



Using Light to Shape Aesthetics, Comfort and Mood

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Graduate Thesis Book

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INTRODUCTION

This thesis project will explore the relationship between light and aesthetics, comfort and mood. I aim to work with light, including temperature and luminosity, to enhance mood and create a sense of comfort in different spaces and times. I am especially interested in empathetic technologies that allow for dynamic adjustment of light based on individual preference and need.



LITERATURE REVIEW

Introduction to Lighting

Architectural lighting has the potential to influence the well-being of users in terms of mood and feeling. Specifically, lighting is essential in defining interior aesthetics and shapes people's psychological comfort. While natural daylight has the greatest impact on people's psychological and physiological experience, poor artificial lighting choices tend to negatively impact people's experience. Notably, the wrong choice of lighting design can occlude the users' performance in interior space [1] Lighting predominantly affects mood-setting by creating positive psychological comfort [2]

Light is continually regarded as a critical aspect of interior design for all kinds of uses, because it helps define space's functionality. Varied elements of light can be applied in architectural interiors to improve the space, set the mood, and compliment furniture, color, pattern, and artwork[3]. Designers often consider how to maximize natural light, and how to supplement with artificial light. Moreover, designers understand specific measures of light temperature, location, and levels of light in considering design choices. Such lighting choices can significantly affect the building environment, energy efficiency, and functionality[4]. Architectural light considerations have practical applications in helping visitors and occupants connect with the built environment without difficulty.

Light enables people to see, identify their location, and understand the things that comprise the interior built environment[5]. Thus, light creates a functional and psychological relationship between the interior space and users, influencing how a person feels and views the space.

While enhancing the visual quality of interior space, lighting is critical in shaping a person's perception of the physical world. The integration of natural and artificial light is important in creating a well-balanced physiological association [6] Many interior space designs have managed to apply artificial light without depending entirely on natural light. Users of spaces that do not employ natural light may appreciate and value the advantages attached to using varied electric colors to suit their moods and feelings [7] Nonetheless, many architectural spaces increase the use of natural light because it creates harmony between exterior and interior spaces[8]. It should be thoughtful how to create an interior vision to emphasis material and constructions. Such as acoustical ceiling panel and LED lighting. LED lighting can provide the comfortable vision and this is very important for the interior space.[9]

The Use of Lighting to Shape Aesthetics

Interior designers carefully regarding the color of light for its impact on aesthetics. A combination of colors of lighting, skillfully and consistently employed throughout an interior space, help form an articulate whole[10]. However, a mistake may arise in interior space through a wrong selection of color temperament of light.

Light sources' unintended application might result in varying shades of colors in a single room, creating an impression of imbalance among the users, leading to a negative discernment of an interior space[11]. In most cases the light that individuals perceive most suitably is warm white around 3,000K color temperature [12]For example, light having a higher color temperature brings about colder, bluer shades of white, which creates a perception of sterility and minimalism in the users' minds[13]. One difficulty in maintaining a consistent and uniform lighting scheme is owners or users of a space may intentionally or unintentionally modify the color temperature. [14]

The aesthetics of lighting design occurs in line with the interior space's intended purpose and functionality, and establishing the look and feel of the general lighting is essential[15]. The chosen color of lighting should have the capacity to illuminate the whole room evenly without creating imbalanced shades or shadows. For example, lighting that is evenly focused on the ceiling creates an amply high uniformity, especially in grandiose spaces. This type of lighting is reinforced vis-à-vis the application of ceiling suspended luminaries[16]. Therefore, having light sources that can distribute their beams widely is an added factor. The intensity with which lighting distributes across space is a parameter that influences the aesthetic perception. In this sense, one cannot generalize non-uniform lighting as being un-aesthetic because there are always uniformities of light spots[17]. Creating aesthetics involves the placement and direction of a beam angle, which may lessen the luminance levels of unpleasant glare, eliminating dissonance instances. This was how does the interior design working to shape the aesthetics.

The Use of Lighting to Shape Mood

While many people do not notice how light affects mood, light has the proclivity to influence many people's feelings, and can be specific to the occasion. For example, a person might feel more creative on a sunny day because the light brightens one's mood[18]. Research indicates that light can effectively impact one's emotions, either positively or negatively. There are various ways in which light might impact emotions. First, bright lights can heighten emotions. Specifically, people tend to experience a greater intensity of emotion, either negative or positive, when they are subject to brighter light. According to a study conducted in 2014, women who sat in brightly lit spaces demonstrated higher aggressiveness and were viewed as more attractive compared to women seated in dimly lit interior spaces[19]. Similarly, research showed that people who sat under brighter lights had a higher preference for spicier foods and seemed more sensitive to positive and negative wordings [20]

It has been shown that color temperature dramatically affects a person's emotions, coupled with characteristic behaviors. Warm colors tend to bring calmness, whereas cool colors enhance focus. Research has also shown that exposure to blue light causes people to feel more energetic and alert since it has a shorter wavelength. High energy blue light increases the mental cognitive task processes and increases productivity [21]. However, exposure during nighttime limits the production of melatonin hormones, leading to reduced sleep[22]. Over exposure to blue lights that results from smartphones and laptops tends to increase impaired judgment and stress, leading to higher blood pressure[23].

Alternately, exposure to natural light from the sun's radiation increases happiness and well-being, which impacts sleep positively. Natural lights help improve an individual's health, providing vitamin D, which decreases cases of depression[24]. It can be understood from the literature that a combination of different light is useful in enhancing well-being and reducing stress and depression.

The Use of Lighting to Shape Comfort

Visual comfort is based on individual reaction towards the eminence and amount of light resulting from a specific interior space. A person's comfort relies heavily on multiple factors like exposition, light type, eye color, and age. Visual comfort relies on the occupant's ability to regulate the levels of light since too little or too much light can result in discomfort[25]. Variations in light levels coupled with sharp contrast can cause stress and fatigue, leading to a permanent adaptation of one's eye to varying light levels. Natural light provides visual comfort because the source of illumination allows one's eye to acclimate naturally[26]. Hence, the use of natural light positively impacts the comfort, health, and well-being of people, including the temporal increments of alertness and patterns of sleep.

To positively impact comfort, the illuminance of light is calibrated at 500 lux to brighten spaces evenly and account for daylight variability. Luminance is measured in candela per square meter, allowing for diverse luminous intensities per unit area. The expression of lux based on illuminance revolves around the luminous powers that result from all directions towards a given point, where the undertaking of a task happens concurrently[27].

Consequently, the determination of luminance is critical in influencing both light and glare contrasts, thus focusing centrally on an even distribution of light from a specified source. Taken as a whole, the emission or reflection of light—including both natural and artificial light—brings about comfort by affecting people's physiological and emotional sensations.

Lighting Design Principles and Applications

In designing lighting systems, interior designers must concentrate on three lighting design principles: function, aesthetics, and energy efficiency.

Regarding function, designers must identify and understand the use of interior space in such a way that the application of light reinforces the intended use[28]. Ambient lighting is regarded as the primary source of general lighting in an interior space because it softens shadows, thus reducing glare. Most architectural interiors stop here since this source of light is relevant for a general use[30]. For task lighting, the requirements are that a direct light source should enhance a visible brightness in a specified locality. This is evident in workstations, where the provision of both general and focused lighting is essential. Task lighting must be set to reduce one's eye from straining, especially for individuals who have expressed challenges for vision[29]. Like task lighting, floodlighting serves a more specific function but on a larger scale, where a high intensity is beamed broadly to improve visibility, especially at night.

Concerning aesthetics, many designers have recently understood the importance of maximizing both the psychological and physiological effects of space. They apply varied strategies to develop high-end architectural interior spaces, without interfering with functionality. The use of wall washers is regarded as a best practice to showcase artwork or environmental graphics vis-à-vis a more concentrated light source[33]. Equally, pendant lights are used to show distinction and variety, especially in locations such as reception counters or over distinguished conference tables. Designers use rope lighting to accentuate architectural elements of interior space. For example, implementing a ceiling cove at a reception table is attainable with this source of light. The application of backlighting is useful in reinforcing aesthetics choices because it emphasizes art and graphics by brightening light from behind the architectural objects[34]. Ideally, this kind of light source is invisible to one's eye. Further, the choice of color temperature is useful in impacting varied aesthetics and brand ethos in interior spaces [35].

Regarding energy efficiency, contemporary designers must employ sustainable lighting systems, including allowing more natural light from outside the built environment[38]. Designers use skylights, solar-tracking mirrors, and light shelves to divert more daytime light into interior spaces. Alternately, they may use adjustable window coverings to assist in reducing glare and maintain a building's temperature during winter or summer times[39]. With the implementation of automatic lighting and motion sensors systems, designers can achieve ideal levels of light, as sensors can either dim or intensify based on the quantity of natural daylighting [40]. Further the use of LED fixtures can achieve a high level of control of color temperature while maintaining energy efficiency [41].

Conclusion and Future Directions in Lighting

Advances in light simulation technology provide for the possibility of achieving better and more finely tuned performances of light. For example, architects have recently applied 3D computational modeling techniques to help explore further the light in interior spaces[42]. Lighting simulators help demonstrate how the environment would look and feel under varied design applications. These simulation systems help designers understand how light would realistically interrelate with other objects within each interior space. For example, there are simulation systems that mirror the rising and setting of the sun, providing designers with predictions on how the lighting system would operate at different phases[43]. With the accomplishment of tasks through the aid of simulation models, designers can utilize virtual reality (VR) to test the appearance of lighting from the perspective of an inhabitant of the space, making it possible to identify defects within the lighting system[44]. This allows designers to envision the same experience that visitors would have.

Further, the use of technology offers designers tools to employ lighting strategies that are sustainable [45]. Such technology allows designers to create interior spaces that evoke positive emotional reactions, thus realizing the user's overall well-being. Other research has delved into ambient intelligence intended to design architectural systems that mirror day-to-day lighting environments. Such intelligent systems are aimed at promoting the quality of people's lives through the creation of an empathic technology, which can readily detect an affectionate state of an individual and adjust the lighting accordingly[46]. The application of empathic technology may help manage well-being and livelihood through more refined and dynamic lighting environments.

One specific application I am interested in for intelligent lighting solutions is to accommodate vulnerable individuals by creating enjoyable ambiances for them in care centers. This has been done by increasing the number of LED sources of light with the capability to miniaturize and integrate electronic sensors [47]. Indeed, such a future direction in architectural design technology could automatically generate light of any color, intensity, and temperature that suits the specified interior spaces' requirements. These technologies could create unobtrusive luminaries useful for reconfiguring light based on a prompt-identified mood of a room. These future directions in lighting are interesting for the way they can further address aesthetics, comfort, and mood in interior spaces.

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[1] Souza 1

[2] Wilson 1

[3] Ekirch 123

[4] Zubairy 5

[5] Zubairy 5

[6] Rossi 1

[7] Zubairy 7

[8] Zubairy 9

[9] Ciriminna 1

[10] Tanizacki 336

[11] Tanizacki 337

[12] Ciriminna 1

[13] Tanizacki 337

[14] Franco 1

[15] Zagan and Kowalska 4

[16] Zagan and Kowalska 5

[17] Zagan and Kowalska 6

[18] "6 Ways Light can Affect Your Emotions" 1

[19] "6 Ways Light can Affect Your Emotions" 1

[20] "6 Ways Light can Affect Your Emotions" 1

[21] "6 Ways Light can Affect Your Emotions" 1

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[23] "6 Ways Light can Affect Your Emotions" 1

[24] Grigoriou 43

- [25] Grigoriou 43
- [26] Grigoriou 55
- [27] Grigoriou 57
- [28] Grant 11
- [29] Grant 14
- [30] Grant 15
- [31] Holl 1
- [32] Holl 1
- [33] Holl 1
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- [35] TCP Lighting 1
- [36] Turrell 1
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- [40] Ciriminna 1
- [41] Ciriminna 1
- [42] Alkhalidi 11
- [43] Alkhalidi 11
- [44] Alkhalidi 11
- [45] Pozzi 1
- [46] Pozzi 1
- [47] National Academies Press 1



Figure 1. The picture on design precedent of light^[31]



Figure 2. Picture of design precedent of light^[32]



Figure 3. Picture of precedent design in Skyscape Chestnut Hill in Philadelphia^[36]

The background of the page features a series of soft, flowing, light blue wavy lines that create a sense of movement and depth. The lines are most prominent on the right side and curve towards the left, with varying opacities and shades of blue, giving the overall appearance a clean, modern, and ethereal feel.

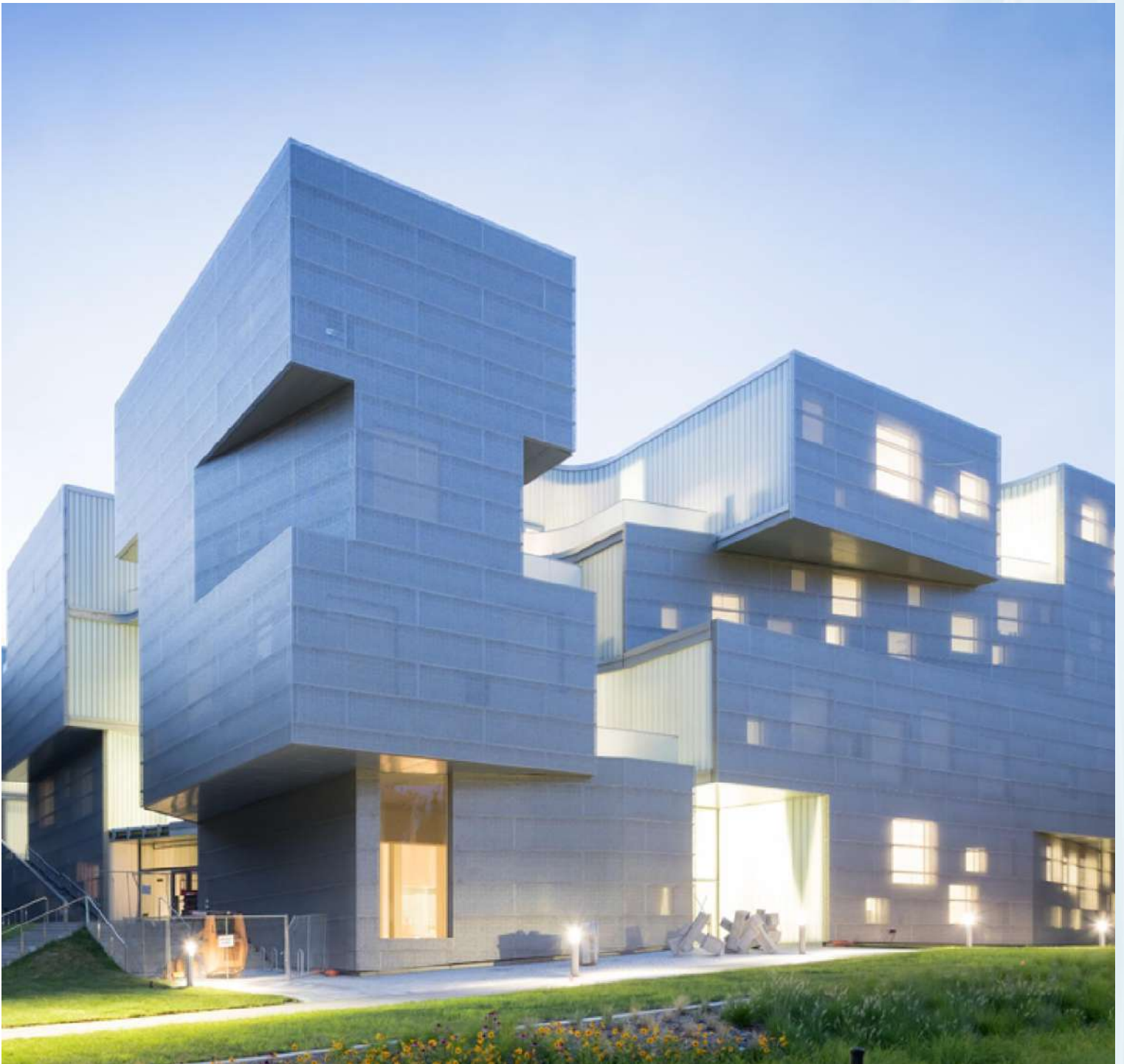
PRECEDENT

Steven Holl-University of Iowa school of art

Build: 2006

Architect: Steven Holl

Location: Iowa City, IA



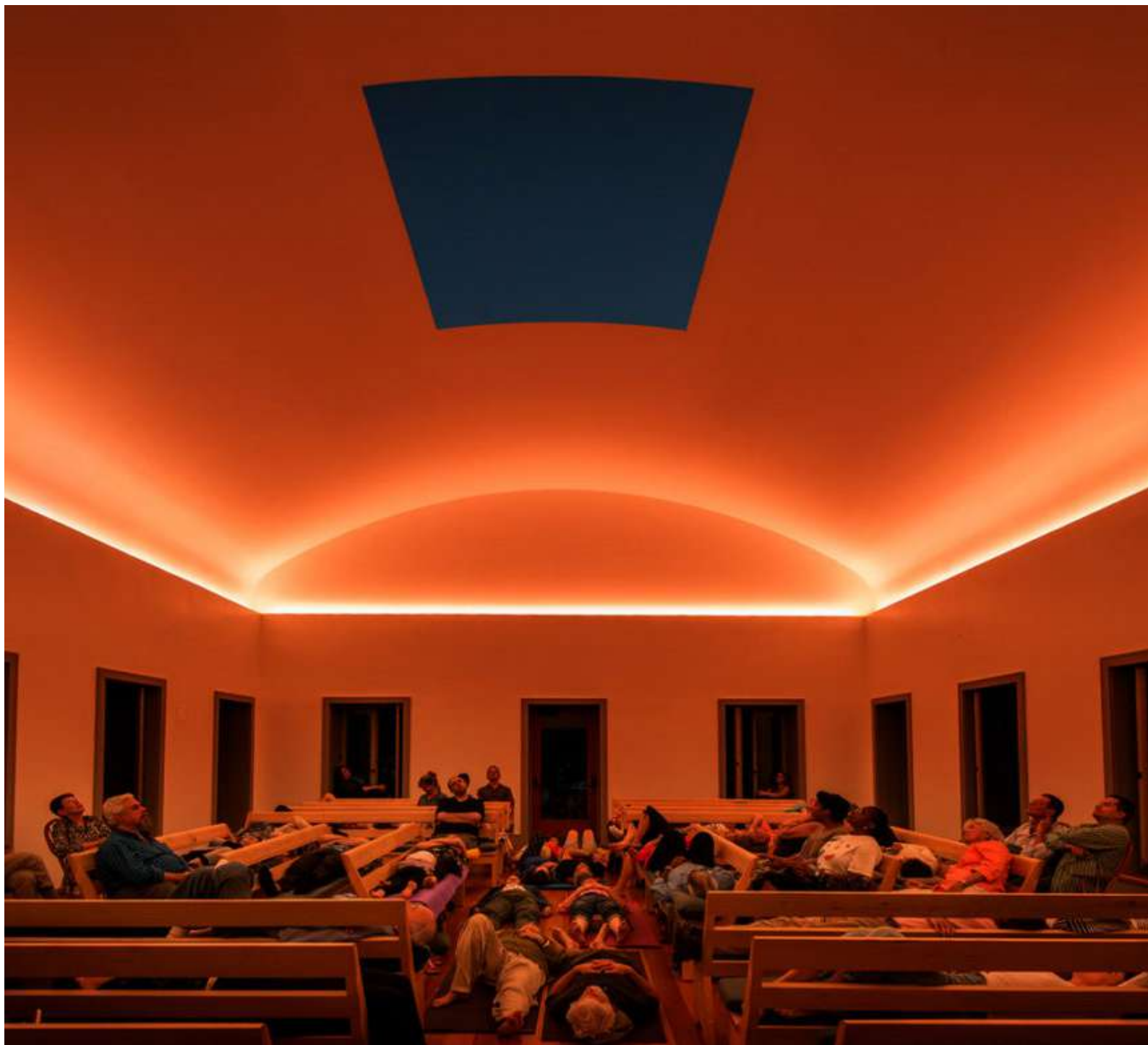


James Turrell-Sky space chestnut hill

Philadelphia

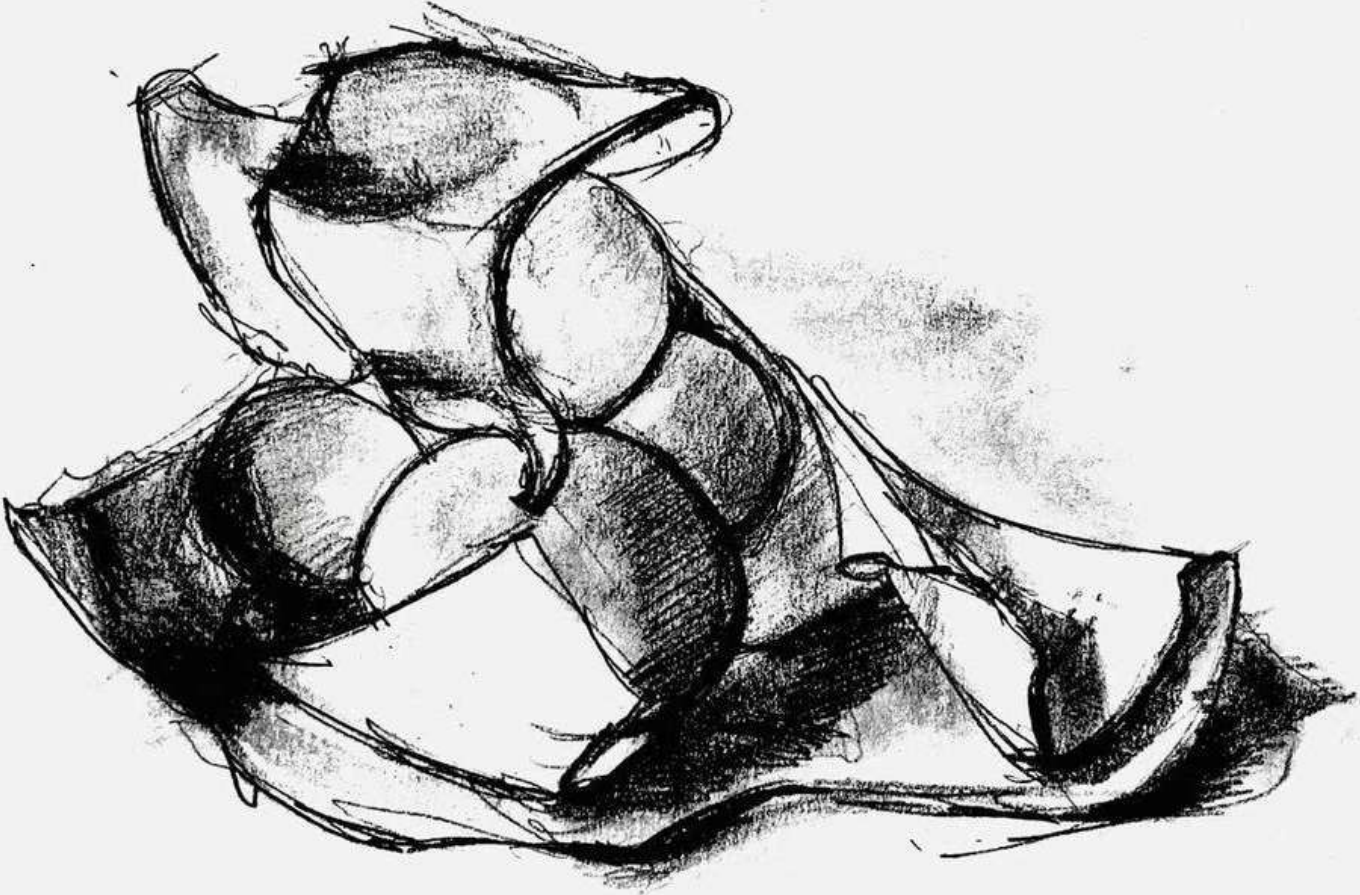






DESIGN PROBLEM

Small Scale Sketch



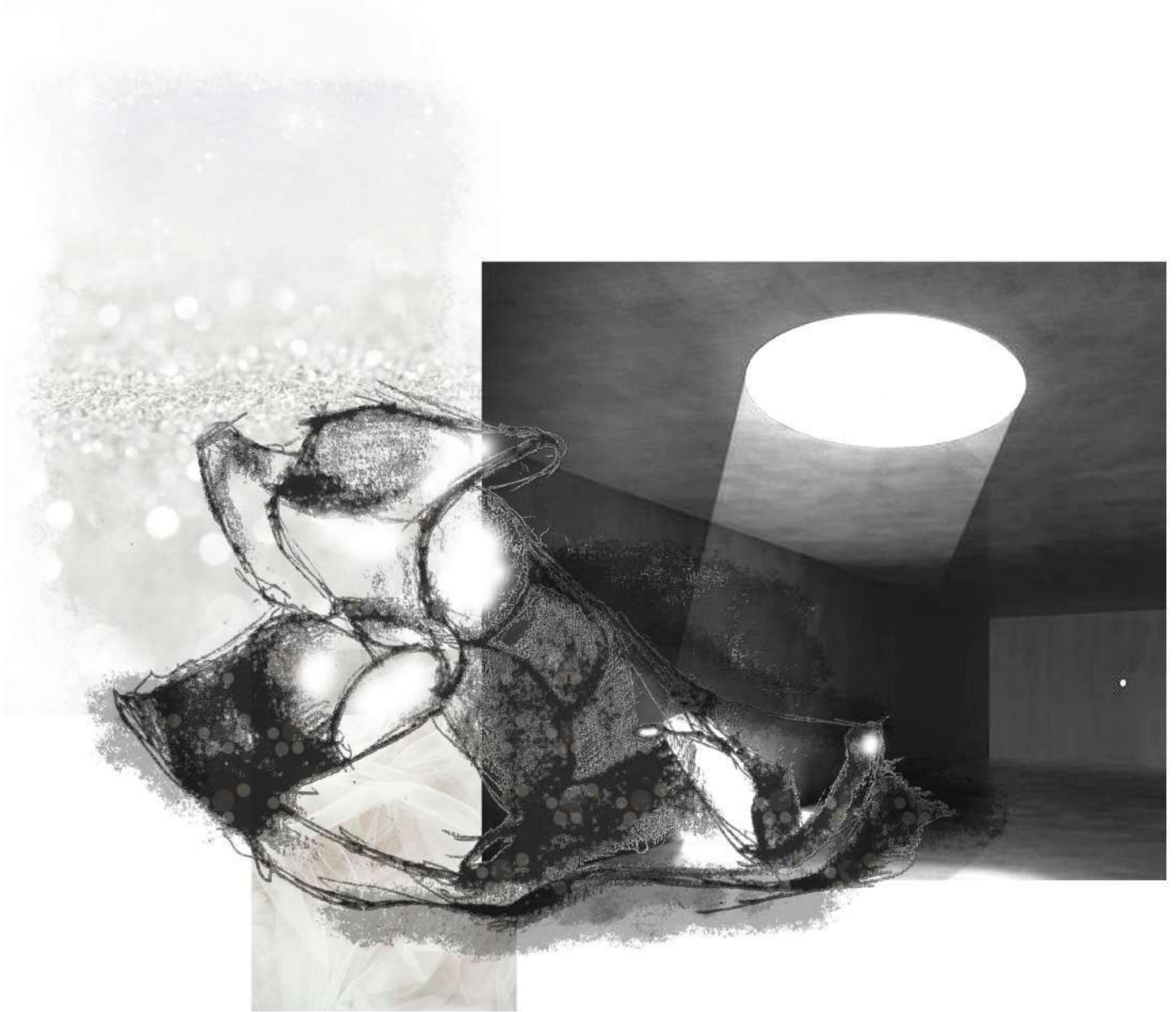
Small Scale Model



Material Platte



Design Agenda



Experience-Interview

Name: Fernando Liu Profession: Software Engineer

1: If you stay in an interior space, what kind of light are you prefer to look at and what is the value of light do you like?

In the interior space, I prefer the warm light lamp, which can make me feel relaxed and the intensity of the lamp should be as soft as possible

2: How much experience do you have on lighting?

2/3 day time for everyday

3: How is your room feeling?

My bedroom light is a warm light, which is very helpful for my rest

4: What kinds of light are you feel comfortable?

In the state of rest, I like the warm light, while in the state of work and study, I will choose the cold light

5.What kind of lights you like?

BenQ(white) Xiaomi Philips

6: Which interior spaces are important to using light? Why?

When eating in a restaurant, the light has a great impact on people's appetite, which will obviously affect people's appetite.

The effect of light at work is also very large, cold light is more conducive to people's attention.

7: What's value of light do you like when you working, playing, and sleeping? working: high value

playing: mid value sleeping: low value

8: How much do you know about palliative care? What kind of light use for healthcare center?

know nothing about palliative care

Name: Yanxi Wang

Profession: mechanical engineer

1: If you stay in an interior space, what kind of light are you prefer to look at and what is the value of light do you like?

I would like to stay in a space with soft, a little bit yellow, and bright light. The value of light I like can let person relax and bring warm them.

2: How much experience do you have on lighting?

Not too much, I started to learn about lighting recently.

3: How is your room feeling?

The lights in my room are nothing special.

4: What kinds of light are you feel comfortable?

The most important is brightness, I prefer bright light all the time (around 500 lux).

And I need a soft light, not dazzling. The light needs to convert through lampshade or reflect with wall.

5. What kind of lights do you like?

The color temperature should be between 3400~4000K.

6: Which interior spaces are important to using light? Why? Any interior spaces need light.

For a normal home, light serves two purposes, illuminating and regulating atmosphere.

Lights illuminate everything, let people could normally work and live.

And different types of light could bring different moods to people.

7: What's the value of light do you like when you are working, playing, and sleeping?

Appropriate light used in special occasions always let people feel better. Appropriate light brings more efficiency in working, more fun in playing and more comfortable while sleeping.

8: How much do you know about palliative care? What kind of light is used for healthcare centers? I do know about palliative care.

I think healthcare centers should install bright and soft lights that give patients hope.

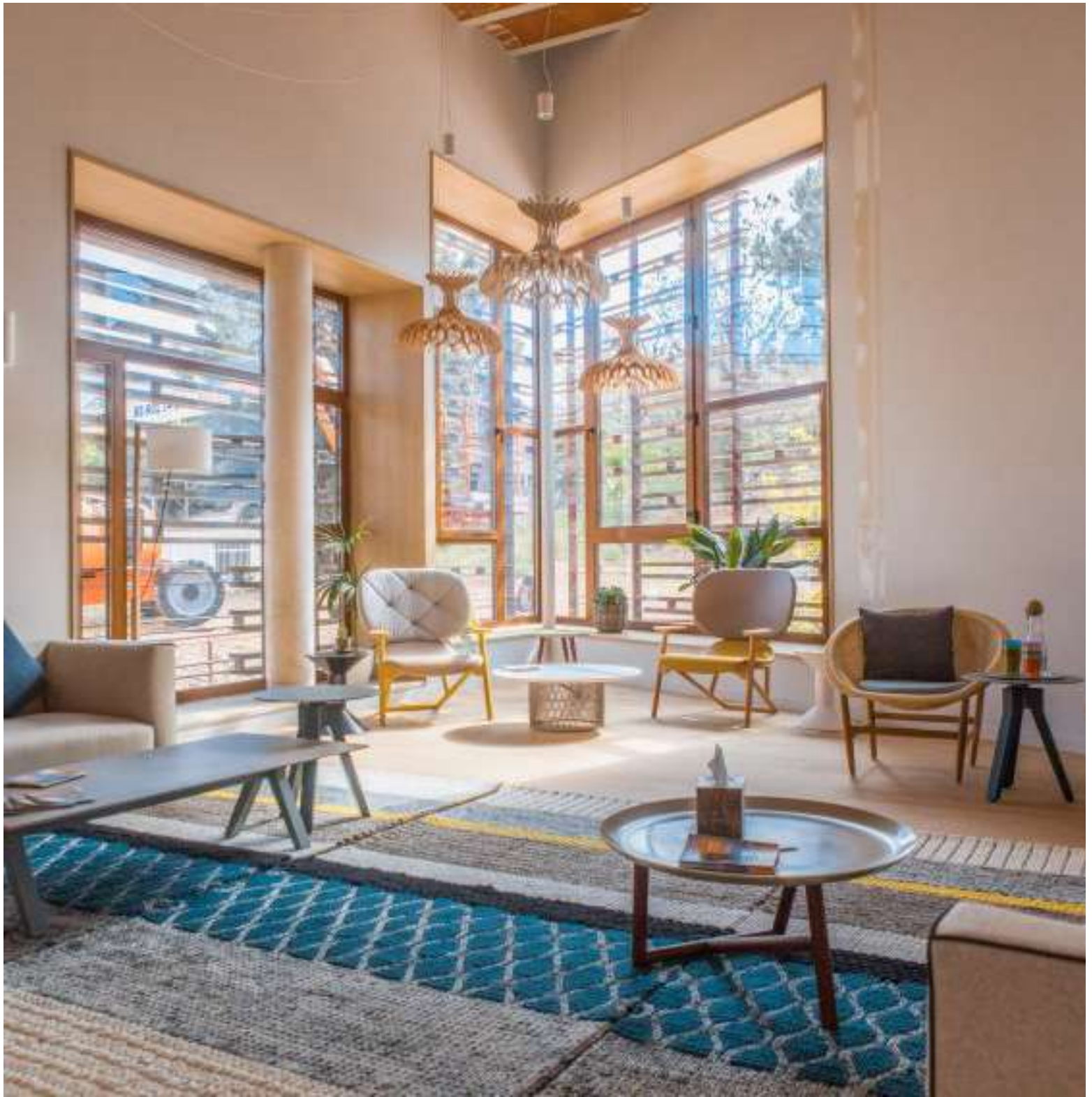
CASE STUDY

The background of the page features a series of smooth, flowing, light blue and white waves that create a sense of movement and depth. The waves originate from the bottom right and curve upwards and to the left, eventually fading into a bright white light at the top left corner. The overall aesthetic is clean, modern, and professional.

Case Study # 1 Maggie Center-Barcelona



The first case study is a palliative center named Maggie center in Barcelona, Spain, It was one of the famous palliative healthcare center in Maggie's community. it has great environment if people live in this area, they will feel comfortable. This is very interesting because the palliative healthcare center was different between regular healthcare centers. it looks like a hotel and has more residential functions, most function in this building are looked like hotel. It includes lobby, café, dining area, gym, living space and guest bedroom. This palliative healthcare center provided patients several type of bedrooms and the patients can feel like home. For lighting selection, some spaces have strong light, and some spaces have soft light. According to the function of each space to make the different value of light



Case Study # 2 Palliative Care Newtown Square



Located in Newtown Square, PA

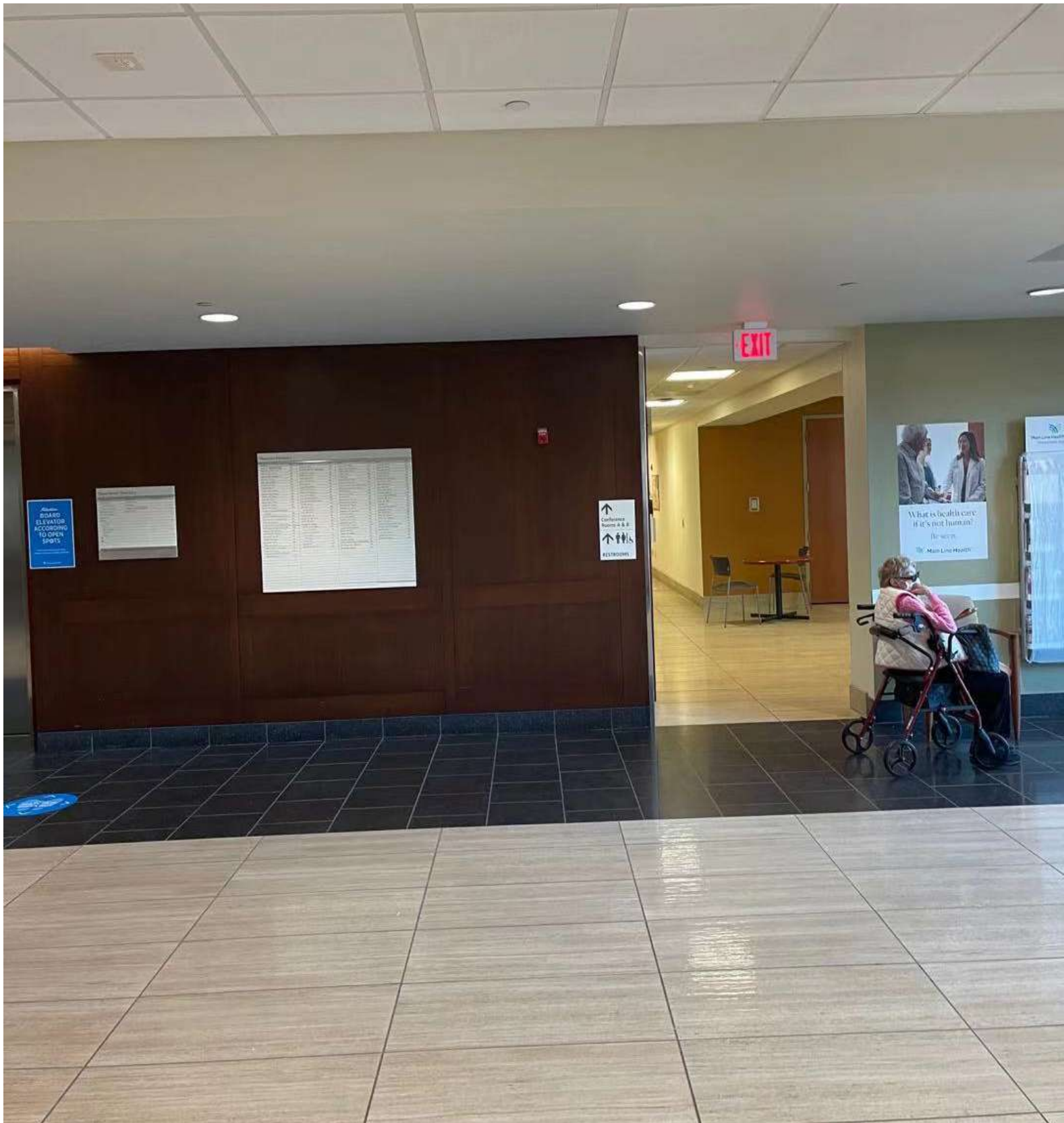
Great Environment

Not far away from city

Regular hospital. Not comfortable for patients.







Please BOARD ELEVATORS ACCORDING TO OPEN SPOTS.

Notice board with various notices and schedules.

↑ Conference Rooms A & B
↑ RESTROOMS

EXIT



What is health care if it's not human?
The Main Line HEALTH



PROGRAMMING

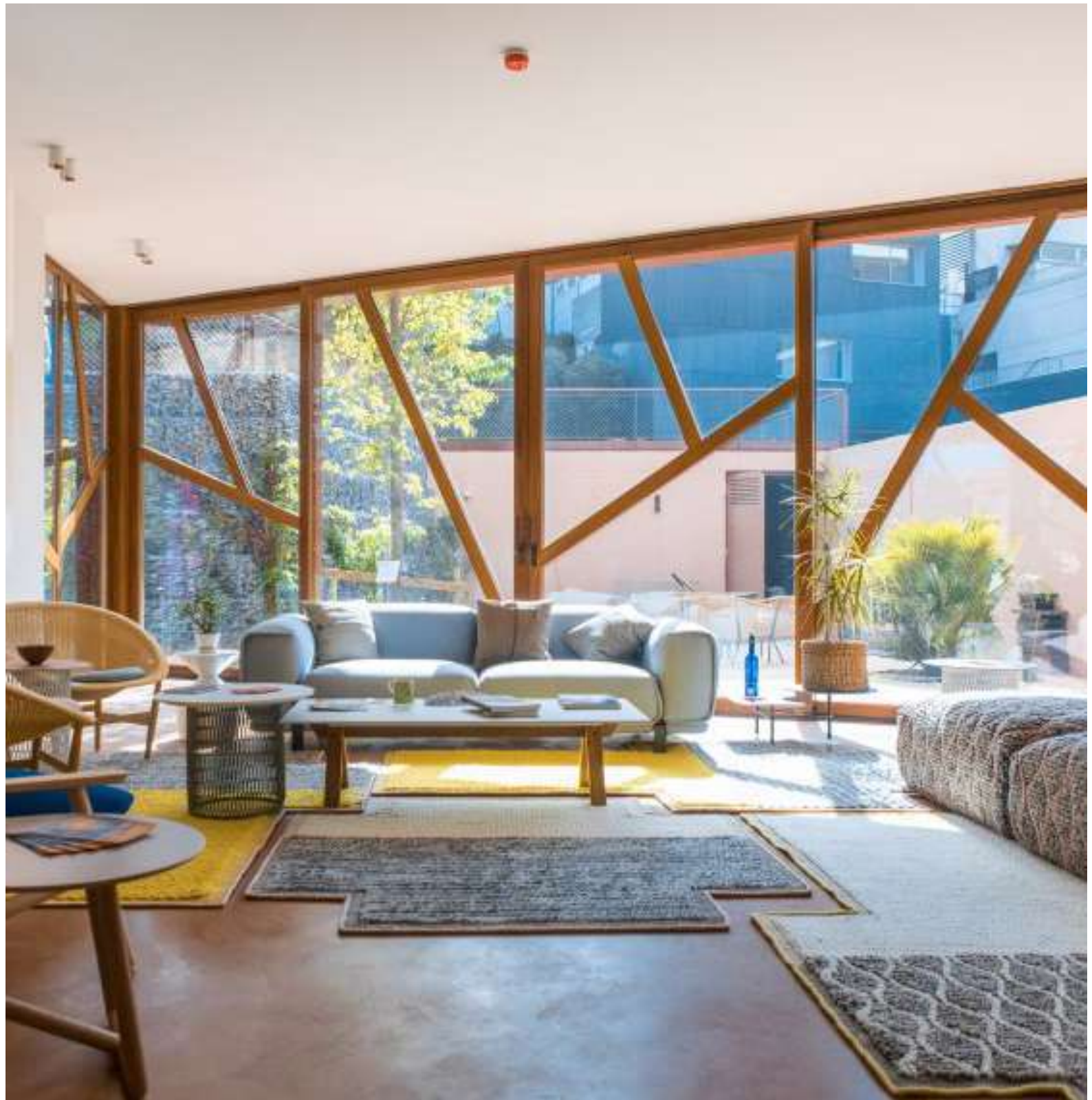
The background of the slide is a light blue gradient with several overlapping, semi-transparent white and light blue wavy lines that create a sense of motion and depth. The lines flow from the bottom left towards the top right, with some lines curving back towards the bottom. The overall effect is clean, modern, and professional.

Palliative Healthcare Center

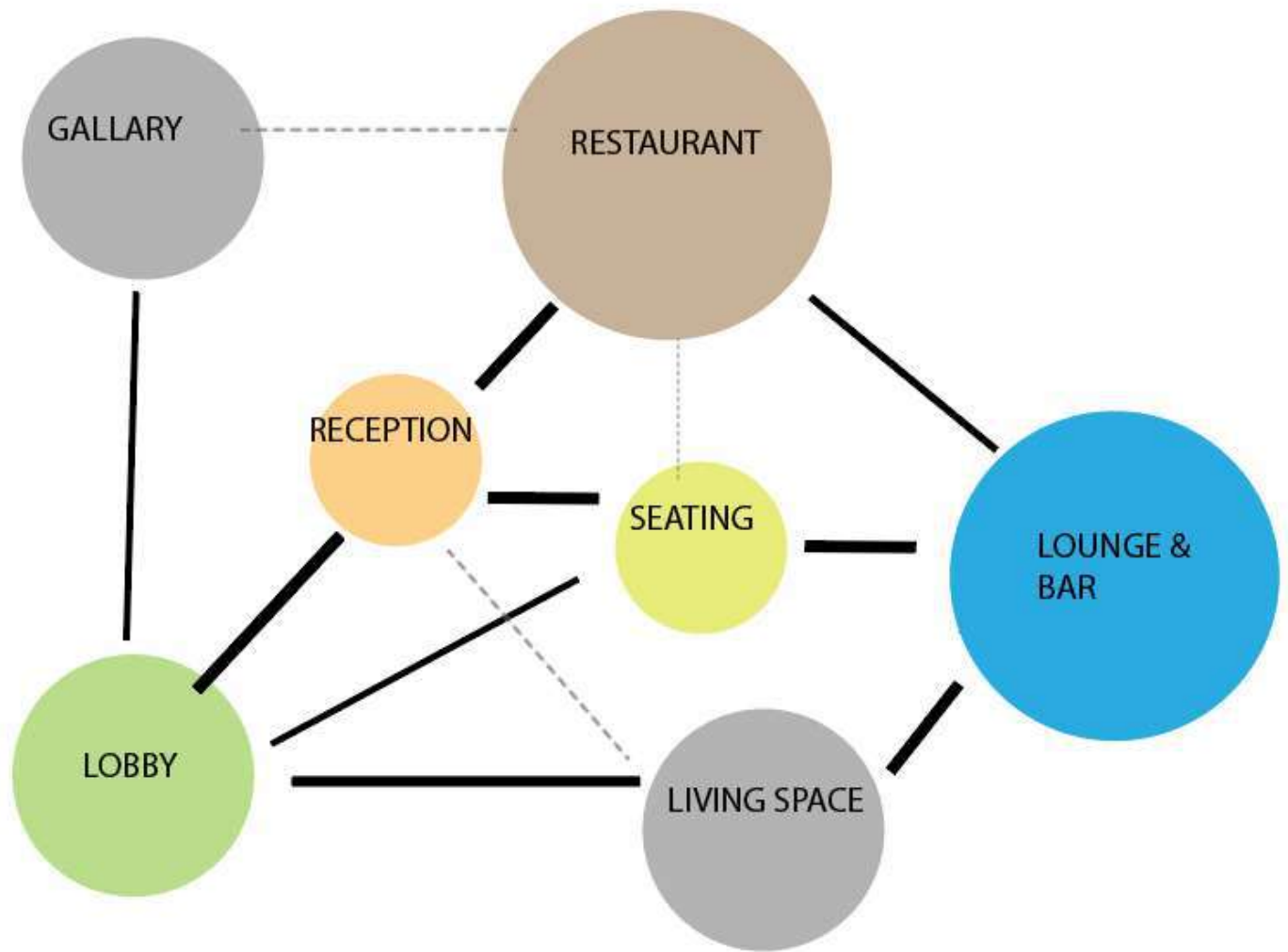
- Puts the patient's desires, goals and decisions first.
- Supports the patient and family.
- Helps patients and families understand treatment plans.
- Improves quality of life.
- Provides pain and symptom control.
- Focuses on body, mind and spirit.
- Reduces unnecessary hospital visits



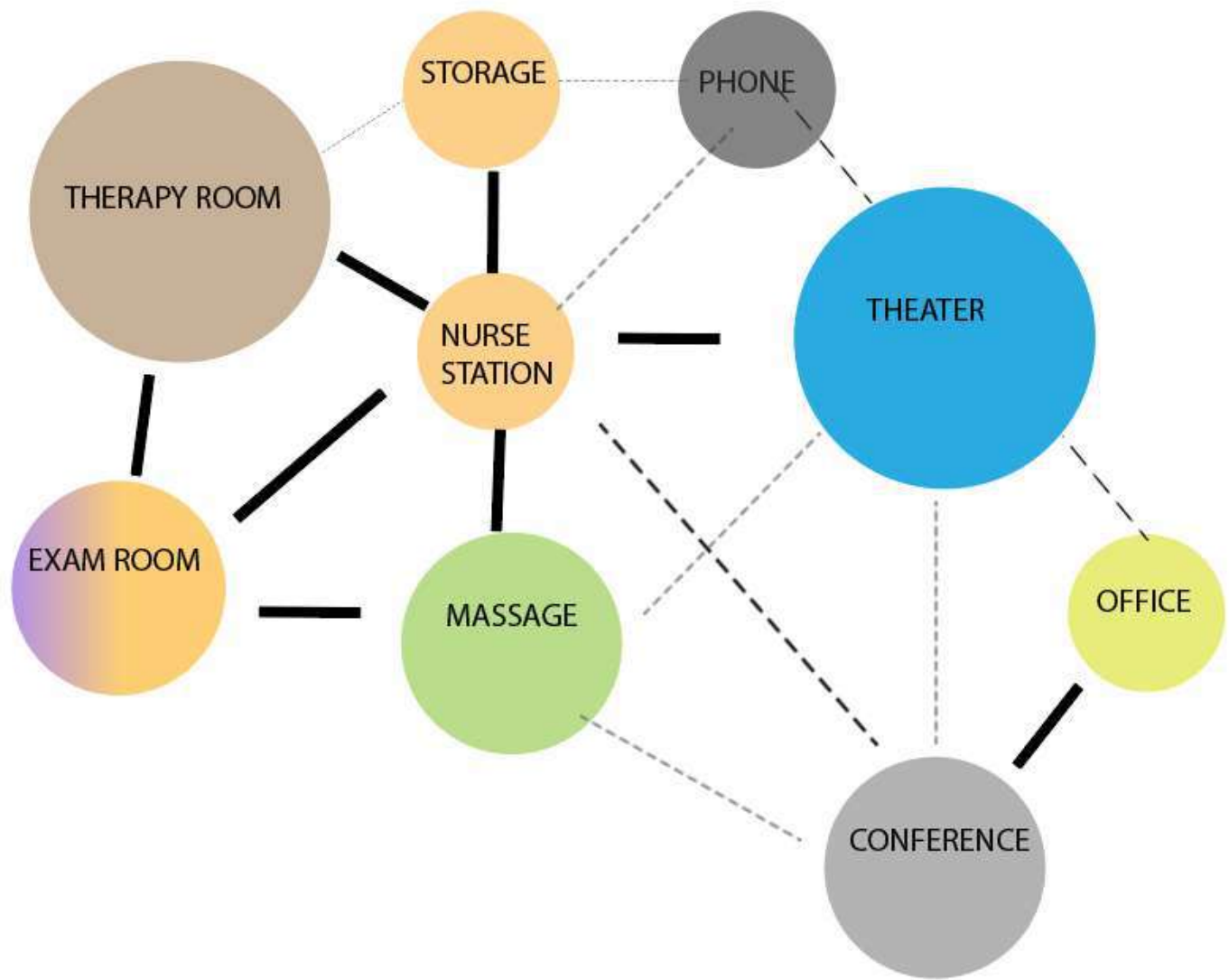




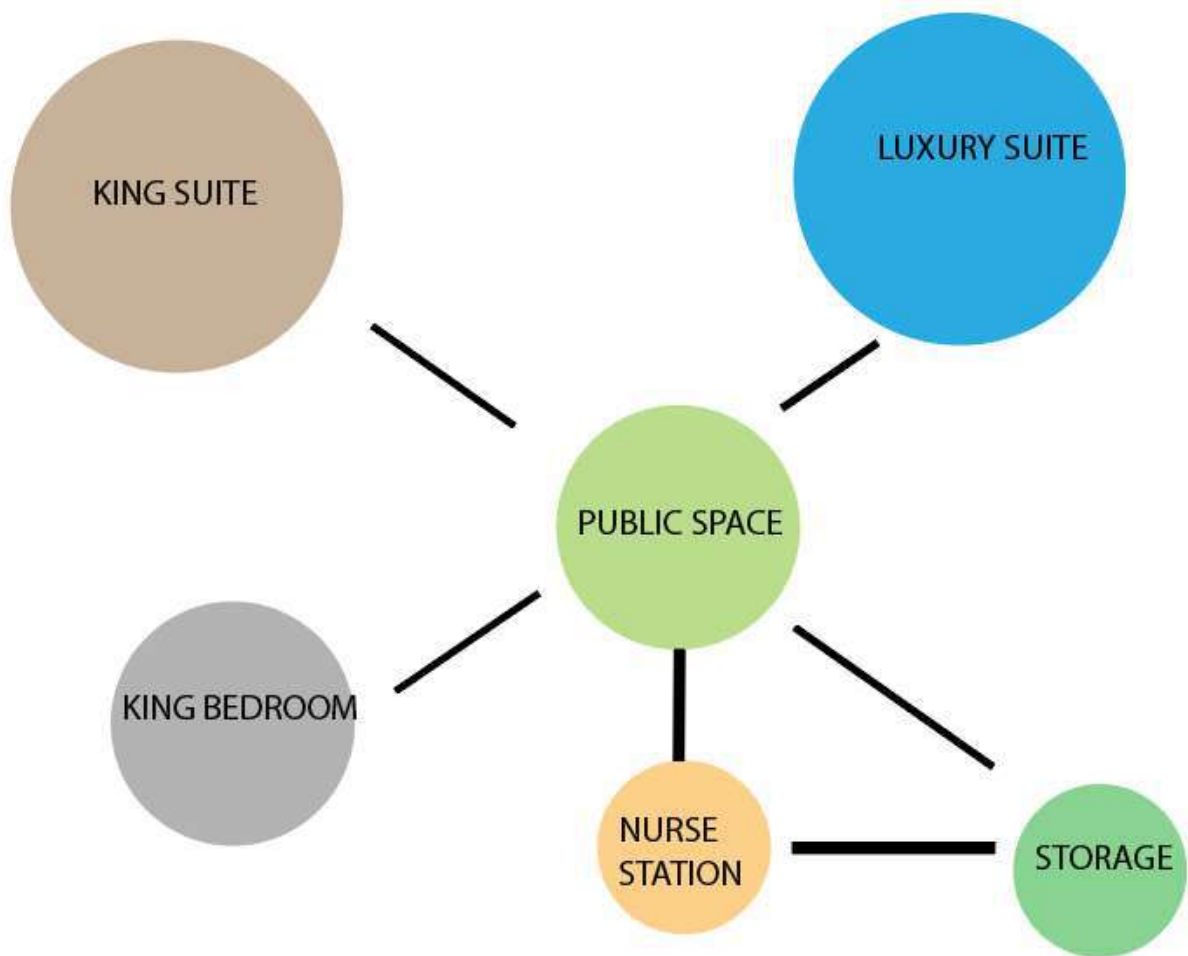
Bubble Diagram



Public Space



Semi-Public Space



Private Space

Space Diagram

Bedroom Nurse Station Storage

Therapy Room Exam Room Massage Room

Storage Nurse Station Conference Room

Theater Office Phone Room

Gallery Restaurant Reception Lobby Seating

Lounge Bar Living Space

Light Value Diagram

Storage Theater Back of House Phone Room

Locker Room

Office Therapy Room Kitchen Conference Room

Nurse Station Exam room

Lobby Reception Restaurant Seating Area

Living Space Gym Gallery Lounge Bar Bedroom



SITE

Studebaker Building, 1469 Bedford Ave, Brooklyn, NY,11216



Site History

IN THE EARLY 1900S, A section of Brooklyn's Bedford Avenue, between Empire Boulevard and Atlantic Avenue, was known as "Automobile Row," so named for its clustering of showrooms, dealerships, garages and other businesses catering to American car owners.

The Studebaker building, a striking early 20th century auto showroom, harkens back to the golden age of the American automobile industry. Built in 1920 by Tooker and Marsh, the building served as a two-story Studebaker showroom for almost 20 years. Studebaker stopped showing cars here in 1939, and in 1941 architect Irving Cohen oversaw a major cosmetic upgrade to the building, removing the plate glass windows from the street front and making alterations to the first and second floors and the mezzanine. A few years later, what had once been a prominent auto showroom had become a collection of a dress shop, furniture showroom and offices.





BED



Abraham Lincoln
B49
Bedford Ave & Sterling Pl







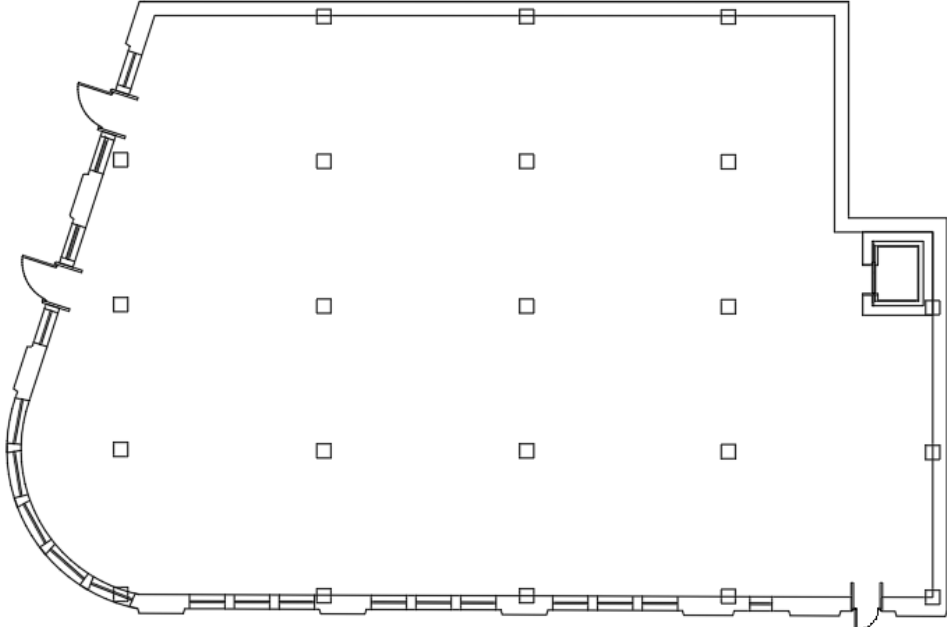


Neighborhood Analysis

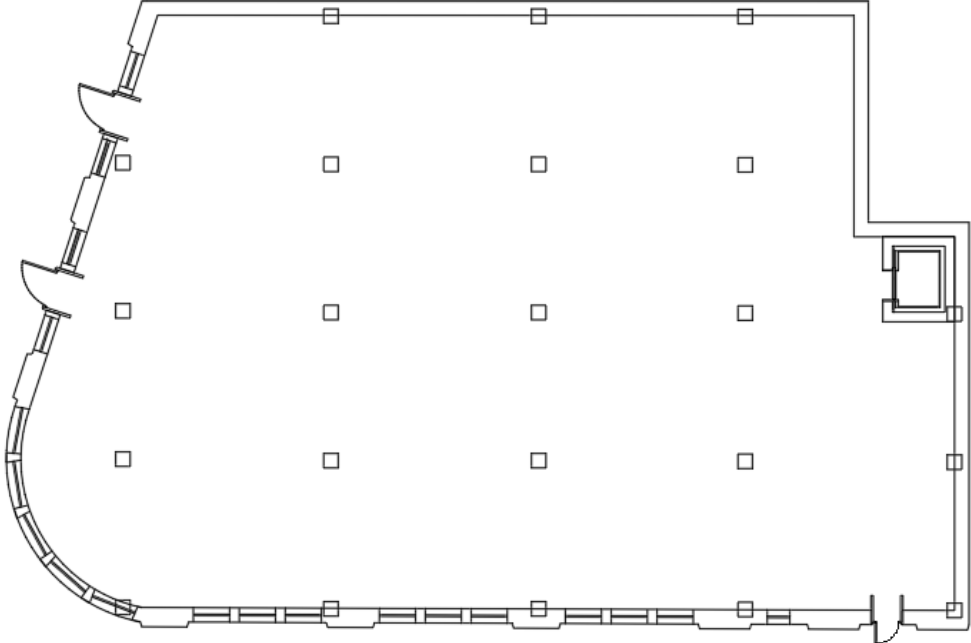
- Food
- Museum
- Public park
- Supermarket
- Library
- Post office
- Bus station
- School
- Café
- Hospital



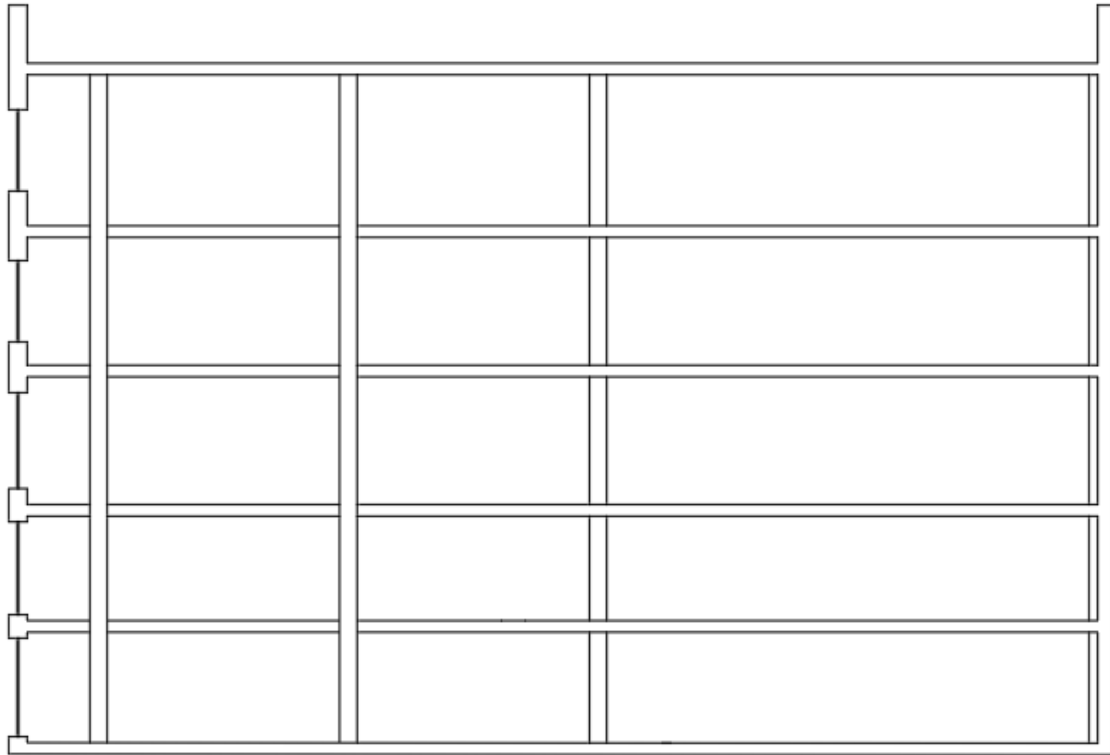
Site Documentation



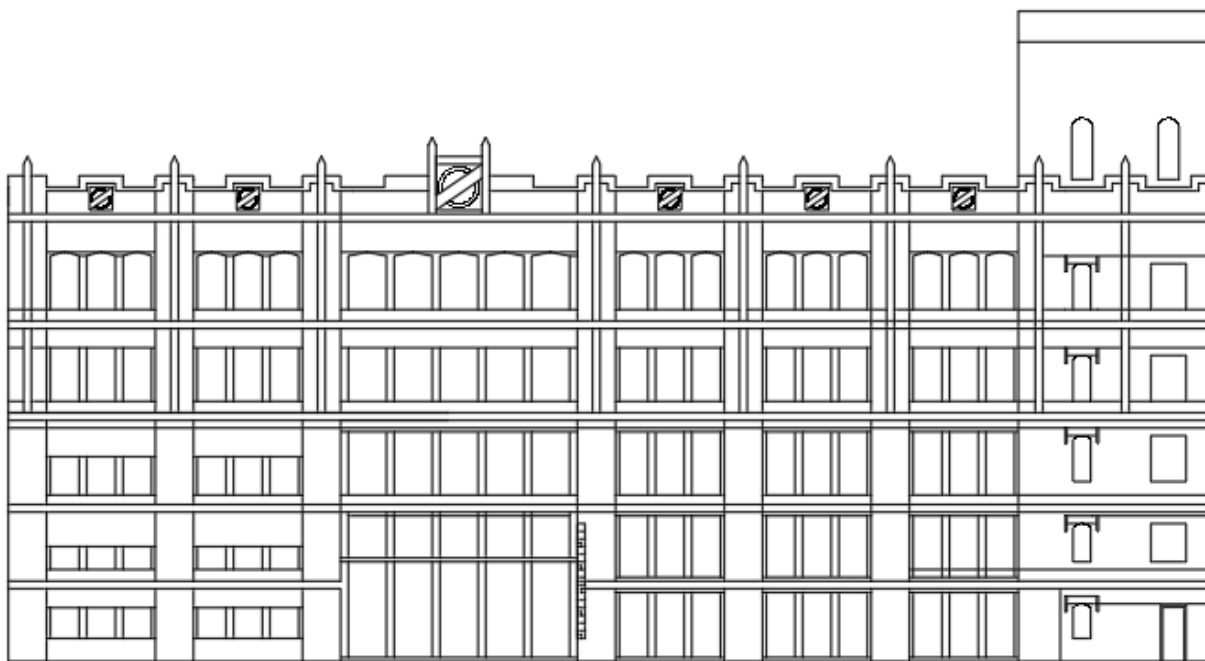
1ST Floor Plan



2-5 Floor Plan



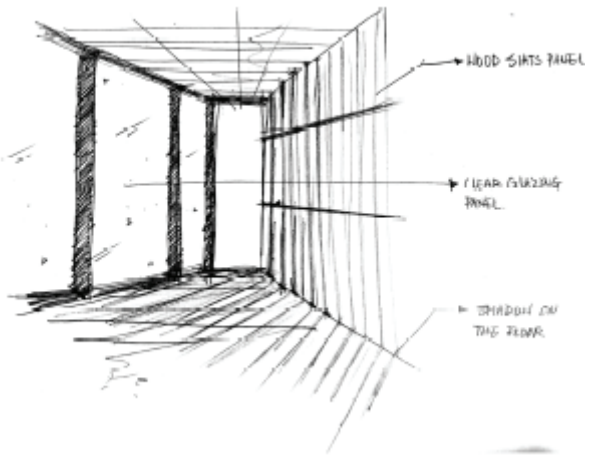
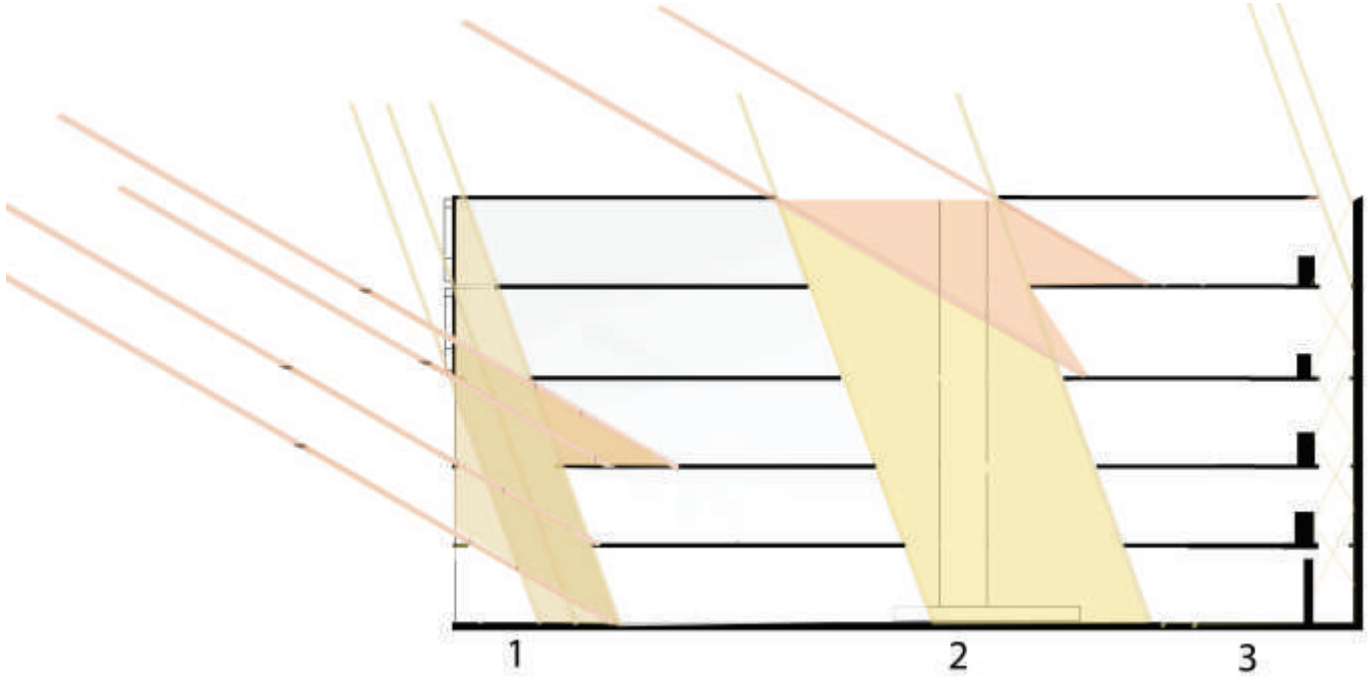
Building Section

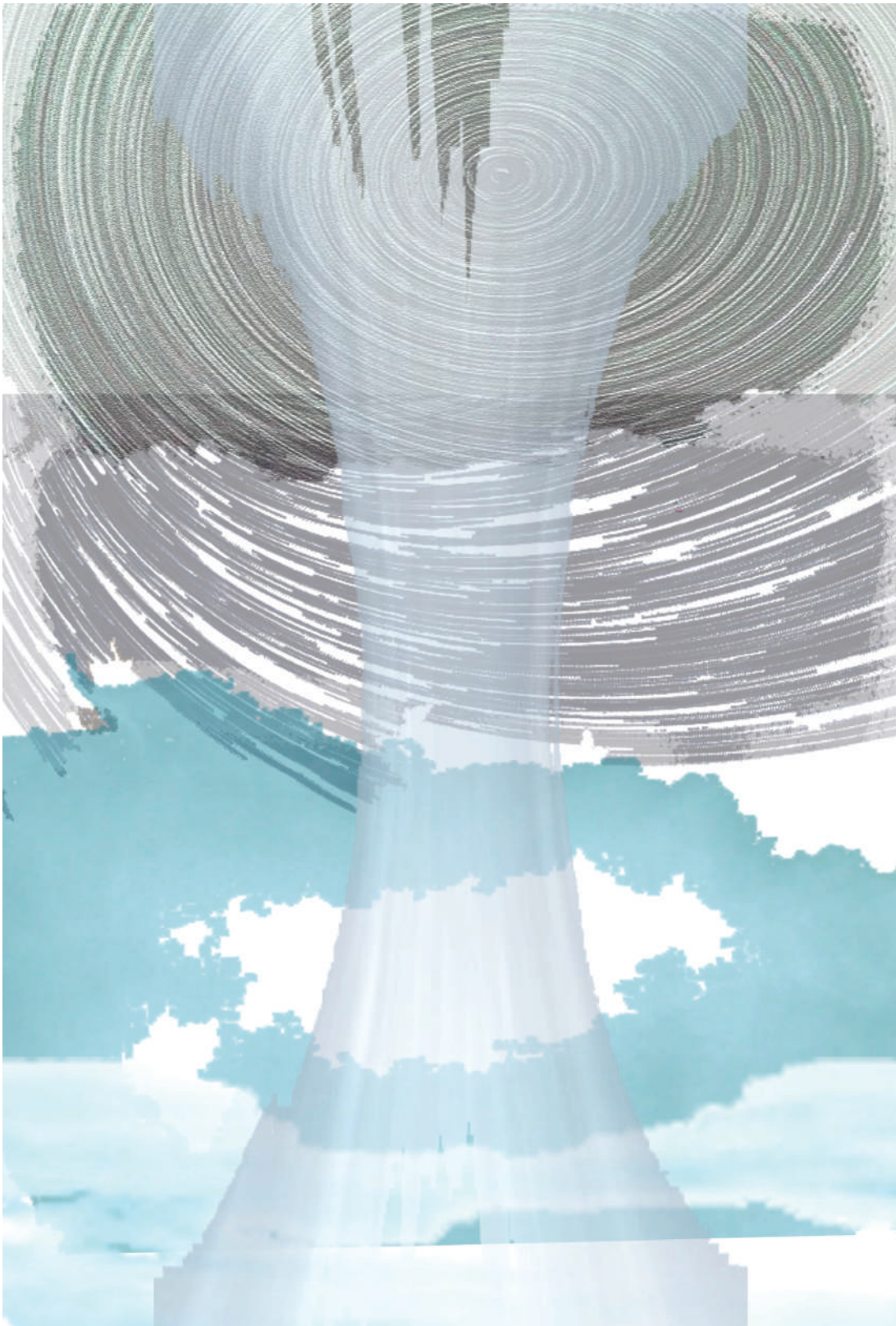


Exterior Building Elevation



Schematic Design





The design concept was Using Light to Shape Aesthetics, Comfort and Mood According to the daylight strategies and new lighting conditions to make the whole space in different layers. Each layer has the specific style of environment, using the different daylight strategies to represent each layer. Movement and layering are the keywords through the design.



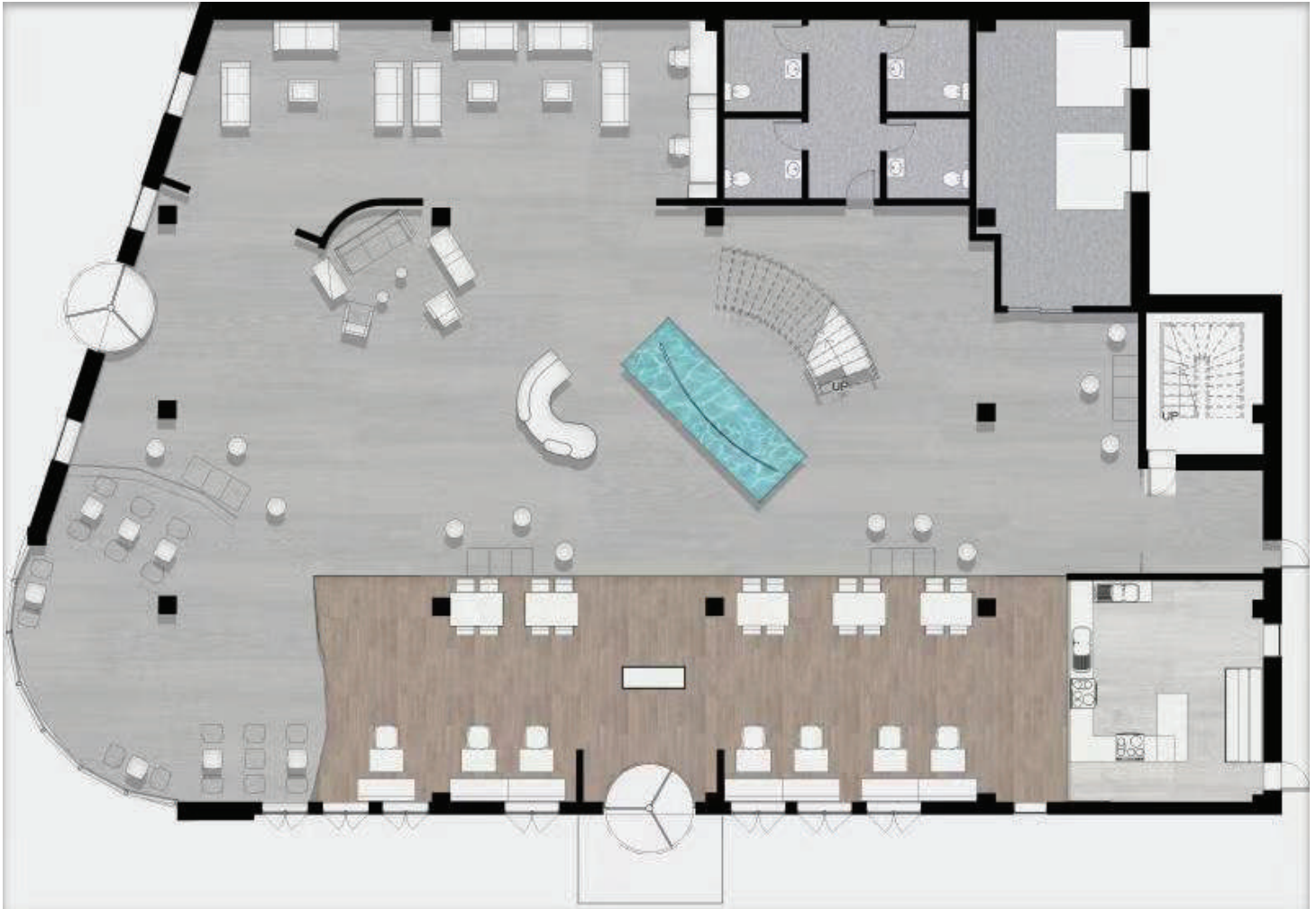








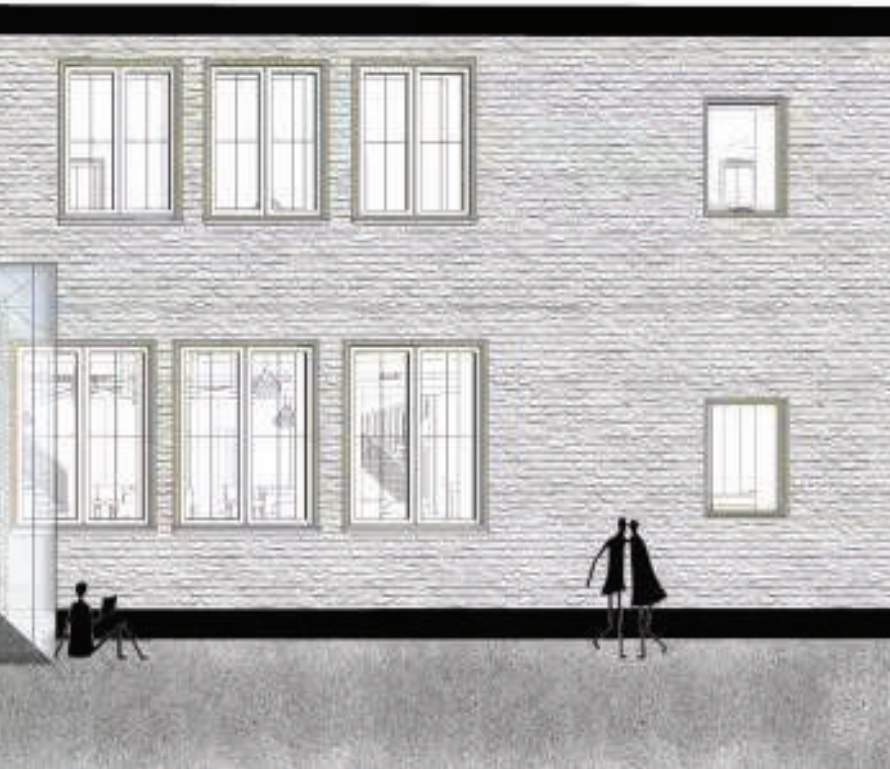
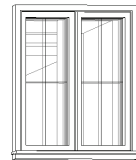
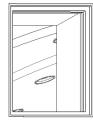
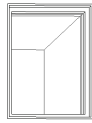
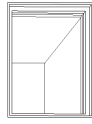




First Floor Plan

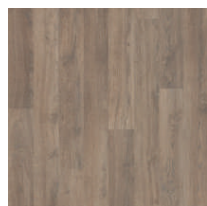
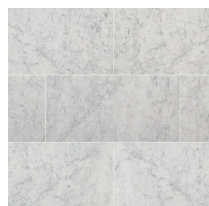


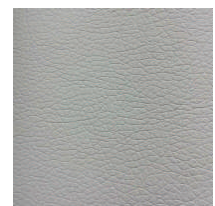




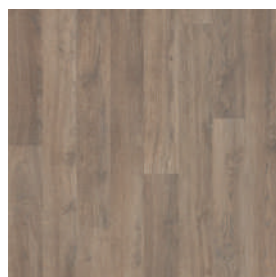
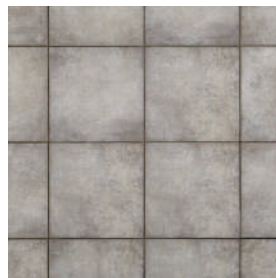






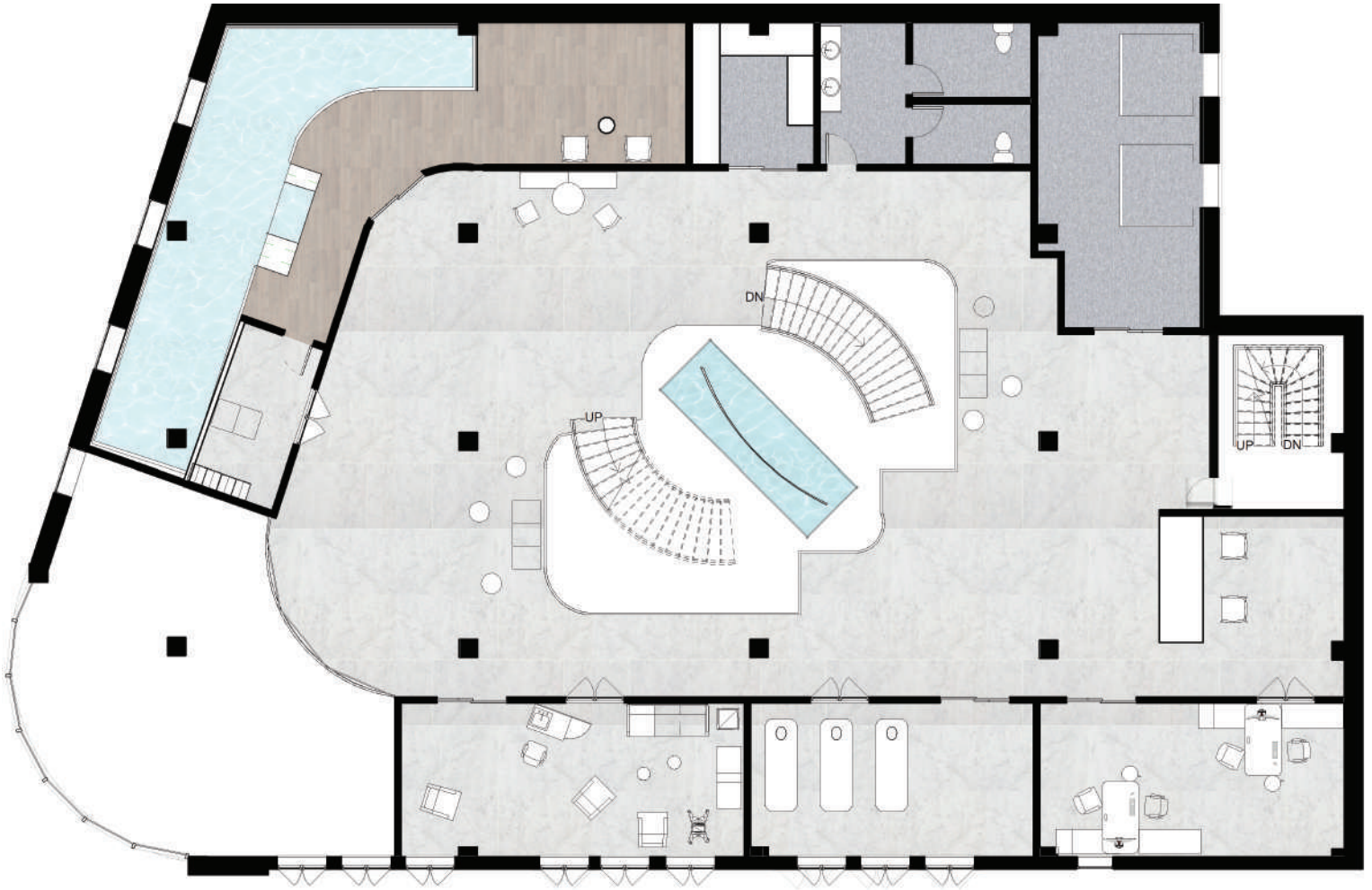










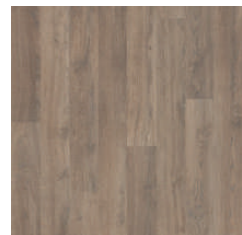


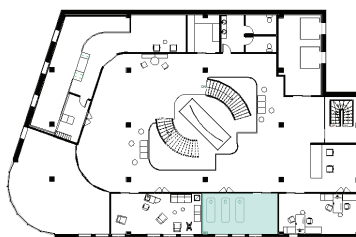
Second Floor Plan

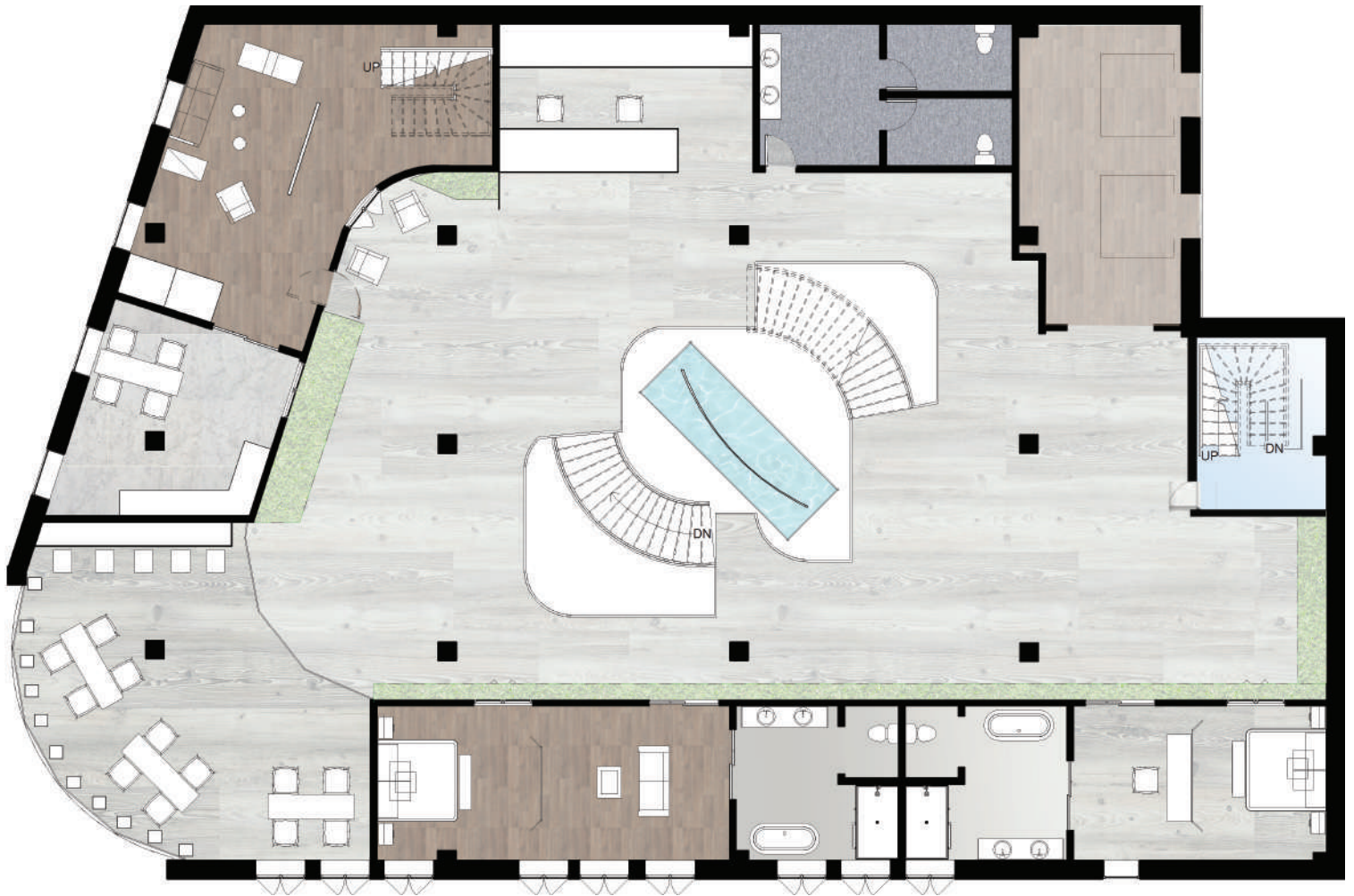












Third Floor Plan

















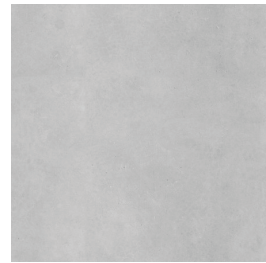
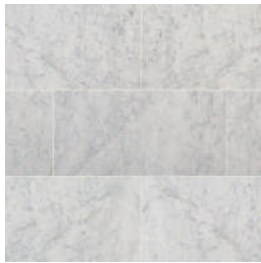


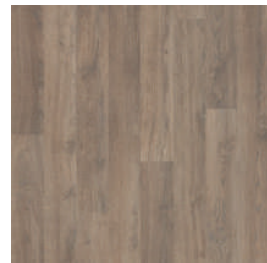


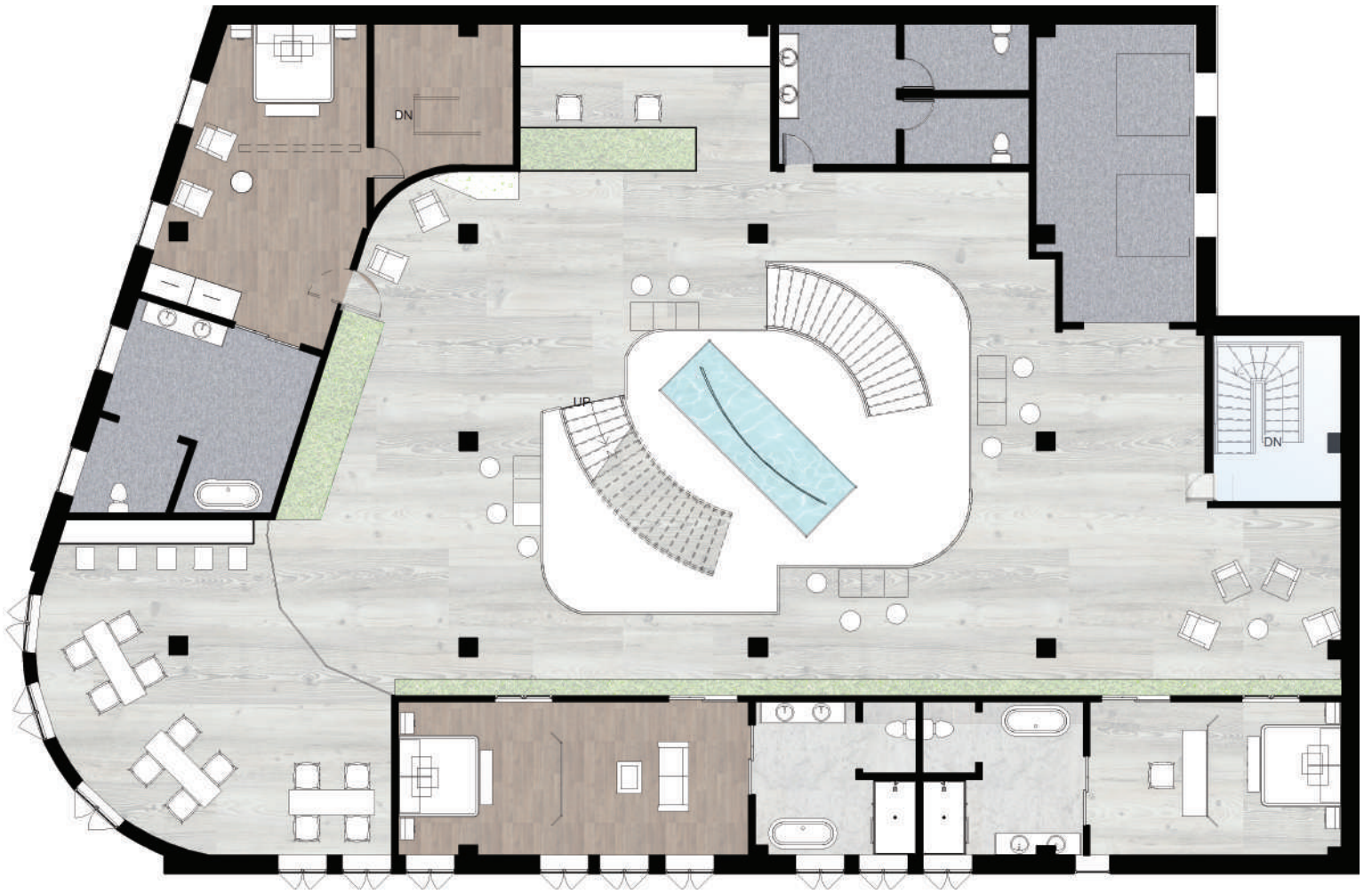






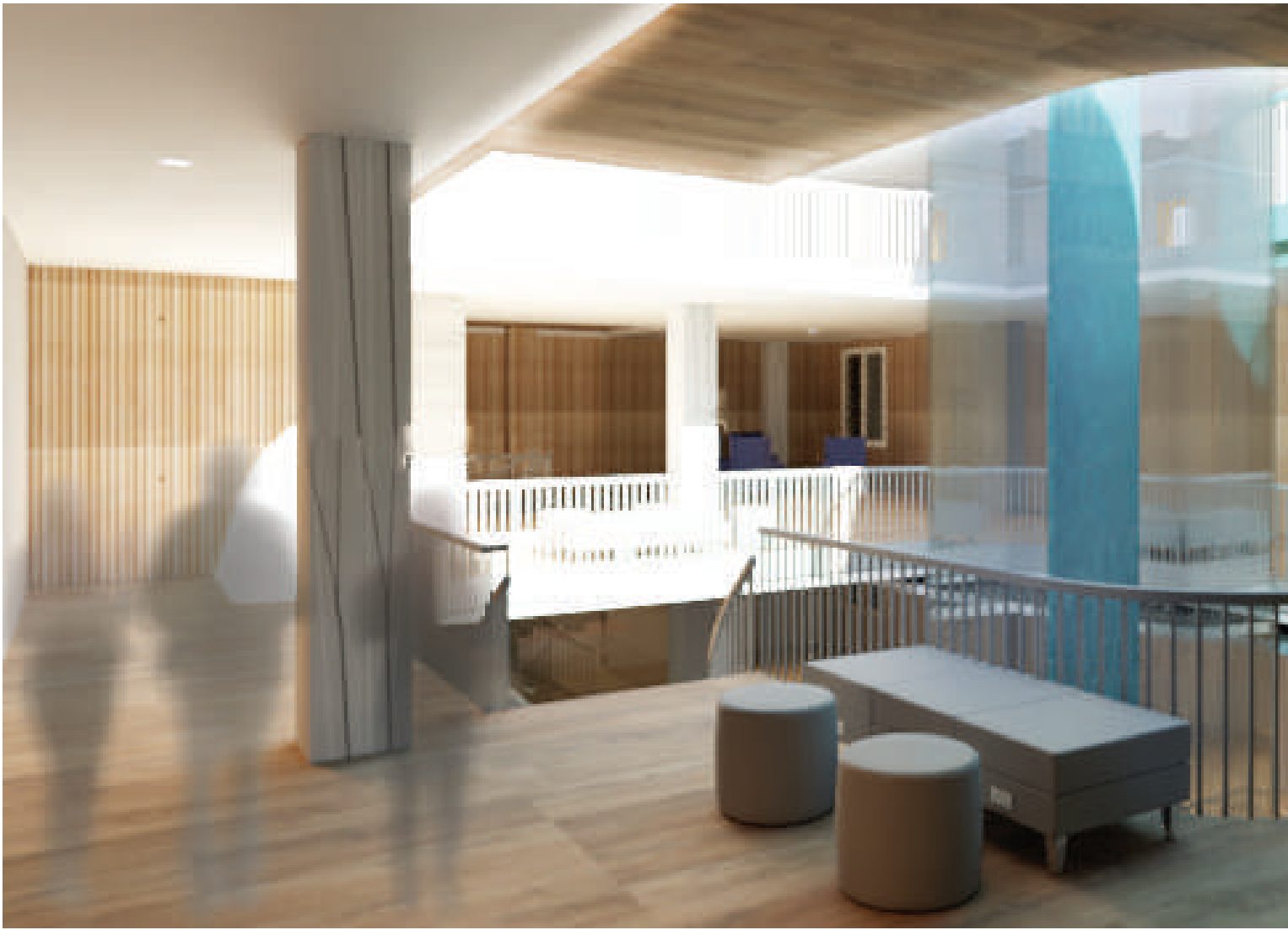




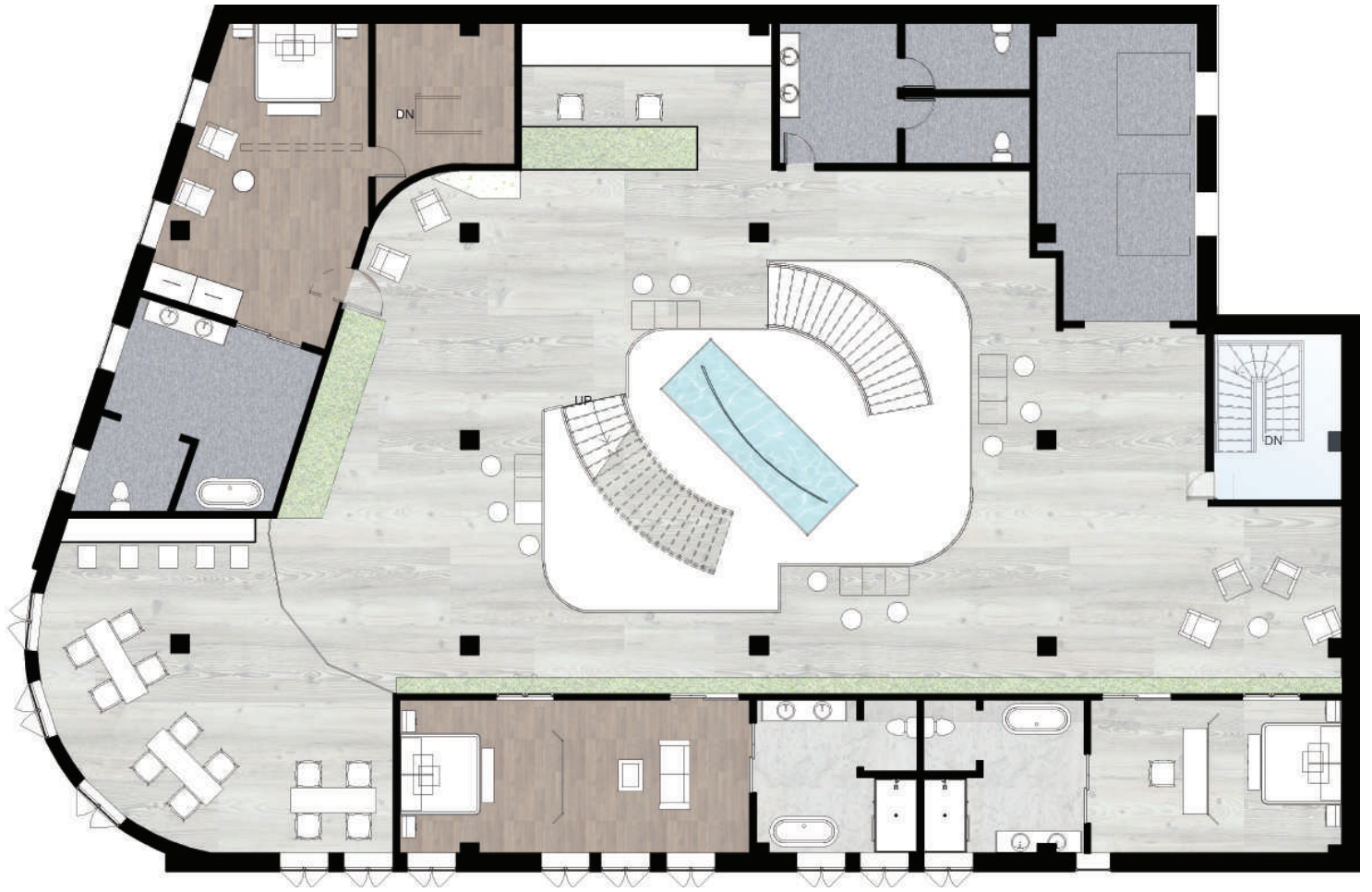


Fourth Floor Plan



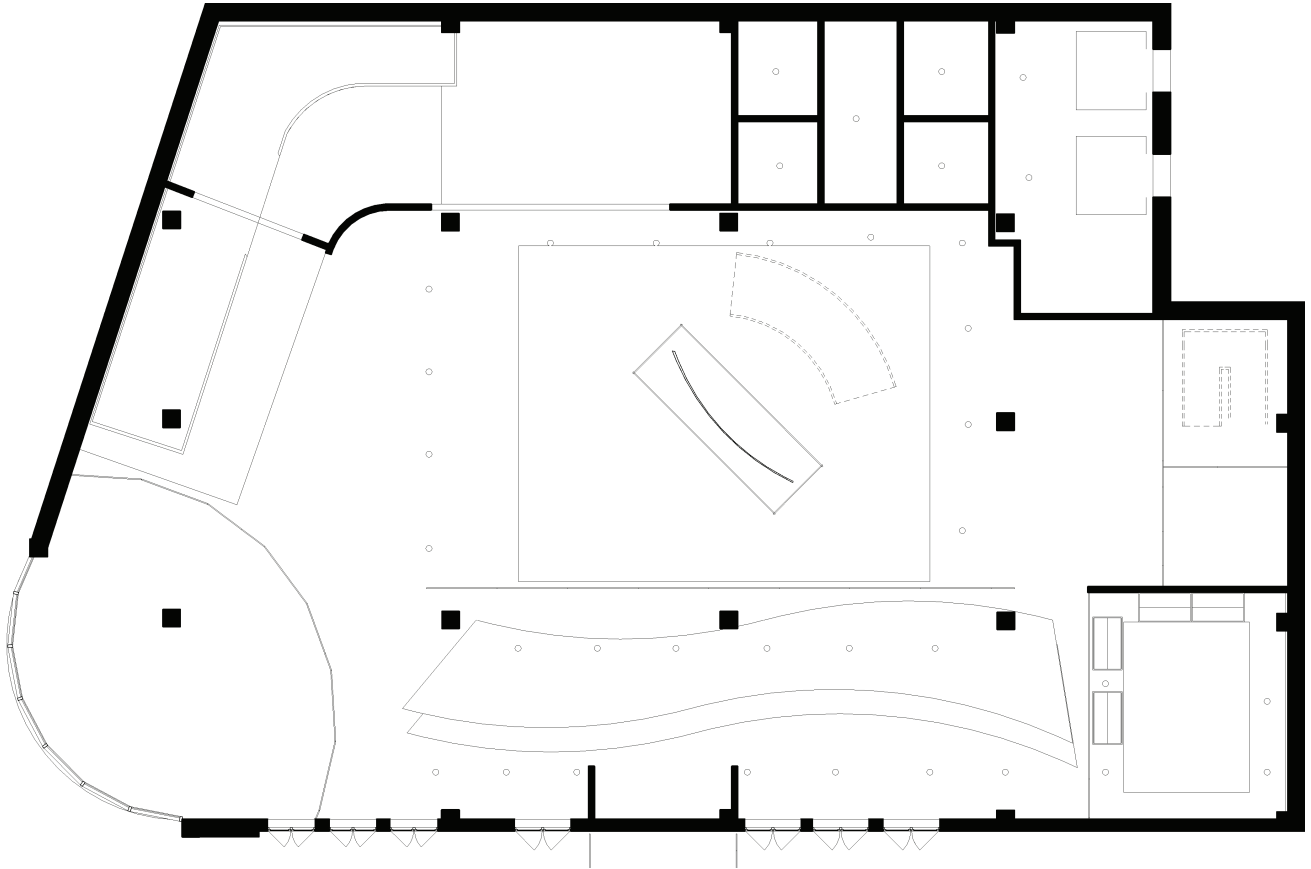






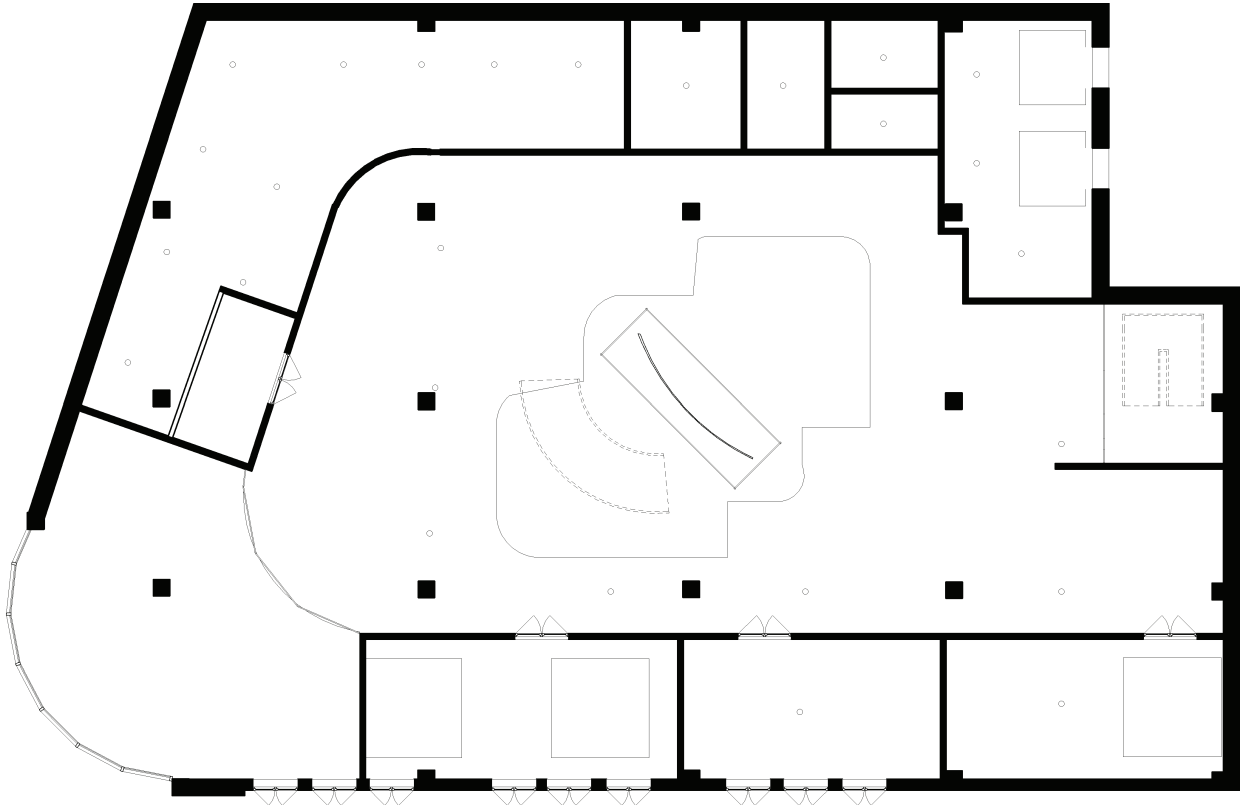
Fifth Floor Plan





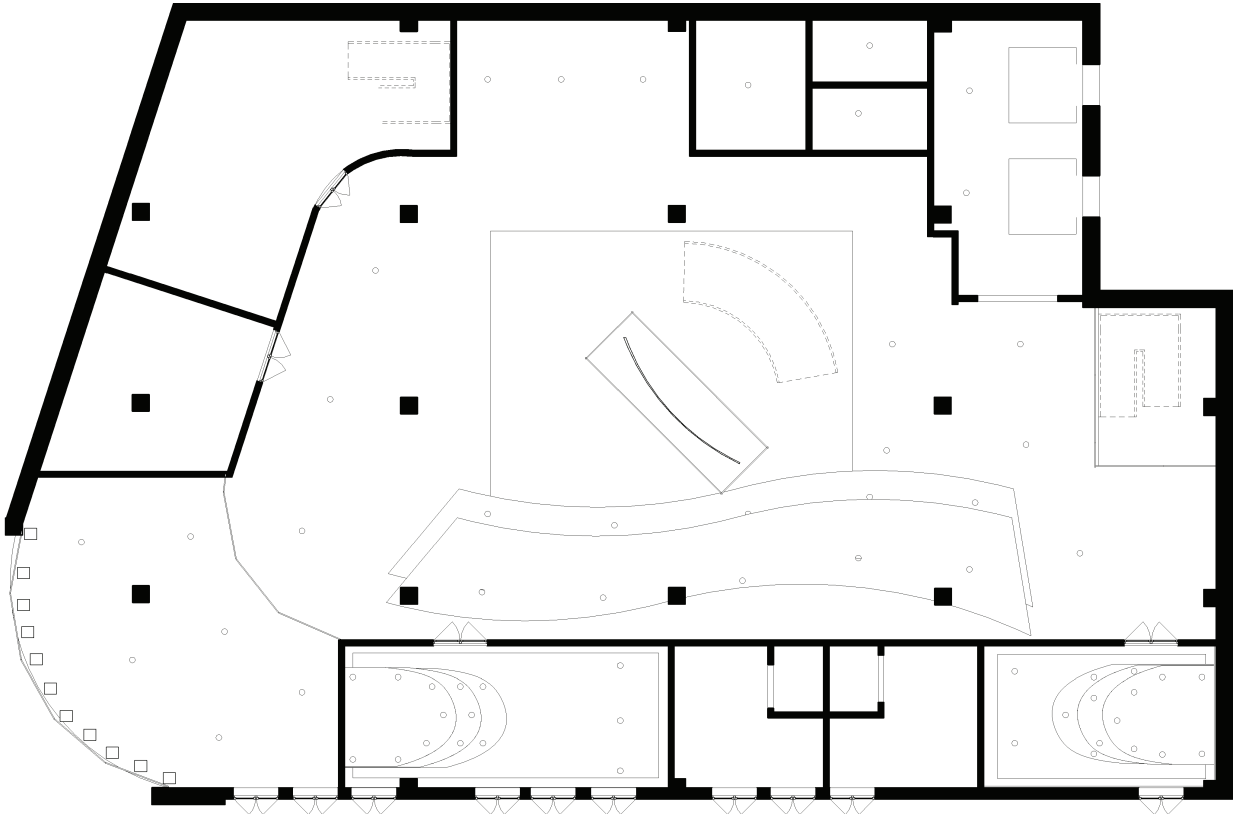
First Floor Reflected Ceiling Plan





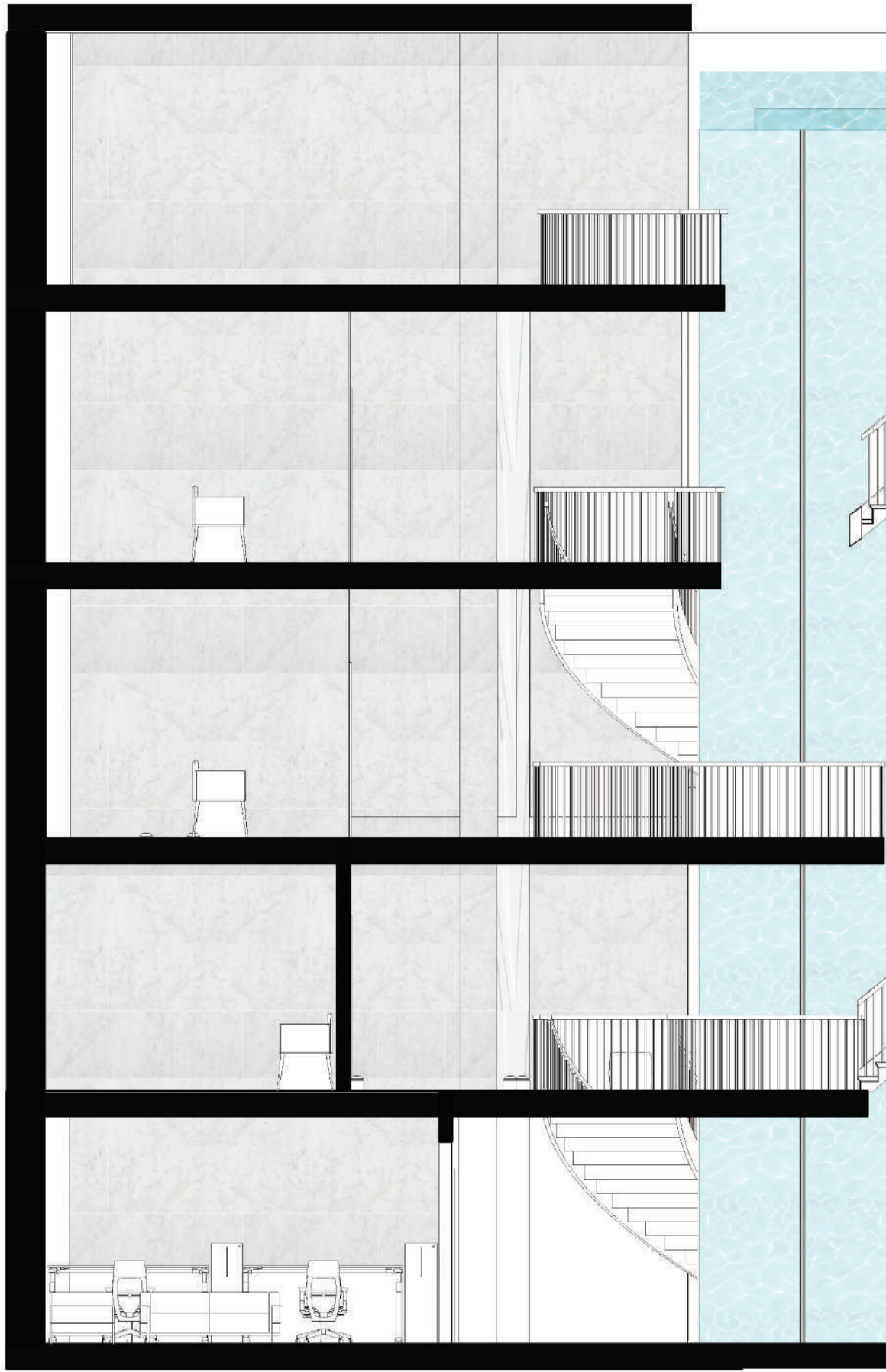
Second Floor Reflected Ceiling Plan



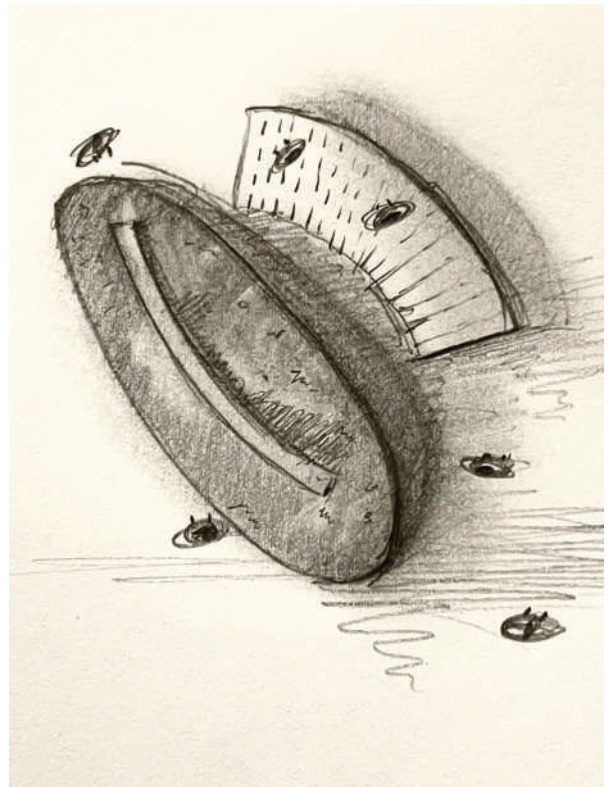
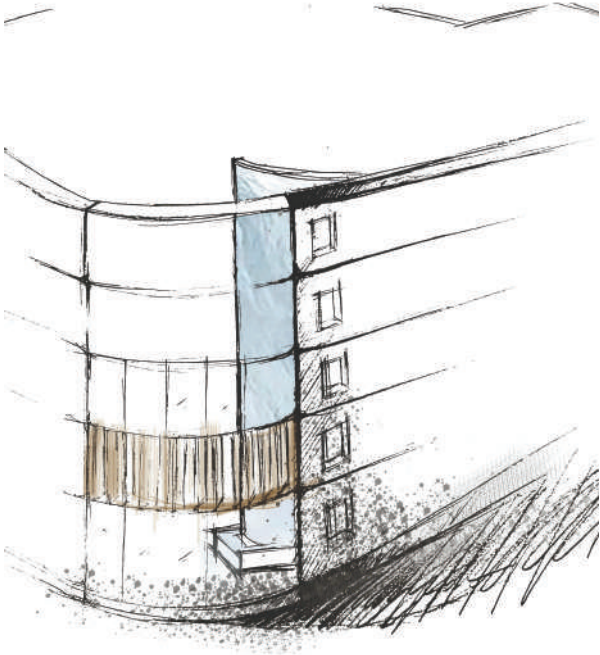


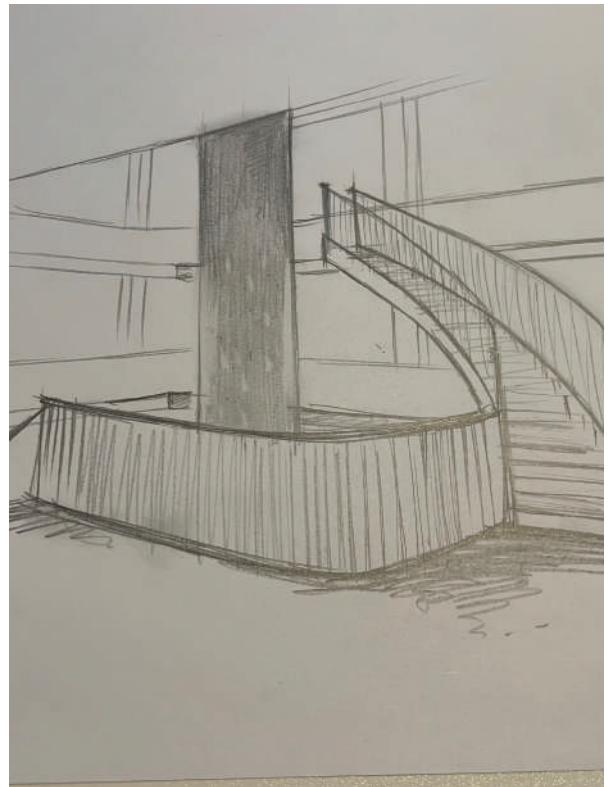
3rd-5th Floor Reflected Ceiling Plan

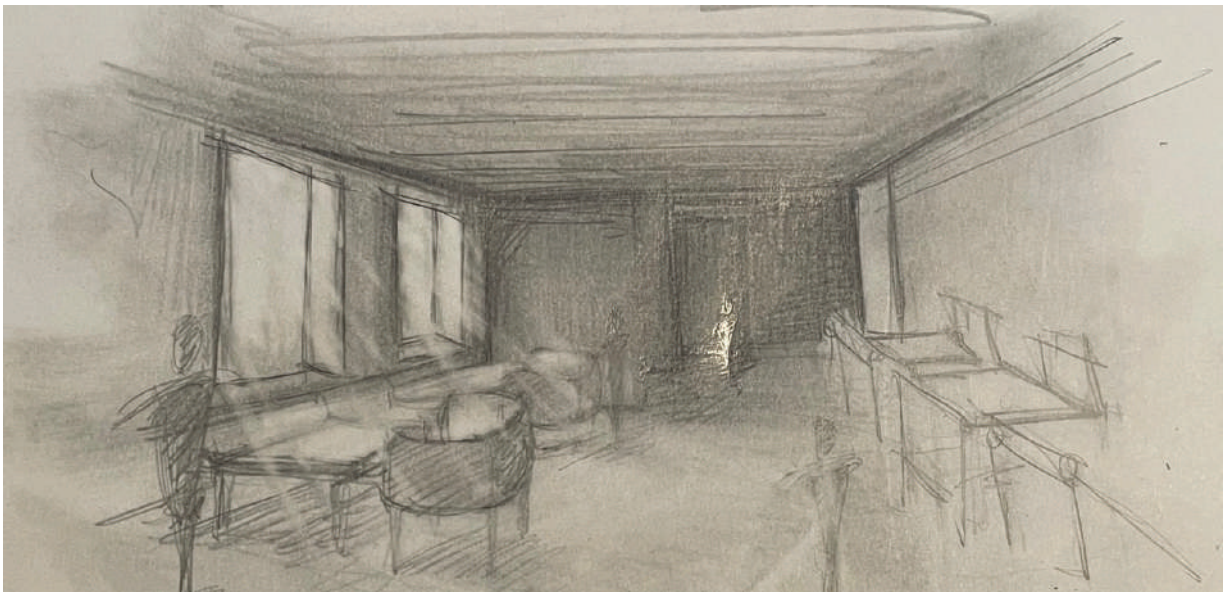
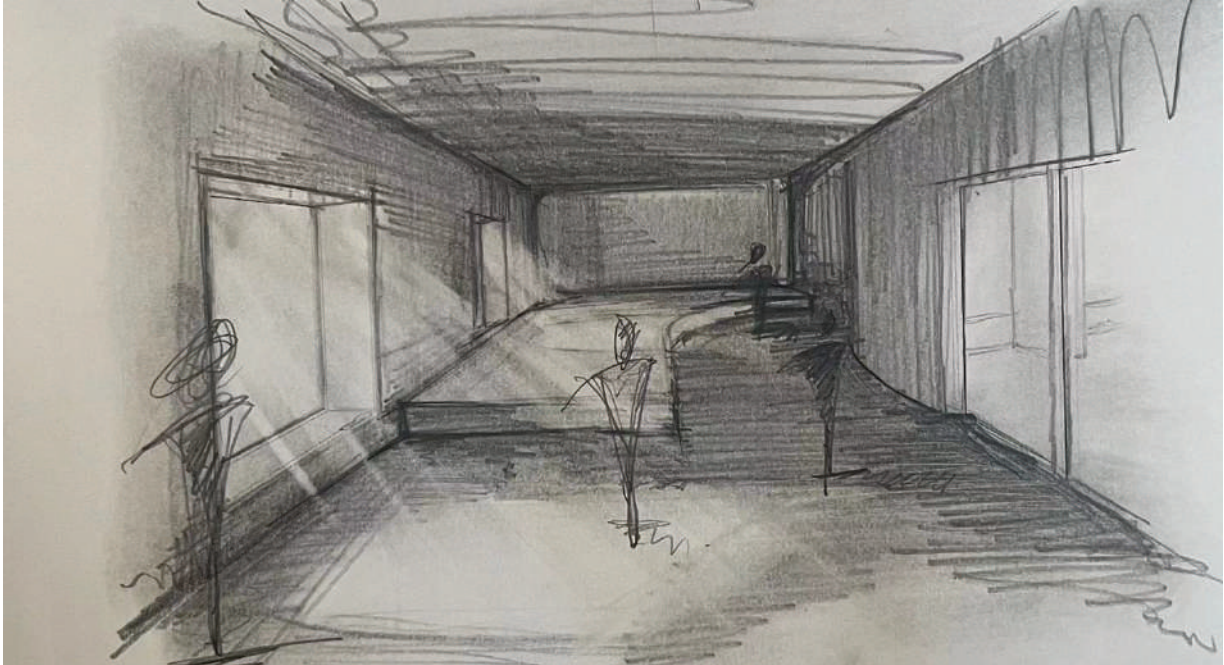


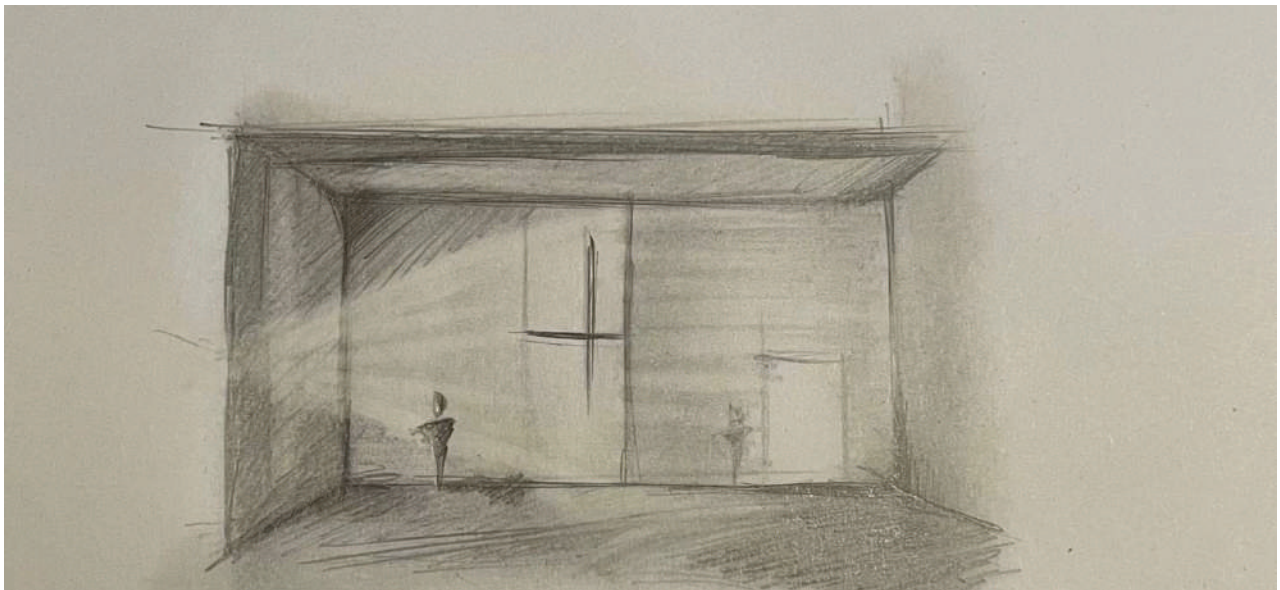
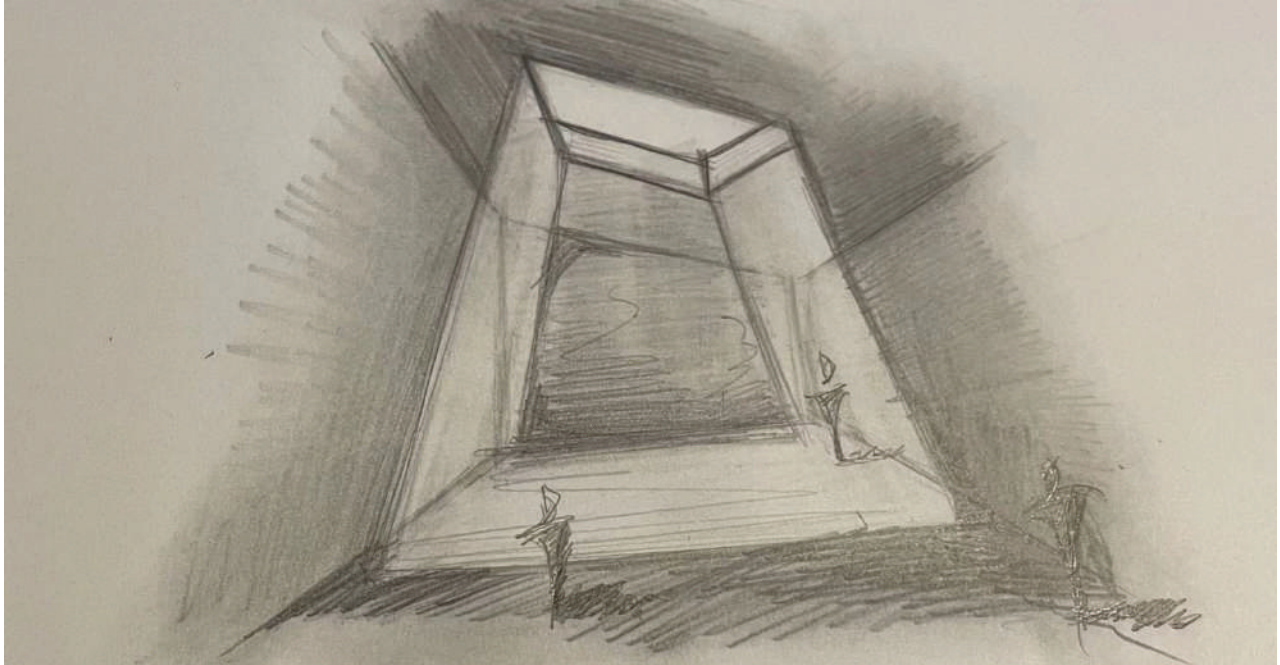












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