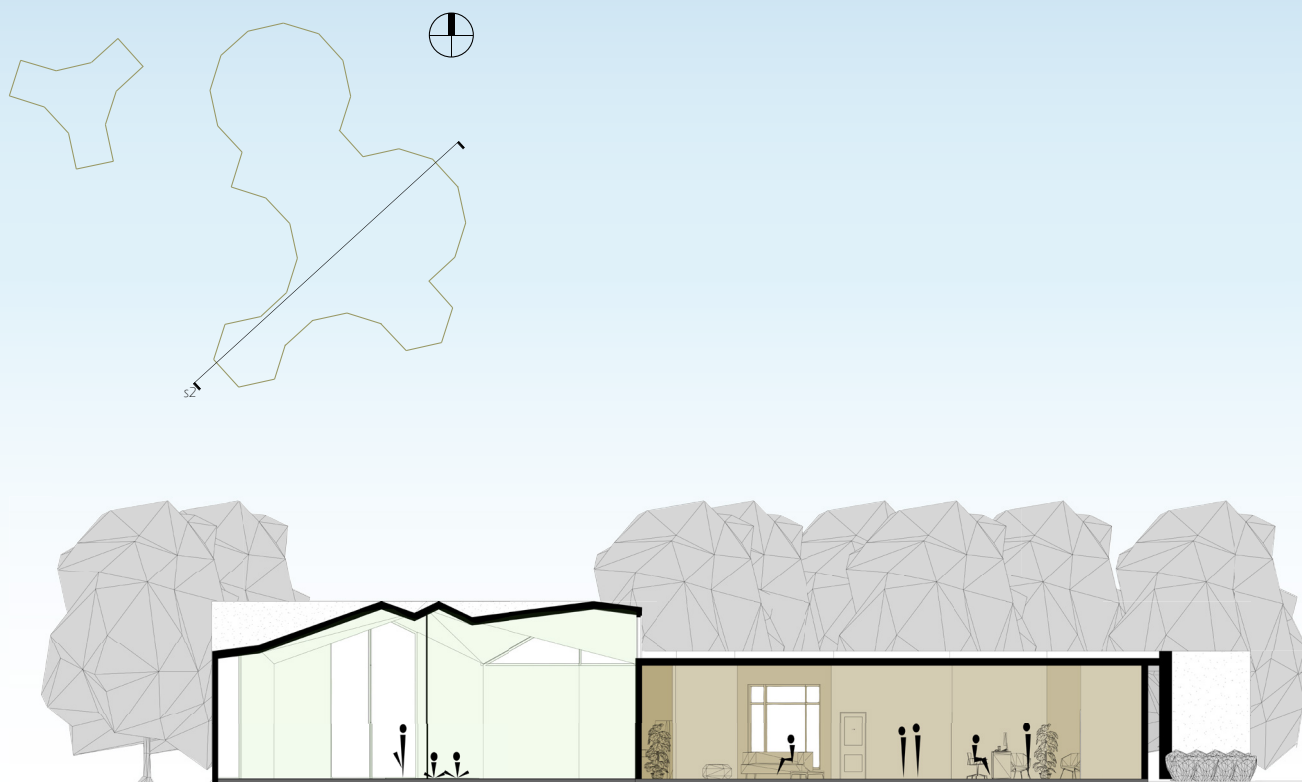


Figure 94. Section Cut 2.

This section cut reveals the spaces that are experienced as one enters the Health Center. On the righthand side, it starts with the main entrance and reception desk. Beyond this is a corridor consisting of an administration office and a single toilet. The corridor leads directly to the doors of the yoga studio which sit in a lounge space.

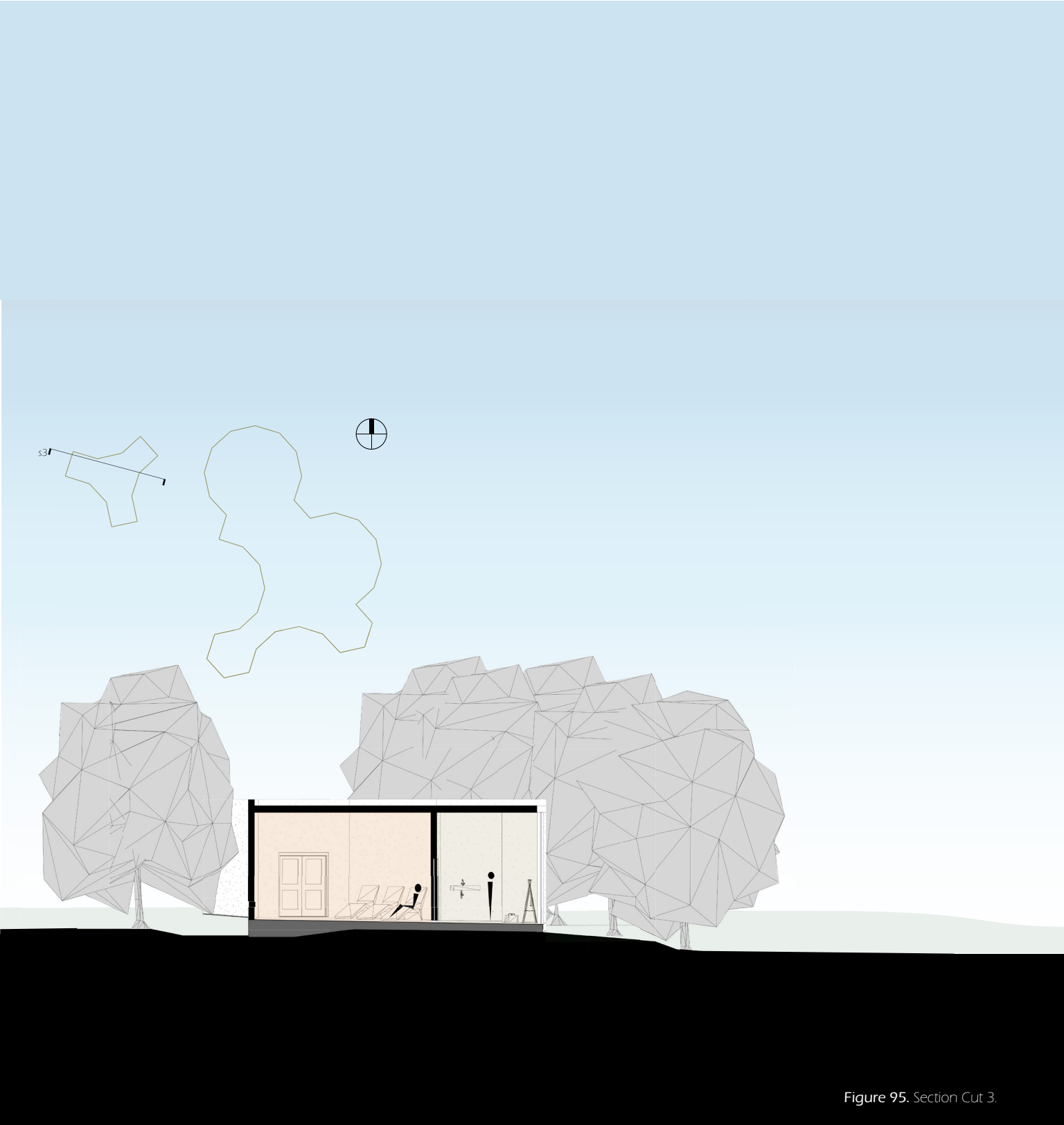


Figure 95. Section Cut 3.

This section cut shows the interior of the sauna, and the connection between the 2 spaces within. It has a dip in topography on the left side of the building.

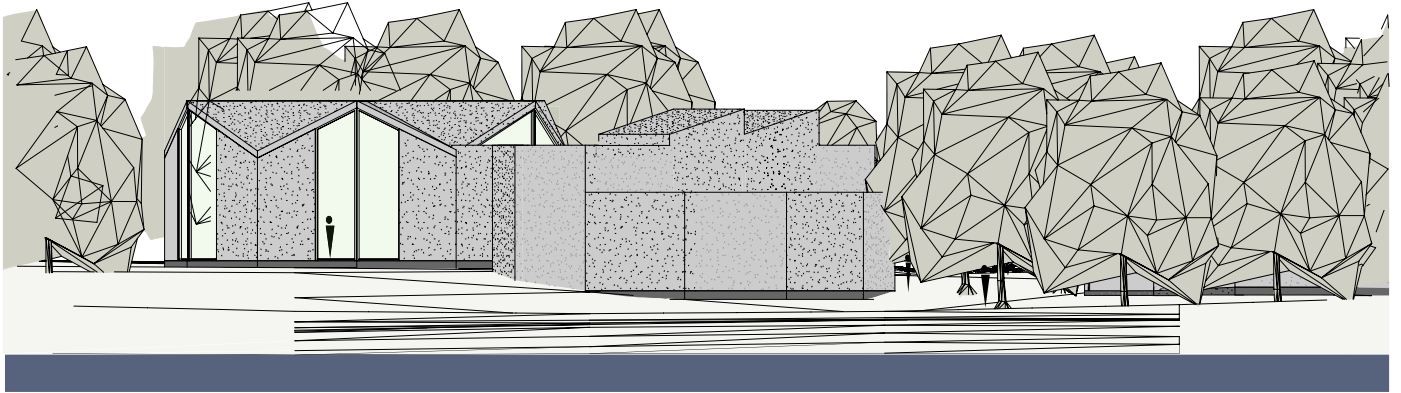


Figure 96. North Elevation.

The north elevation shows the exterior of the thermal bath which is interesting to see how it slopes down toward the river with the topography. The interesting form of the thermal bath is shown here.



Figure 97. South Elevation.

The south elevation shows the parking lot and front entrance. The garden can be seen peeking out of the left.

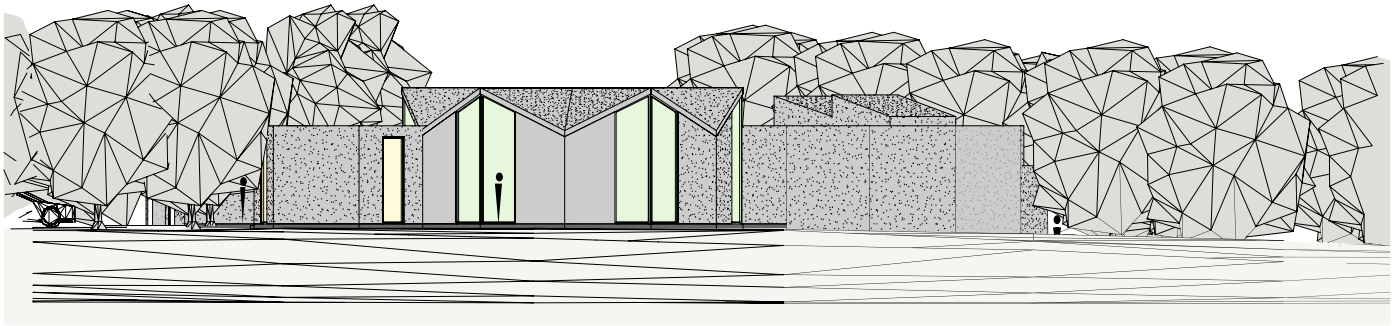


Figure 98. East Elevation.

The east elevation, this one is similar to the north as the north elevation is very narrow. This view does include the tearoom on the right, though. It is interesting to see the 2 large, main spaces in 3D.

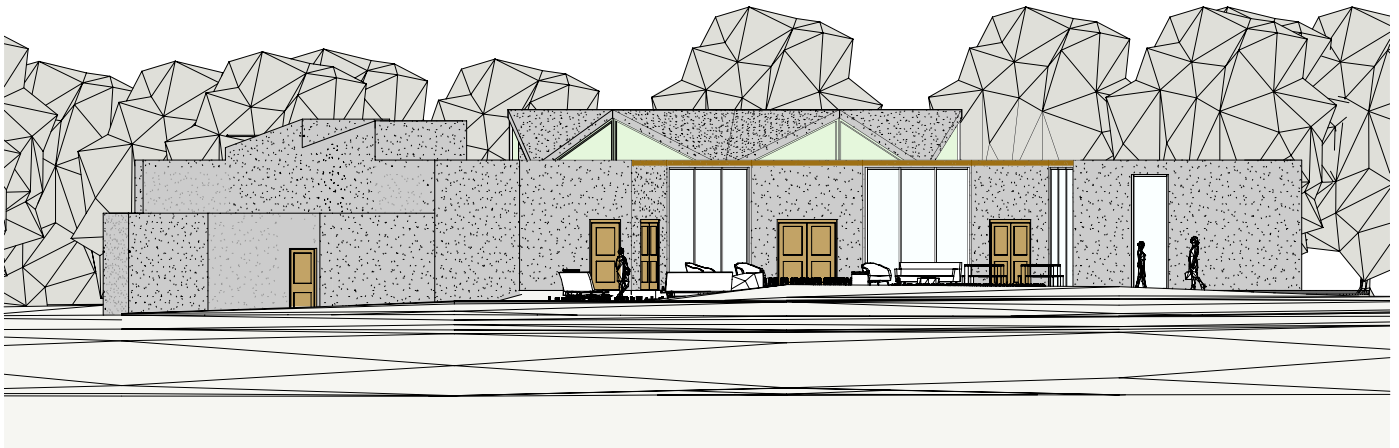


Figure 99. West Elevation.

The west elevation shows almost every space in the main structure and highlights the outdoor garden courtyard.

PRODUCT OVERVIEW

SUPERIOR DESIGNS PROVIDE EASY SOLUTIONS TO COMPLEX PROBLEMS

GREE Ductless Multi Zone systems provide quiet comfort and energy efficient heating and cooling in up to five different rooms – without ductwork. For most residential and light commercial applications, this is the best solution to balance comfort, efficiency and ease of installation. This inverter-driven system has Energy Efficiency Ratings (SEER) up to 16. With individual room control and variable speed operation, comfort is boosted throughout your home or office, while utility bills are



Gree's exclusive G-10 Inverter technology powers the twin rotary compressor inside the outdoor compressor section. The G-10 Inverter constantly adjusts the compressor speed to maintain a comfortable room temperature. This saves energy, reduces outdoor noise and maintains a consistent room temperature by eliminating the harsh starts and stops of conventional systems.

When laying out a new project, you'll appreciate the flexibility of Gree's Multi Zone Systems. A single outdoor unit can simultaneously power up to five indoor units while eliminating expensive ductwork. Without those ducts, your installation is simpler, faster and more cost-effective. And the flexibility doesn't stop there, as you can also mix and match your choice of Wall Mount, Ceiling Cassette, Concealed Duct, Universal Floor/Ceiling and Mini Floor Console indoor units to create a unique heating and cooling system to perfectly fit any project.

No pipe sweating

No sweating is needed for the pipe connection between the indoor and outdoor units. All piping connections are flared to simplify and ease the piping installation.

Simple Wiring

No special or hard-to-find communication wire is needed between the indoor and outdoor units. The system uses common 14-4 AWG stranded copper THHN 600V wire. The system's communication is ready as soon as the electrical wiring between the indoor and outdoor units is complete.

High Lift Design

Gree's High Lift design allows for extended piping length, up to 262 feet total, as well as 50 feet of vertical lift from the condensing units. This allows for greater flexibility in the layout of the system.

Allows up to 262 feet of pipe length

Energy Saving

Multi Zone systems allow each room to be individually controlled. Only those rooms requiring air conditioning (or heating) are cooled (or heated), and all of it is accomplished without ductwork. In addition, Gree's G-10 inverter technology reduces energy waste, maximizes efficiency and achieves up to 16 SEER.

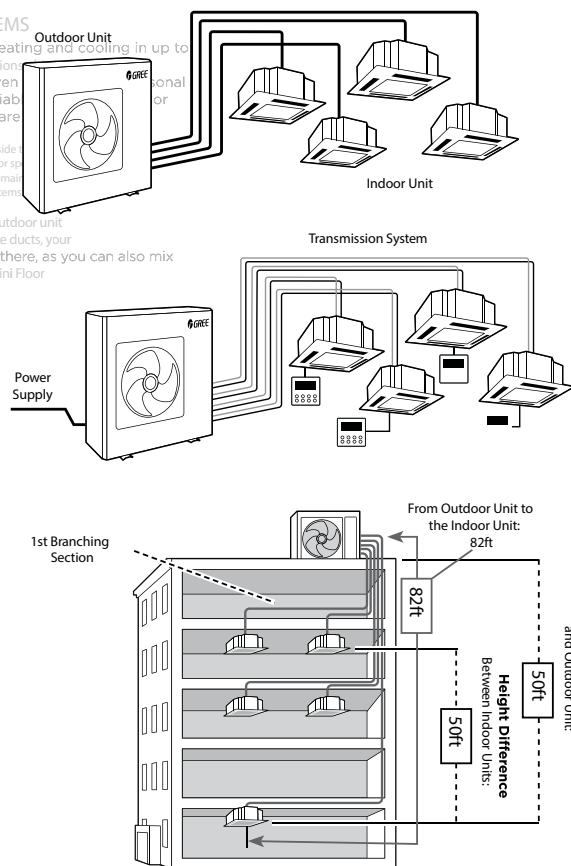
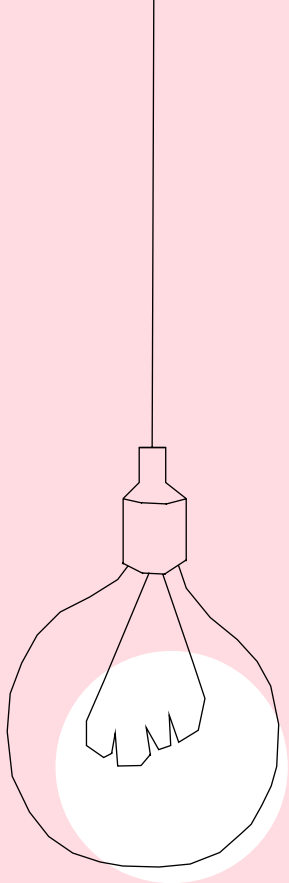


Figure 102. HVAC detail.



Previous Studio Experience

2nd Year

Fall: Charlott Greub

Tea House, Montessori School

Spring: Cindy Urness

Dance Academy, small Dwelling, Birdhouse

3rd Year

Fall: Mike Christenson

Border Crossing Station, Art Museum

Spring: Bakr Aly Ahmed

Affordable Housing, Grade School

4th Year

Fall: David Crutchfield

High-Rise Capstone (Miami, FL)

Spring: Paul Gleye

Study Abroad Urban Design Project

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