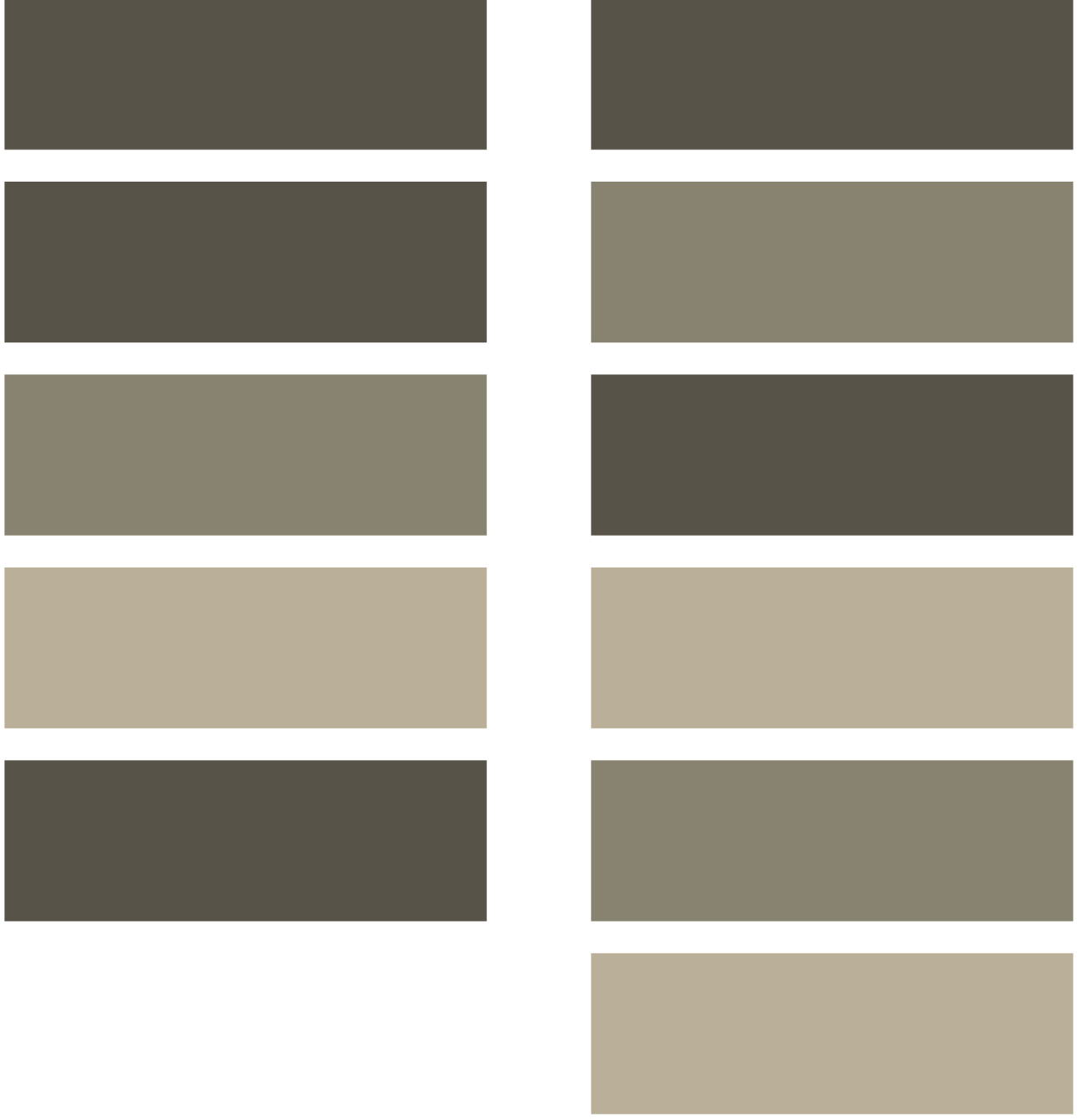
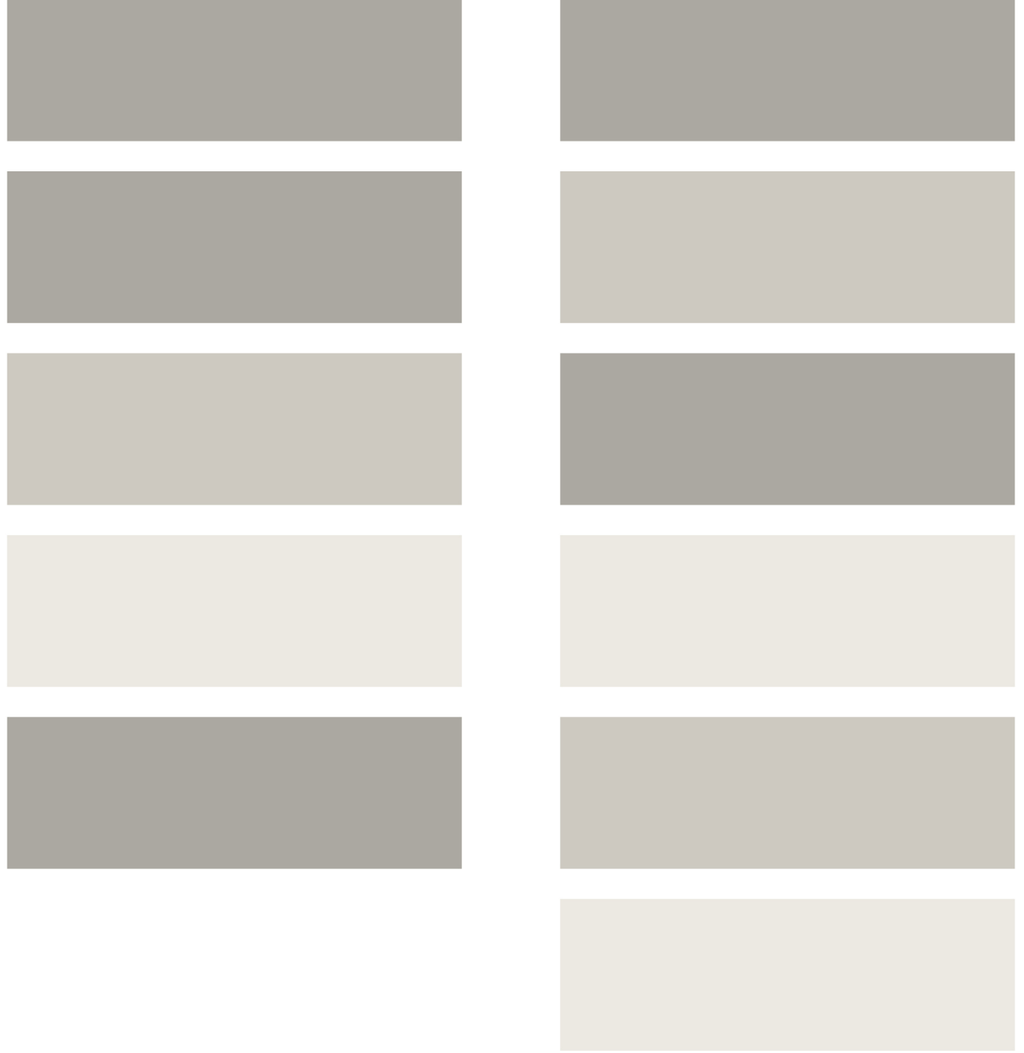


ILLINOIS

AN EXPOSURE TO SENSORY INTERACTION

WILBUR HOLT



ILLINOIS

AN EXPOSURE TO SENSORY INTERACTION

WILBUR HOLT

ILLINOIS

AN EXPOSURE TO SENSORY INTERACTION

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

By
Wilbur Holt

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

Primary Thesis Advisor

Thesis Committee Chair

May 2016
Fargo, North Dakota

TABLE OF CONTENTS

PROPOSAL

8 Abstract
10 Narrative
12 Project Elements
20 Thesis Goals
22 Emphasis

SITE

24 Site Background
38 Water And Soils
42 Wind Patterns
50 Interaction

HISTORY

58 Historical Context
66 Visionaries
68 Columbian Expo

CASE STUDIES

72 Case Studies
94 Artistic Case Studies

RESEARCH

100 Summary
102 Sensory Experience
112 Social Connections
118 Biomimicry Fabrication
124 Social Trends

PROGRAM

130 Project Justification
134 Plan For Proceeding
140 Spatial Configuration
146 Design Process
158 Final Project
190 Personal Identity
192 References

LIST OF TABLES AND FIGURES

1	14	Museum Hours of Operation
2	18	User Spatial Matrix
3	24	Chicago River
4	25	Chicago Waterfront Aerial
5	26	Southern Edge of Site
6	28	World Map
7	29	United States Map
8	30	Illinois
9	31	Chicago Waterfront Map
10	33	Chicago Downtown
11	34	Site Images
12	35	Looking Toward Lake Michigan
13	36	Site Images
14	37	Thesis Site Map
15	42	Wind Roses
16	44	Wind Pattern Map
17	47	Scenic View Map
18	48	Traffic Path Map
19	51	Social Interaction
20	51	Activity Through Site
21	53	Lake Proximity Distress
22	54	Temperature
23	55	Humidity
24	56	Precipitation
25	57	Cloud Cover
26	59	Historic Chicago Waterfront
27	60	Northerly Island Redevelopment
28	63	Historic Lake Shore Drive
29	65	Chicago Fire Rubble
30	65	Historic Waterfront Event
31	67	Two Tower Projects
32	68	Fine Arts Palace World Expo
33	70	Reflecting Pool World Expo
34	71	Decorated Architecture World Expo
35	77	Córdoba Gallery Space
36	78	Córdoba Floor Plans
37	79	Córdoba Interior Daylighting
38	80	Córdoba Elevations
39	81	Córdoba Form Diagrams
40	83	Jewish Museum Tower
41	84	Jewish Museum Floor Plans
42	85	Jewish Museum Interior Daylighting
43	86	Jewish Museum Elevations
44	87	Jewish Museum Form Diagrams
45	89	Louis Vuitton Foundation Facade
46	90	Louis Vuitton Foundation Floor Plans
47	91	Louis Vuitton Foundation Exterior Skin
48	92	Louis Vuitton Foundation Elevations
49	93	Louis Vuitton Foundation Form Diagrams
50	94	Louvre Abu Dhabi Water Reflections
51	95	Louvre Abu Dhabi Structure Daylighting
52	96	Weather Project Ceiling Reflections
53	97	Weather Project Smog Effect
54	98	Kolumba Museum Ancient Ruins
55	99	Kolumba Museum Facade System
56	105	Dynamic Visual Shadow Patterns
57	107	Dubai Mosque Reflecting Pool
58	109	Sensory Usage Breakdown
59	110	Rain Room Installation
60	113	City Social Interactions
61	114	Paris La Grande Arch
62	116	Dubai Fountain
63	120	Robotic Installation Pavilion
64	122	Wooden Robotic Installation
65	124	Neon Light Installation
66	125	Hanging Reflective Installation
67	127	Vapors and Sparks Installation
68	127	Tree Bark Installation
69	128	Hanging Light Installation
70	129	Various Web Installations
71	133	Chicago River Aerial
72	136	Plan for Proceeding Fall
73	138	Plan for Proceeding Spring
74	140	Thesis Program Square Footages
75	142	Spatial Usage Matrix
76	143	Spatial Connectivity
77	144	Spatial Lighting Qualities
78	145	Space Relations Matrix
79	146	Beneath Lake Shore Drive Gallery
80	148	Spiral Staircase Iterations
81	150	Sound Chamber Iterations
82	152	Vertical Canvas Iterations
83	154	Voronoi Shadows Iterations
84	155	Subterranean Void Inspiration Sketches
85	160	Floor Plan Layout
86	162	Wind Diagrams & Mech System
87	164	Building Sections & Plaza Concept
88	166	Elevations & Concept Forms
89	168	Isometric Building Components
90	172	Section Isometric Analysis
91	173	Building Construction Details
92	177	Aerial of Thesis Site
93	178	Various Renderings of Final Design
94	188	Display Installation Boards & Model
95	190	Wilbur Holt Traveling

ABSTRACT

This thesis intends to establish a new interpretation of the museum - a museum that is solely influenced by the presence or absence of sensory interaction through installations. Architectural installations have the ability to inspire individuals through dramatic or subtle artistic movements that fill an entire space. It is a moment that cannot be replayed because the installations are only a portion of the experience. What makes the installation so inspiring are the individuals that surround you and the excitement or emotion that is experienced together.

In this project the architecture acts as its own installation - a dynamic performance and filter that transitions the user through varying spatial conditions. Built on a peninsula just north of the Chicago River, the site is a prime location to take on lake swept winds, long sun exposures and various intensities of sound from Lake Shore Drive. This thesis transforms the modern museum from a collection of art and into a collection of unforgettable artistic experiences.

KEY TERMS

light . wind . interaction . museum . façade . sensory . experiential

PROPOSAL

PROBLEM STATEMENTS

How can architecture become a performance that captivates an audience and cultivates connections, similar to that of an installation?

SUBSTATEMENTS

How can the architectural façade be enhanced in an aim to regain a connection to our sensory environments?

Can architecture alter human perceptions and invoke a sense of memory?

NARRATIVE

This thesis is rooted in the way natural elements – such as wind and light – behave. In Eyes of the Skin Juhani Pallasmaa writes, 'the task of architecture is to make visible how the world touches us'. This thesis aims to do exactly that. The project will do this through heightened exposures of the senses, or the opposite: minimal exposures in a controlled environment. The architecture intends to be simplified and pure so the structural elements are exposed and have a visual materiality. This museum becomes a place not only of thrilling visual spaces but also one of self-reflection and deep meditation. Inspiration in a fast-paced world can sometimes be hard to find. This thesis begins to reconnect the human being to imagination and motivation. 'The senses not only mediate information for the judgement of the intellect; they are also a means of igniting the imagination and articulating sensory thought' Juhani Pallasmaa. This unique museum typology will expose individuals to various senses of various intensities, which will ignite a passion for creativity within the mind. The architecture will facilitate changes in space by the changes that occur in the environment. Pallasmaa also writes: 'homogeneous bright light paralyses the imagination in the same way that homogenization of space weakens the experience of being, and wipes away the sense of place'. The progression of moving to and from altering variations of sensory levels enhances the perception of the mind. Each adjustment or shift of parameters is a sensed moment and each moment builds upon the previous and anticipates what is to come.

Human beings have a particular interest in the 'museum'. Whether it be creative art galleries, historical memorials, interactive science institutions, etc. – humans continuously seek knowledge and entertainment. From personal experience, museums cultivate inspirational moments. I chose the typology of a museum for this thesis because I too, want to inspire others, encourage the cultivation of lifetime experiences, and provide everyone with well-versed meaningful thoughts. When searching for a location, I thought about how significant this museum could become not only to a city but to the world. Another factor in my decision was environment. What locations could offer unique experiences with the natural landscape but also have a connection to the heart of the city. While walking along the lakefront of Chicago, I came upon a peninsula in the heart of the downtown area that fit the description.

THE SUN NEVER
KNEW HOW GREAT IT
WAS UNTIL IT STRUCK
THE SIDE OF A BUILDING

-LOUIS KAHN

PROJECT TYPOLOGY

A MUSEUM IN CHICAGO, ILLINOIS.

PROJECT ELEMENTS

PRIVATE

ADMINISTRATIVE OFFICES

offices or flexible work spaces for managers and assistants as well as open conference spaces for meetings, discussions with artists, or potential event planning

STORAGE / MECH SPACE

side spaces for installations or art pieces not currently on display, props and supplies for proposed events at museum, and space to house the mechanical equipment for the building

MATERIAL TRANSFER

space to load and unload materials for art production and fabrication of installations, temporary space for trucks to deliver large shipments for projects, large capacity elevators for transfer

ARTIST WORKSHOP SPACE

large open studio for production and creation of installations, including a variety of space sizes and qualities, and a robotics and tecnical reserach room for the production of installations

PUBLIC

ENTRY AND LOBBY

main entry point at a position where access makes sense to the overall site orientation and pedestrian traffic flow, the site is passed more often than visited - dramatic entry would attract indivduals

EVENT SPACE

available for meetings, conferences, weddings, etc. located facing southwest or southeast for a view of city, or an emphasis on the vertical height to remember the significance of the site

ARCHITECTURAL TRIBUTE

located where the Calatrava Chicago Spire was proposed to be constructed, this space would be a memorial to a few select architectural projects that failed to be constructed

EXHIBIT

CIRCULATION SPACE

corridor spaces and transition pathways amidst indoor or outdoor environments, as well as lobby space, visitor parking, and reception desk queue space

EXHIBITION SPACE

large spaces of varying dimensions to accommodate altering artistic installations: each with varying exposures to natural daylight for preferred artist quality

EXPERIENTIAL PLATFORMS

various pathways or spaces with minimal distractions and a defined focus on the environmental impacts and isolated senses on the space, such as wind, water, and sounds

EXPLORATION AREAS

small nooks within the architecture or isolated outdoor spaces in which individuals can seclude themselves and explore, contemplate, or find inspiration

GATHERING SPACE

a more localized or central space in which visitors can return to reconvene with acquaintances: a space in which artist demonstrations might take place every so often

RIGHT

Figure 1 . Museum Hours of Operation .

USER DESCRIPTION

ADMINISTRATION

DIRECTOR

manages the operations of the building, the business status of the museum and the profit or income from visitors or private contributors

EVENT MANAGER

has the task of scheduling events and hosting the venue for the client, as well as organizing with the consultant or privately hired event planner

ADMINISTRATIVE ASSISTANTS

maintains the reception desk and oversees the relationship with the daily visitor or tourist by providing information about the museum and its galleries

CURATORS

oversees the relationship with artists and innovators, and schedules as well as arranges the museum gallery to best suit the architecture and the creations within

MARKETING TEAM

regulates the museum website, creates marketing media to promote interest, and networks with professionals in chicago, and art critics or artists around the world

ARTISTS OR SPECIALISTS

setup and stage the installations for showings and the exhibition as well as experiment with tools and materials to create potential future artwork

SECURITY OFFICER

governs the museum premises and surrounding site to maintain a secure and safe environment for users and visitors throughout the day and into the night

VISITOR ROLES

FREQUENT LOCAL

a resident of the chicago area that desires to experience the museum on varying occasions to participate in the seasonal transformations of sensory installations

ART CONNOISSEUR

an artist, designer, innovator, or art fanatic that might visit the museum to experience the installations and possibly find involvement in the process

CITY TOURIST

a member or group of individuals in the general public that might seek the museum as a city attraction or stumble upon the museum while touring around the city of chicago

EVENING EVENT

a wedding ceremony or late professional business banquet that is seeking a memorable or profitable event directly on the edge of lake michigan

PROSPECTIVE CLIENT

a member of the professional business class or someone involved in artistic expression that might be seeking to hire an artist for private installations worldwide

MATRIX

ABOVE

Figure 2 . User Spatial Matrix .

THESIS GOALS

The scope of this thesis project aims to inspire individuals through architectural space and experiential design, and intends to become a living platform of knowledge on the Chicago lake front.

The goal is to create a dynamic museum based on elements that are found in nature, and develop a space that can inform an audience through multiple experiences. The form is dictated by the research and practical circulation patterns rather than an inspirational artifact or iconic form.

In the end, this thesis is designed to stimulate the imaginative mind and give individuals insight or a keen awareness of environmental elements. Humans have an innate desire to learn, explore and, experience, and this thesis aims to facilitate that desire in the form of a museum.

ACADEMIC

For this thesis, the aim is to create a project that address more than just artistic form. Past projects have been mainly based on appearance and less in construction methods or the connections of the site to the city. This project intends to address a multitude of issues that arise when designing and constructing a new facility.

PROFESSIONAL

The aim for this project, from a professional stance is to impress an international firm. I have a particular interest in large architectural firms that work in the field of hospitality. While traveling to Dubai, I was encapsulated by the detail and impression that architecture left on me. That is exactly what I want to achieve in my career. The intent of this thesis is to explore further the idea that architecture can inspire individuals and leave a lasting impression on their lives. Because I am in search of a firm that designs high-end luxury hospitality projects, I hope that this thesis will be constructed with a similar aesthetic and attention to materials as well as unforgettable audience experience.

PERSONAL

From a personal standpoint I would like to create a few extremely eye catching renderings and building construction drawings that could find a place in my portfolio. Everything I do needs to be of high quality. During the process I would love to sketch a few schematic designs and put those sketches in my portfolio. Personally, everything I do is for the portfolio and ultimately for the future job that I hope to have.

CLAIM

Individuals are born with an innate desire for creativity. Some have more creative thought patterns or influences than others, but human genetic makeup includes creativity. Museums exist and continue to be an influence in society because humans take pleasure in the experience that occurs through the arts. The museum is a space for experimentation and innovation, a place for social interaction and thoughtful inspiration. The perceptions of the mind can sometimes be limitless, which is the appeal of the abstract. A personal connection is derived from the visual creations of the mind, which stimulates the mind in a way that cannot be reproduced through other means. Contemporary museums challenge the perceptions of the mind and lead an audience through various experiences that stimulate the imaginative mind. But museums can evolve even further and transform into spaces that encompass an array of architectural installations. This distinctive typology enables an audience to partake in altering sensory experiences that stimulate the intellect and provide meaningful connections to others. The design and implementation of this thesis will not only provide a society with a strengthened bond because of lived experiences, but it will also strengthen the importance of design within a culture. Artists and the public will be introduced to the currently rising typology of the architectural installation. Experts and designers can cultivate growth for innovation, invention, and advancements in various fields through artistic experimentation.

PROJECT EMPHASIS

An emphasis is placed on the exploration of the façade and its interaction with the wind, and light. Throughout the design, the facade exterior and interior will morph into a variety of patterns that alter ones individual perception of a space. Voids within the building will provide individuals with various exposures to differing elements or textures. Human beings are drawn to several things in life, one of them being: partaking in surreal experiences. By altering the façade, this theoretical idea about human individuals can be controlled and inspiration can be gained through real life experience. An emphasis will also be placed on experiential design within the space. Individuals will feel emotional ties to spaces and be absorbed or fascinated by the architecture. The museum will be a tranquil place for meditation and thought. Through the architecture various spaces can be designed to influence such emotions, and provide for a variety of individuals palates. The architecture will act more like a performance that is observed, studied, and reflected upon. Spaces will provide users with steadily changing environments, each obscurely unique from the other. Visitors will be able to partake in various full scale installations, creating art themselves as they interact with the expressive forms the artist has visualized and fabricated. Through experience, individuals create a closer connection with their counterparts. In some cases, such experiences can enable strangers to feel a connection with each other because they were able to share a moment in life.

SITE

The thesis site - near Navy Pier in Chicago - has distinct qualities that distinguish it from the city atmosphere. The site is located at the end of a peninsula between the downtown and Lake Michigan. Being lakefront provides the site a great view of the skyline as well as a gorgeous horizon panorama. A multitude of sounds can be heard at the thesis site - sounds of moving water and waterway transportation, sounds of vehical traffic moving across the Lake Shore Drive bridge into the highway. Being just north of the Chicago River, the site has very few obstacles which gives the site a range of sunlight exposures. Two sensory experiences that are most prominent: moisture, smells, and humidity in the air from the nearby water and the sounds of the surrounding movement.

ABOVE

Figure 4 . Chicago Waterfront Aerial .

LEFT

Figure 3 . Chicago River .

THE SITE

This thesis will be located on the shore just south of Navy Pier in the downtown Chicago area. Positioned at the edge of a peninsula, the project will be in a prime location to take on lake swept winds and long sun exposures. The site is just south of a major parking structure and an exit off Lakeshore Drive and only one mile away from the intersection of I-90 and I-94. In the summer this site is used primarily as a quick pit stop for bikers and runners that take the Lake Shore Drive trail. An obstacle of the site - Lake Shore Drive - located directly in the center to the thesis site location. The thesis project will need to create a transition across the highway for pedestrians. The site will need to accommodate large numbers of people, mostly in the summer time when the plaza and green space is being used as a place of leisure. In order to preserve this concept the project should retain a great amount of public pathways and vantage points that surround the entirety of the project. The thesis site is also home to the void left here by the Calatrava Chicago Spire project, this void will be used as a feature in the project. This thesis must keep or replace all these elements currently on the site in order to preserve the unique character of the site.

LEFT

Figure 5 . Southern Edge of Site .

SITE INFO
MACRO

ABOVE

Figure 6 . World Map .

RIGHT

Figure 7 . United States Map .

ILLINOIS

ABOVE

Figure 8 . Illinois .

RIGHT

Figure 9 . Chicago Waterfront Map .

SITE INFO
MICRO

CITY

CHICAGO, IL

POPULATION

2.7 MILLION

AREA

234 SQ MI

The major design challenges that are particular to this site location involve the peninsula, the highway that divides the site into two halves, and the void left by the Calatrava Chicago Spire project. The current observations of the site will influence various design decisions because most of these features are unique to the site and cannot be lost because of the architecture. The program will need to fit the size and scale of the site as well as accommodate adequate amounts of parking and program elements. The design can take several directions depending on the placement of the structure: centrally located near the highway; along the northern edge of the site; or an extension west into the lake. A huge design decision that will impact the project is how to create a passage between the two halves of the site. How to react to the highway, do you block or isolate the sounds from the highway, do you interact with the surrounding water, and how do you integrate the void in the north west corner of the site.

ABOVE

Figure 10 . Chicago Downtown .

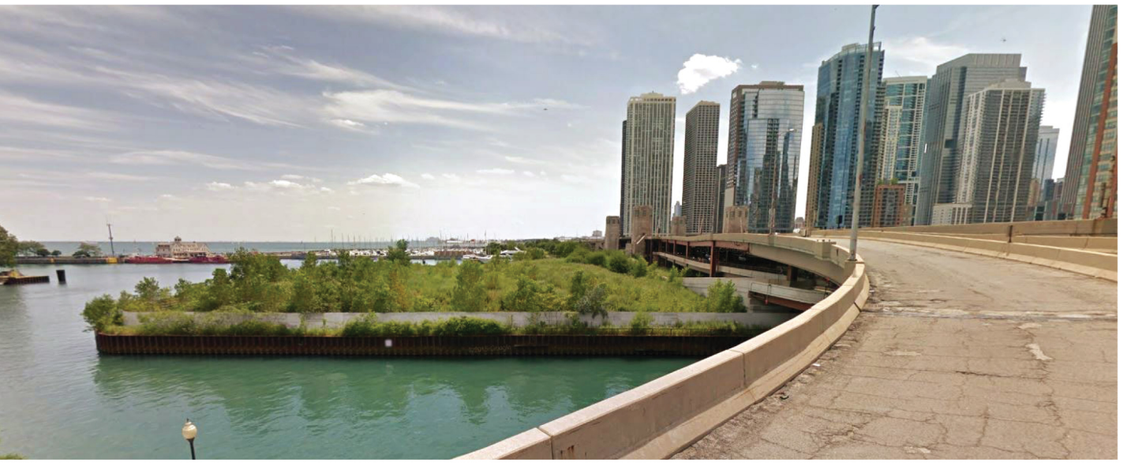
SITE PHOTOGRAPHY

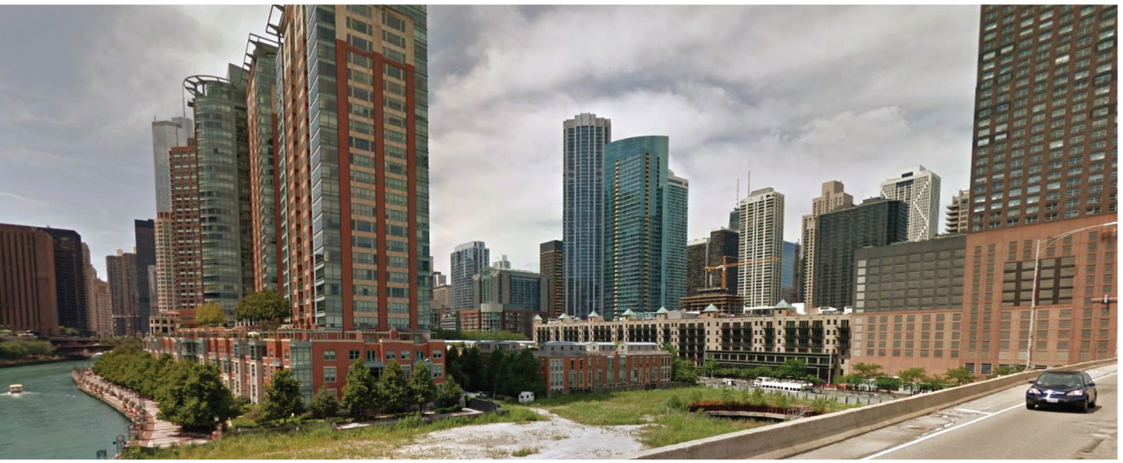
ABOVE

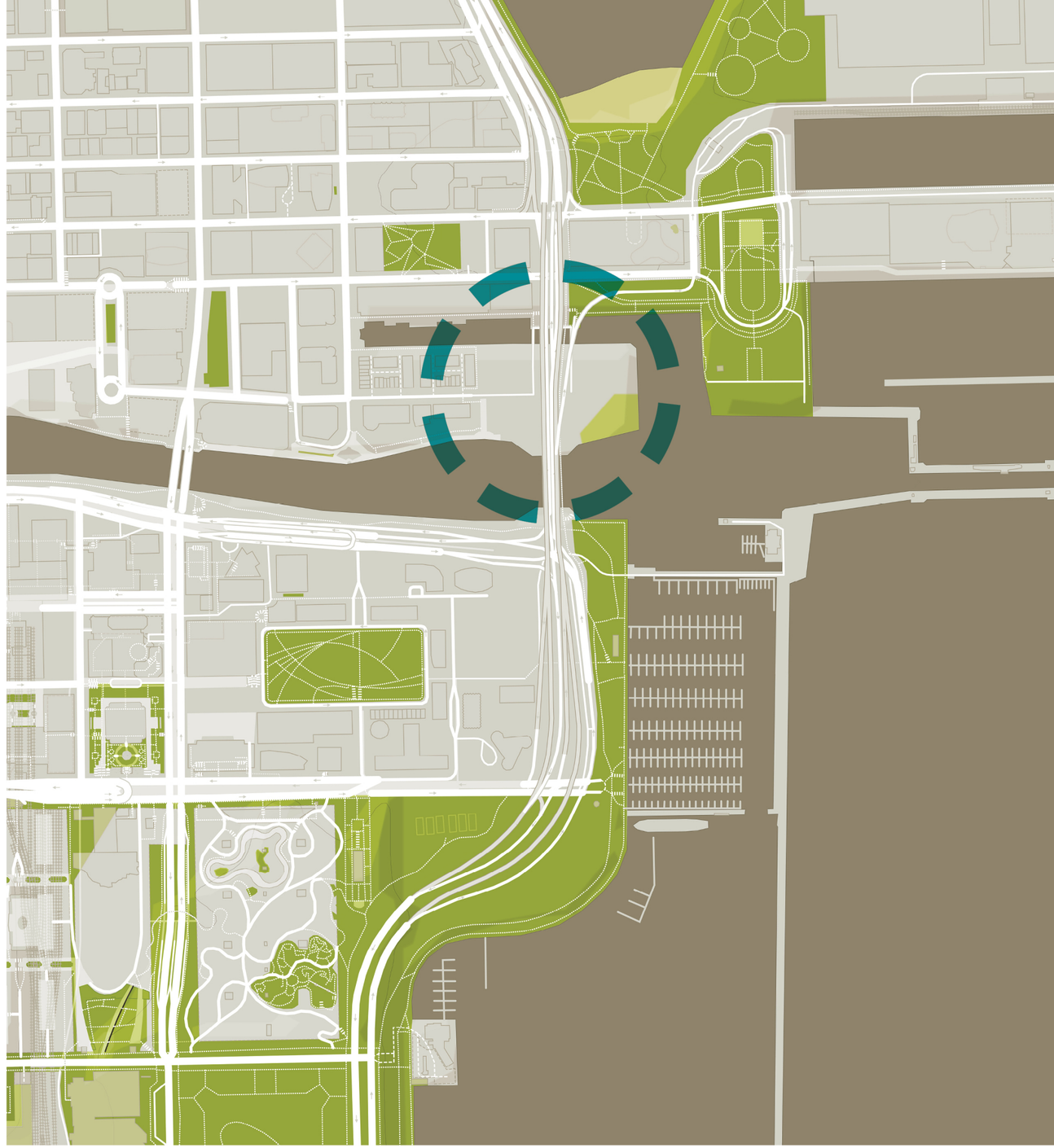
Figure 12 . Looking Toward Lake Michigan .

LEFT

Figure 11 . Site Images .







ABOVE

Figure 14 . Thesis Site Map .

LEFT

Figure 13 . Site Images .

WATER AND SOILS

SOIL CLASSIFICATION

50 Degrees Fahrenheit - Mean Annual Air Temperature

28 - 40 Inches Mean Annual Precipitation

Soil Class - Urban Land 533

140 - 180 Days Frost Free

SITE SURFACE AREA

6.4 Acres of Land - Including Space Underneath Overpass

North Edge - 750'

East Edge - 400'

South Edge - 700'

West Edge - 400'

Total Area - 280,000'

ELEVATION OF LAKE SURFACE

577 Feet Above Sea Level

WATER TEMPERATURES

In the months of July and August, Lake Michigan has been seen to reach a water temperature in the 60 degree to 70 degree range, being higher when air temperatures are high for a number of consecutive days.

'The water of Lake Michigan has an unusual circulatory pattern - and moves very slowly. Winds and resulting waves keep Lake Michigan from freezing over, but it has been 90 percent frozen on a number of occasions. Ocean-like swells, especially during the winter, can result in drastic temperature changes along the coast causing shoreline erosion.' (Zimmermann)

WATER LEVELS

TIDES

'True tides - changes in water level caused by the gravitational forces of the sun and moon - do occur in a semi-diurnal or twice daily pattern on the Great Lakes. Studies indicate that the Great Lakes tide in the spring is the largest but is still less than five centimeters in height. These minor variations are masked by the greater fluctuations in lake levels produced by wind and barometric pressure changes. Consequently, the Great Lakes are considered to be non-tidal. Water levels in the Great Lakes have long-term, annual, and short-term variations. Long-term variations depend on precipitation and water storage over many years. Annual variations occur with the changing seasons. There is an annual high in the late spring and low in the winter.'

(Moravchik)

FLUCTUATIONS

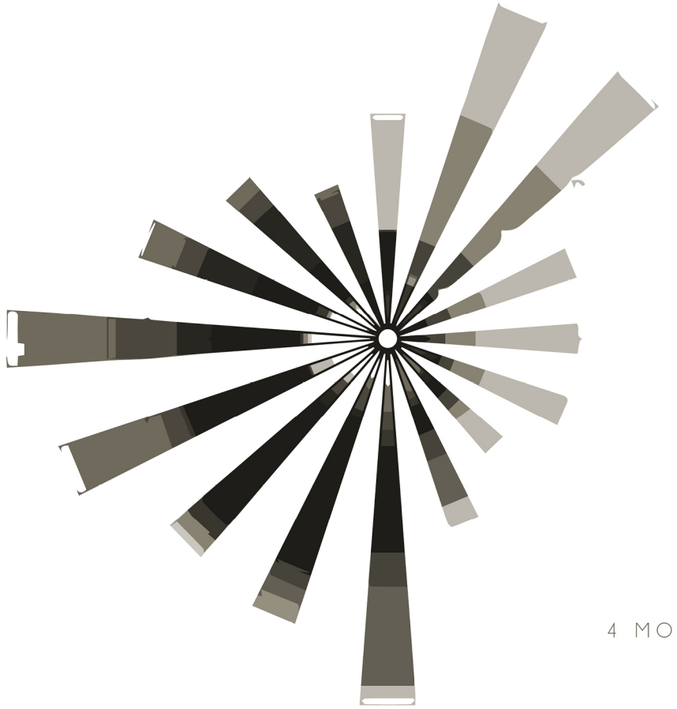
'Since hitting a record-low water level two years ago, Lake Michigan has been replenishing at an almost unprecedented rate, rising more than 3 feet since January 2013, according to government agencies. Experts say the swift, unexpected resurgence has provided relief to commercial shipping, recreational boaters and wildlife. However, the rising waters have also contributed to significant erosion that threatens local beaches and may damage other shoreline properties as forecasts anticipate this pattern to continue through summer. The Great Lakes are the world's largest source of freshwater, and some of those lakes have experienced a decade and a half of below-average levels. Lake Michigan lost 4 feet of water in the late 1990s, and its levels remained low for an unusually long period. While a number of factors contribute to fluctuations in lake levels - including air temperature, humidity and wind speeds - research suggests that the catalyst of the drought was a strong ocean current that brought about warmer waters and greater evaporation rates.' (Briscoe)

WINDS

NEAREST WEATHER STATION

Chicago Yacht Club Belmont Harbor

Located further north of the city, the Yacht Club at Belmont Harbor is also placed alongside the waterfront. This weather station will provide the most accurate wind patterns in relation to the thesis site because it has similar site attributes.



4 MONTH OVERLAY

ABOVE

Figure 15 . Wind Roses .

WIND PATTERNS

LAKE BREEZES

UNDISTURBED LAND

The major influence of wind on the thesis site is the vast flat sheet of surface water that extends out to the east. Wind swept currents travel over water differently than land, which may alter the forces that impact the thesis site. Not only is the site directly on the water, but it is also completely exposed to any of the environmental effects that arise. This presents an opportunity to use the undisturbed natural forces that occur in an expressive way.

PUBLIC PARKING REQUIREMENTS

The Art Institute of Chicago and Museum of Contemporary Art do not provide any on site parking, instead they direct visitors to park in nearby garages within walking distance. Here are just a few of the larger parking garages in the area :

E Illinois St Garage 500’ North of Site

Cityfront Place Garage 780’ West of Site

N Lake Shore Drive Garage 650’ North of Site

Millennium Garage 2000’ South of Site

Navy Pier Garage 1200’ Northeast of Site

Impark Garage 900’ Northwest of Site

LEFT

Figure 16 . Wind Pattern Map .

LIGHT

COLOR TEMPERATURE . WATERFRONT QUALITIES . WINTER

The light quality on the site is particularly dependent on the surface characteristics of the water that surrounds the sandy peninsula. If the atmosphere is windy, the lake water will be moving at altering depths which modifies the reflectance qualities of the surface water. Depending on cloud cover the sunlight might reflect various shimmering or glistening beams of light onto the site. If there exists a high amount of cloud cover the surface will have a matte finish instead of glossy, which changes the sensations felt by the individual on the site.

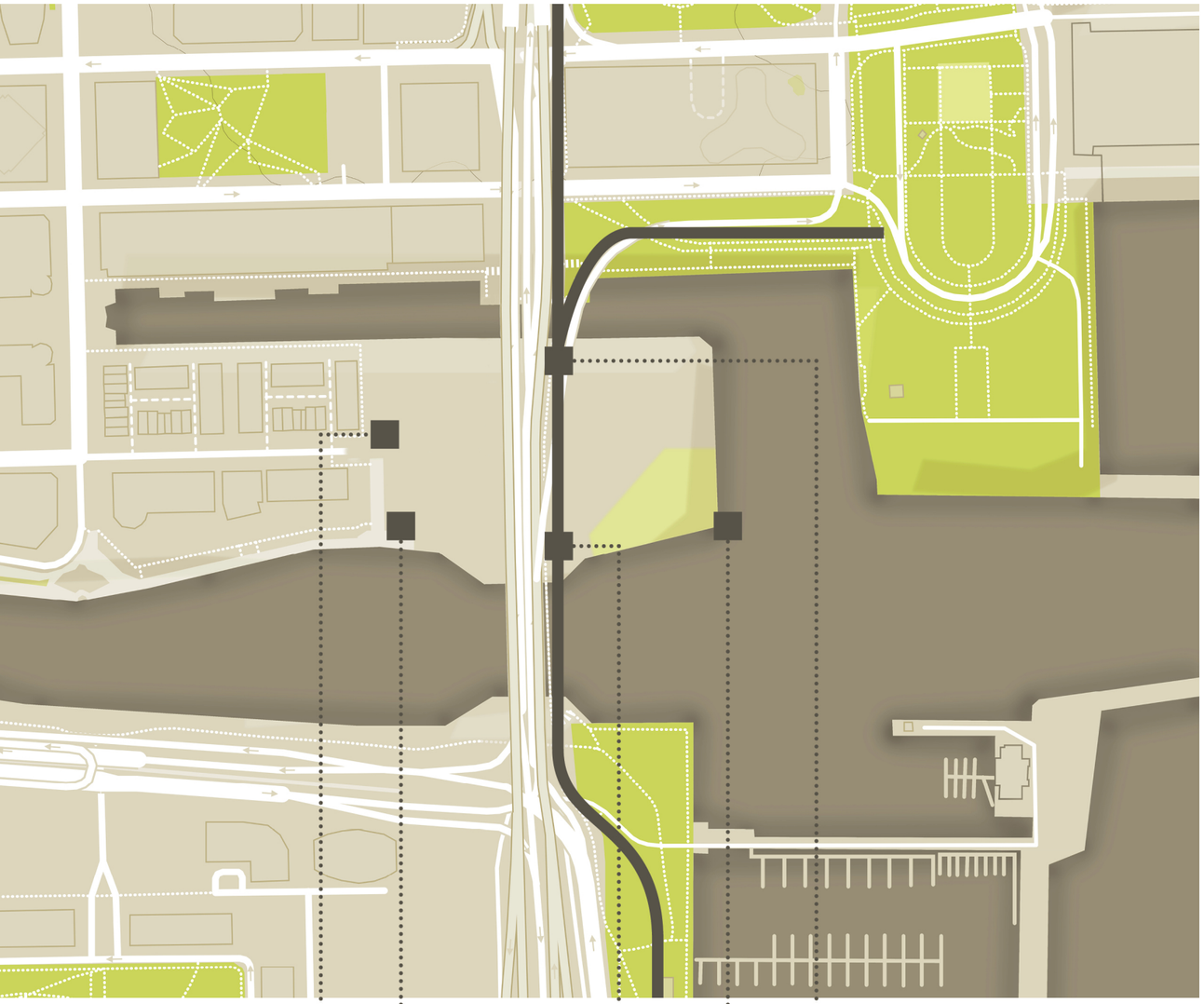
Light color and temperature is more dependent on the season. In the cold winter months, the lake water might be warmer in temperature than the air, which produces a microclimate atmosphere of steam and fog. The light quality at this time will be obscure and grey in color. The temperature of the light will be a cool grey that is unsaturated. On other winter days when the sky is clear, the lake might be frozen on the surface and a white or dark grey blue in color. If the sky is clear, the color of the sky being a deep blue fading to light blue on the horizon, will increase the saturation of the light and produce an even cooler light temperature than a foggy day would.

SCENIC VIEWS

RIGHT

Figure 17 . Scenic View Map .

TRAFFIC PATHS



LIGHT

SUNLIGHT EXPOSURE . SUMMER

In the warmer months, the light temperature will be mostly warm because of the sandy color that the clay of the site obtains, but the color of the water can change. For the most part the lake color may be muted, cloudy, and dark in color, but on sunny days the water takes on a brilliant cerulean hue. In the summer, the characteristics of the site and its properties will produce an extremely warm color temperature. Due to the Midwest location of the thesis site and the attributes that arise from being waterfront bound, the variation of light quality is extreme.

Because the thesis site is located on a peninsula, it becomes exposed to all the natural elements of the atmosphere and cannot be protected from any climatic effects. On the western portion of the site - where the peninsula connects to the land formation – there exists various towers which shelter the site and cast long evening shadows across the ground. At all other times of day, the site is completely open to the intensity of sunlight that is produced from the regional atmosphere and weather patterns.

LEFT

Figure 18 . Traffic Path Map .

INTERACTION

LEISURE AND SPORTS

jogging . biking . relaxing . exploring . photography . boating . driving

The site is currently abandoned but can be used for leisure activities. Its level of interaction is dependent on the season and other weather factors such as sunlight, water temperature, and wind. In the summer and neighboring months, athletes can be seen passing through the site but rarely making the site a final destination point. This site is located as a node of the biking and running paths that extend the waterfront of the city. Ships and boats are known to take loops back and forth from the river and out the lake. Some residents might use the wide trails for exercise before or after work, or as a means of commuting. The site is also most known for its gorgeous view of the surroundsing highrises and view toward Trump Tower down the river. Countless couples take use of the backdrop by holding their photoshoots at this location. In the winter the site is covered in snow and occupied only by exploring individuals looking to play.

ABOVE

Figure 19 . Social Interaction .

BELOW

Figure 20 . Activity Through Site .

DISTRESS

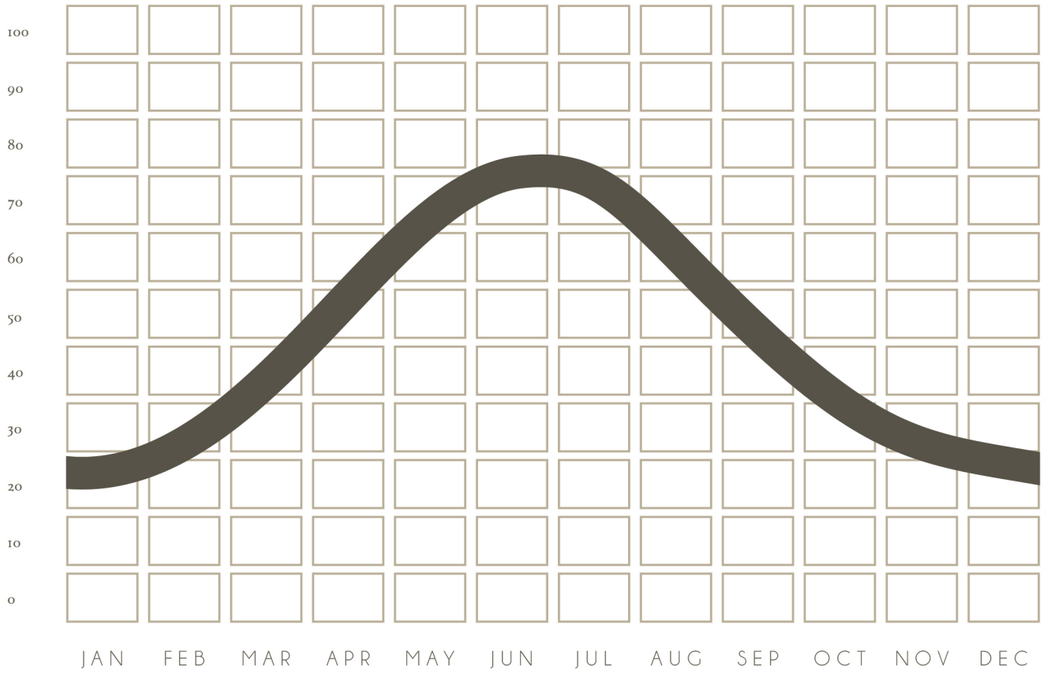
ICE . SOILS . EROSION

The thesis site is constantly transforming. Located at the water's edge, the site has a continuous interaction with the water. Developing a design strategy and solution that can interact and withstand the continual mixture of elements that occur on the site will be a tremendous challenge. Because of the various social and environmental confines the placement of the structure becomes critical to the success of the project. The transforming qualities on the site require certain materials that can withstand the constant force of winds and prevent the building materials from collecting pollution from the nearby highway. The extreme highs and lows in temperature variation with the added impact of icy surfaces might require a specific amount of control joints for the expansion or contraction of materials. Due to the natural eminence of the site and the high amount of leisure activities, it is critical that the character of the site be restored or maintained as much as possible.

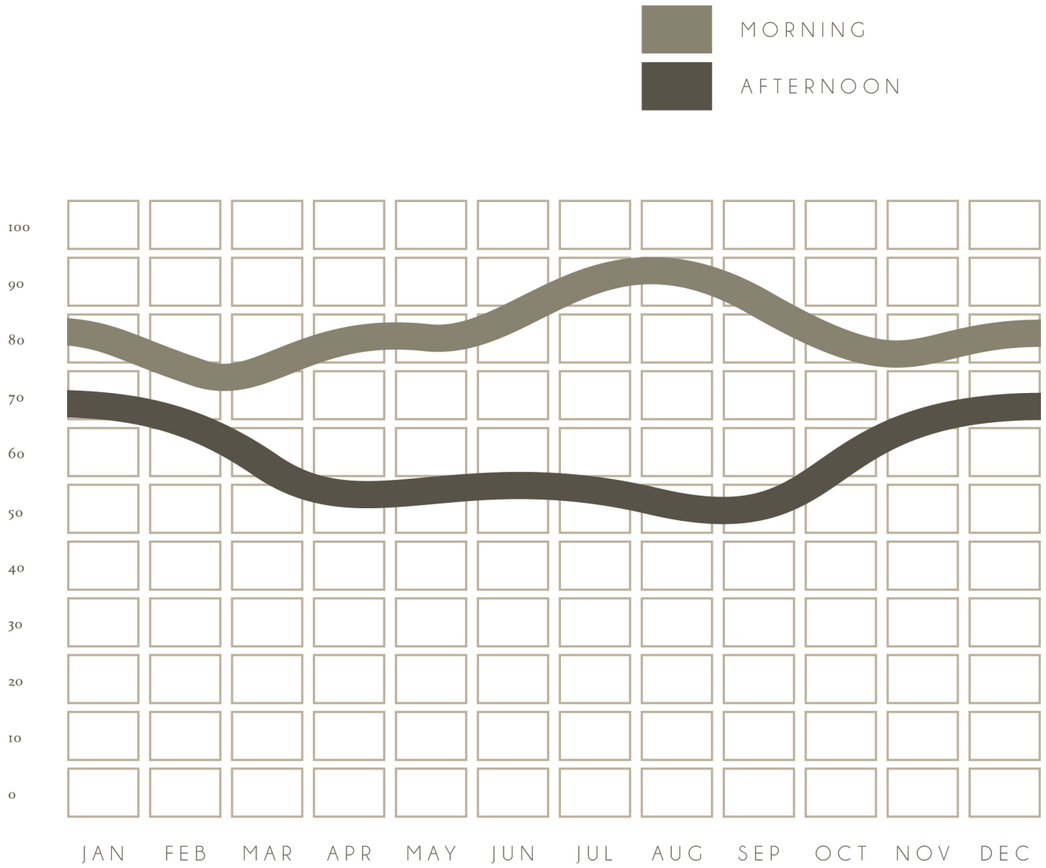
RIGHT

Figure 21 . Lake Proximity Distress .

TEMPERATURE °F



HUMIDITY



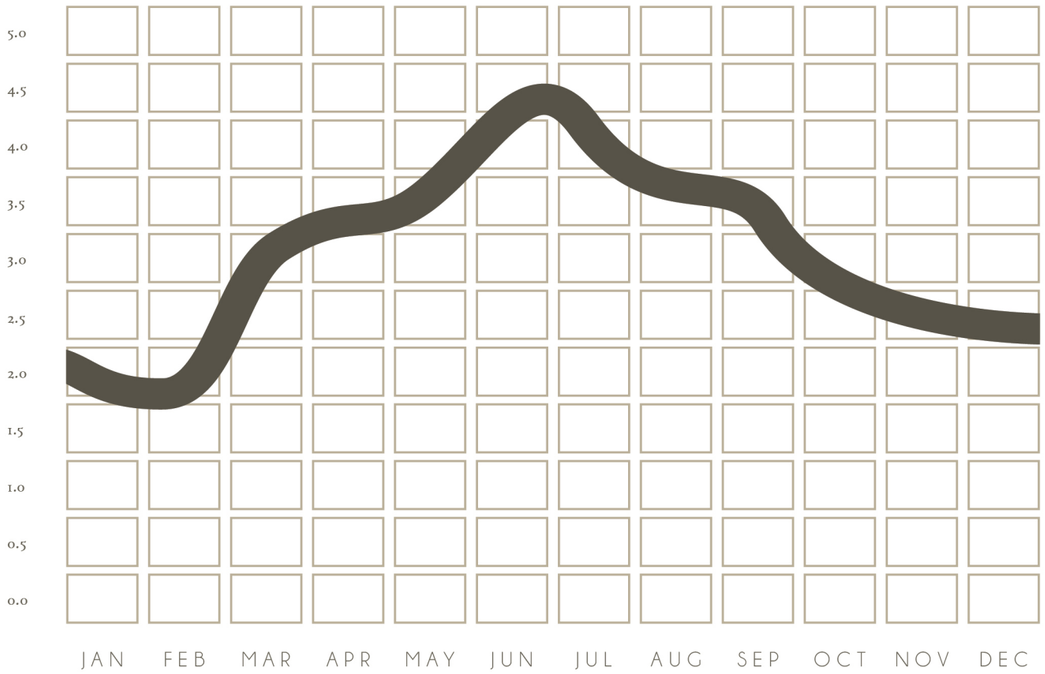
ABOVE

Figure 22 . Temperature .

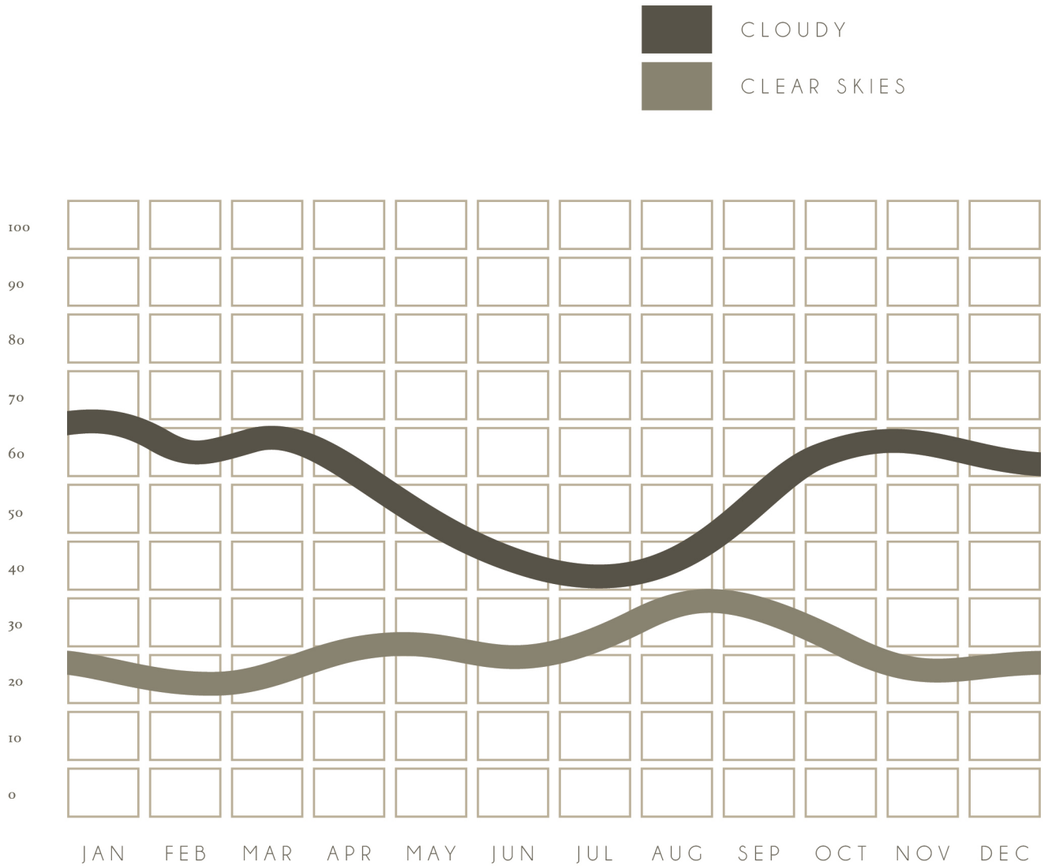
RIGHT

Figure 23 . Humidity .

PRECIPITATION



CLOUD COVER



ABOVE

Figure 24 . Precipitation .

RIGHT

Figure 25 . Cloud Cover .

HISTORICAL CONTEXT

BELOW

Figure 26 . Historic Chicago Waterfront .

LAKEFRONT

NORTHERLY ISLAND REDEVELOPMENT

LAKE FRONT EMPHASIS

After the Chicago Fire, the city began expanding Grant Park into Lake Michigan with landfill and debris. This movement became a popular model and practice that was implemented throughout the lake shore area. In the early twentieth century a plan was devised to preserve the entire lake shore as a recreational and cultural place. This prevented new construction from blocking views of lake. Landfill both north and south of Grant Park sparked the construction of Navy Pier and the Chicago World's Fair in 1933 titled the Century of Progress. Eventually Lake Shore Drive was constructed, a transportation system that extends the entirety of the water front. The zoning plan enacted by Chicago enabled the lake shore to become a focal point for culture and recreation, and still the area remains.

Chicago has a unique relationship with its lakefront due to the Chicago fire in 1871. This vast destruction was the catalyst for an abundance of growth and expansion. Massive amounts of wreckage infill lead to the master planning of several manmade islands and piers to span into the lake. From then on, the lakefront surrounding the city of Chicago was preserved for recreation and cultural institutions. Shown above is the 2014 masterplan to redevelop Northerly Island just south of the downtown area.

ABOVE

Figure 27 . Northerly Island Redevelopment .

HISTORICAL CONTEXT

INDUSTRIAL CONTAMINATION

Chicago in the late 1800's primarily focused on industrial expansion and production which resulted in major pollution along the river, harbor, and lake. All these waterways were being contaminated by the commercial and industrial growth in downtown Chicago as well as up and down the waterfront. Chicago residents who wanted to enjoy a day at the beach were forced to travel outside the city for a distance to reach unpolluted waters.

At the end of the nineteenth century, the city of Chicago began to revitalize the waterfront by zoning the area and dividing the lake shore into four primary typologies: recreational; residential; agricultural; and industrial. In the upcoming years, the city's concern of water quality and preservation of clean water supply become one of Chicago's top priorities.

The year of 1871 became a dramatic year for the city of Chicago. The city made the decision to reverse the direction of the river with the intention to prevent the river from contaminating the lake. Construction of the ship canal started which enabled a major increase in recreation activities along the water front.

LAKESHORE DRIVE NEW CONSTRUCTION - LATE 1800'S

RIGHT
Figure 28 . Historic Lake Shore Drive .

THORIUM - BROWNFIELD SITE

The thesis site was created in the early 1800's by the movement of sand and sediment particles through the Chicago River. The waterfront became an industrial zone where ships passed through the canal and into Chicago to deliver or package all sorts of supplies and service equipment. The site was used primarily for the transfer of materials and railway cargo shipments. With all this industrial movement and impact on the site, the ground became contaminated with Thorium. Thorium is a hazardous rare metal that fades from silver to black with exposure to oxygen.

CHICAGO RUIN

THE CHICAGO FIRE: DESTRUCTION AND REBIRTH

During the fire of late 1871, Chicago witnessed complete destruction. The fire began in the southwest at the city border and burned east across the entire city. Its path left only ruin and almost nothing remained intact. The city was reduced to pieces of rubble. Fragments of stone and metal were spread among piles of ash and the wasteland remained desolate for some weeks after. Bricks and stone were hot to the touch but eventually action took place and hundreds of wagons upon wagons were loaded of waste and rubble. Five thousand wagons were dumped into the lake each day until the ruin was gone.

'When I look back on the effect of the Great Fire on the city, I understand that it had a truly transformative impact. It not only burned, but led to the addition of nearly a half-mile of land east of the existing lake shore as well as initiated the modernizing of the city and, in the process established the city's reputation as the great repository of innovative architecture. Without the Fire, Chicago would be nothing like it is today.' (Ambrose)

ABOVE

Figure 29 . Chicago Fire Rubble .

BELOW

Figure 30 . Historic Waterfront Event .

VISIONARIES

CHICAGO SPIRE - CALATRAVA
THE ILLINOIS - FRANK LLOYD WRIGHT

The thesis site has a great history when it comes to previous construction. Currently the void of the Calatrava Chicago Spire sits on the site - at about 80 ft in depth. The project failed because of lack of funding but its memory continues on. In 1956, Frank Lloyd Wright designed the Mile High Illinois. A tower that would double the current height of the tallest building in the world the Burj Khalifa. Obviously, too technical and extensive for its time, the project was more of a vision for the near future. From drawings, the Illinois was proposed to be built near the thesis site along the waterfront of Chicago.

These tower projects proposed for the Chicago Waterfront were inspiring and visionary design concepts that were never realized. They as well as architectural installations created by artists symbolize and stand for innovation, investigation, imagination, invention, and ingenuity. The void of the Chicago Spire remains on the site and will be incorporated as a vertical skyspace to emphasize and instill inspiration and innovation to others. If these two projects were built, the human eye would gaze up toward them. This thesis project intends to emphasize the vertical height of the proposed towers by creating moments that force the user to look up.

RIGHT

Figure 31 . Two Tower Projects .

BELOW

Figure 32 . Fine Arts Palace World Expo .

THE WORLDS COLUMBIAN EXPO

The World's Columbian Expo took place in 1893. It was designed and built around the lagoons of Jackson Park just south of downtown Chicago. Chicago had three years to construct the exposition and they more than succeeding in creating something magnificent and grand. Over the six month period nearly 27 million visitors attended. The complex had large reflecting pools and a multitude of fountains to show off the Chicago grandeur, but its most impressive and stunning characteristic were the sparkling white facades of the architecture. The expo covered hundreds of topics but is lasting legacy demonstrated to the world the advancement of technology.

ABOVE

Figure 33 . Reflecting Pool World Expo .

RIGHT

Figure 34 . Decorated Architecture World Expo .

CASE STUDIES

TYPOLOGICAL CASE STUDIES

Contemporary Arts Center Córdoba

Jewish Museum Berlin

Louis Vuitton Foundation Paris

ARTISTIC CONCEPT CASE STUDIES

Louvre Abu Dhabi

The Weather Project

Kolumba Museum

SUMMARY

PRIMARY CASE SUMMARY

Each of the three primary case studies added valuable information to the design and process of the thesis project. All three case studies had a museum typology, but each had an additional space requirement that furthered the program element of the design: Córdoba- a research laboratory space for a technical institution and artist workshop spaces; Berlin- an event space for professional business banquets or musical concerto; Paris- an array of offices for professional business as well as a café and auditorium for musical concerto. Each case had an apparent simplicity and attention to pure material elements. In all cases, the interior spaces varied in arrangement and orientation and all spaces were white, pale, or neutral in color. Soft material palettes were chosen in all cases and the immense attention to the interaction and joints of materials can be sensed. All cases are built in varying site conditions; one within the heart of a city, another at the boundary of a river, and the last in a natural environment of trees. Each case is built of multiple floors with vertical movement but has a clear dominant axial horizontal spatial arrangement. A common programmatic element in all cases is an allocated space for temporary large-scale installations or visual demonstrations.

The light properties of each case vary. The Jewish Museum of Berlin has a distinct effect of light limitations by incorporating rare slits in the façade. Proportions of the slits vary but in most cases they are slender and long. The Contemporary Art Museum of Córdoba also has its own distinct visual theme by which light enters the structure. Hexagon shapes are randomly placed across façade and roof structure to illuminate the spaces. Depending on the solar orientation, the light may cast contrasting intricate forms or an even glow throughout the space. The Louis Vuitton Foundation in Paris uses a glass paneling system to bounce and refract light in certain directions. The prominent light quality is owed to the lattice framework of the curved forms in the structure.

CASE ADDITIONS

Architectural installations and artistic methods that explore the possibilities of light can be studied for inspiration and observed as a foundation to drive design decisions. The Louvre Abu Dhabi is a distinct sculptural exploration of light and how faint-delicate light informs spatial quality. The Weather Project, an installation within the Tate Modern atrium is an experimentation of artificial light that creates a hazy obscure environment to experience. Artistry breaks into the boundaries of the unknown and provides an audience with extraordinary experiences. A blend between artistic expression and architectural form will achieve the utmost success.

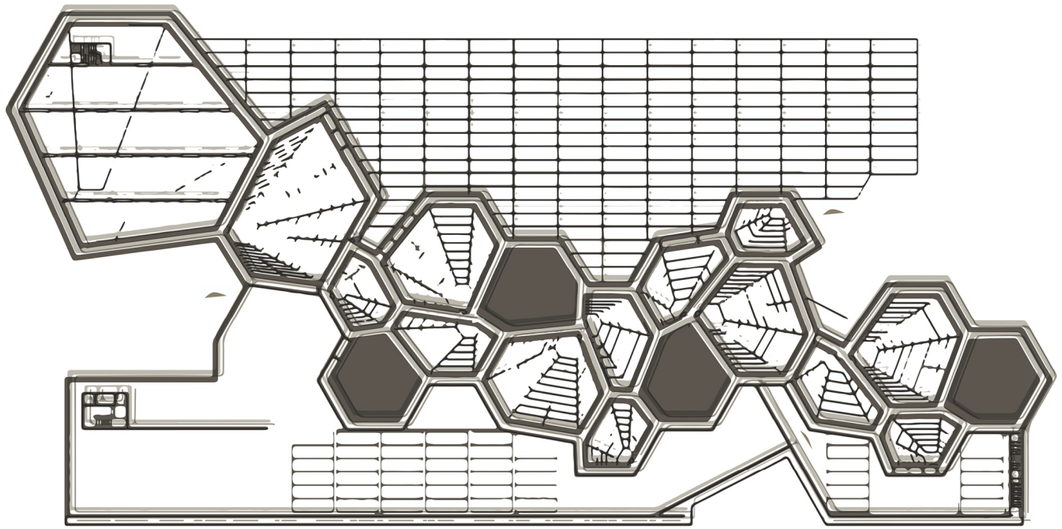
CONTEMPORARY ARTS CENTER CÓRDOBA

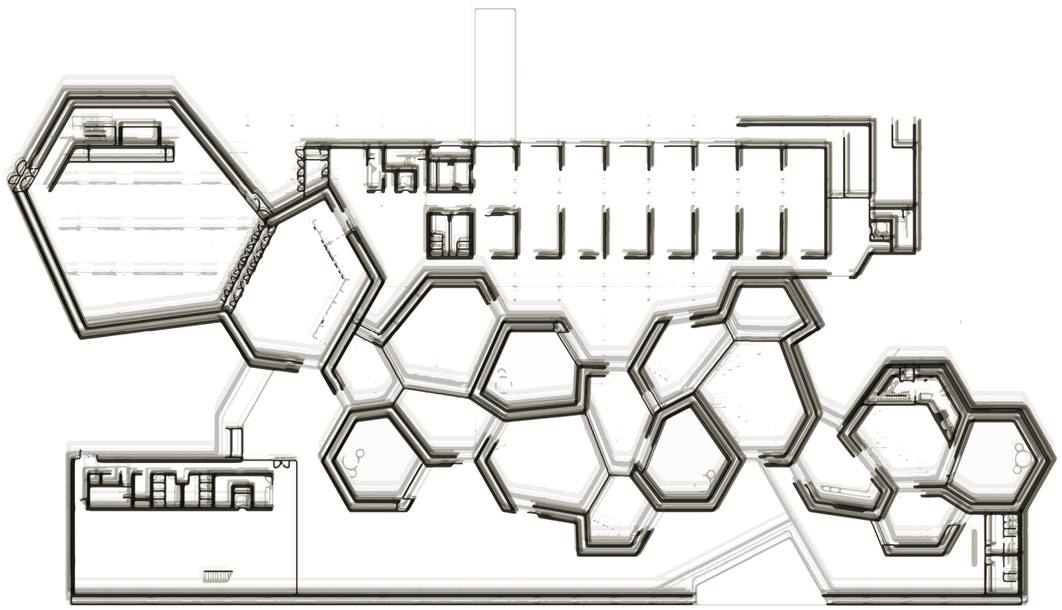
LOCATION	Córdoba, Spain
ARCHITECT	Nieto Sobejano
COMPLETE	2013
AREA SQ FT	130,000

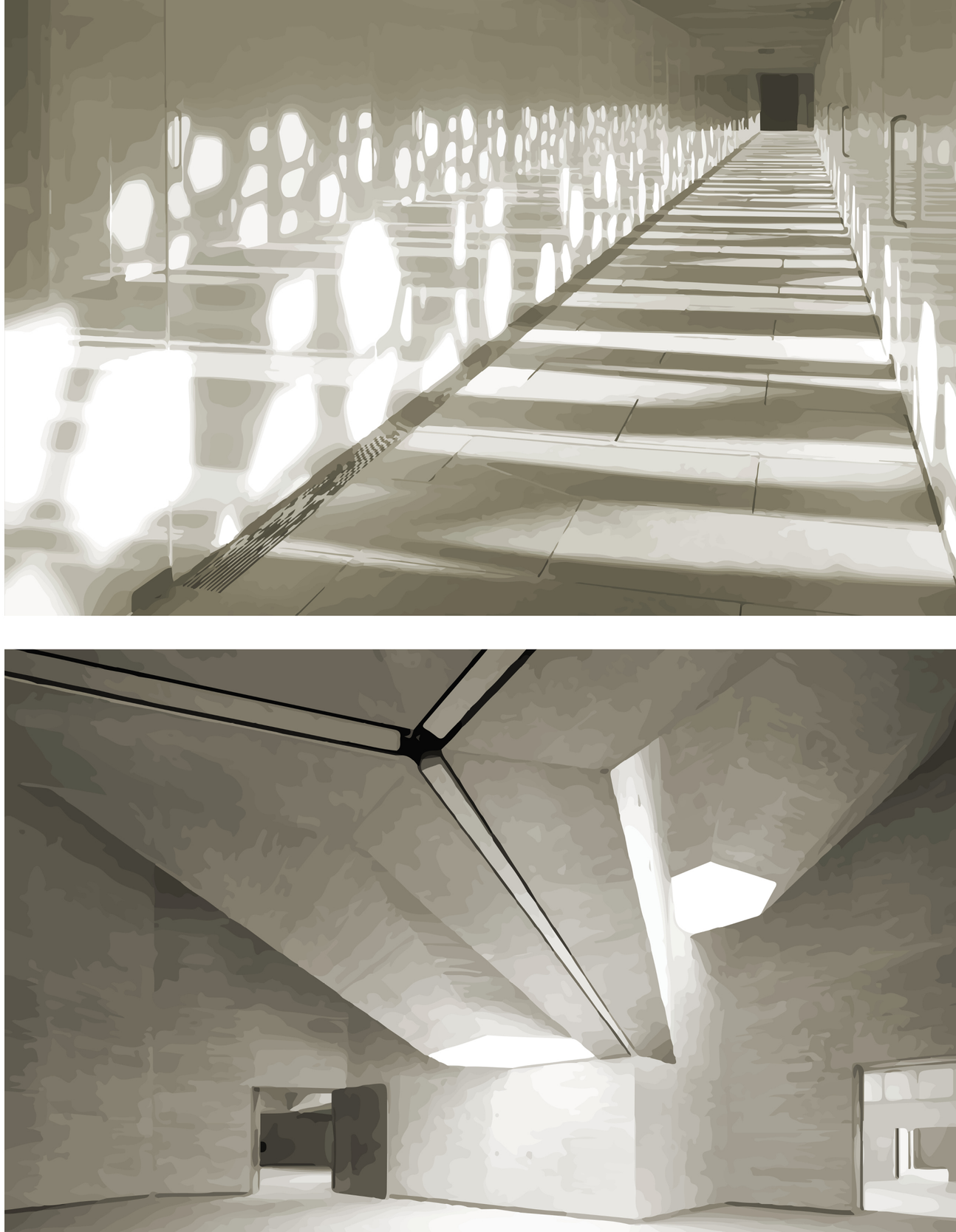
The Córdoba Contemporary Arts Center is located on the riverside and gleams white in its context. Its complex and intricate façade of geometric hexagons allows for natural light to permeate into the spaces within. 14 main hexagons make up the form of the floorplan and act as randomly placed skylights for the interior. The museum will house virtual objects, audio and visual installations, and digital technologies. The entire structure is built with three materials: concrete structural walls; white prefabricated glass-fiber concrete panels on the roof and exterior façade; and galvanized steel for interior accents. The simplistic aesthetic and calm material palette gives the architecture a sculptural experience. The hexagon shaped concrete shafts provide light and are open to rainwater collection within the structural members. The skylights vary in depth, size, and angle, thus changing the interior spatial sequences. The linear front façade is also adorned with the hexagon pattern which illuminates the interior hall with streaks of sunlight.

RIGHT

Figure 35 . Córdoba Gallery Space .







ABOVE

Figure 36 . Córdoba Floor Plans .

RIGHT

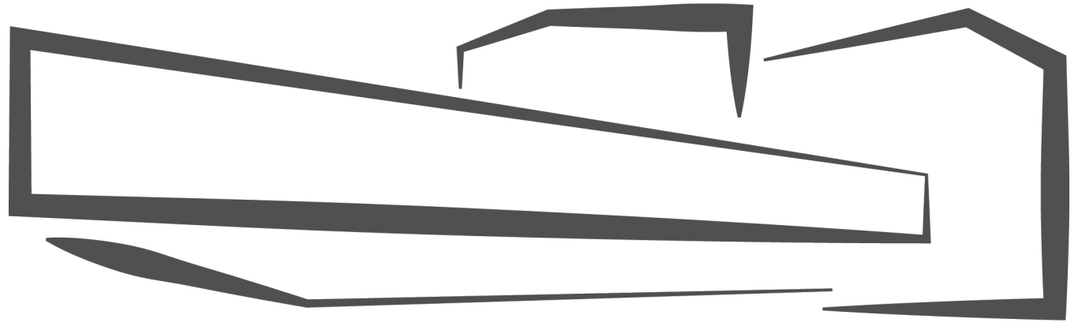
Figure 37 . Córdoba Interior Daylighting .

ABOVE

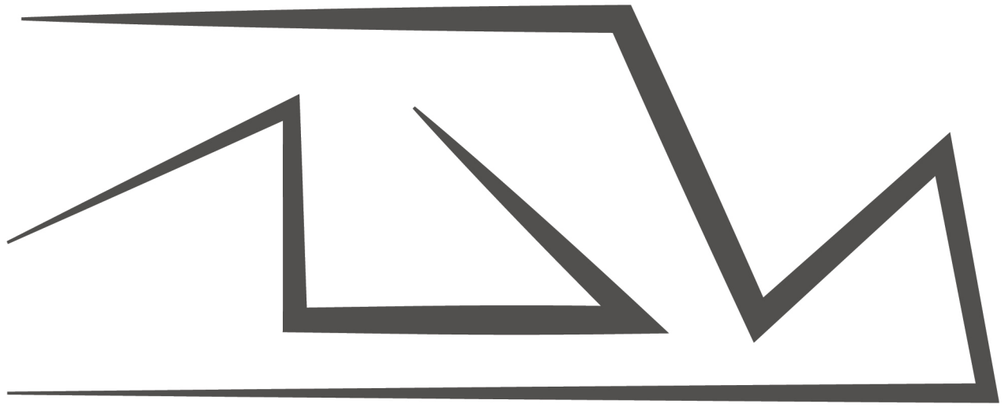
Figure 38 . Córdoba Elevations .

RIGHT

Figure 39 . Córdoba Form Diagrams .



EXTERIOR FORM



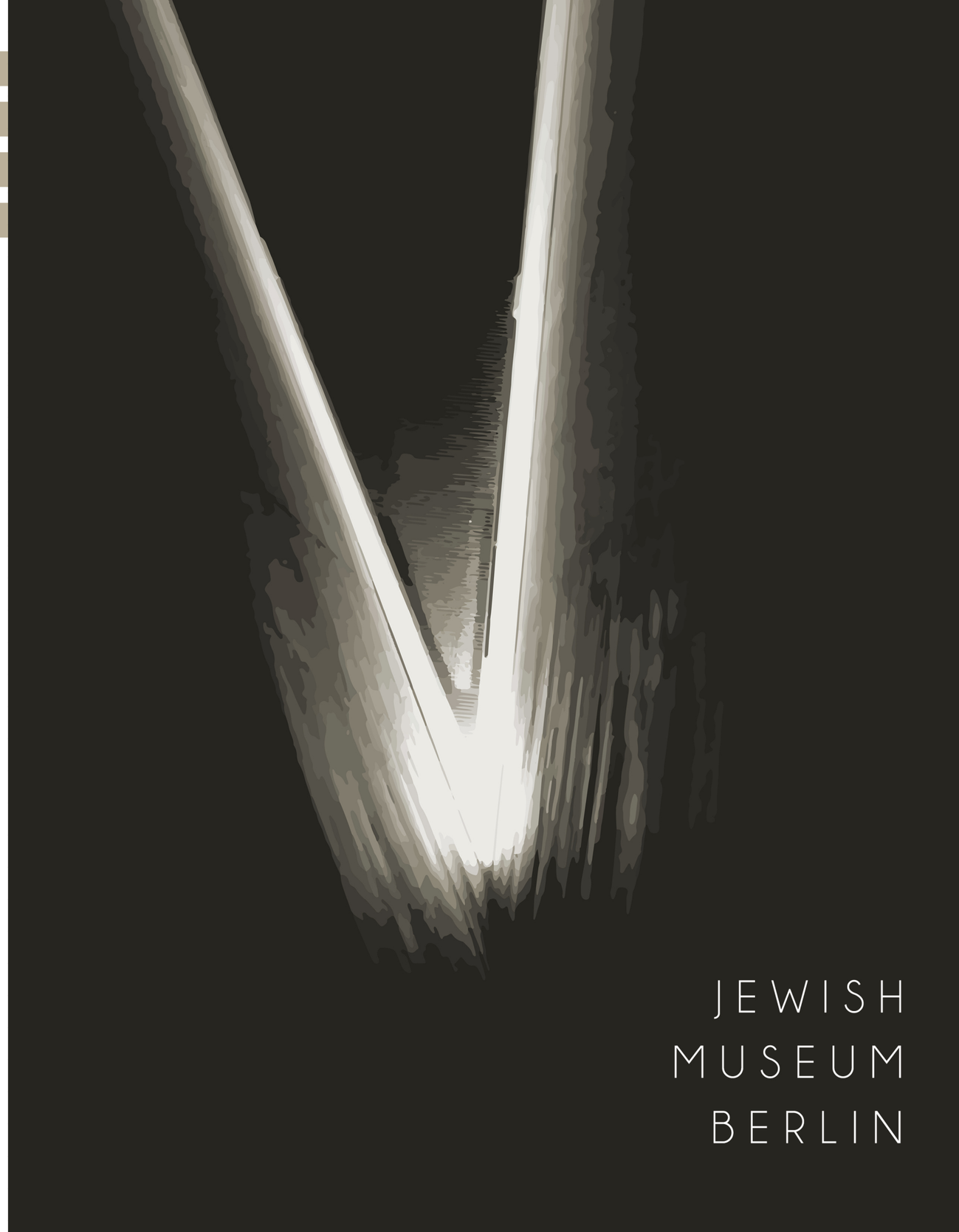
CIRCULATION PATHS

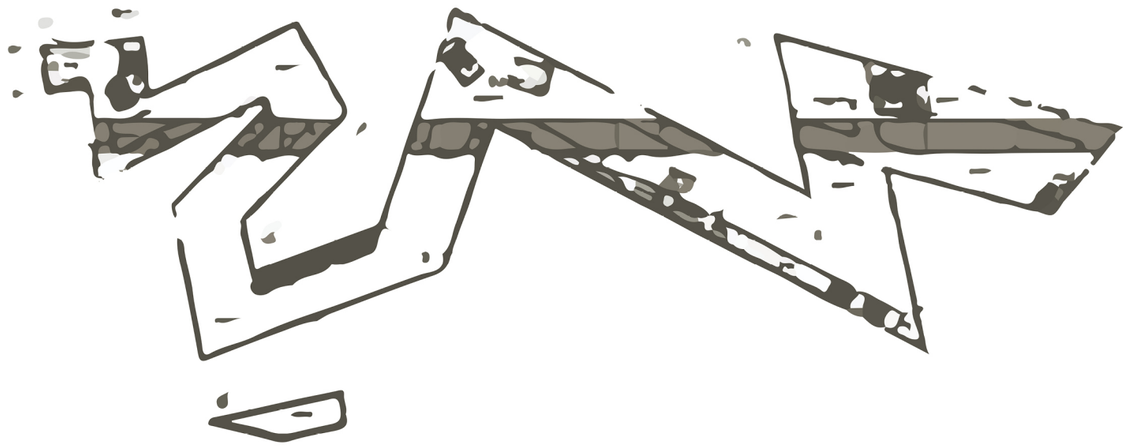
LOCATION	Berlin, Germany
ARCHITECT	Daniel Libeskind
COMPLETE	2001
AREA SQ FT	167,000

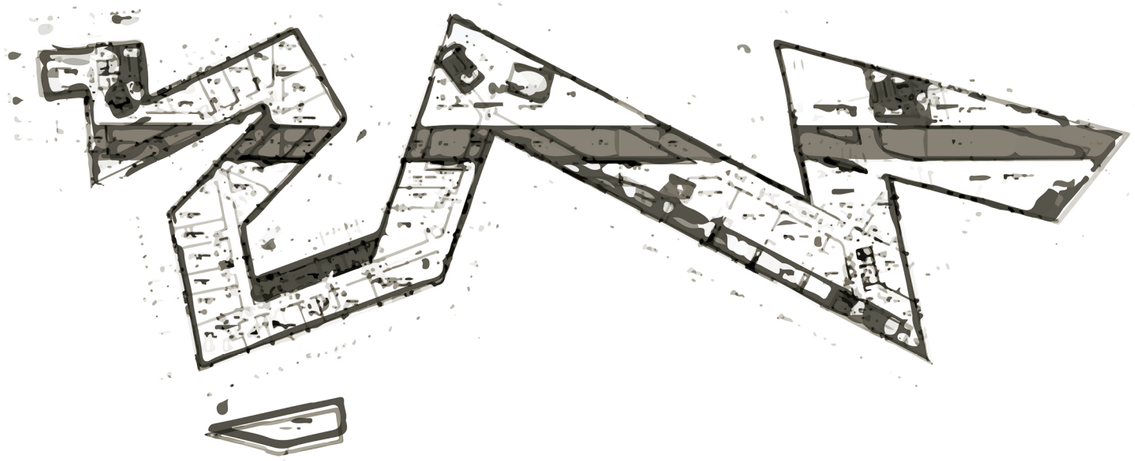
The Jewish Museum in Berlin is an experience that architecturally speaks to the voids that occurred in the lives of those impacted by the Holocaust. The museum has no visible entrance; it is instead located in the adjacent historic building - the original Prussian Court of Justice. A dramatic staircase descends into the ground and below the surface three axial routes move through the space. The overall form of the structure is a repetitive back and forth across a central line of axis – the void. Throughout the museum the visitor is continuously reminded of the void and what it embodies. The Holocaust Tower is a separate concrete vertical cavern that has only a sliver of light in the uppermost corner and results in a dead end. Throughout the museum the spaces imply an absence from the outside world and all things human. The experience of the Holocaust museum in Berlin is one that will never be forgotten.

RIGHT

Figure 40 . Jewish Museum Tower .







ABOVE

Figure 41 . Jewish Museum Floor Plans .

RIGHT

Figure 42 . Jewish Museum Interior Daylighting .

ABOVE

Figure 43 . Jewish Museum Elevations .

RIGHT

Figure 44 . Jewish Museum Form Diagrams .

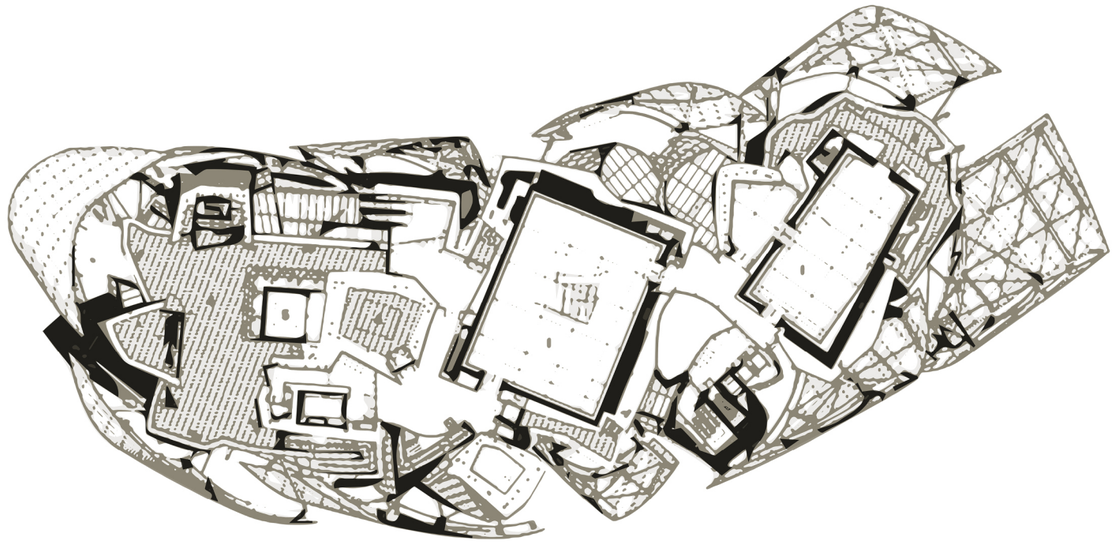
LOCATION	Paris, France
ARCHITECT	Frank Gehry
COMPLETE	2015
AREA SQ FT	125,000

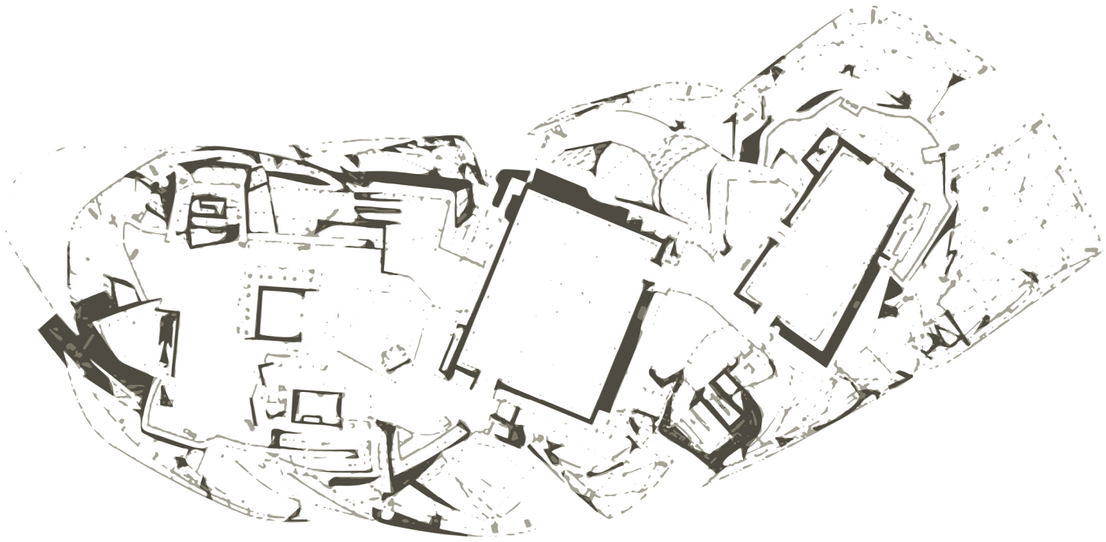
The Louis Vuitton Foundation consists of 12 glass curving elements that wrap the concrete core of the interior structure. Described as an iceberg, cloud of glass, or sailing ship, the structure clearly expresses a transparent sensation. Its intrinsic glimmering and reflective qualities provide its spaces with rare moments of light properties. Built on a channel of water, the museums' 11 gallery spaces will hold art exhibits and temporary installations. At the entry, Olafur Eliasson has designed a space in which art becomes an experience through use and study of lighting, materiality, and spatial reactions. The museum is also home to an event space that is located near the entrance on the ground floor. The arrangement of spaces and vertical movement creates various outdoor rooftop terraces that look out over the city of Paris. In a field of trees this structure stands tall and cannot be missed. The spaces within the museum are entwined both horizontality and vertically leading to stunning moments in which lattice shadows and streams of light appear to react to the dynamic forms of the structure.

RIGHT

Figure 45 . Louis Vuitton Foundation Facade .

LOUIS VUITTON
FOUNDATION



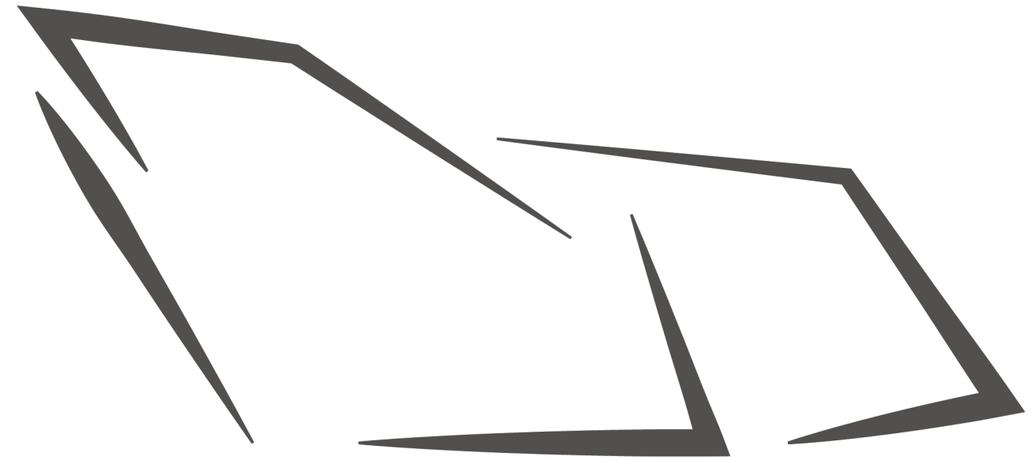


ABOVE

Figure 46 . Louis Vuitton Foundation Floor Plans .

RIGHT

Figure 47 . Louis Vuitton Foundation Exterior Skin .



EXTERIOR FORM

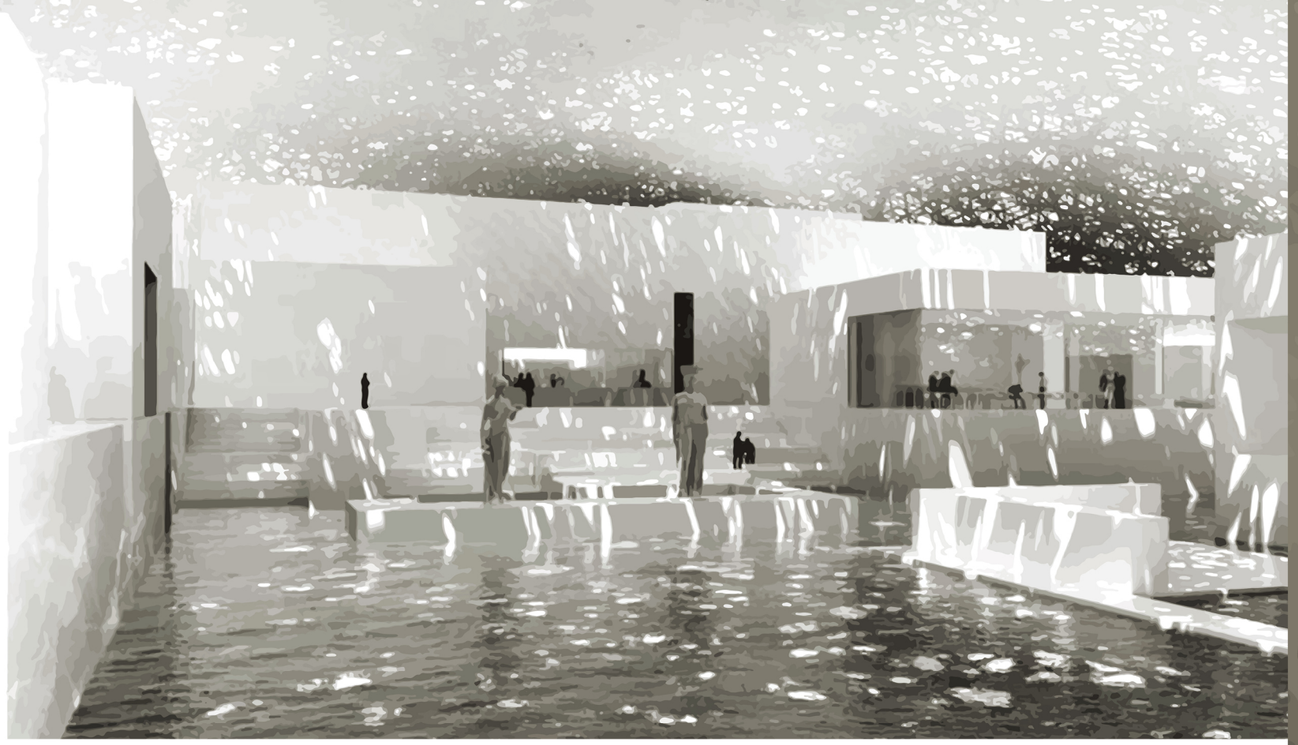
CIRCULATION PATHS

ABOVE

Figure 48 . Louis Vuitton Foundation Elevations .

RIGHT

Figure 49 . Louis Vuitton Foundation Form Diagrams .



LOUVRE ABU DHABI

The Louvre Abu Dhabi is currently under construction but reaching its opening date. Its design by Jean Nouvel is a stunning experience for visitors because if its interaction with the elements of nature. The ceiling is a slightly curved dome that extends over much of the exhibit space. The transparency of a tiny lattice structure enables sunlight to glow through the space at different intensities. Depending on time of day and weather conditions the experience can be extremely transformed. The design also incorporates water and the glimmering affects that sunlight creates when combined with a water surface. This idea of creating a museum that is actually a surreal experience is exactly what I am searching to create for this thesis project.

ABOVE

Figure 50 . Louvre Abu Dhabi Water Reflections .

RIGHT

Figure 51 . Louvre Abu Dhabi Structure Daylighting .

The Weather Project created by Danish-Icelandic artist Olafur Eliasson is an exquisite form and artistic take on atmosphere. This specifically designed array of lights has a tremendous reaction to materials and produces a bizarre and dreamlike experience. Fabricated in the atrium of the Tate Modern in London, this feature is a grand entry experience for all visitors. The atrium space is almost six floors tall and quite long and narrow. The entire ceiling is a mirror that reflects the movement of visitors below. The combined elements create an experience that is unforgettable.

ABOVE

Figure 52 . Weather Project Ceiling Reflections .

RIGHT

Figure 53 . Weather Project Smog Effect .

The lower level of the Kolumba Museum is unusual because the modern museum was built into the ruins that originated on the site. The blend between in the exterior and interior of the museum is seen as a grey area because the façade is completely open to the elements outdoors. The textures and light levels are dependent on factors that are continuously fluctuating making for a unique experience. The way light enters the space and illuminates the architecture is inspiring. The multitude of contrasting elements that exist in this space provides the audience with a dynamic performance. It is the architectural performance that this thesis project intends to address.

ABOVE

Figure 54 . Kolumba Museum Ancient Ruins .

RIGHT

Figure 55 . Kolumba Museum Facade System .

KOLUMBA MUSEUM

RESEARCH

AREAS OF INVESTIGATION

Sensory Experience and Stimulation

Meanginful Interactions between Strangers

Biomimicry and Fabrication Methods of Installations

SUMMARY

The research for this thesis project includes a focus of further exploration into the artistic realm of architecture and the meaningful experiences architecture intends to elicit. Divided into three areas of investigation, this research had various perspectives on architecture and installations. The first included a search into the human stimulation of the natural world through the means of architecture. The second impacted a finding on the significance of meaningful human interaction between strangers. And the third dealt with integrating biomimicry and technical fabrication into design.

SENSORY EXPERIENCE

STIMULATION THRESHOLDS

The alteration of stimuli levels is exactly what this thesis strives to introduce to individuals. By designing spaces that contrast adjacent spaces the individual will become more readily aware of the characteristics that encompass each space. Each individual will become more in tune with their senses as they experience a multitude of various intensities of stimuli. Another vital aspect to this research is the understimulated sensory experiences that have more focus on a specific sensory experience rather than a combination of senses. An extreme lack of sensory information allows the individual to discover tiny fragments of experience in a calm and relaxing space. The subtleties can be more dramatic and memorable than the excess.

'Every living thing on earth reacts to sensory stimulation. Each of our five senses can be overstimulated or understimulated. An important concept to understand is that of threshold, the point at which too much or too little stimulation is available. At one end of the threshold spectrum is the absolute minimal intensity of stimulus we can perceive and at the other is the maximum amount of stimulation we can cope with effectively. Once accustomed to a certain level of stimuli, we will no longer consciously notice it until it changes. Our level of perception will often dictate how much the stimulation must change before it is noticed.' (Kopec)

EXPOSURE TO NATURAL ELEMENTS

Within the text 'Questions of Perception' it is stated that the urban lifestyle has diminished human perception. This lifestyle is so technical and quick that humans become oblivious to the environment in which we live. Architecture should not be a static environment that humans ignore, but rather it should highlight the environmental changes that occur and transform them into a dynamic performance. The environment is something humans speak about and analyze but rarely do we see it as an art piece to experience.

'One of the tragedies of modern urban life is that a complex of urban constructions often puts us out of touch with the poetry and unpredictability of the everyday change in weather. In the Fukuoka housing project a fresh rain is immediately evident in ripples on the void space water courts. The wind changes the pattern of the reflections depending on intensity. Clouds pass overhead and likewise pass through the mirror bottom voids. Dusks twilight is brought into reflection in the heart of the housing through these 'phenomenal lenses.'

An attention to phenomenal properties of the transformation of light through material can present poetic tools for making spaces of exhilarating perceptions. Refraction phenomena produce a particular magic in architecture that is adjacent to or incorporates water.' (Holl)

ARCHITECTURE AS A PERFORMANCE

Architecture is a performance. The way light morphs across a space altering its qualities is something that cannot be reiterated. Every second in time is irreplaceable and momentous. Time should be an observation of the environment. No longer do humans examine the shadow patterns or intensity of light. Humans are enveloped by lifestyle and they forget to pause and appreciate the architectural performance that occurs each and every day. This thesis aims to take highlight of the performance and reunite the human experience with architecture.

> *'Where music has a materiality in instrumentation and sound, this architecture attempts an analog in light and space.' (Holl)*

The subtleties in nature are exquisite moments in time. Architecture serves as the medium in which nature paints and creates an art piece. It is architecture that allows light to display its performance and capture an audience. Sensory experiences are so vital to human existence. The natural qualities of various textures can inspire human thought. Vast empty spaces have the ability to silence an individual in a state of awe. Reducing architecture to its most simplistic characteristics and tectonics in order to emphasize natural elements will only enhance sensory experience and create memorable moments in time.

> *'A complex interlocking of time, light, material, and detail creates the 'whole' of cinema wherein we can no longer distinguish individual elements.' (Holl)*

RIGHT

Figure 56 . Dynamic Visual Shadow Patterns .

'Architecture more fully than other art forms, engages the immediacy of our sensory perceptions. The passage of time; light, shadow and transparency; color phenomena, texture, material, and detail all participate in the complete experience of architecture. Only architecture can simultaneously awaken all the senses – all the complexities of perception.' (Holl)

'Architecture holds the power to inspire and transform our day to day existence. The everyday act of pressing a door handle and opening into a light washed room can become profound when experienced through sensitized consciousness. To see, to feel these physicalities is to become the subject of the senses.' (Holl)

'In memorable experiences of architecture, space matter and time fuse into one single dimension, into the basic substance of being, that penetrates the consciousness. We identify ourselves with this space, this place, this moment and these dimensions as they become ingredients of our very existence. Architecture is the art of mediation and reconciliation.' (Holl)

RIGHT

Figure 57 . Dubai Mosque Reflecting Pool .

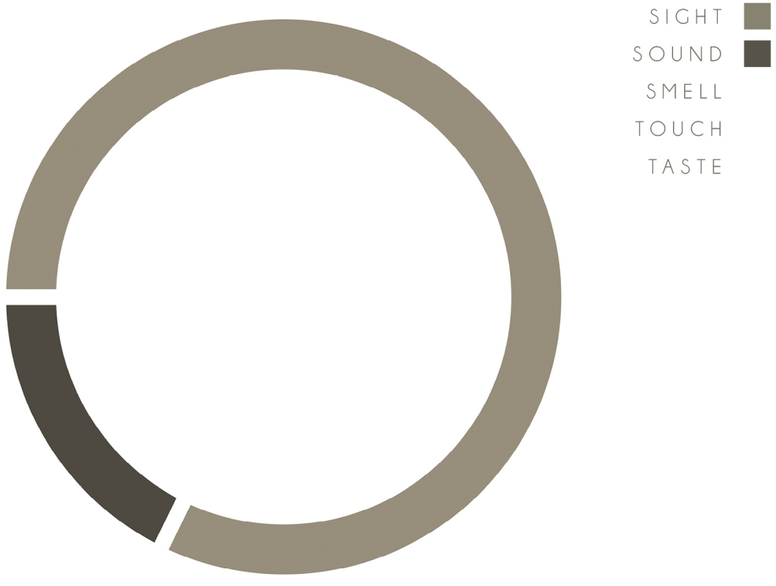
ISOLATED SENSES

ONE SENSE AT A TIME

Fascinated by human interaction with architecture, both Paul De Vries and Simon Droog began to explore how emotion and sensory experience can be reintroduced to architectural design. It is their goal to bring back attention to spatial sensory qualities and environmental influences on architectural rather than just appearance.

'In architecture all senses are important, but the sense of sight is very dominant. The other senses are underappreciated in architecture. We could pay more attention to the other senses, as the combined perception of all the senses gives us our total experience of a space. We leave so much of our spatial experience to chance if we leave the other senses untouched during the design process.' (De Vries)

'A particular smell makes us unknowingly re-enter a space completely forgotten by the retinal memory; the nostrils awaken a forgotten image, and we are enticed to enter a vivid daydream. The nose makes the eyes remember.' (Pallasmaa)



In order to justify their concerns in research they established a workshop in which students wandered the architecture institute in controlled environments and were limited to using one sense. Without the sense of sight it was found that students became much more aware of their other senses. And when limited to only one sense they had observations they had never been exposed to. The sense of vision has become the human dependent sensory experience and in some cases it has hindered or reduced our awareness that the other senses even exist. Dialogue in the Dark, an experience that takes individuals through a series of rooms in which vision is taken away, has opened the doors to finding these lost senses once again. Finding and exploring the potential moments that arise from these lost senses is what this thesis strives to achieve.

RIGHT
Figure 58 . Sensory Usage Breakdown .

RAIN ROOM

RANDOM INTERNATIONAL

'Founded in 2005, Random International is a collaborative studio for experimental practice within contemporary art. Taking science as a means to develop a new material vocabulary, their work invites consideration of the man and machine relationship through explorations of behavior and natural phenomena, with the viewer being an active participant.' (Random International). In 2012 the technology savvy studio created the Rain Room. It is a combination of advanced technology and water drops. The changing sounds, lighting effects, and rain moisture create an environment that is imaginative and inspiring, but rain room is unexpected because the observer does not get wet. Hundreds of tracking devices analyze the body movements of participants and time the release of water.

Random International is most known for their artistic methods of choreographing technology to mimic body movement or alter perceptions.

ABOVE

Figure 59 . Rain Room Installation .

CONNECTION

SIMPLE BUT POWERFUL

Interactions between strangers are vital to human life because they strengthen our ideas on individual worth and remind us that we a part of something greater than ourselves. Something as little as holding a door shows that you are being acknowledged in society. One simple interaction can transpire into a multitude of actions for the greater good. These social interactions among strangers vary in intensity but all types of interactions are memorable and meaningful. A simple smile to someone walking by can impact their mood and make their day a more meaningful one. While traveling various individuals might encounter feeling connected to strangers more so because of their willingness to ask for directions or partake in unknown cultural events. Events have the ability to inspire not only the imagination of individuals but inspire strangers to feel a closeness or connection to those around them. Experiences, humorous or mesmerizing, frightful or passionate, no matter the emotion, have the ability to connect people. These connections remind us that we are not alone and we all have similarities. No matter where we come from we are all human.

RIGHT

Figure 60 . City Social Interactions .

'Stranger interactions can be emotional and meaningful. Stranger interactions make us more tolerant people, and expand our sense of the group we belong to.' (Stark)

'Even the simplest exchange among strangers can contain a tangled accumulation of meanings: what transpires may have physical, emotional, social, political, technological and historical dimensions.' (Stark)

'Jane Jacobs writes beautifully about the anonymity of big cities. Lively public space creates opportunities for social contact without commitment. Share a smile.' (Simon)

'No friction, no repetition, no expectation. These anonymous collisions may seem trivial, but they aren't. They are continual reminders that we are all human. They often reinforce civility and empathy. They allow us to be kind, and generous, a bit wild even, without consequence.' (Simon)

'With our installations we find the relationship a person has with a space or other people is an interesting area of investigation. You see people genuinely touched by it. You can actually reach people because it is a very physical experience.' (Shaw)

LEFT

Figure 61 . Paris La Grande Arch .

Built to inspire everyone who surrounds the installation and partakes in the theatrical event, the Dubai Fountain is much more than a show to electrify the night, it is an artistic movement that fills a space for only a fraction in time. It is a moment that cannot be replayed because the fountains are only a portion of the experience.

What makes the event so inspiring are the individuals that surround you and the excitement or emotion that is shared. These moments give people meaningful connections between strangers because for that second in time we experienced a moment together.

ABOVE

Figure 62 . Dubai Fountains .

BIOMIMICRY

FINDING CONCEPTS IN NATURE

Designing with a biomimetic approach can impact the inspirational form of a project as well as inform the structural or chemical characteristic properties that push the project to a beyond ordinary level. Integrating biomimicry into a design can take on various roles. In some ways it can help to facilitate a construction process or a novelty framework that has yet to be tested. Biomimicry can benefit the chemical properties of materials, enable them to last longer or span further distances. The concepts we are able to find in nature can advance our technologies and help human beings to not only design more efficiently but to hopefully design and create livable spaces that more align with nature and the planet we live on. These advancements can produce materials that are more lightweight or porous, such as those used in the research pavilion.

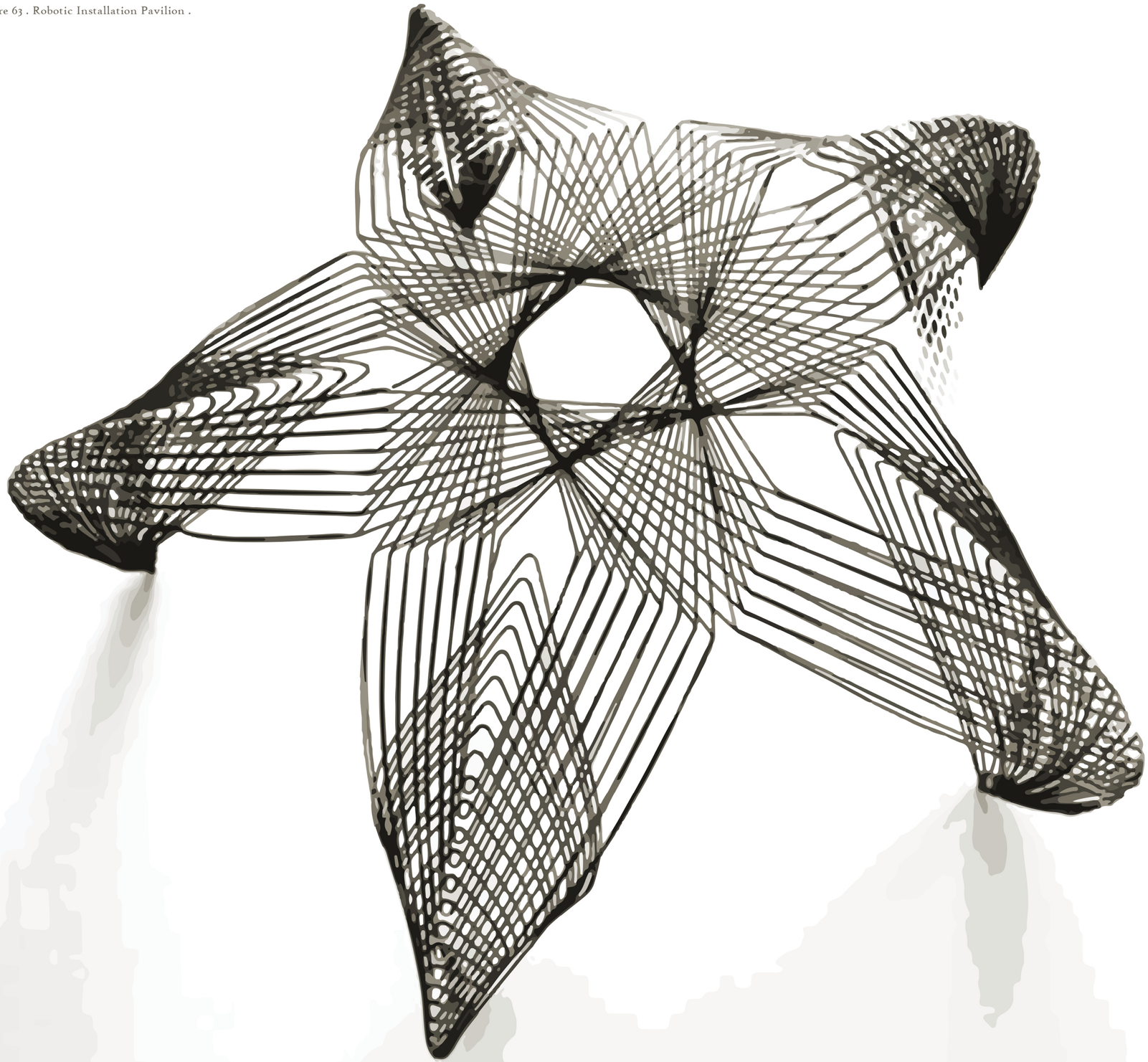
'The research focused on the material and morphological principles of arthropods' exoskeletons as a source of exploration for a new composite construction paradigm in architecture.' (Menges)

The exoskeleton of the lobster has various layers and fibers that are oriented in certain directions depending on force and local body requirements. In areas of the exoskeleton where non-directional loads are transferred the layers are attached in a spiral arrangement. This attribute allows for uniform distribution in every direction. Areas of the shell that require directional loads are specifically optimized for that sole purpose. The material adaptation is what gives the exoskeletal shell is efficient structure.

'The concurrent integration of the biomimetic principles of the lobster's cuticle and the logics of the newly developed robotic carbon and glass fiber filament winding within the computational design process, enable a high level of structural performance and novel tectonic opportunities for architecture. Despite its considerable size and span, the semi-transparent skin of the pavilion weighs less than 320kg and reveals the system's structural logic through the spatial arrangement of the carbon and glass fibers. The synthesis of novel modes of computational and material design, digital simulation and robotic fabrication allows both the exploration of a new repertoire of architectural possibilities and the development of extremely lightweight and material efficient structures.' (Menges)

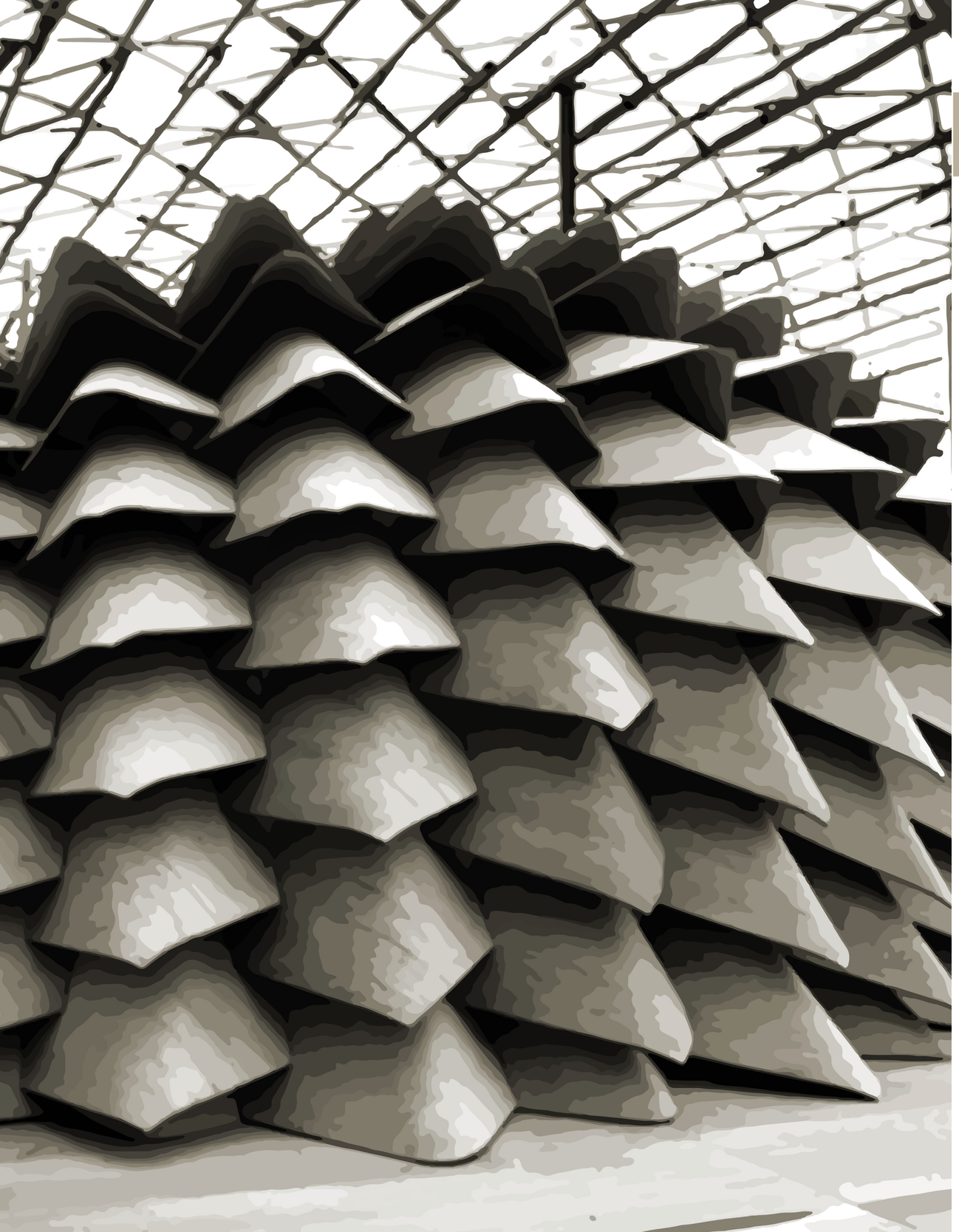
BELOW

Figure 63 . Robotic Installation Pavilion .



RESEARCH PAVILION

Built in collaboration between Achin Menges and Jan Knippers, the pavilion is completed entirely through robotic technology. Made from carbon and glass fiber, the structure is a research project in itself to investigate the interrelation of biomimetic design strategies and robotic production. The lightweight material and transparency of the fiber strands interact with light sources and produce a layering glow. The enclosure is so transparent that the boundaries between exterior and interior are elusive and continuously changing.



FABRICATION

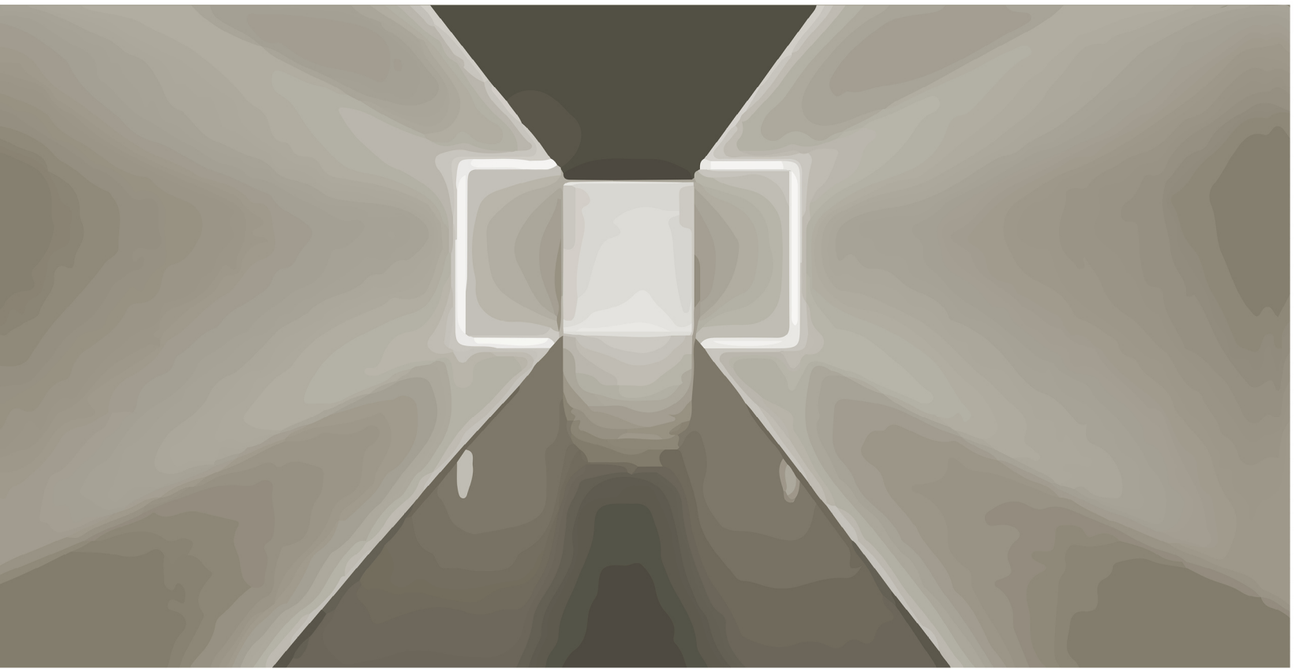
ROBOTIC ADVANCEMENTS

Architectural Installations are usually built with the means of technical computer programs and physical robotics to construct and organize the project. The research pavilion was constructed using robotics and real time technical methods to respond back and forth between virtual model, robotic movements, and physical properties. The communication between these technologies allowed for a seamless process of construction. Once the virtual model is complete, the robotic elements have control over the production of the pavilion which gives the project extreme precision and accuracies. The technology can be taught and manufactured to analyze a multitude of optimal factors in order to produce the most effective and efficient installation possible. Sensors on the robotics can constantly monitor the stress and strain of material placement within the structure to ensure the installation is correctly built. Various orientations and robotic procedures can be created with code and parametric equations to create virtually any layout of space necessary to fabricate the installation. The artistic and creative possibilities of constructing an installation are limitless.

LEFT

Figure 64 . Wooden Robotic Installation .

SOCIAL TRENDS



A current artistic trend is the architectural installation. This thesis outcome will house an array of architectural installations in exhibition spaces as well as artistic performances that take place within the art. Lighting effects and advanced technology are starting to merge into the art form through installations. Architectural installations are not only exciting but they also have a memorable effect on an audience.

ABOVE

Figure 65 . Neon Light Installation .

RIGHT

Figure 66 . Hanging Reflective Installation .

SOCIAL TRENDS

ARCHITECTURAL INSTALLATIONS

A new artistic method on the rise is the architectural installation. It can be seen and experienced in public atriums or outdoor spaces as well as in some contemporary museums. The architectural installation is a large scale sculptural piece that creates an experience for the audience. It takes on various forms and scales but its main purpose is to transform an entire space into an artistic piece – blurring the boundary between architecture and art. In the end the entire space becomes an art form that evokes emotion and experience to the audience. In some cases lighting levels are altered. Dan Flavin showcases fluorescent lights organized in patterns to illuminate a space. The entire space changes its color and mood. This art method alters the space and the audience perception.

Artistic installations take the static art form and transform it into something dynamic and interactive. Its purpose is to create a feeling of energy and inspiration to those that interact with it.

ABOVE

Figure 67 . Floor Vapors and Sparks Installation .

BELOW

Figure 68 . Tree Bark Installation .

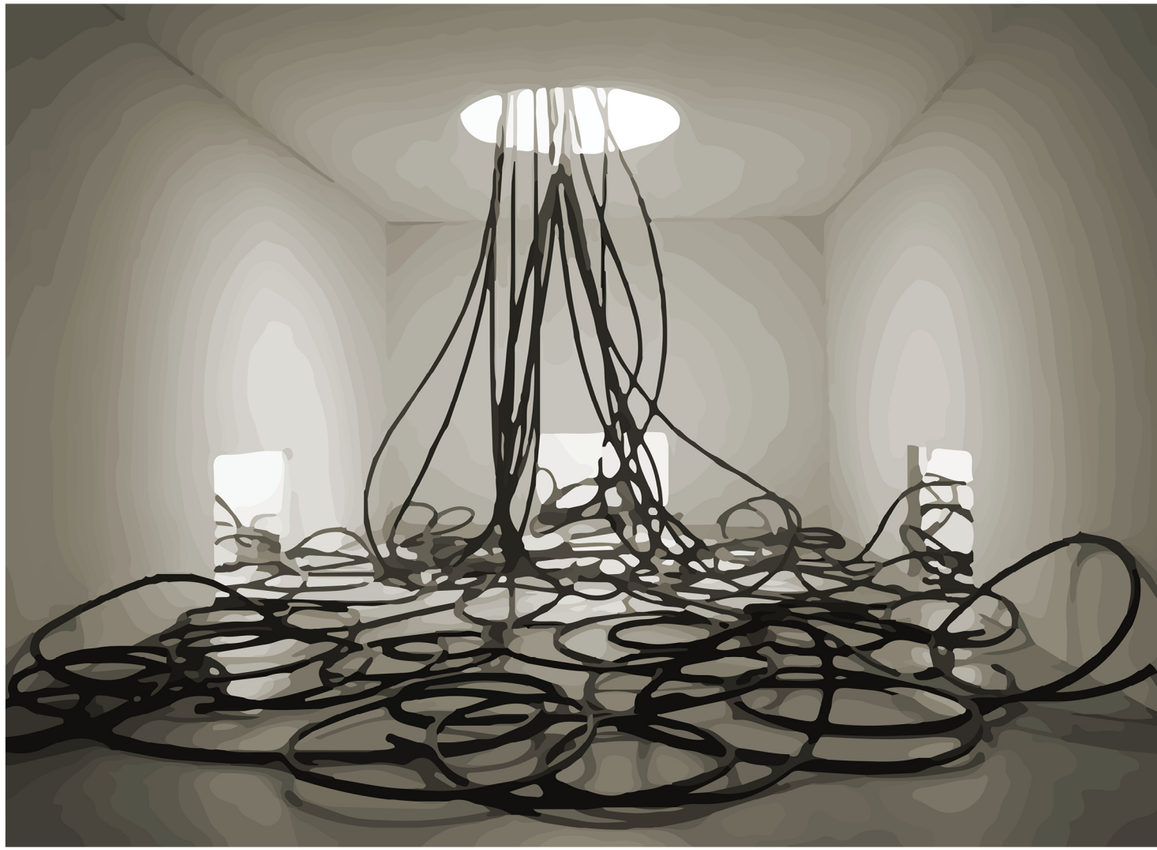
Installations invite the observer to participate or walk through the piece to experience it fully or at a closer scale. Scale is a huge part of an architectural installation. The difference between an art installation and architectural installation is scale; an architectural installation fills the entire space and forces the audience to act as an active participant in the piece. In some cases the art is able to transform due to the actions and movements of the audience.

ABOVE

Figure 69 . Hanging Light Installtion .

RIGHT

Figure 70 . Various Web Installations .



THESIS PROGRAM

PROJECT JUSTIFICATION

This thesis is significant to society because it is a typology on the rise. Artistic methods are broadening their scope of expertise and the architectural installation is one of those expanding fields. With such immense improvements of technical skill artists are transforming the definition artistic space. Through the use of programs that aid in visuals and multidimensional modeling, technology has transformed the artistic profession into a versatile and innovative workplace. This thesis aims to expose individuals to these inventive and spatially imaginative art forms. The architectural installation can be seen in major cities across the globe, but various populations are still unaware of its existence. Shared experiences have been known to cultivate powerful moments in which even complete strangers find simple but meaningful connections. With a global community it is vital that societies understand that humans across the world are much alike. Creating a simple moment between two people - who may not speak the same language but can communicate through shared emotions or experiences - is extremely inspiring. This thesis has importance because it is based on creating experiences that evoke human inspiration.

DATA RESEARCH

The research for this project will use both qualitative and quantitative data. Research will include but is not limited to: structural forms found in the surrounding context; worldwide research specific to ecology and morphology; analysis of similar typologies in regards to spatial requirements and organization; and digital interaction of solar and wind current analysis. Virtual representations of climatic patterns and pathways will be studied with regards to structural form and façade or envelope design solutions. Statistical data, such as results from previously completed studies, will be collected through archival discovery in published documents obtained online through articles and periodicals. Scientific data, such as wind velocities and patterns will be obtained through simulation tests and experimentation. Each alteration will be documented and the outcome will be observed through a graphical and written method. Qualitative data will be compiled through research in public opinion and observation statements made by specialists in the field.

ARTISTIC RESEARCH

Research will also focus on the benefits of stimulating the creative and imaginative mind through impactful life experiences. Various artistic expressions that exist or have been created in the past will be studied to become an inspirational piece in the design process. Design on varying levels will be considered in the solution: art sculptural forms that exist within museums; large scale architectural spatial installations; architectural renderings of unbuilt projects; and both simple and abstract architectural built case studies.

RIGHT

Figure 71 . Chicago River Aerial .

PLAN FOR PROCEEDING

DOCUMENTATION

Documentation of the thesis project will be compiled in an InDesign Document that is structured to reflect the design process. Throughout the entire time period for the project, sources will be documented and referenced with valuable information being quoted within text. The thesis book will be an art form that cultivates inspiration through both the writing word and graphic diagrams. The final product will be printed for the physical exhibit and presentation. Drawings and progress diagrams will be scanned and included in the design process section of the thesis book. All iteration renders and visual graphics will be saved and important transitions will be included in the thesis book as well as on the boards and a part of the verbal presentation. Sketches and iteration models will be displayed in exhibit or collection book of process sketches. Process collection will be held throughout the project, whenever a multitude of iterations can be accumulated or after personal deadlines when the most critical design thinking is had.

The physical exhibit will include a large model with site context and the final design, as well as small iteration models and a structural model. The boards will be plotted and hung alongside the models. A digital presentation will also be created for the verbal portion of the thesis project.

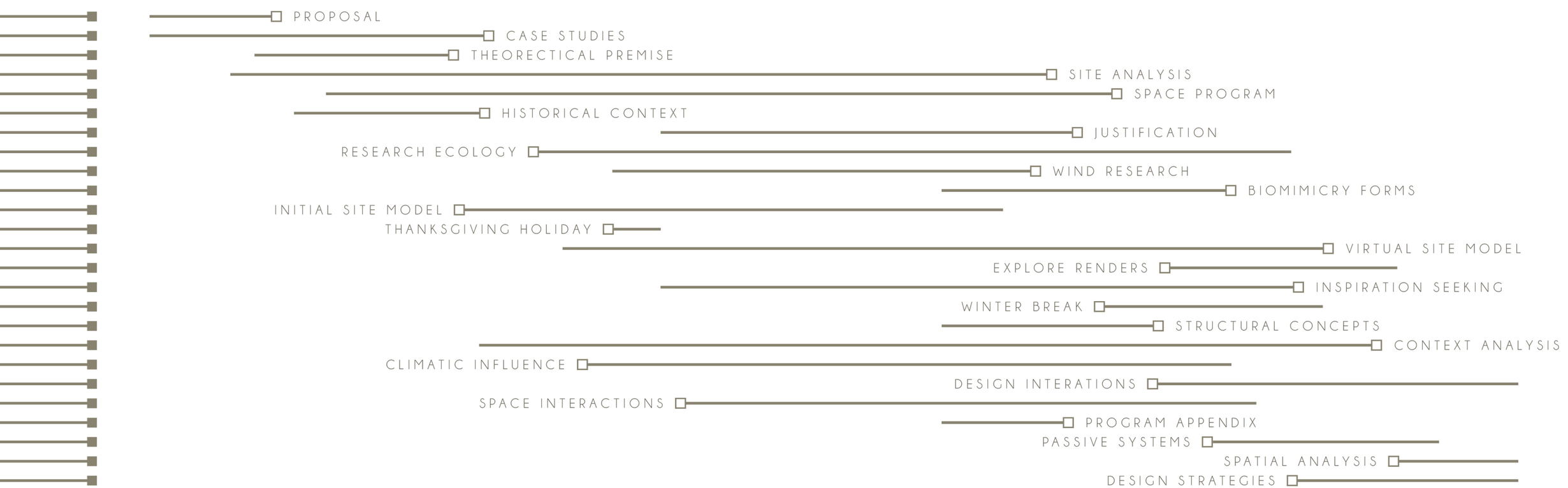
DESIGN METHODOLOGY

Within the iteration design process, the use of established methodologies will help facilitate design decisions. Vasari and Revit will be used as a means of visualizing and testing form interactions within the various climatic environments. Design options can then be interpreted and a comparative study can be conducted. Quantitative data such as lighting levels and lighting patterns as well as wind current speeds or movements will be thoroughly tested and observed through the use Vasari simulations. The primary focus of this thesis is experience based qualitative analysis which occurs through alterations of quantitative data. Design solutions will be selected and further tested due to the properties that occur in software simulations. Various daylighting situations will be chosen in respect to the times of day that the museum or event space be active. Both the exterior form and the interior quality of space will be studied for optimal correlations. The process will be stimulated by a variety of mediums: through the use of physical models, hand sketches, digital simulations, artistic sculptures, and computer modeling.

PLAN FOR PROCEEDING

OCTOBER NOVEMBER DECEMBER JANUARY

2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30



ABOVE

Figure 72 . Plan for Proceeding Fall .

PLAN FOR PROCEEDING

FEBRUARY

2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

MARCH

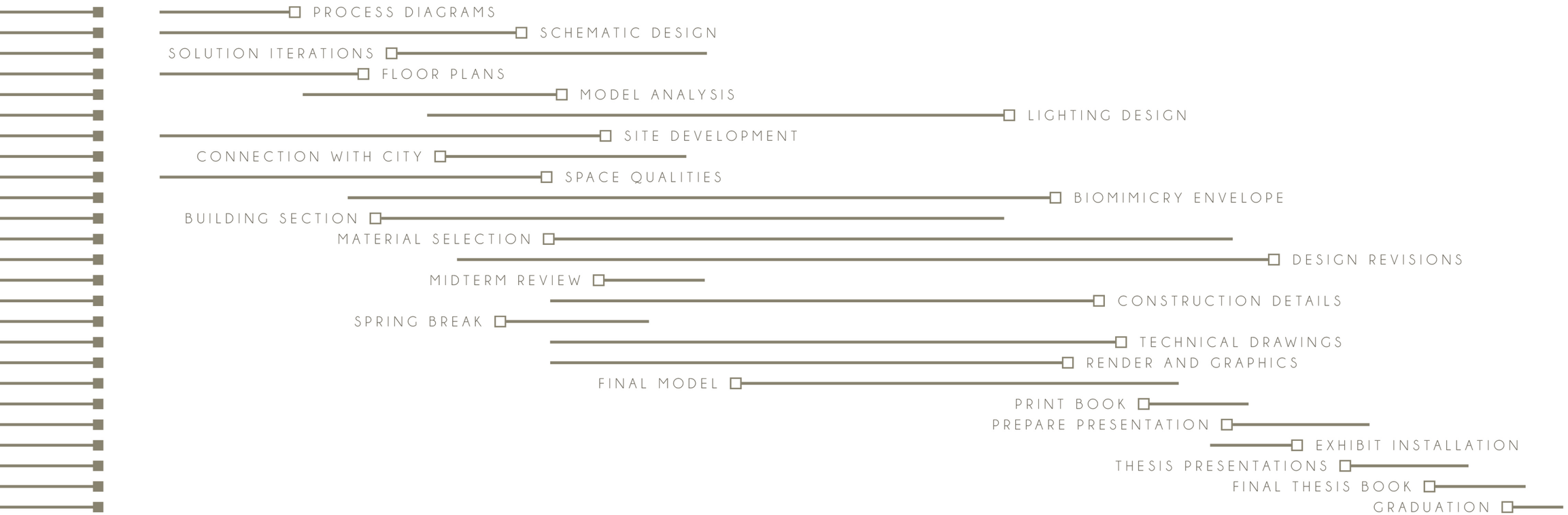
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

APRIL

2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

MAY

2 4 6 8 10 12 14 16 18 20 22 24 26 28 30



ABOVE

Figure 73 . Plan for Proceeding Spring .

PRIVATE

ADMINISTRATIVE OFFICES

4,750

MECH / STORAGE SPACE

16,028

ARTIST WORKSHOP SPACE

39,242

PUBLIC

SKYSPACE CAVERN

7,328

RESTROOMS

4,482

EXHIBITION

EXTERIOR COURTYARD

11,464

EXHIBITION SPACE

99,456

SOUND CHAMBERS

35,250

SQUARE FOOTAGE

TOTAL

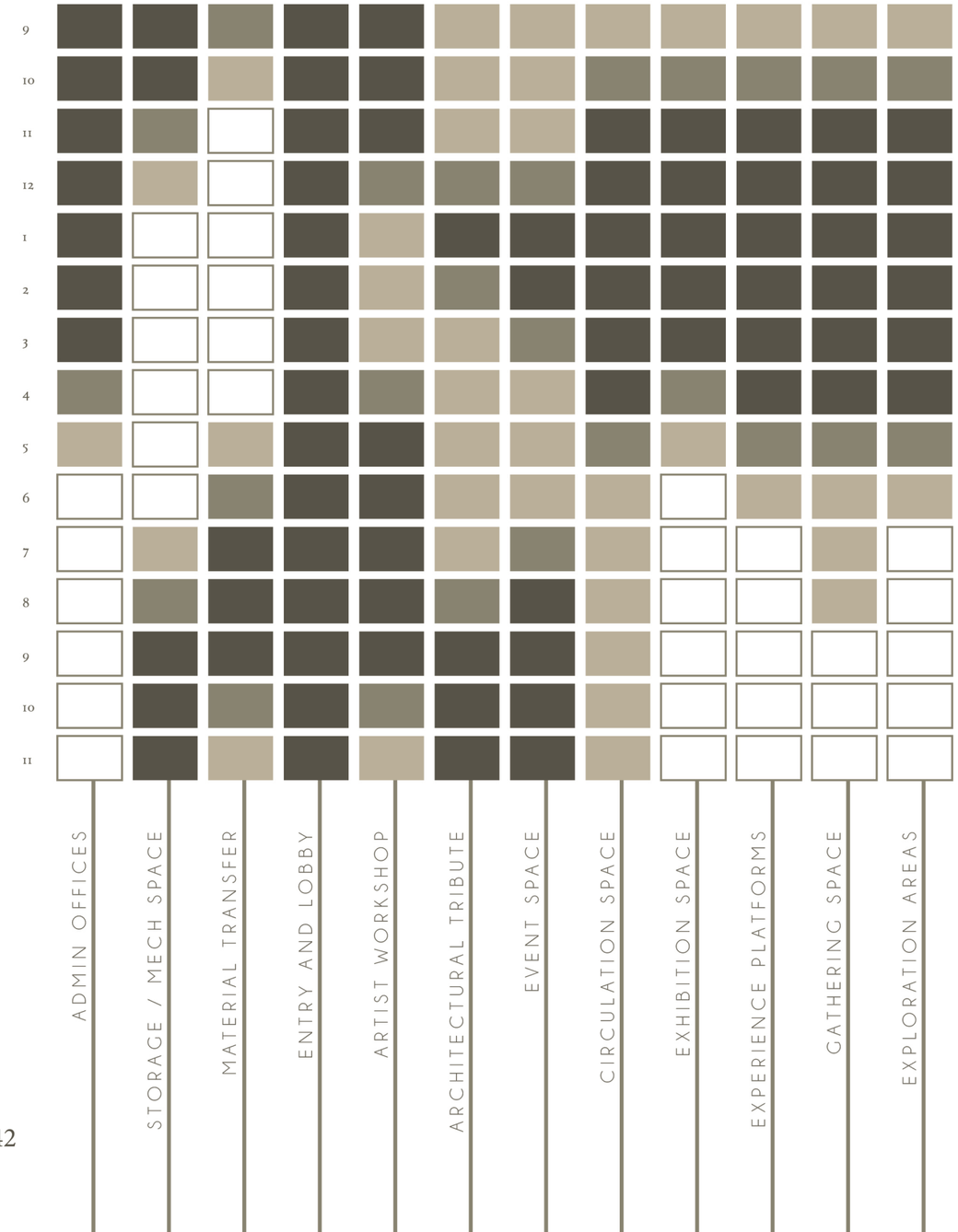
SQUARE FOOTAGE

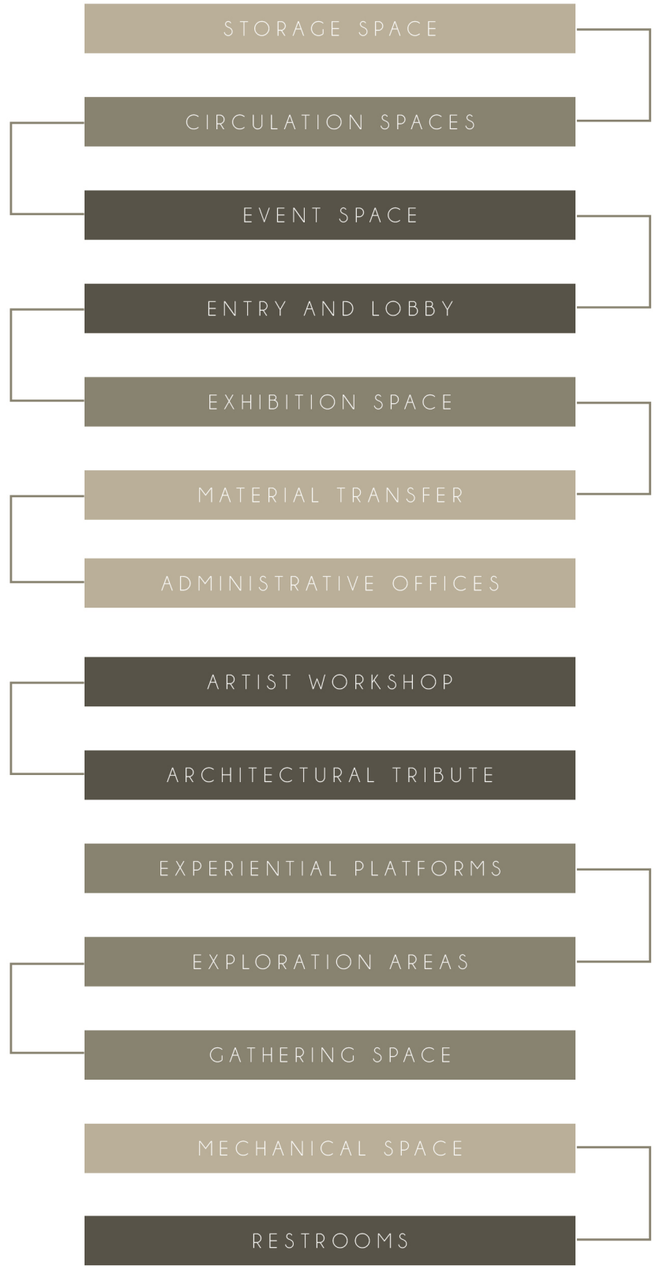
218,000

ABOVE

Figure 74 . Thesis Program Square Footages .

BUILDING PROGRAM





ABOVE

Figure 76 . Final Spatial Connectivity .

LEFT

Figure 75 . Spatial Usage Matrix .

LIGHT

ENTRY AND LOBBY

ADMINISTRATIVE OFFICES

EVENT SPACE

GATHERING SPACE

EXPERIENTIAL PLATFORMS

CIRCULATION SPACES

ARCHITECTURAL TRIBUTE

ARTIST WORKSHOP

EXHIBITION SPACE

MATERIAL TRANSFER

EXPLORATION AREAS

RESTROOMS

STORAGE SPACE

MECHANICAL SPACE

DARK

This thesis project calls for a variety of lighting characteristics. Some spaces do not require daylighting or become further stimulating with minimal daylighting levels. The explorations areas are a good example if this because they are built with the basis of light variations or adjustments. Some exhibition spaces will be staged for installations that are shown are night or in dimly lit spaces to contrast or highlight the artistic nature of the piece.

DAYLIGHT LEVELS

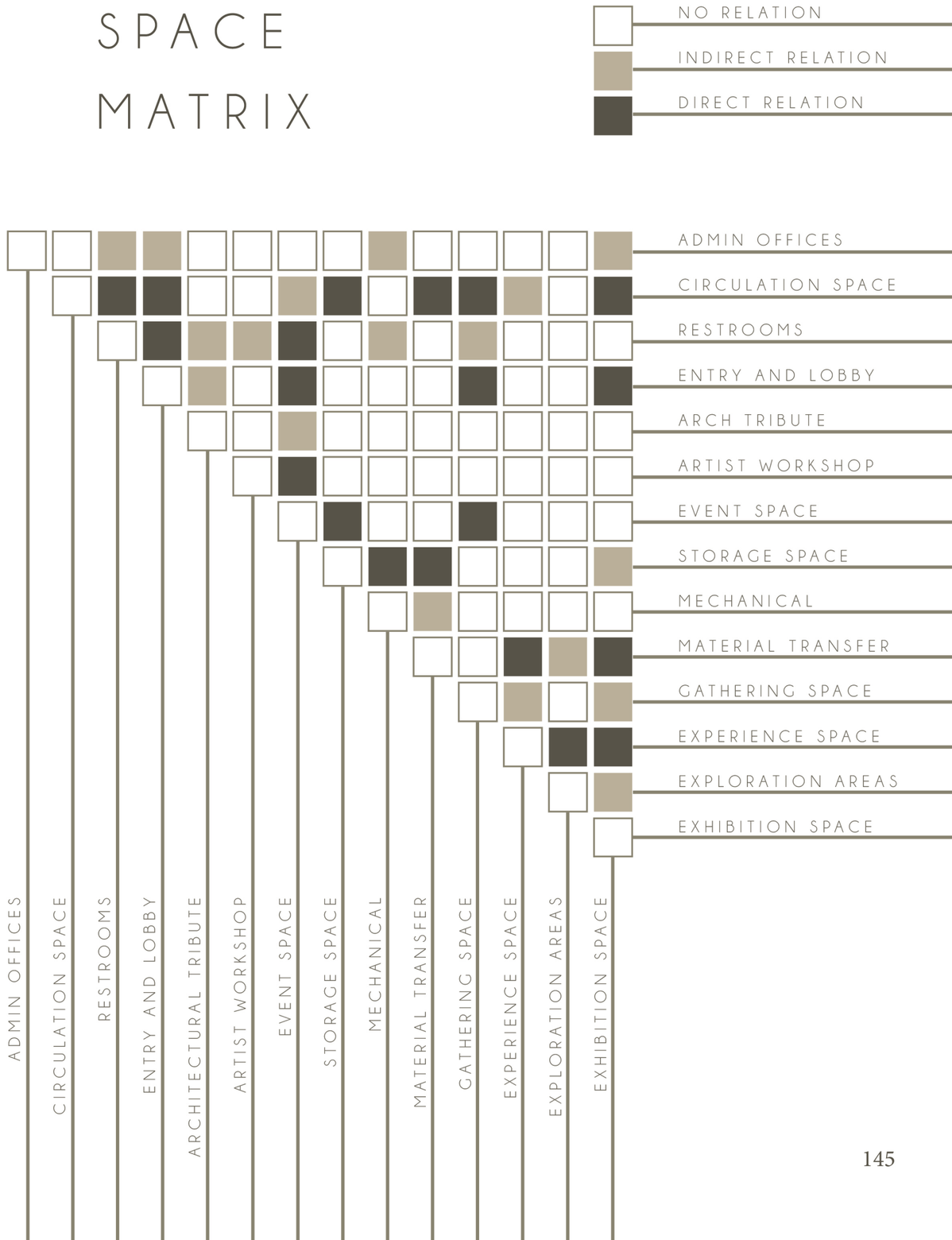
ABOVE

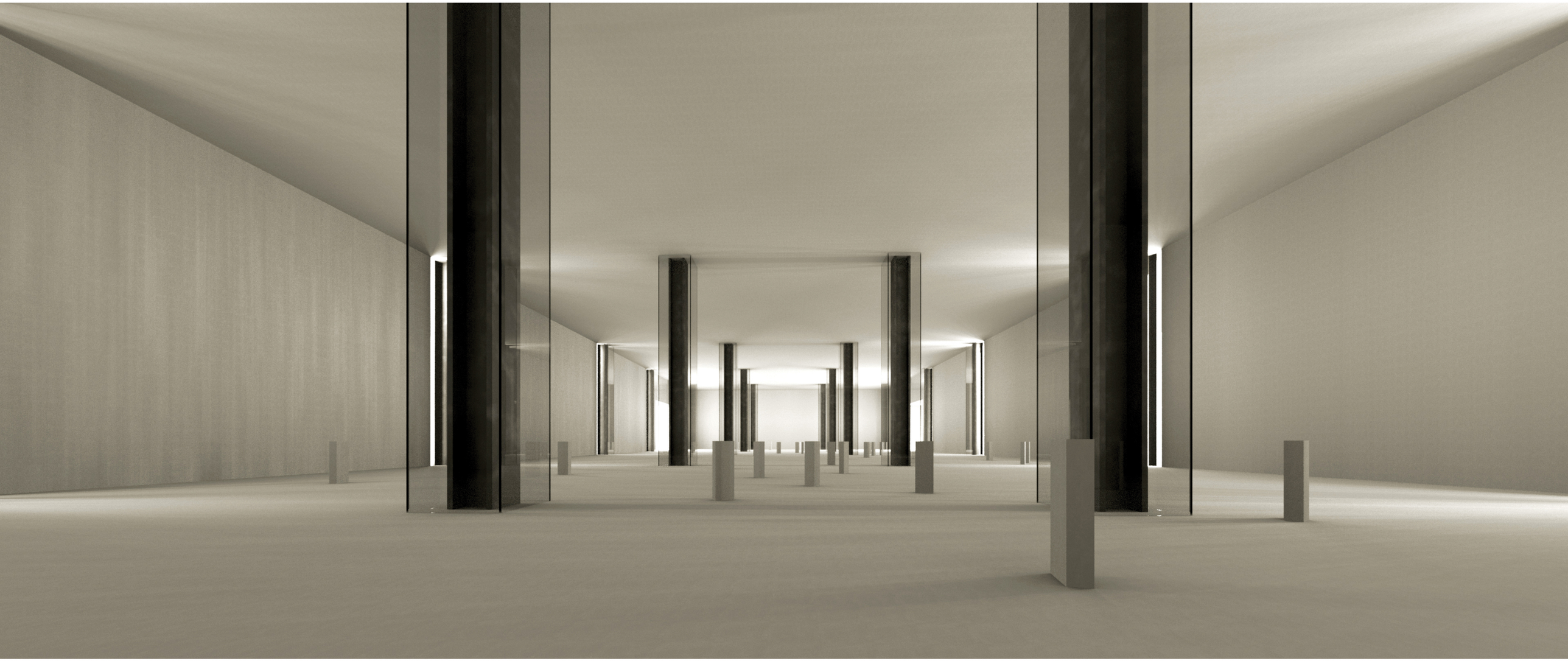
Figure 77 . Spatial Lighting Qualities .

RIGHT

Figure 78 . Space Relations Matrix .

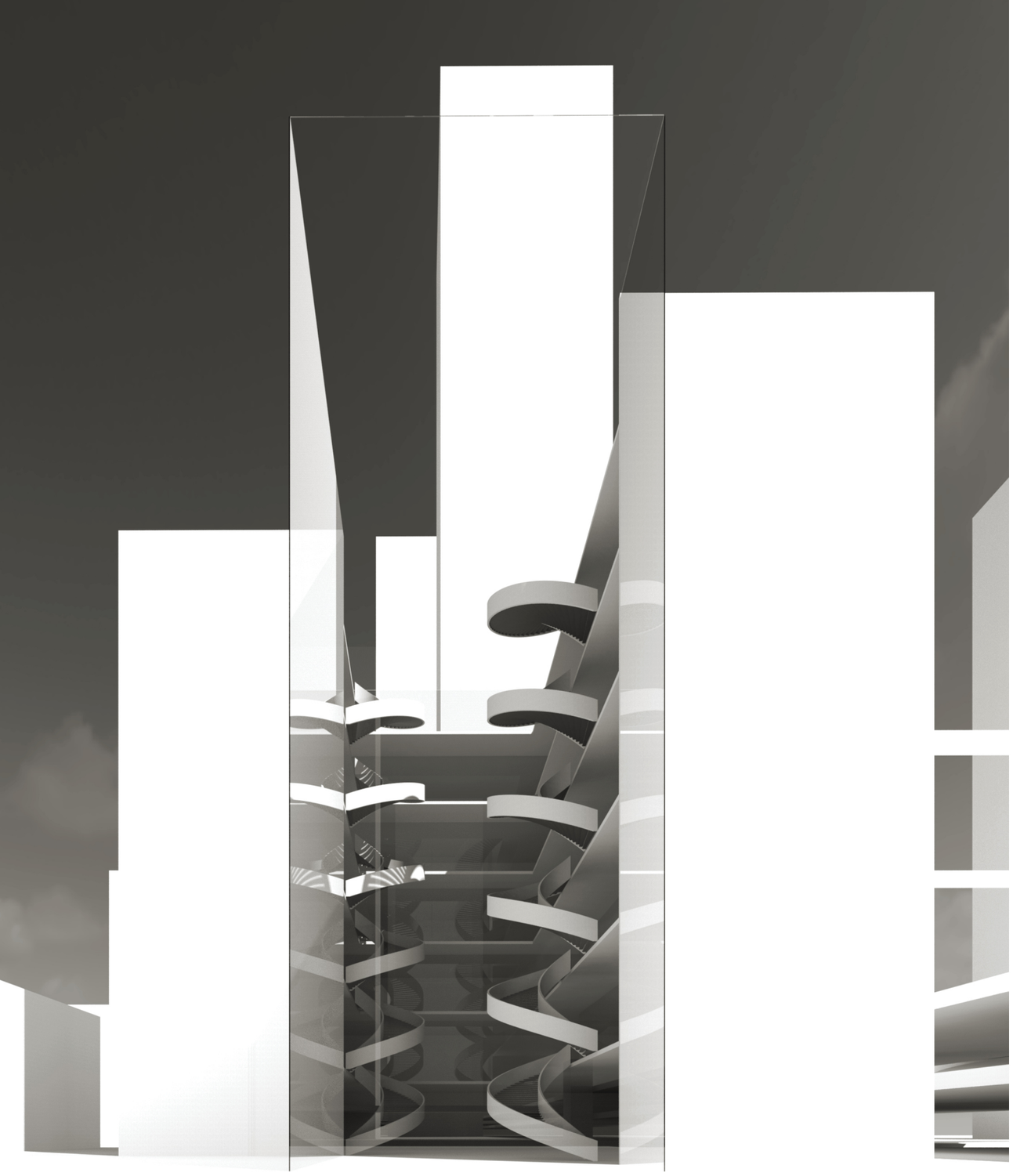
SPACE MATRIX

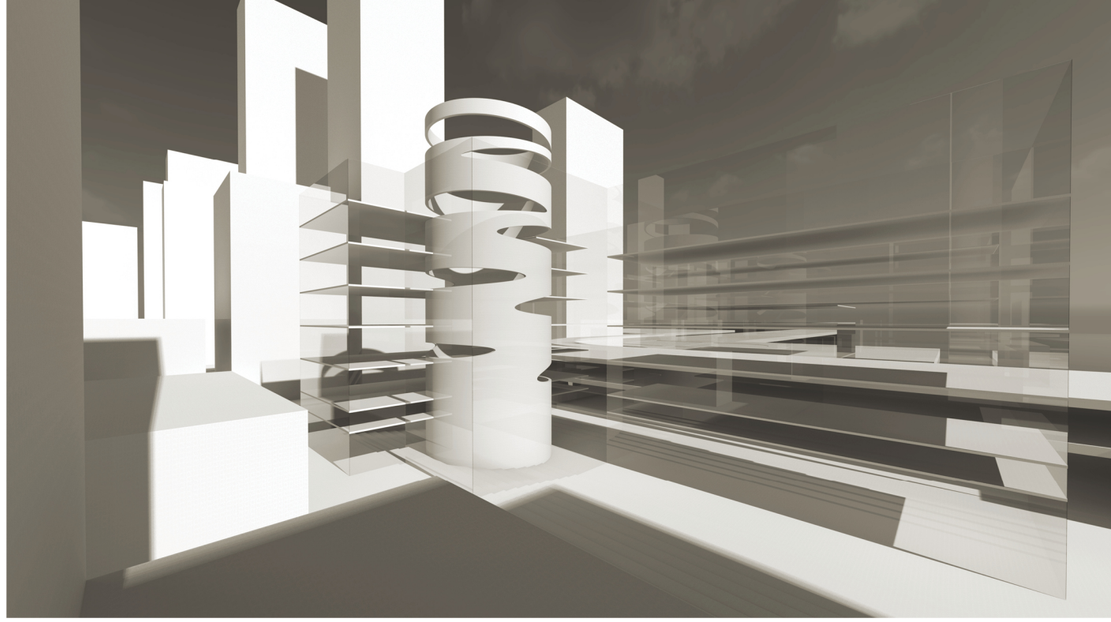


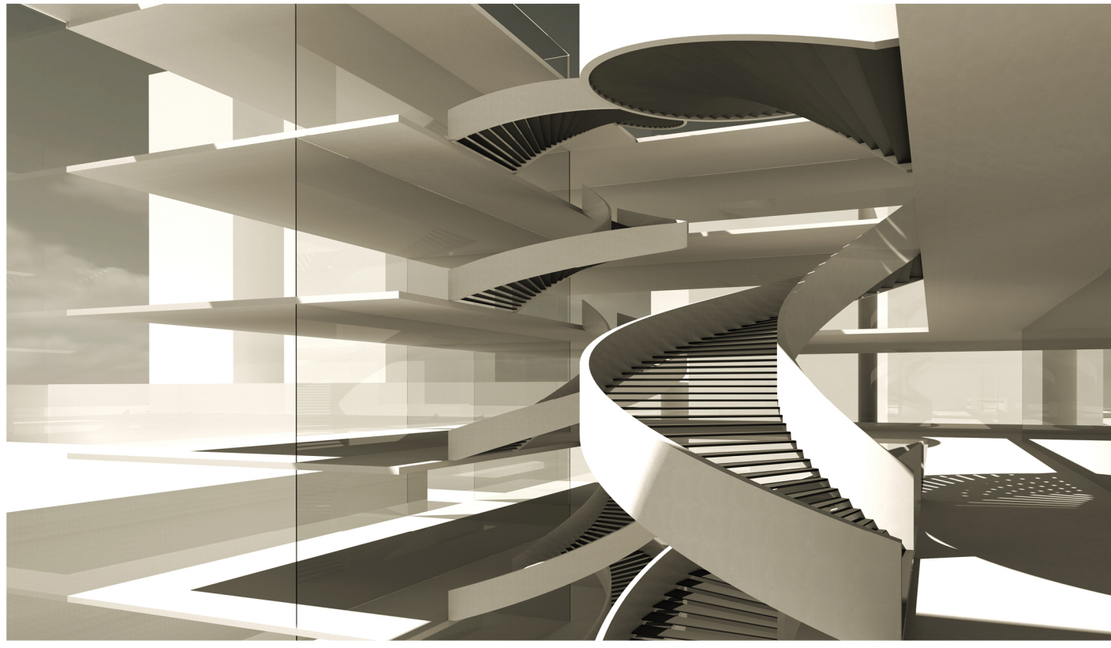


ABOVE

Figure 79 . Beneath Lake Shore Drive Gallery .







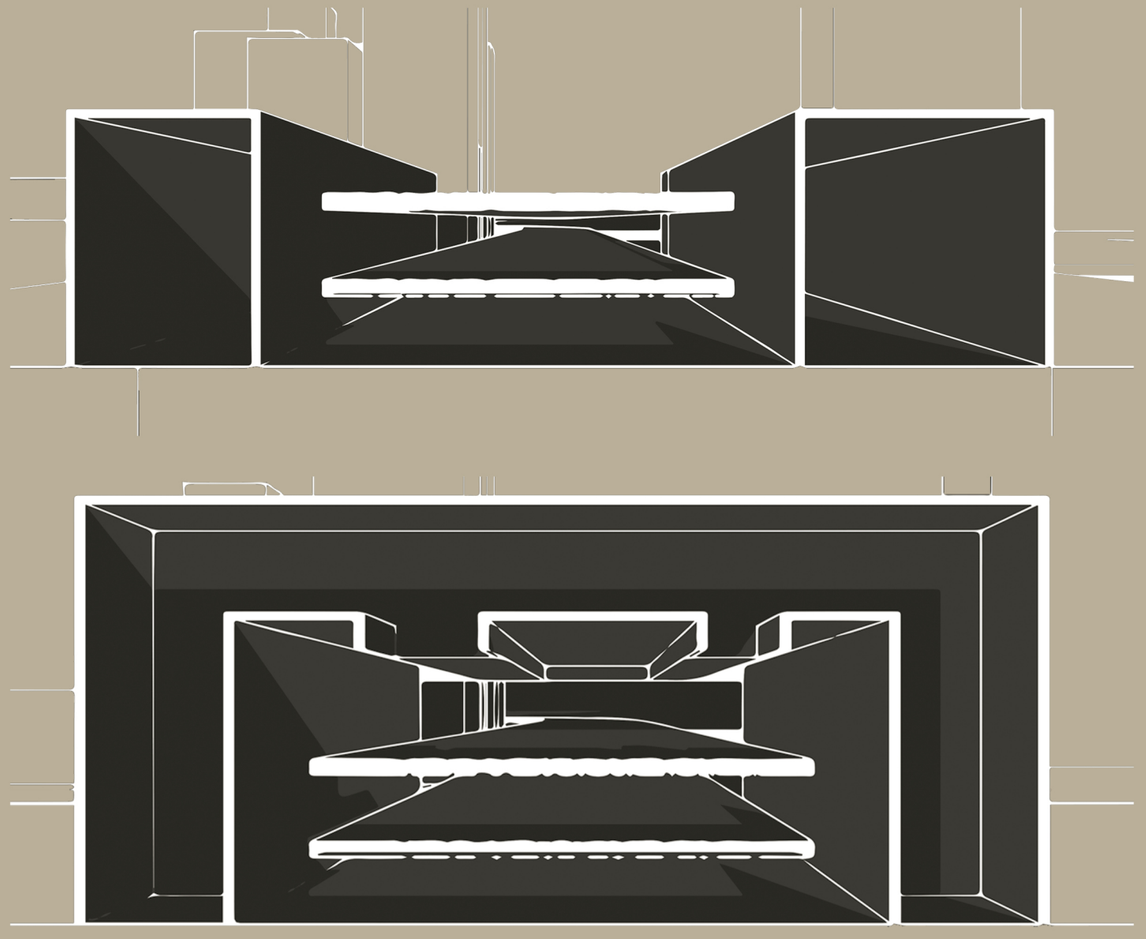
These process iterations were based on the circular form of the Calatrava Void and the vertical emphasis of the surrounding Chicago towers and skyline. As site research and analysis developed this concept had little to no relation with Lake Shore Drive which lead the project in a different direction.

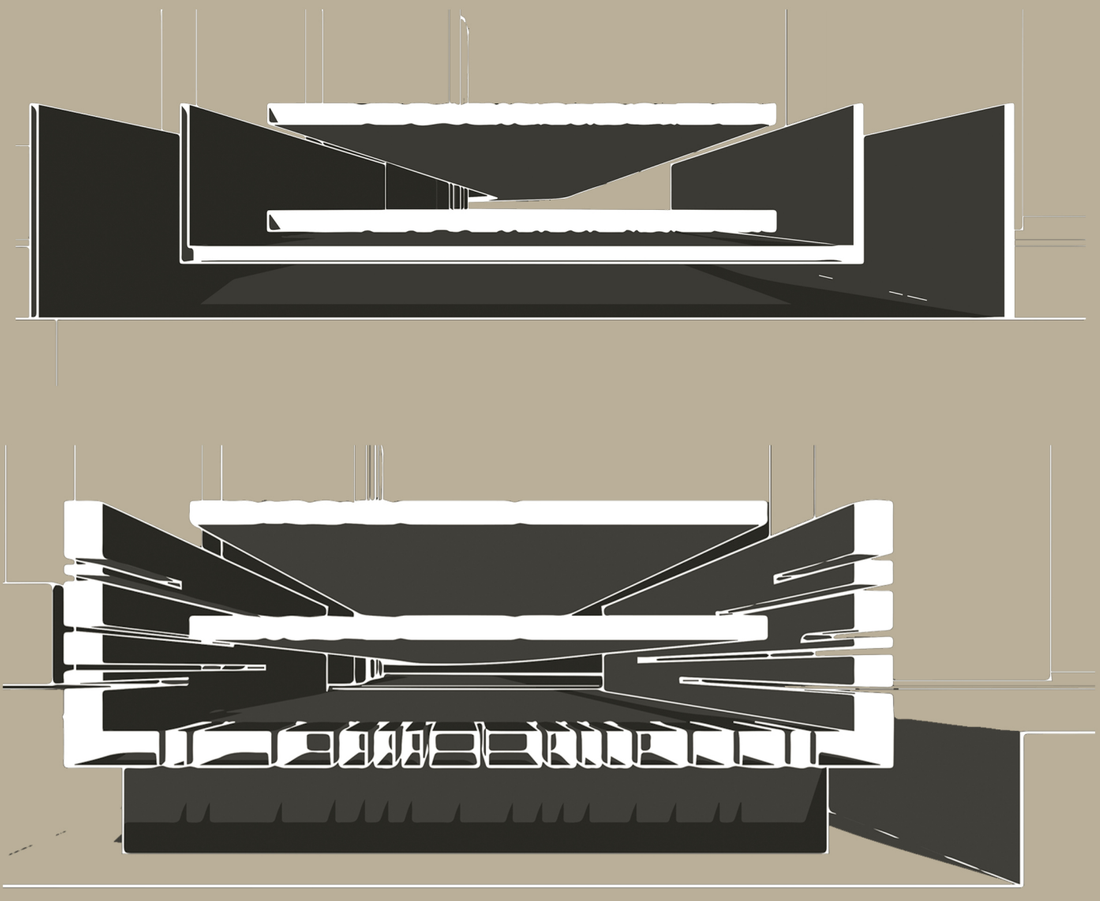
ABOVE

Figure 80 . Spiral Staircase Iterations .

SOUND CHAMBERS

Incorporating the Calatrava Void and Lake Shore Drive into the thesis project became a challenge. Iterations involving the relationship of a proposed structure to Lake Shore Drive were tested to see which spatial ideas would bring the most sensory experience to visitors and which could successfully provide movement about the site.

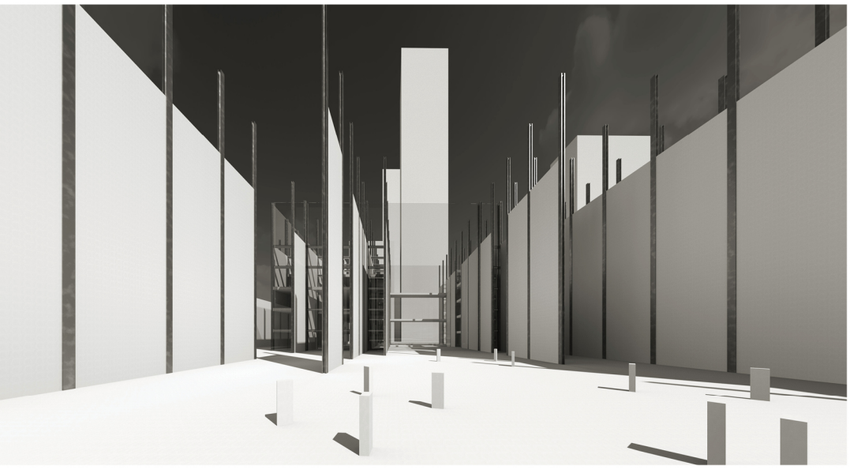


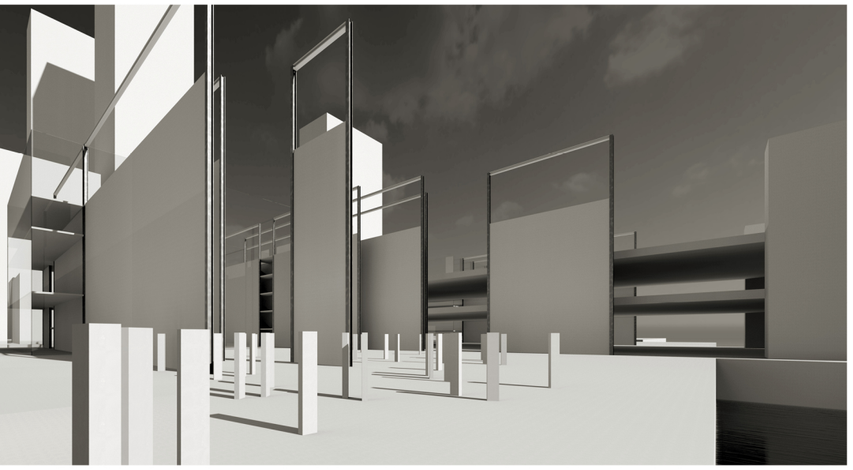


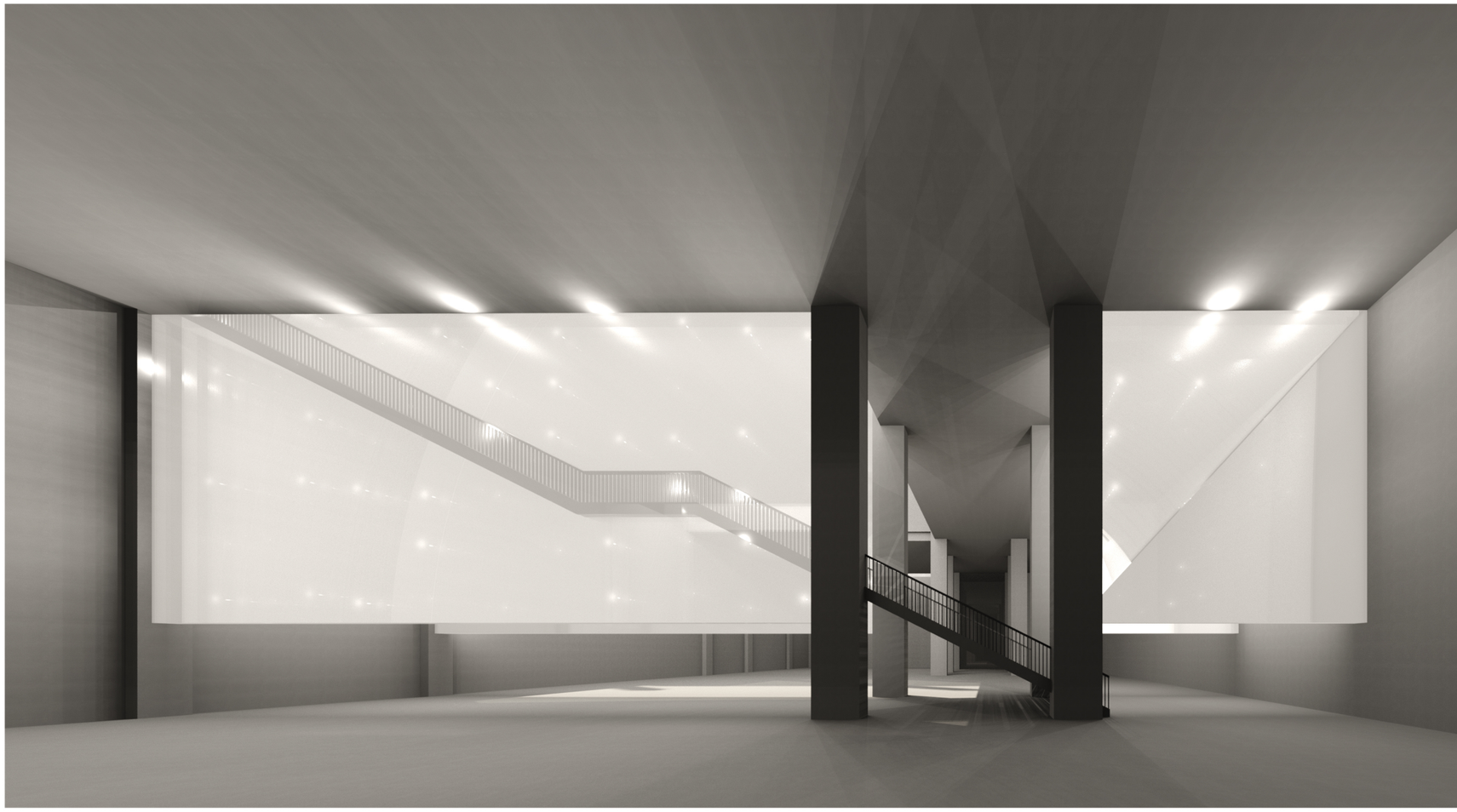
ABOVE

Figure 81 . Sound Chamber Iterations .

VERTICAL CANVAS



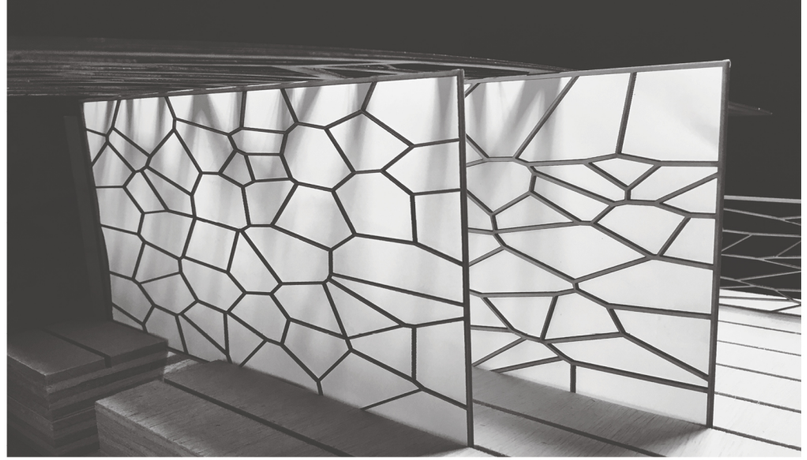


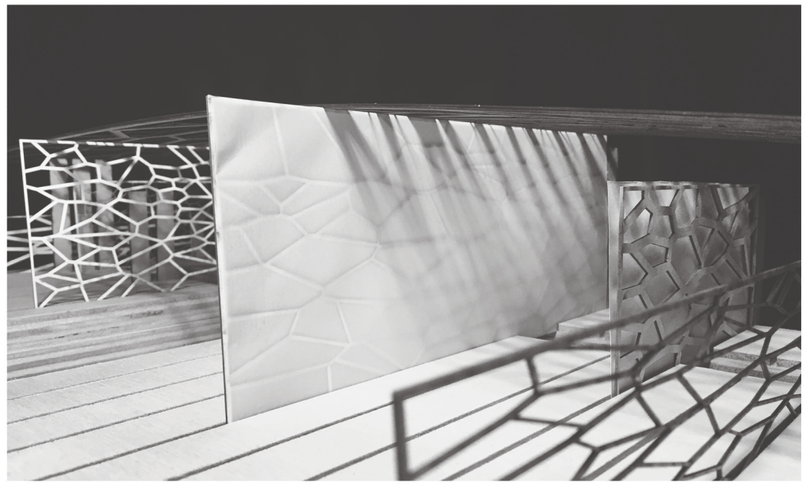


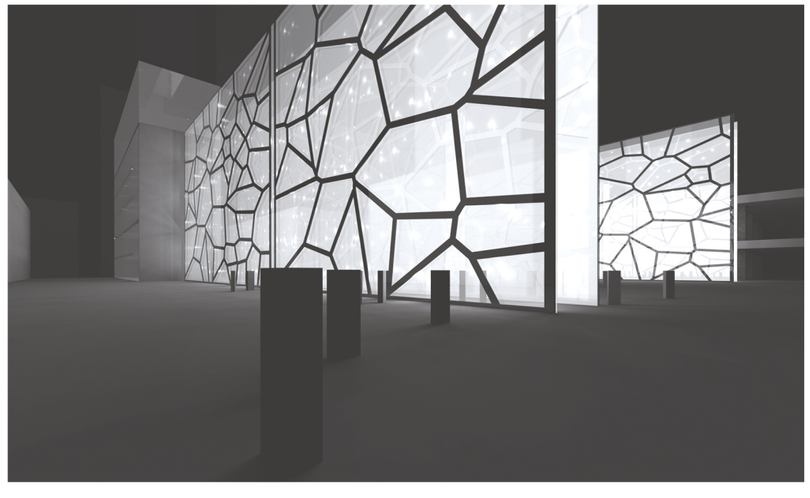
ABOVE

Figure 82 . Vertical Canvas Iterations .

The vertical canvas iterations were designed to act as filters that disperse sound and light as well as wind. These structures are randomly distributed and include 138 transparent panels and 26 sound chamber tubes. Originally they were only located at the plaza level, but as the project transitioned into a museum below grade so did they. These vertical walls capture daylight and transfer that light into the gallery spaces below.





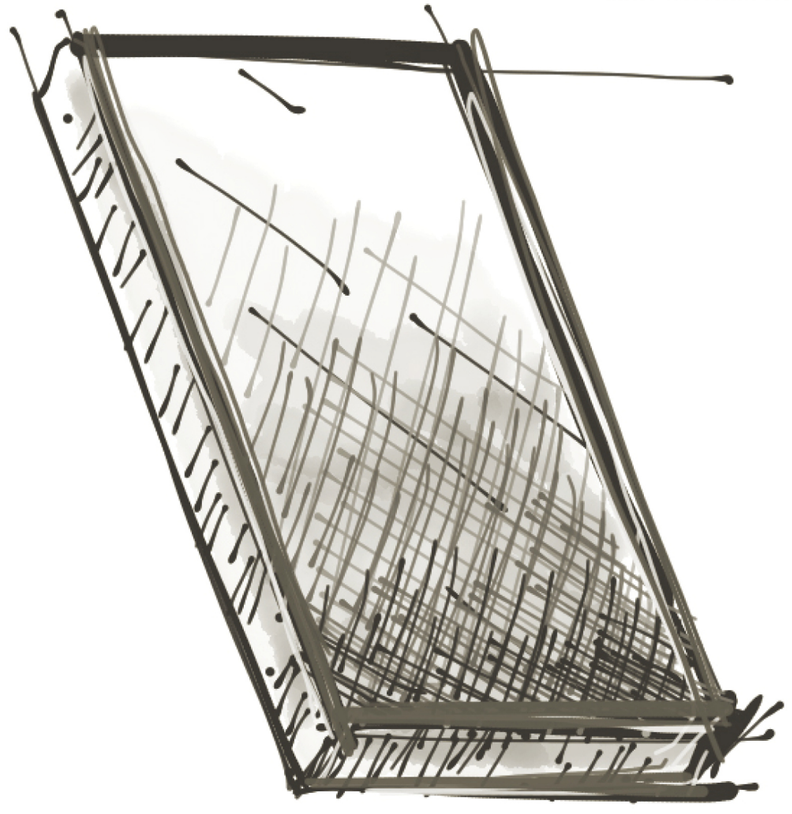


INSPIRATION SKETCHES

Fading semi transparent wall panels

covered in photovoltaics and wind

micro turbulents for energy

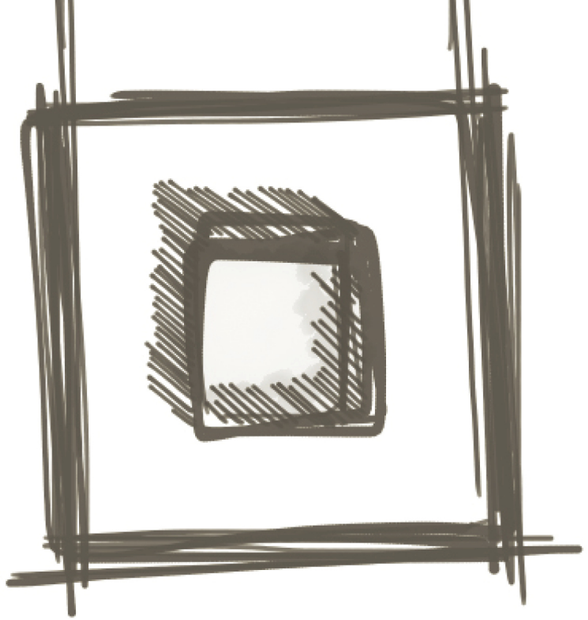


ABOVE

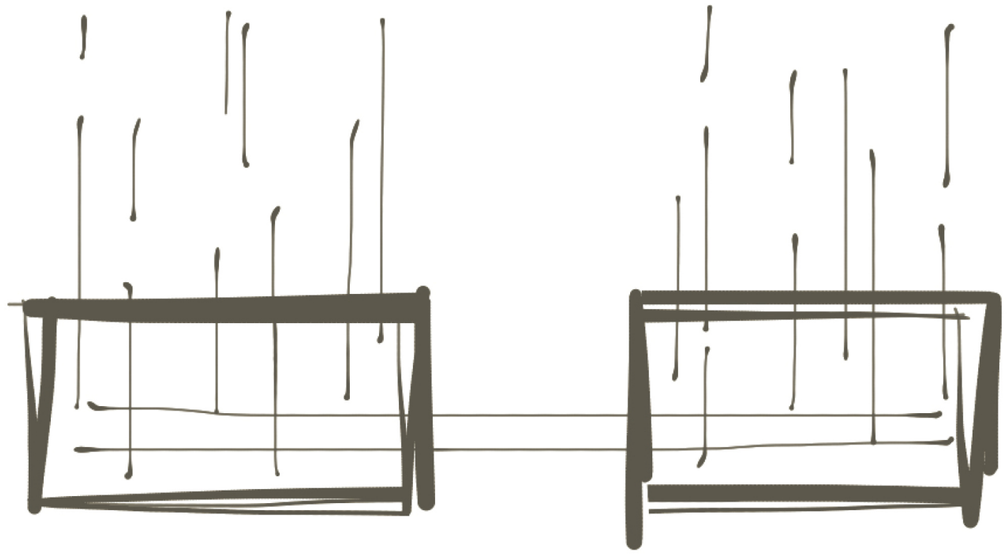
Figure 84 . Subterranean Void Inspiration Sketches .

LEFT

Figure 83 . Voronoi Shadows Iterations .

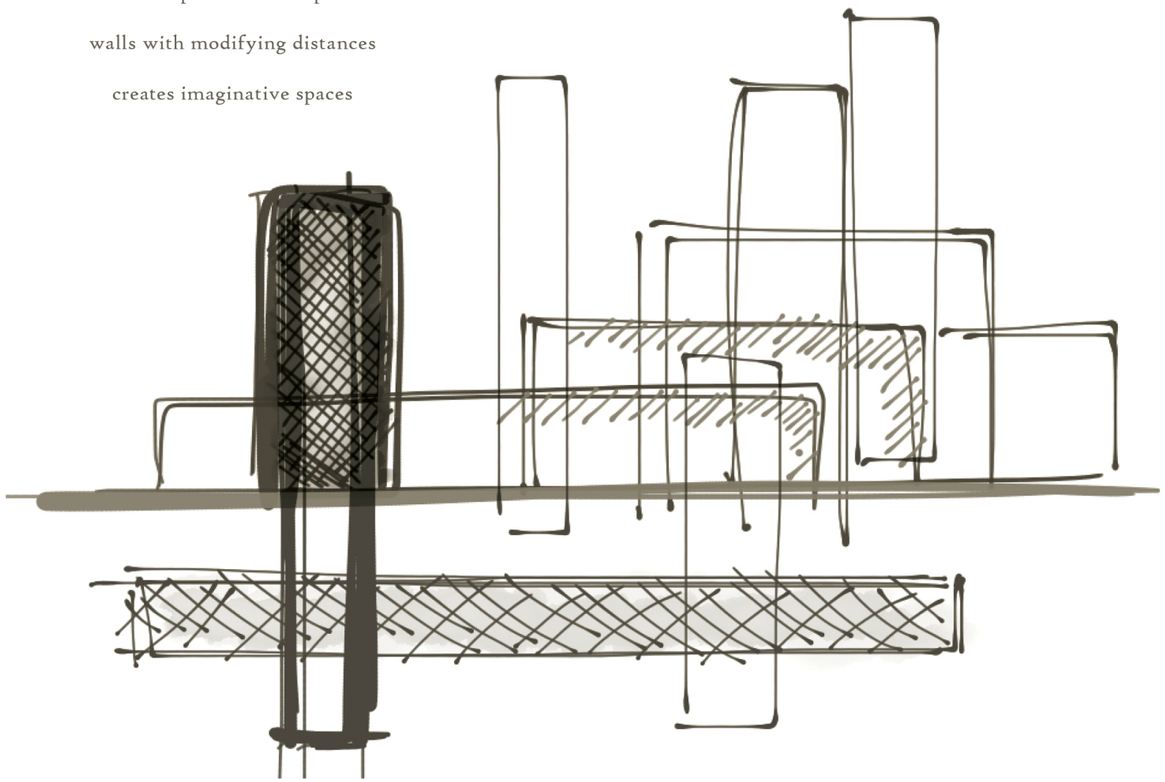


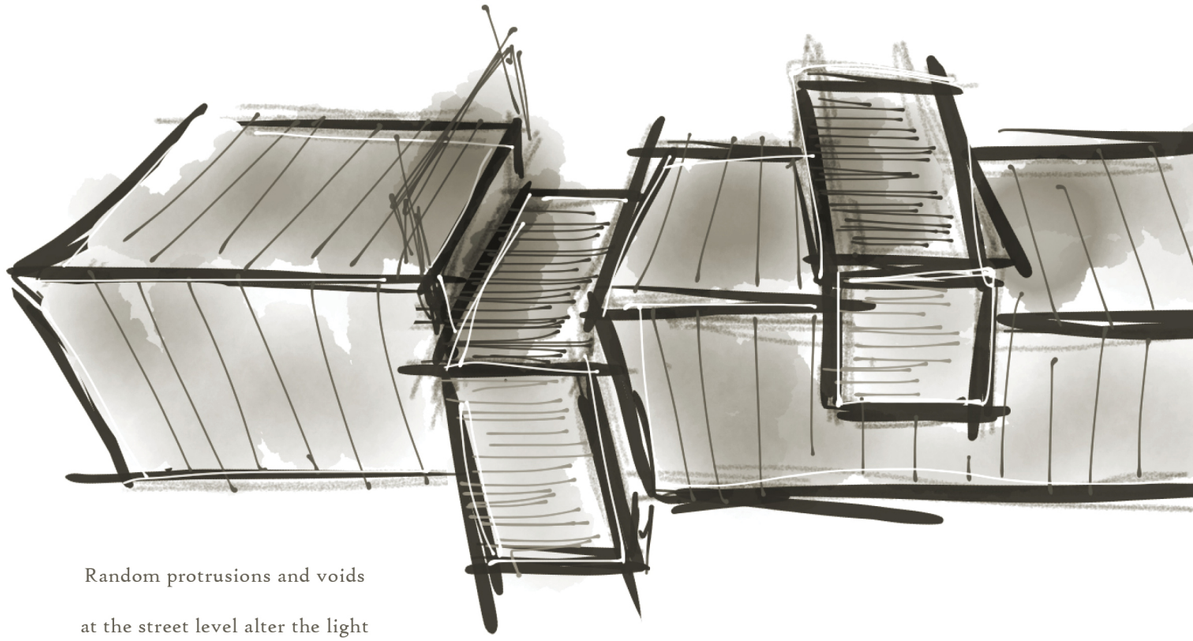
Contrasting solid core element as distinct skyspace surrounded by scattered clear panels in the plaza



Building elements transfer from the subterranean levels and reach up into the sky

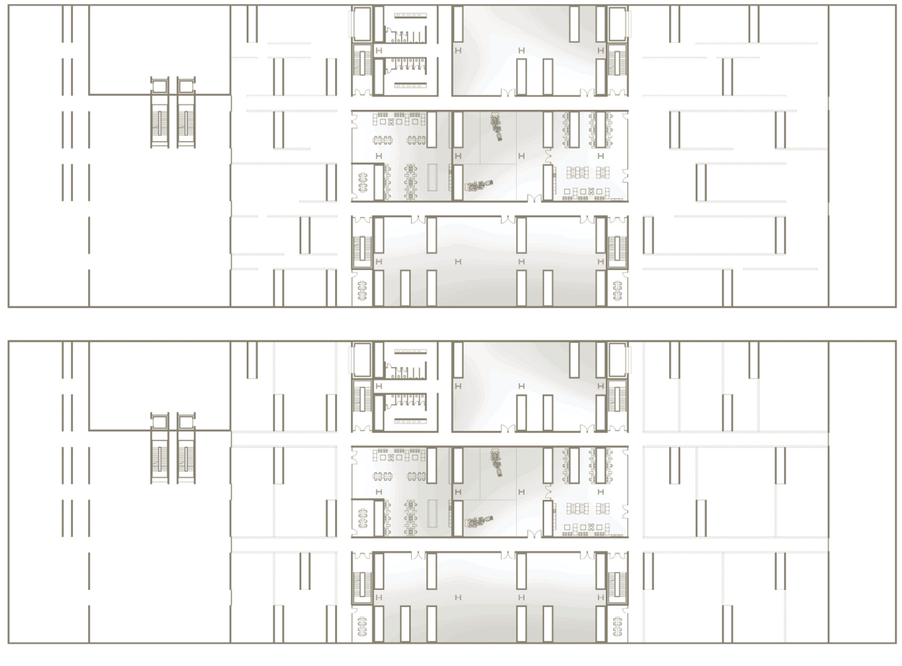
Various repetitive white parallel walls with modifying distances creates imaginative spaces

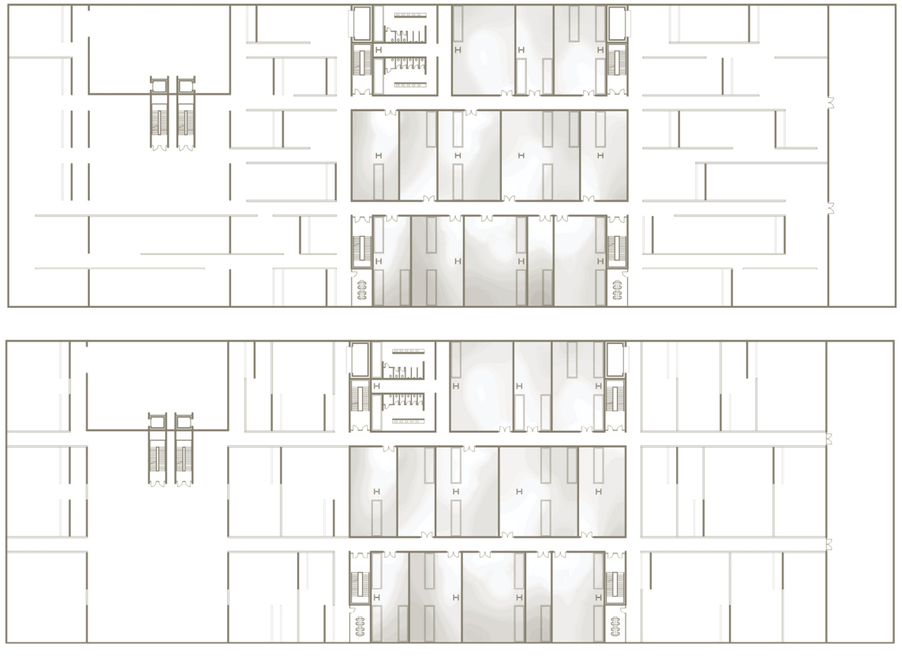




Random protrusions and voids at the street level alter the light levels of the spaces below

FINAL PROJECT





ABOVE

Figure 85 . Floor Plan Layout .

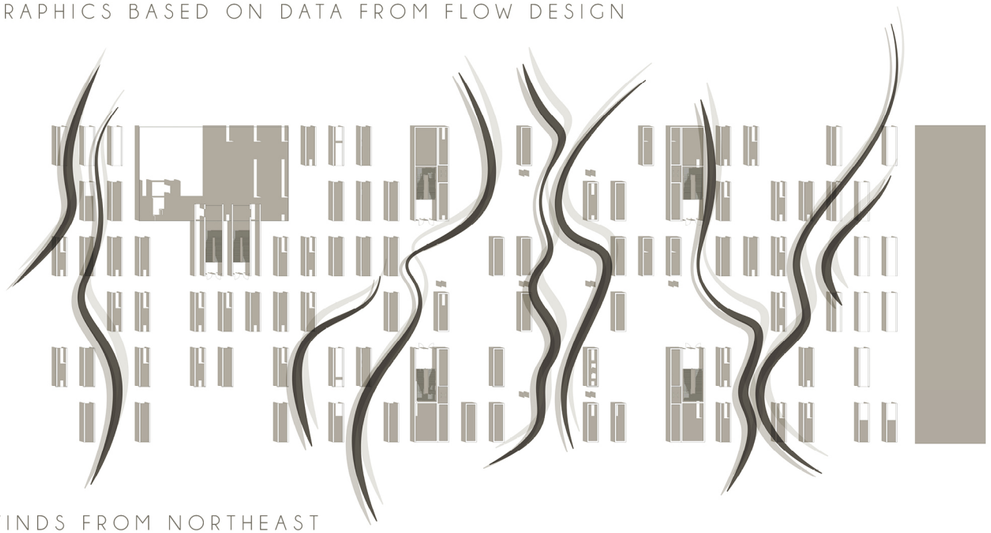
UPPER LEVEL . 80,785 SQ FT

PRIVATE MEZZANINE EXHIBIT SPACES . 18,524 SQ FT
PRIVATE EVENT/MATERIAL ELEVATOR
ADMIN CONFERENCE ROOMS
ADMIN OFFICE WORKSPACE LOUNGE . 4,750 SQ FT
ADMIN/ARTIST/EVENT RESTROOMS . 2,241 SQ FT
SOUTH MECH/STORAGE . 9,540 SQ FT
NORTH MECH/STORAGE . 6,488 SQ FT
ARTIST ROBOTIC LAB . 4,284 SQ FT
ARTIST RESEARCH SPACE/LOUNGE . 3,400 SQ FT
ARTIST MATERIAL TRANSFER ELEVATOR
ARTIST CREATION/GALLERY WORKSPACE . 31,558 SQ FT
ARTIST BREAKOUT/CONFERENCE
FOUR PRIVATE AND EGRESS STAIRS

LOWER LEVEL . 137,215 SQ FT

WEST ATRIUM EXHIBIT SPACE . 13,792 SQ FT
SKYSPACE . 7,328 SQ FT
PAIR OF ENTRY STAIRS & ELEVATORS
RECEPTION & COAT CHECK
CENTRAL EXHIBIT . 20,850 SQ FT
MAIN ATRIUM EXHIBIT . 11,740 SQ FT
PRIVATE EVENT/MATERIAL ELEVATOR
ARTIST MATERIAL TRANSFER ELEVATOR
PUBLIC VISITOR RESTROOMS . 2,241 SQ FT
TWO SMALL BREAKOUT SPACES
FOUR PRIVATE AND EGRESS STAIRS
EAST EXHIBIT . 20,850 SQ FT
SUBTERRANEAN COURTYARD . 11,464 SQ FT
SOUND CHAMBERS . 35,250 SQ FT

GRAPHICS BASED ON DATA FROM FLOW DESIGN



WINDS FROM NORTHEAST

WINDS FROM SOUTHWEST

WINDS FROM SOUTHEAST

MUSEUM ATTENDANCE

1,500,000 Visitors Per Year

4,000 Visitors Per Day

Final Design: a capacity of 1,000 visitors at one time

PLUMBING FIXTURES

Men : 1 per 125 // 6 x 125 = 750

Women : 1 per 65 // 12 x 65 = 780

780 + 750 = 1,530 visitors at one time

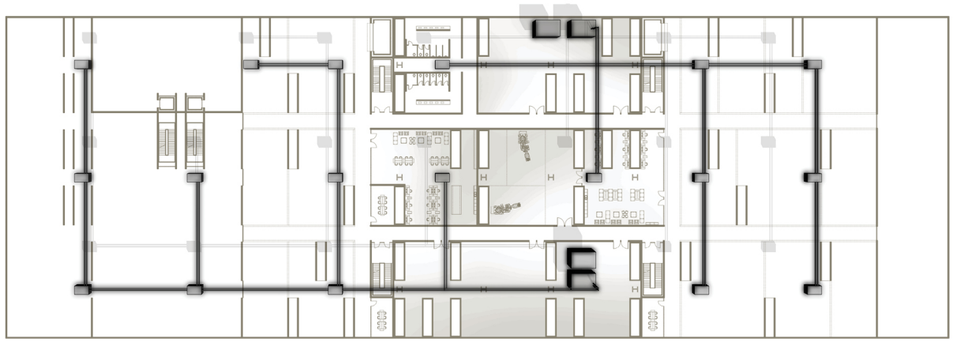
HVAC ZONE SIZING

Suspended Ceiling Package Air Handling Units

50 Tons // Serves 5,00 - 7,500 Sq Ft Floor Area

10' Length x 8' Width x 4' Height

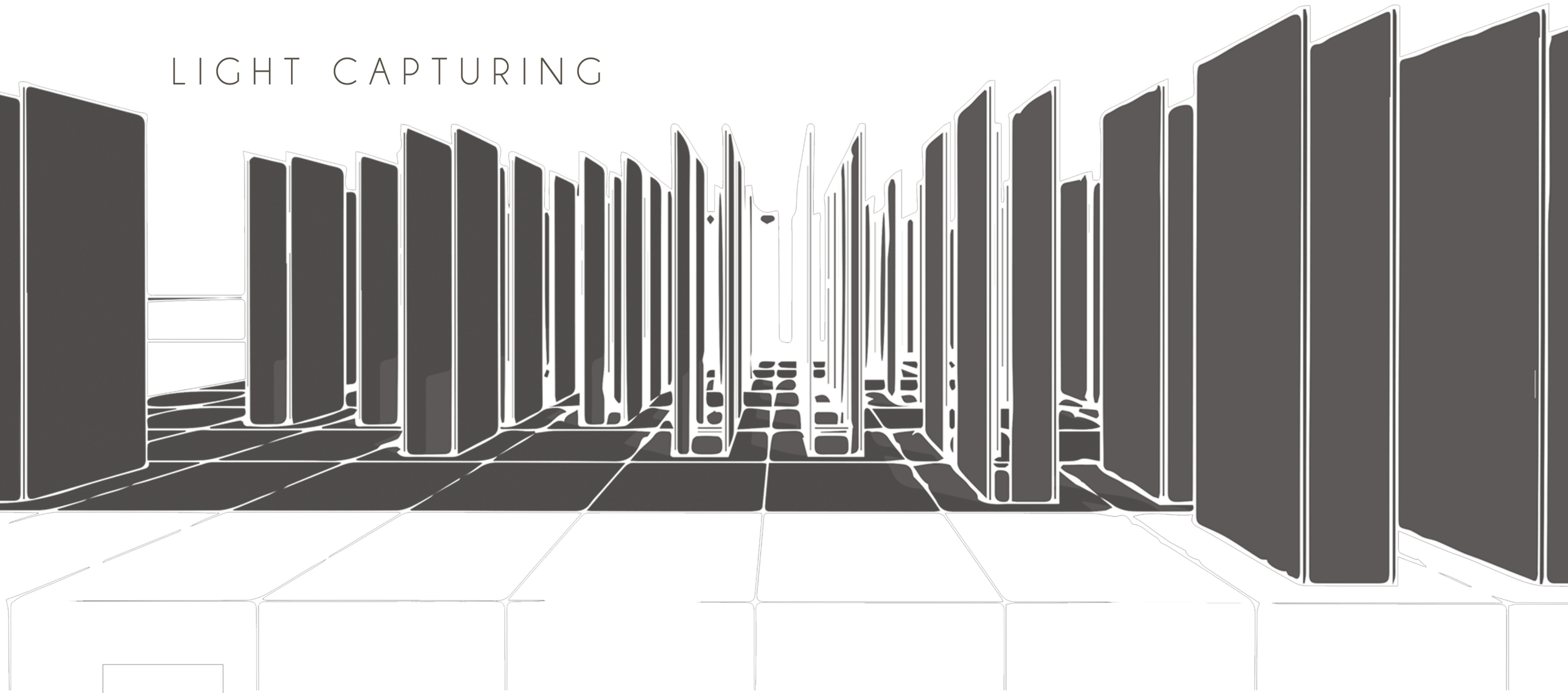
Water Induction System



ABOVE

Figure 86 . Wind Diagrams & Mech System .

LIGHT CAPTURING



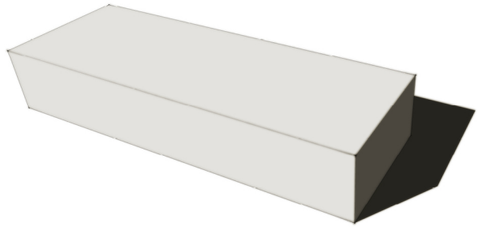
SECTION LOOKING NORTH

SECTION LOOKING EAST

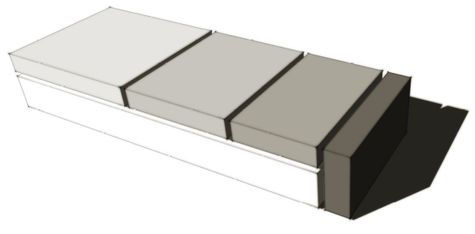
ABOVE

Figure 87 . Building Sections & Plaza Concept .

FROM CONCEPT TO FORM

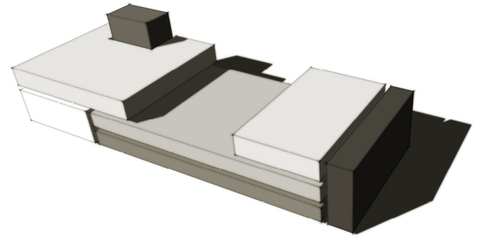


Program Elements



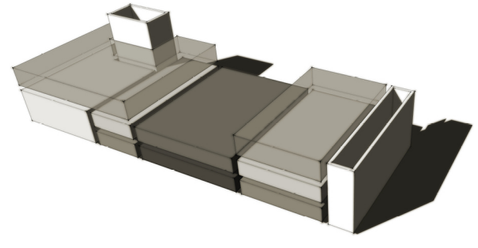
Establish Composition with

Relation to Lake Shore Drive



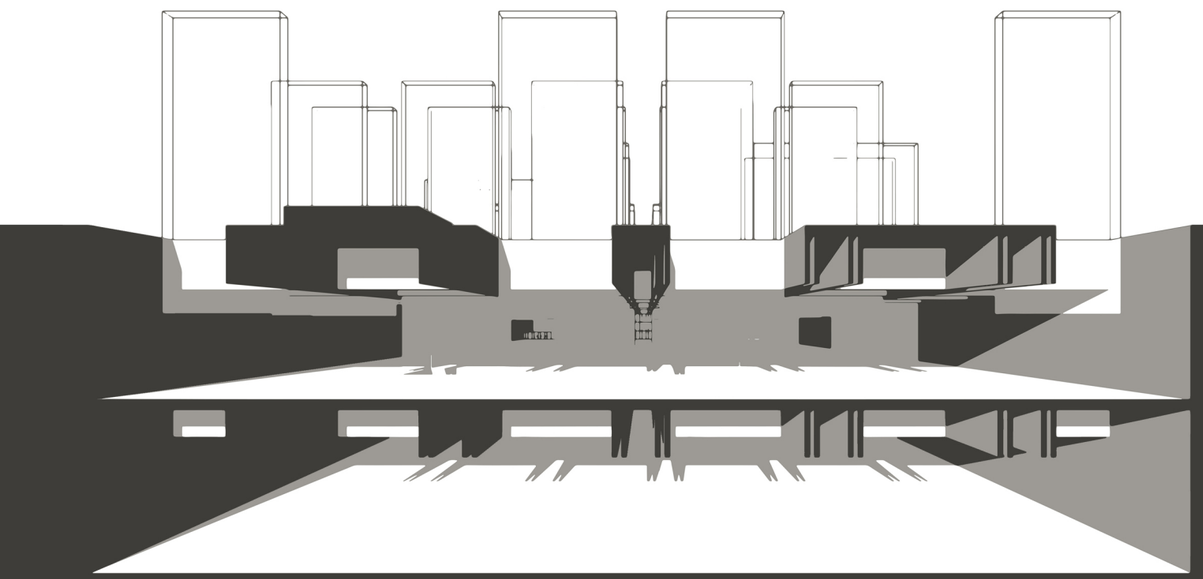
Divide into Plaza, Skyspace,

Artist Space, and Exhibit Space

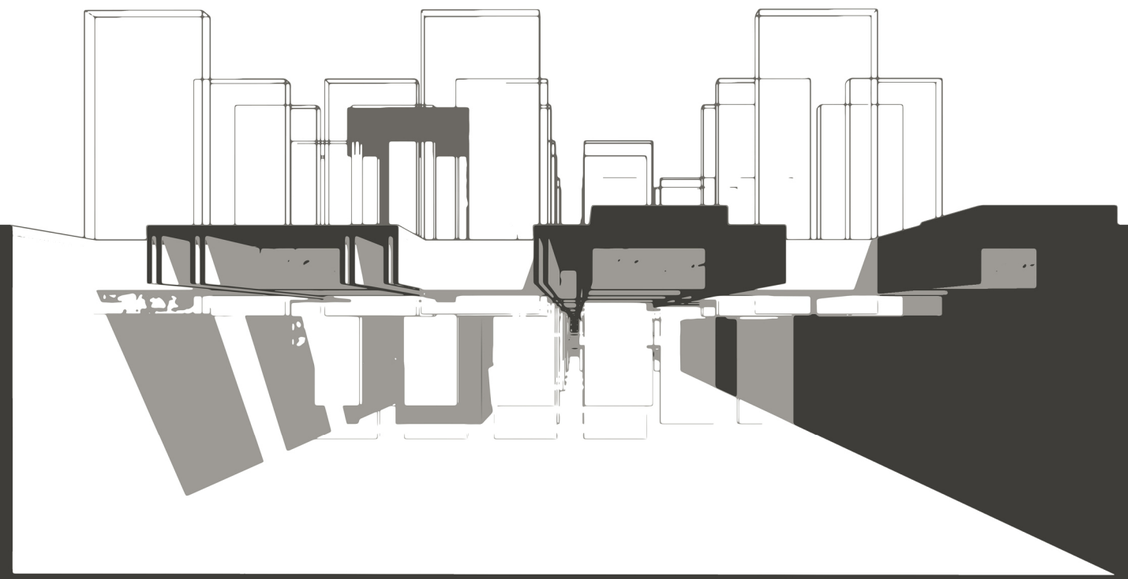


Function of Sound Chambers and

Daylighting Levels



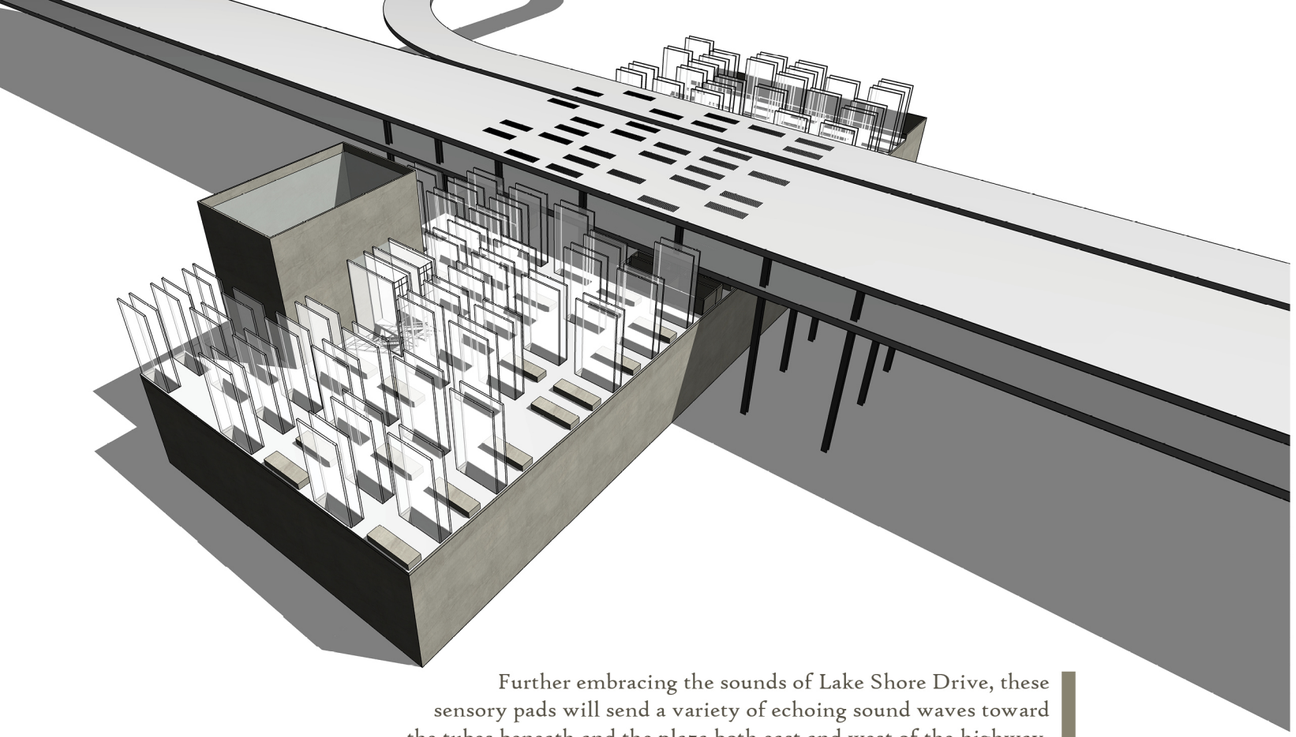
EAST ELEVATION PERSPECTIVE



WEST ELEVATION PERSPECTIVE

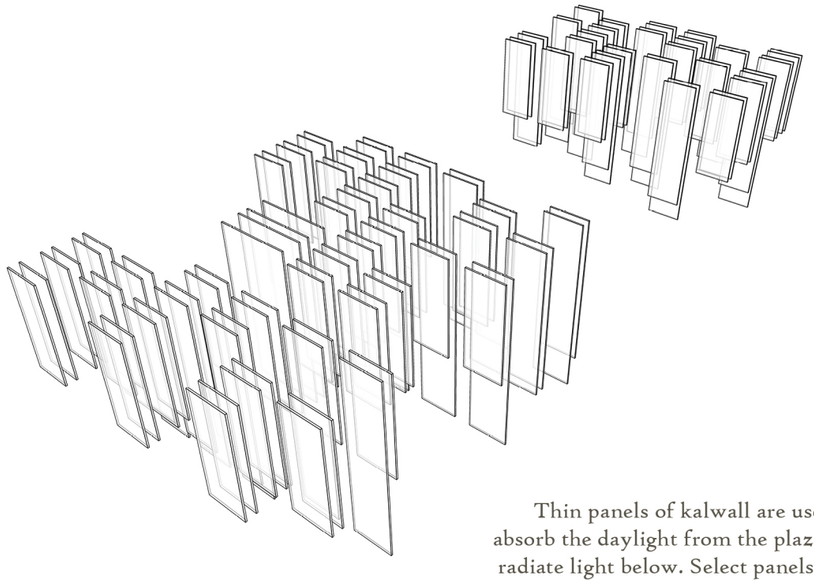
ABOVE

Figure 88 . Elevations & Concept Forms .



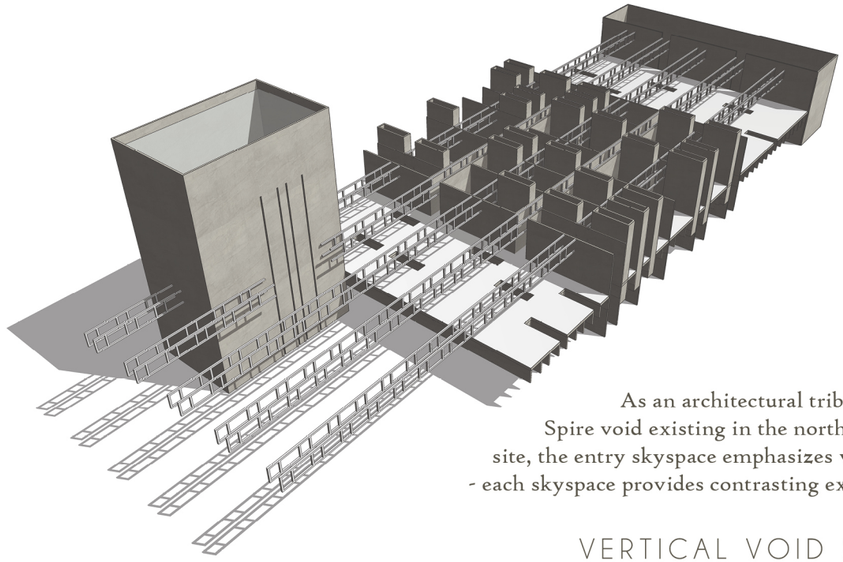
Further embracing the sounds of Lake Shore Drive, these sensory pads will send a variety of echoing sound waves toward the tubes beneath and the plaza both east and west of the highway.

SENSORY PADS ON LAKE SHORE DRIVE



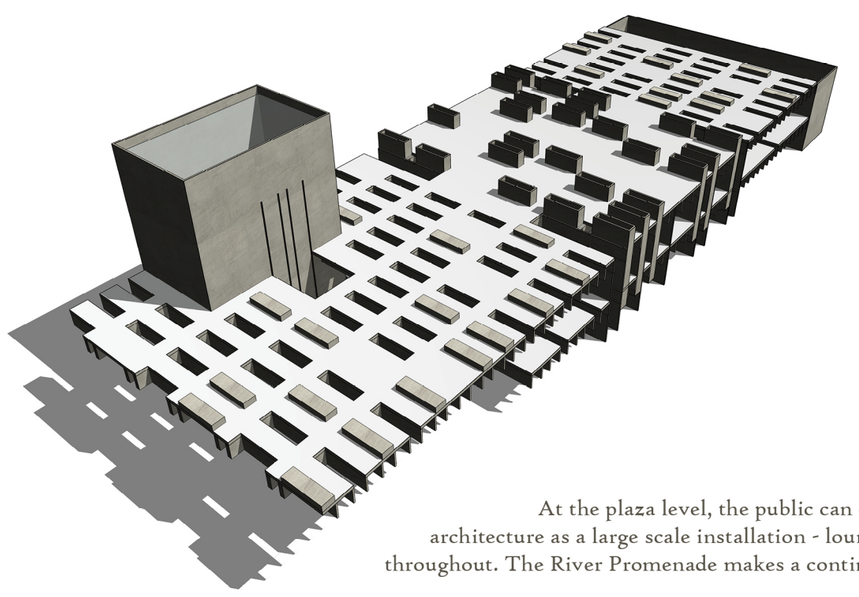
Thin panels of kalwall are used to capture and absorb the daylight from the plaza level above and radiate light below. Select panels will be equipped with photovoltaics and micro turbulents.

138 LIGHT & ENERGY PANELS



As an architectural tribute to the Chicago Spire void existing in the northwest corner of the site, the entry skyspace emphasizes vertical movement - each skyspace provides contrasting experience qualities.

VERTICAL VOID SKYSPACES

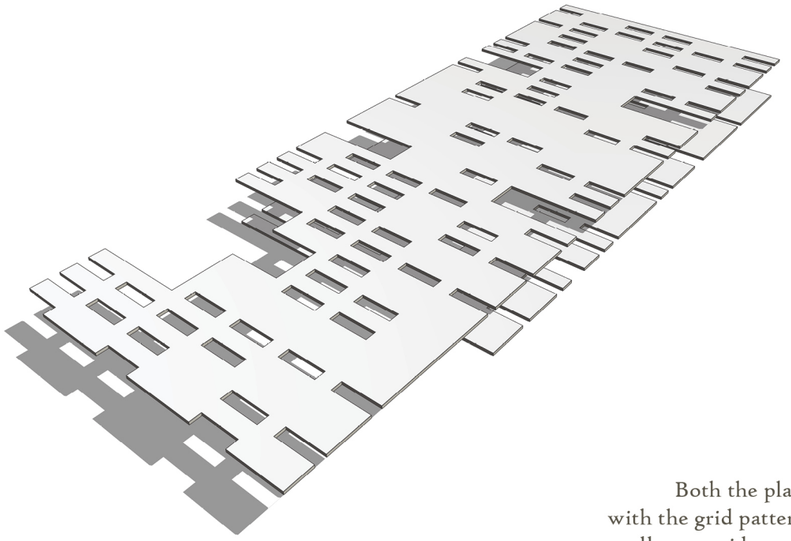


At the plaza level, the public can explore and experience the architecture as a large scale installation - lounge platforms are scattered throughout. The River Promenade makes a continuous loop around the site.

PLAZA LEVEL SEATED PLATFORMS

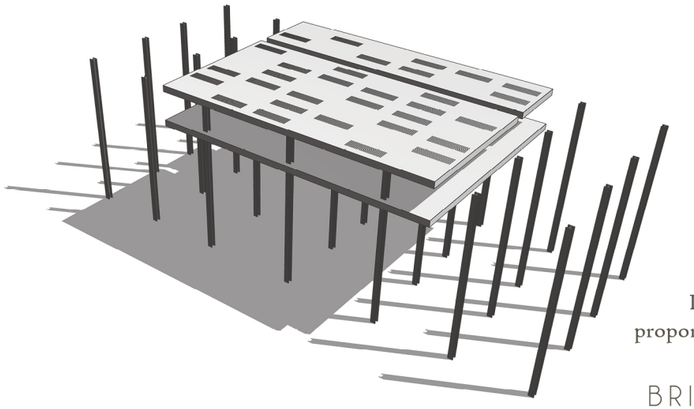
ABOVE

Figure 89 . Isometric Building Components .



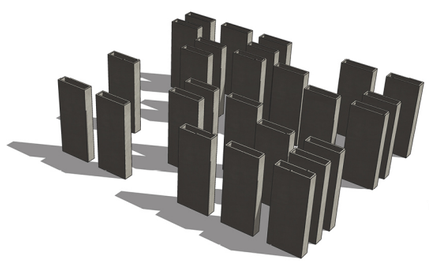
Both the plaza and interior floor slab are void with the grid pattern to allow for natural daylight as well as provide a repetitious installation experience.

PATTERNED FLOOR SLABS



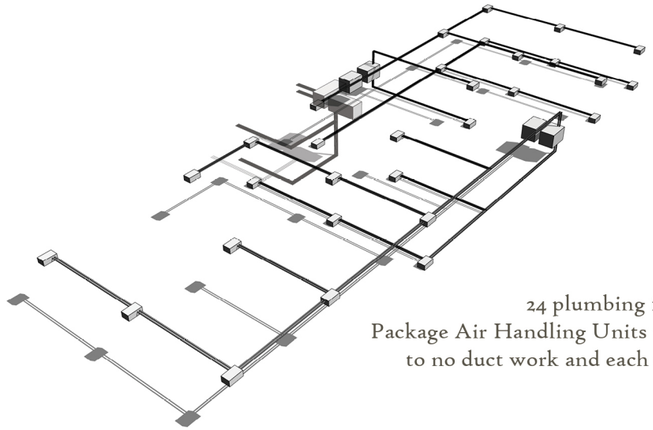
The existing structural elements of Lake Shore Drive protrude into the museum but are directly proportioned into the grid system of the spaces below.

BRIDGE STRUCTURAL ELEMENTS



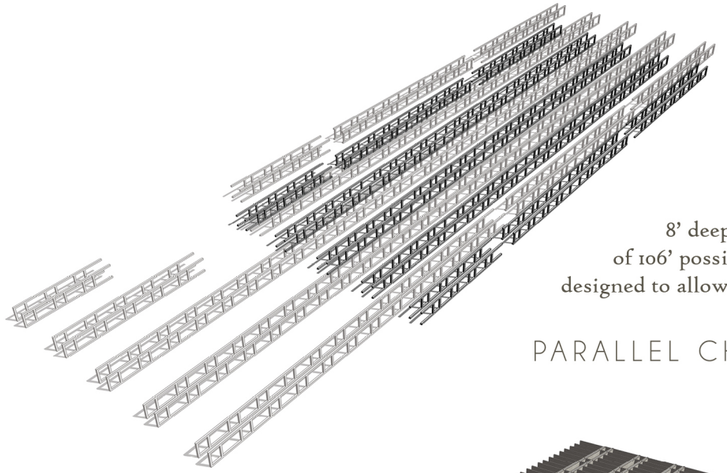
Concrete tube forms enable sound waves to travel into the 13 sound chambers on the lower floor. The tubes also allow for the transfer of exterior humidity, air pressure, temperature.

SOUND CHAMBER TUBES



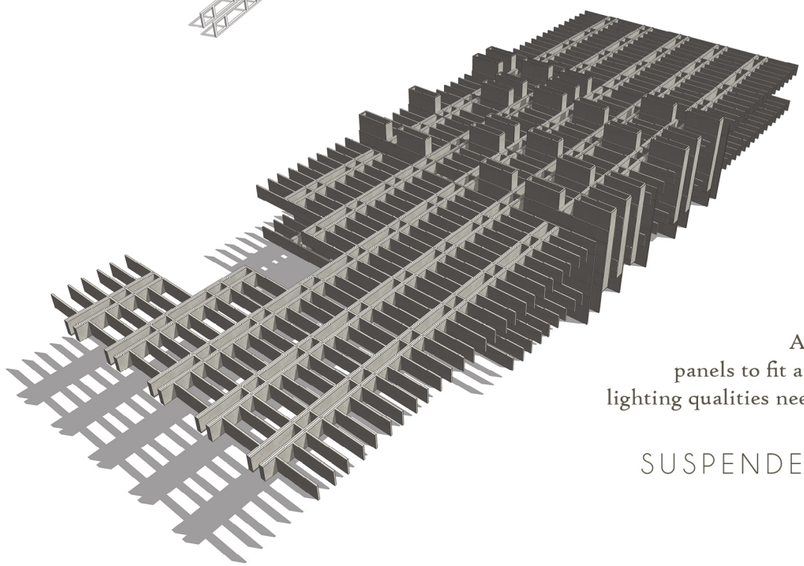
24 plumbing fixtures allow for a capacity of 1,530 visitors. Package Air Handling Units with a Water Induction System enable little to no duct work and each serve a floor area of 5,000 - 7,000 square feet.

MECHANICAL SYSTEMS



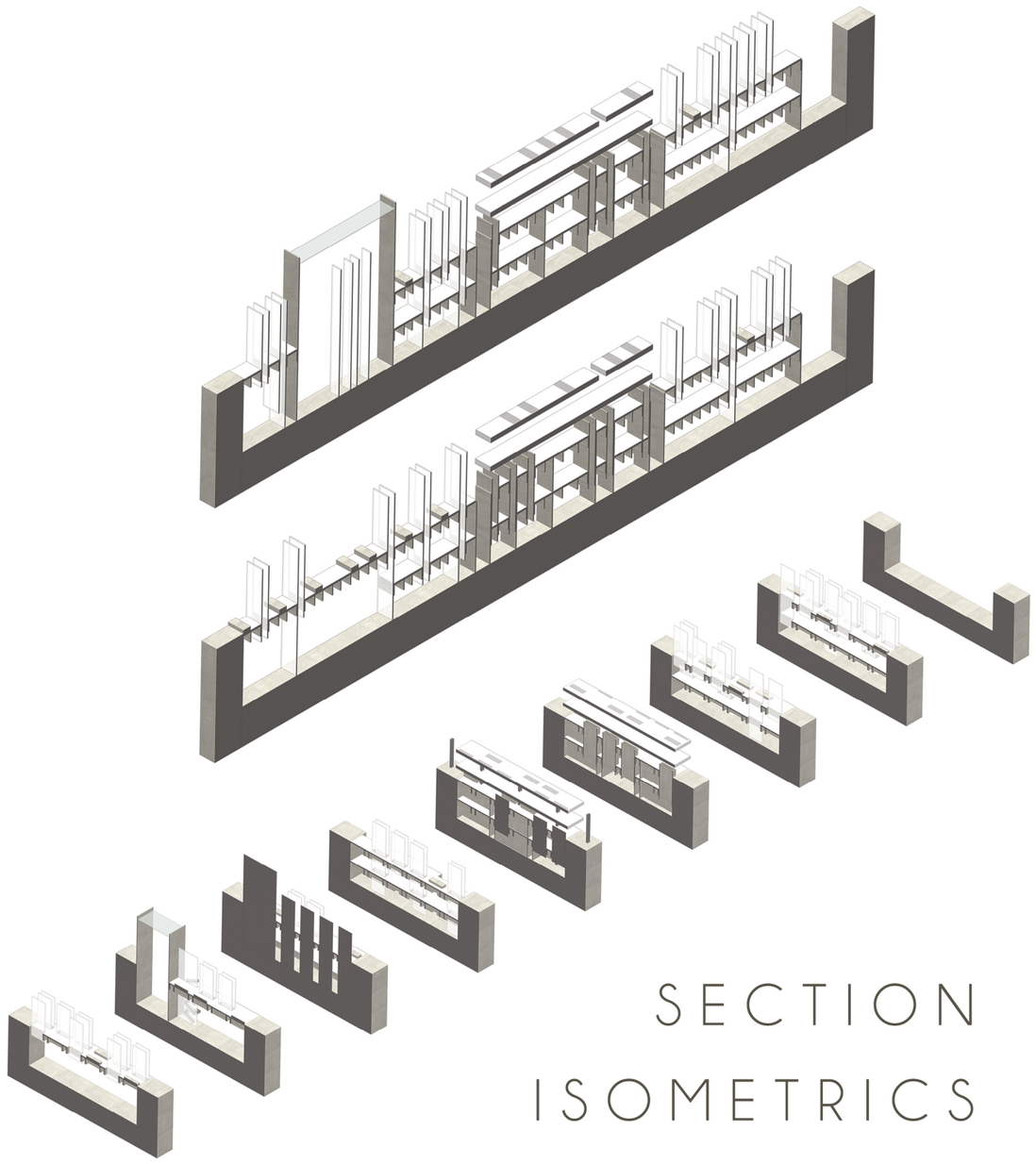
8' deep Vierendeel trusses make the largest span of 106' possible. Spaced in pairs every 28' feet they are designed to allow for a flexible spatial arrangement within.

PARALLEL CHORD VIERENDEEL TRUSS



Artists can adjust/add/remove wall panels to fit any arrangement, size of space, and lighting qualities needed or desired for the installation.

SUSPENDED STRUCTURAL GRID



SECTION ISOMETRICS

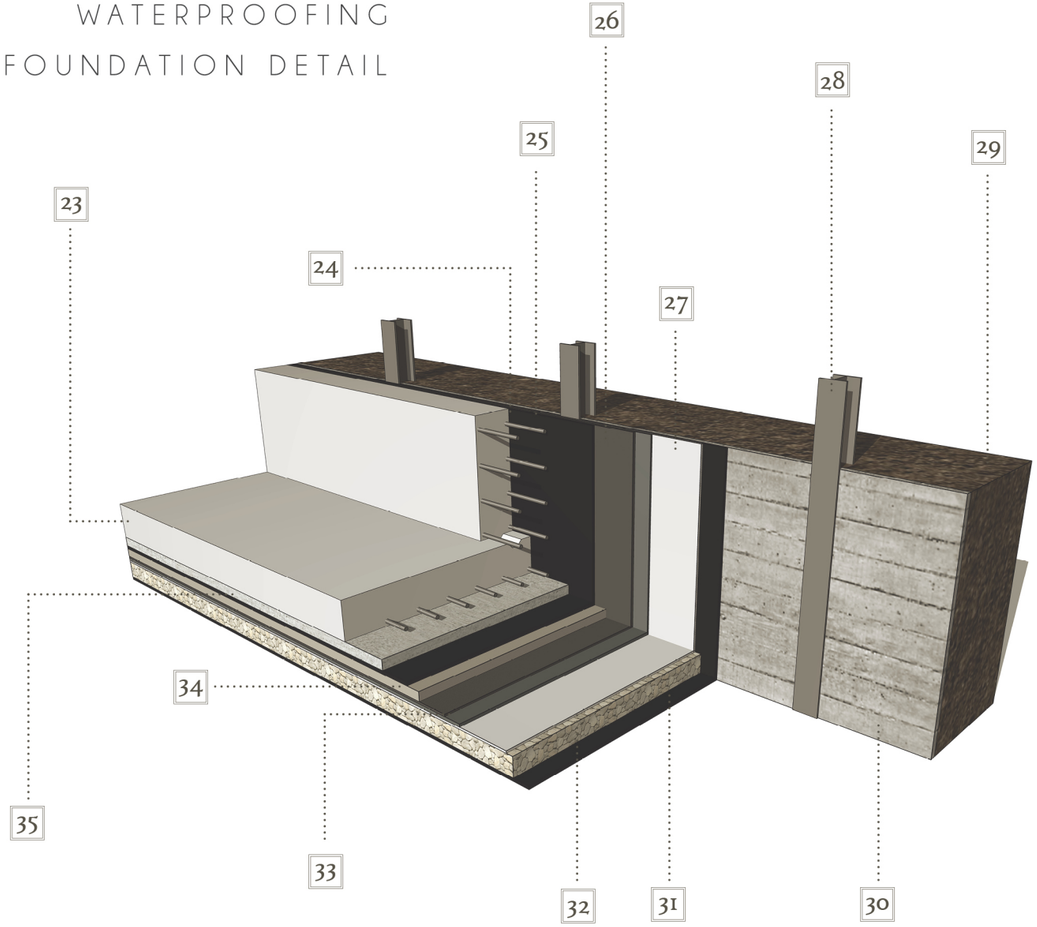
ABOVE

Figure 90 . Section Isometric Analysis .

RIGHT

Figure 91 . Building Construction Details .

WATERPROOFING FOUNDATION DETAIL



23 2' Thick Raft Mat Slab

24 #8 Reinforcing Rebar for Slab and Wall

25 Rubberized Asphalt Coating

26 Sheets Heavy Duty Asphalt Board

27 Filter Fabric Lining

28 Steel Pilings Pre-excavation

29 Exterior Soils

30 Wooden Planks (Lagging)

31 Drainage Blanket

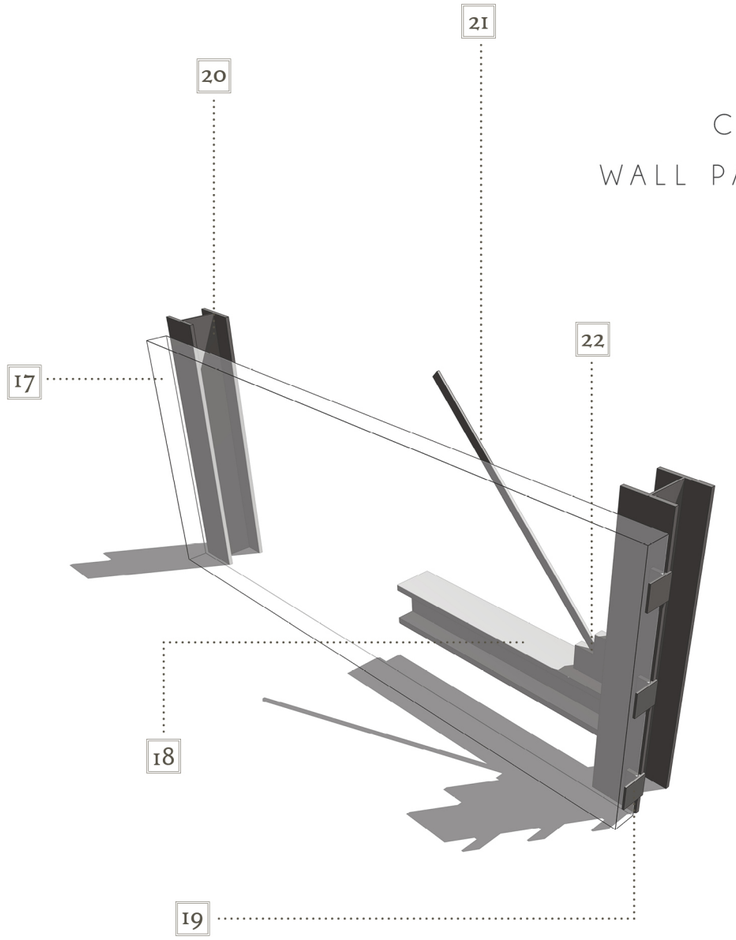
32 Coarse Crushed Stone Aggregate

33 Heavy Duty Reinforced Felt Fabric

34 Mud Slab

35 Secondary Protection Slab

COLUMN AND WALL PANEL DETAIL



17 28’ Length of Kalwall Paneling

18 28’ Length Steel Beams

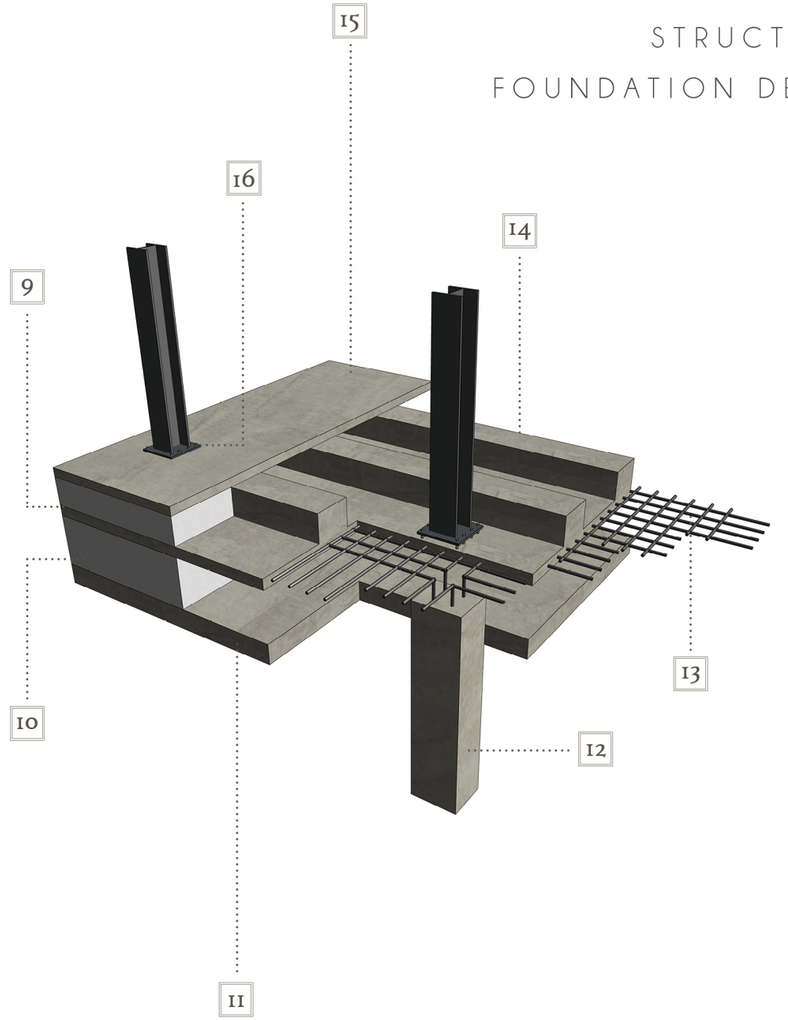
19 Stainless Steel Angle Clasps

20 Structural Steel Wide Flange Columns

21 Tension Cables for Lateral Bracing

22 Steel Angle Connection

STRUCTURAL FOUNDATION DETAIL



9 1’ Thick Rigid Foam Insulation

10 Waterproofing Membrane

11 1’ and 6” Continuous Split Slab

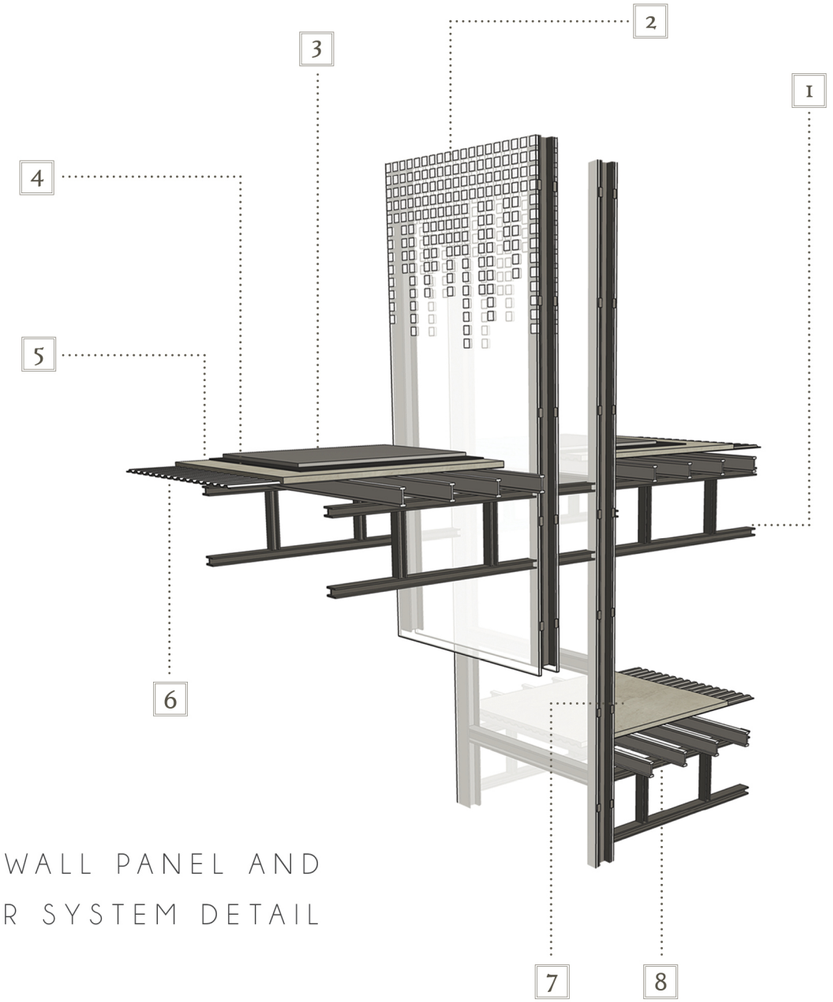
12 3’ Diameter Concrete Caisson

13 #8 Rebar Crosshatch Reinforcing

14 One-way Concrete Raft Foundation

15 5” Protection Slab

16 Steel Plates, Angles and Bolts



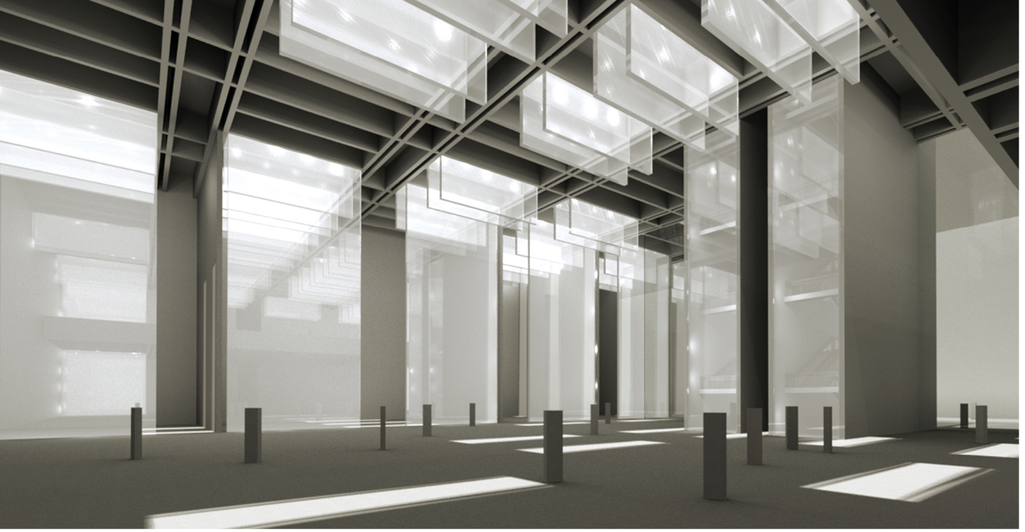
WALL PANEL AND FLOOR SYSTEM DETAIL

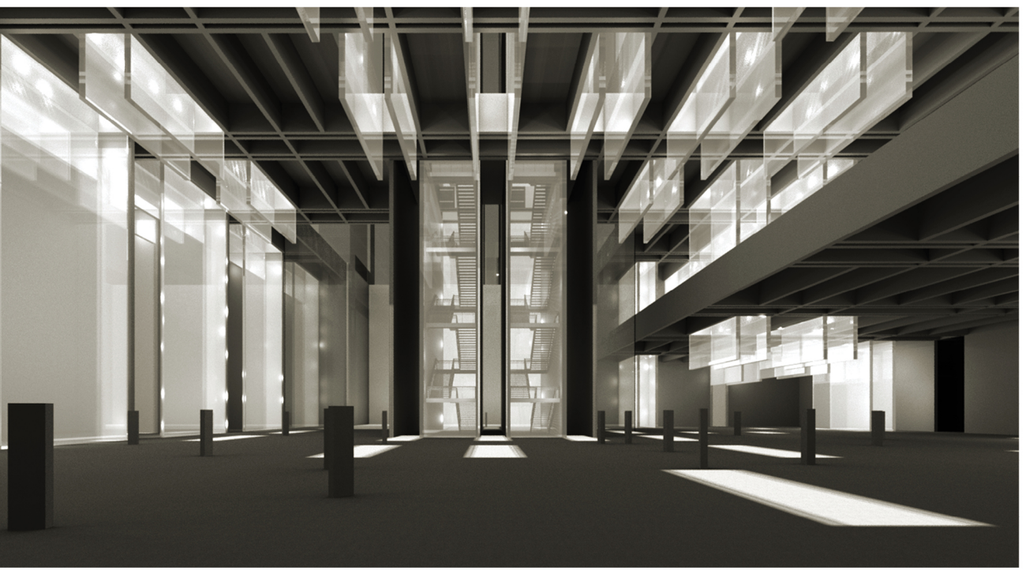
1. 8’ Parallel Chord Steel Vierendeel Truss
2. Facade of Turbulents or BIPV
3. 4” Square Cobblestone Plaza Pavers
4. Drainage Blanket and Sand
5. Rubberized Asphalt and Filter Fabric
6. 4” Steel Decking and Concrete Slab
7. Finished Interior Concrete Flooring
8. 2’ Steel Joists with 6’ Spacing

AERIAL OF THESIS SITE LOOKING WEST TOWARD DOWNTOWN

RIGHT

Figure 92 . Aerial of Thesis Site .

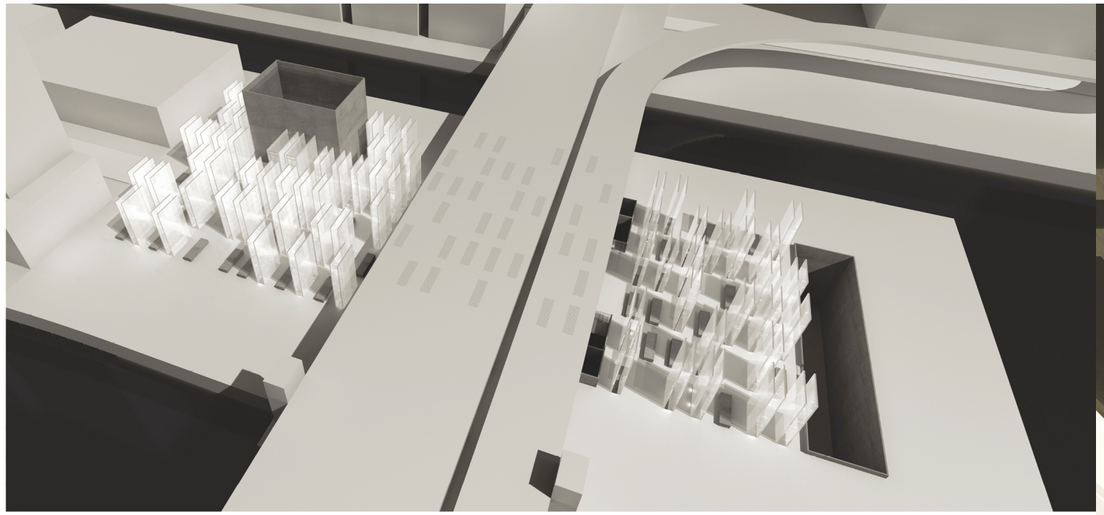


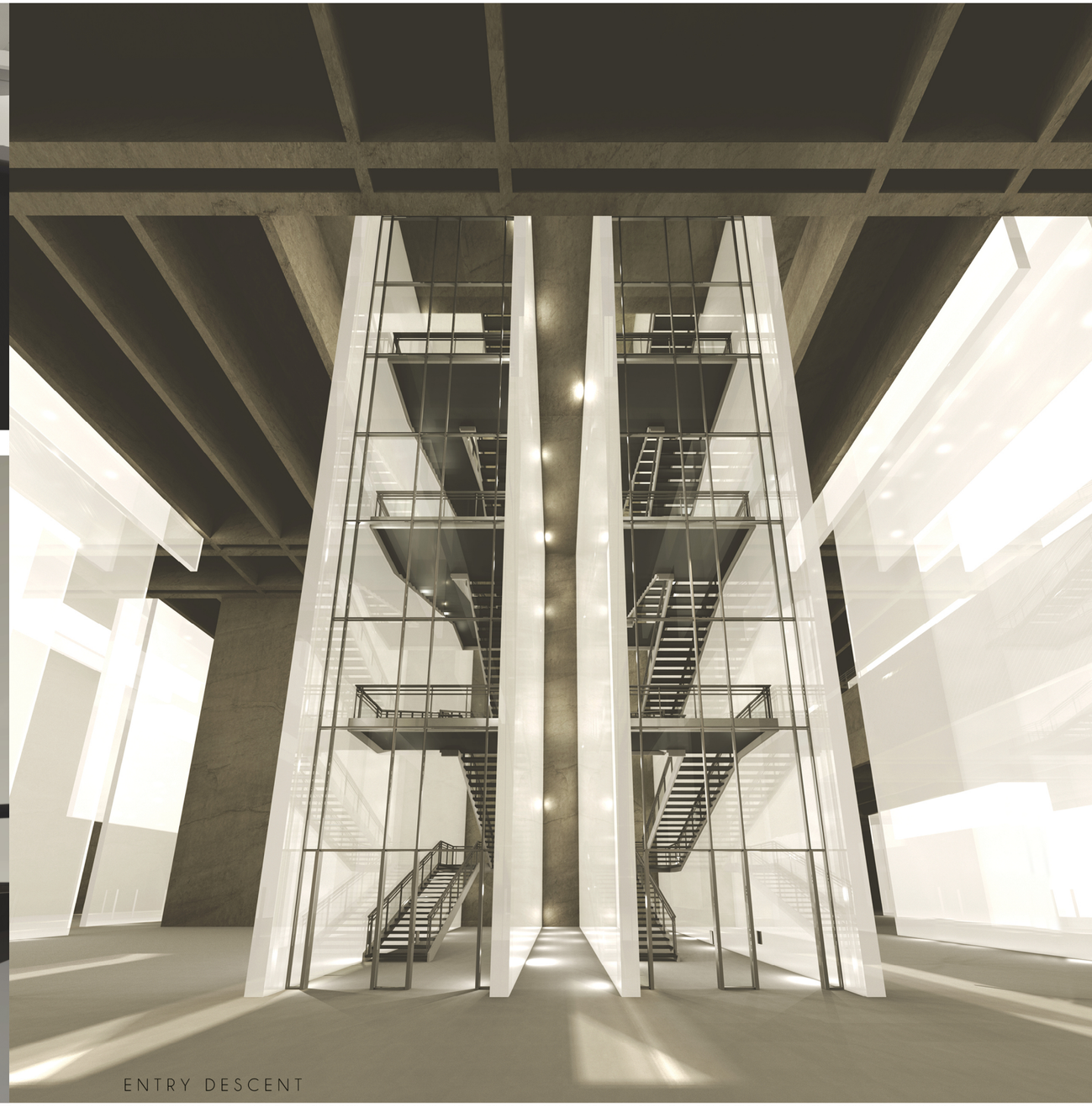


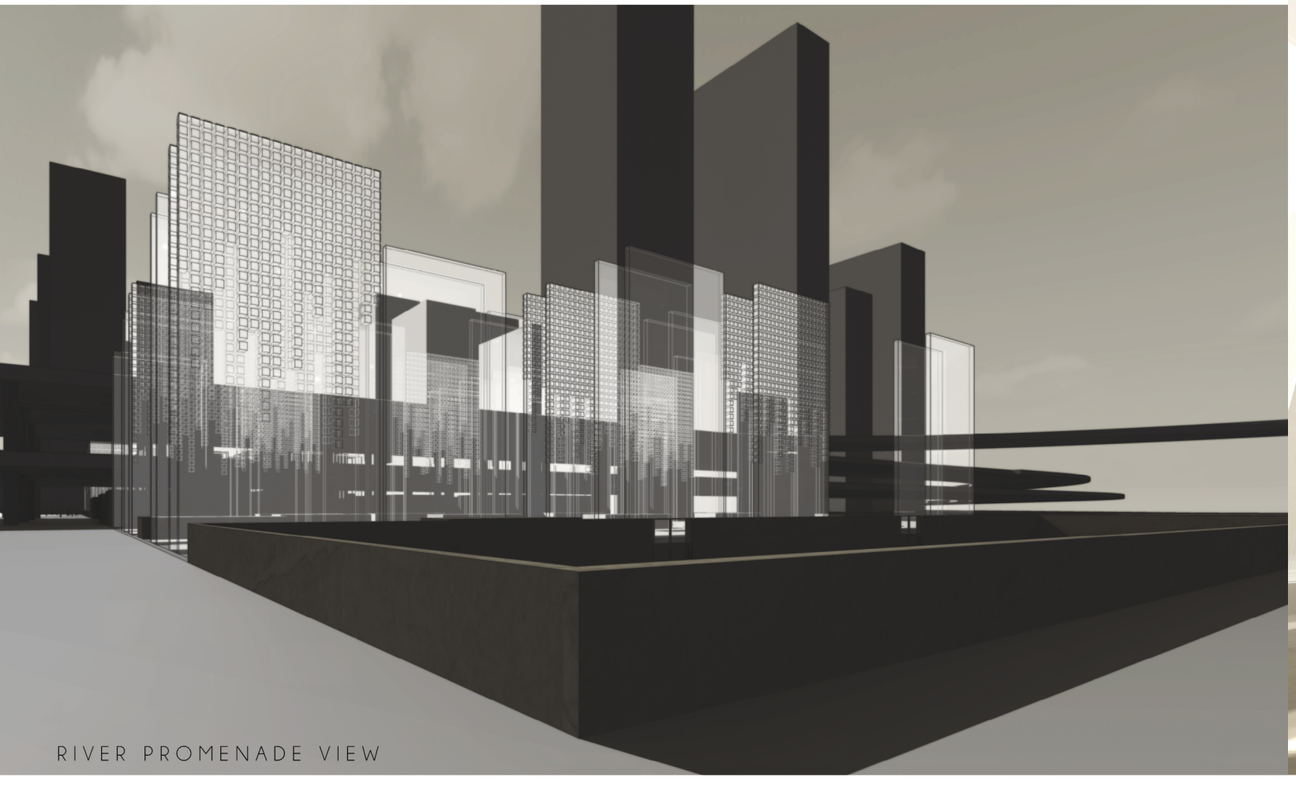
ABOVE

Figure 93 . Various Renderings of Final Design .

PLAZA . STREET LEVEL







RIVER PROMENADE VIEW

ENTRY DESCENT

EXHIBIT . DARK SCHEME

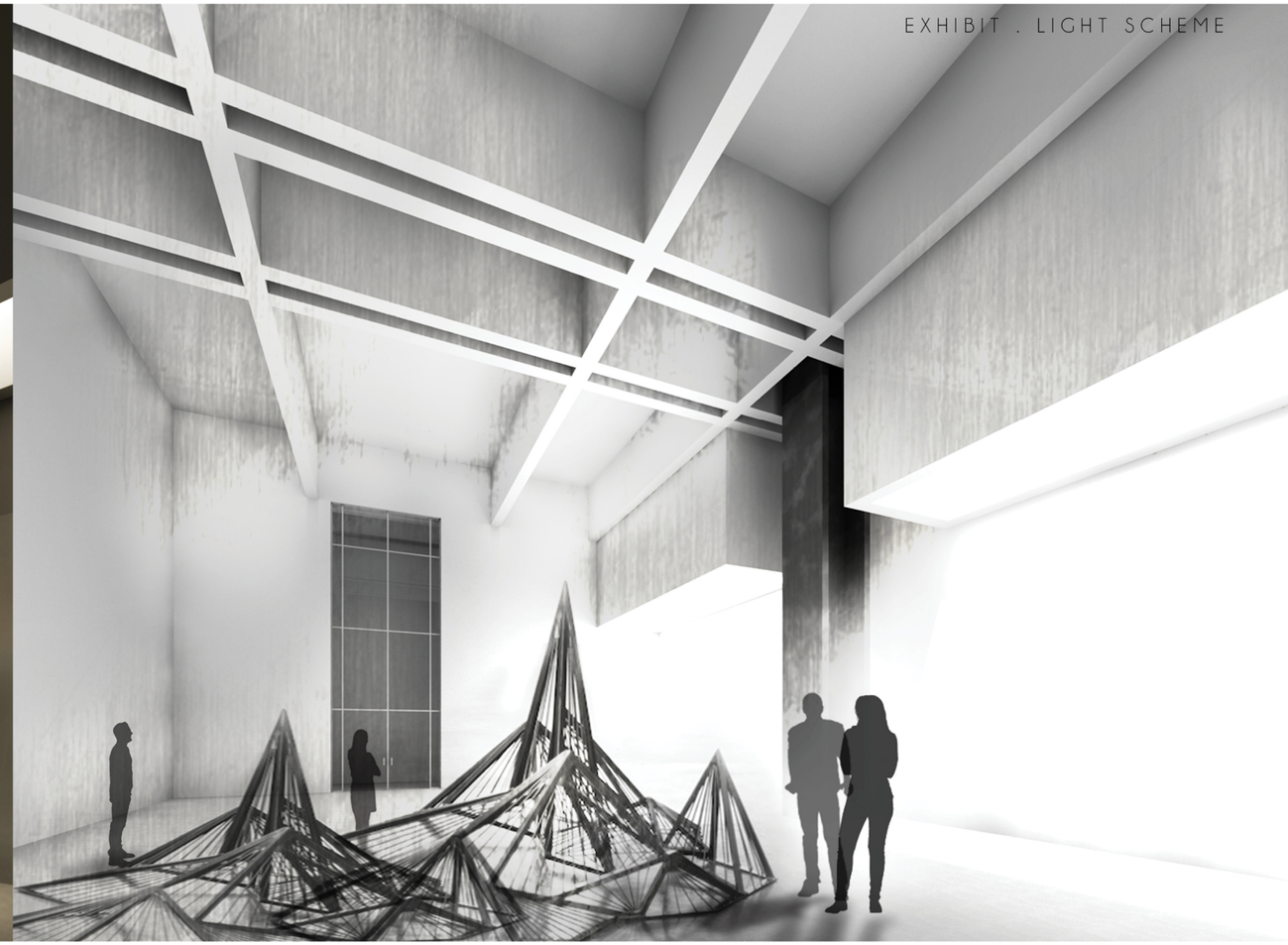
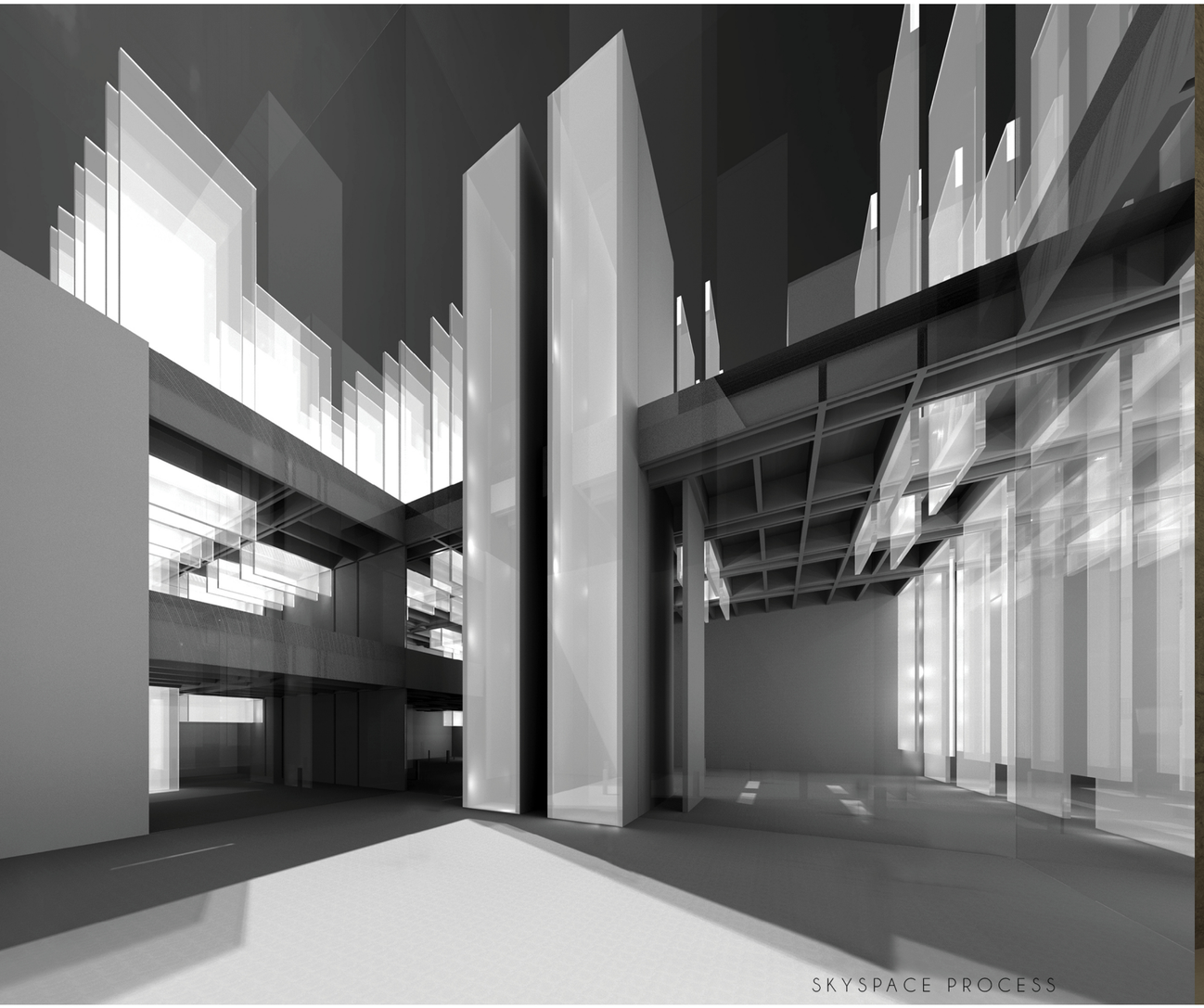
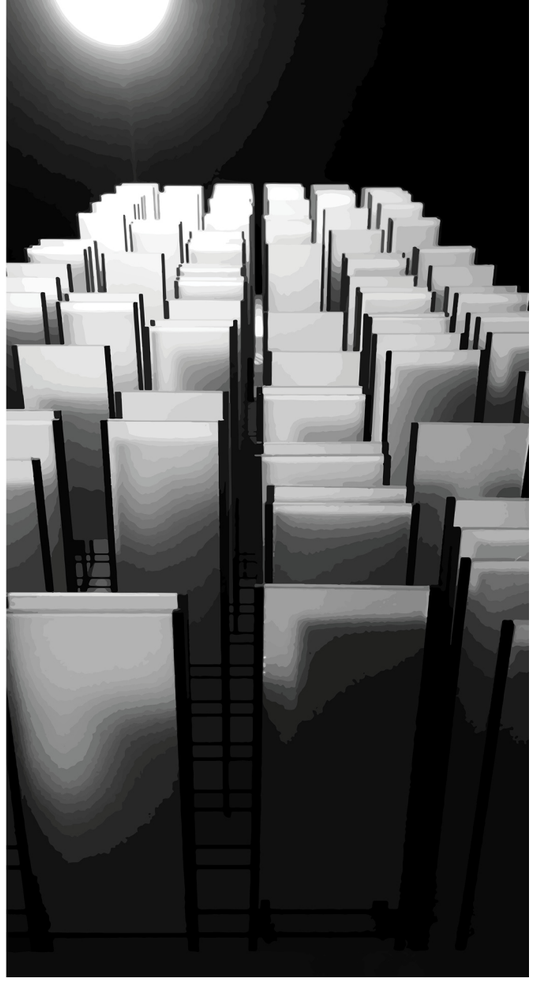


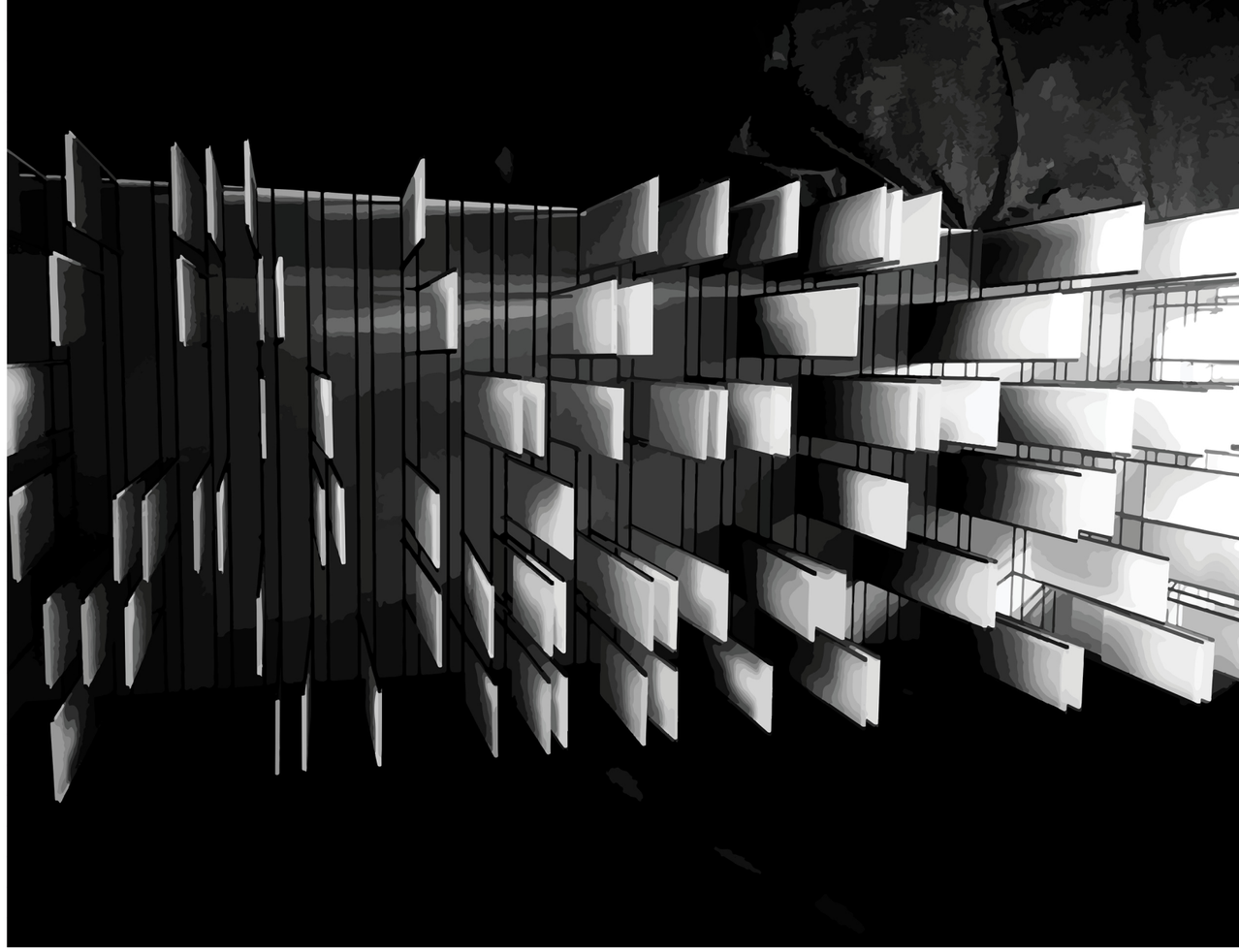
EXHIBIT . LIGHT SCHEME



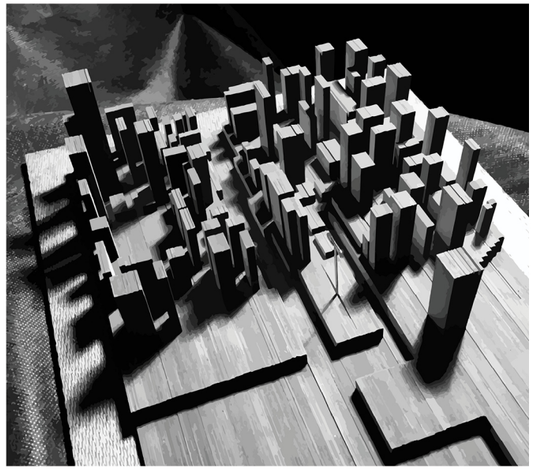
SKYSPACE PROCESS

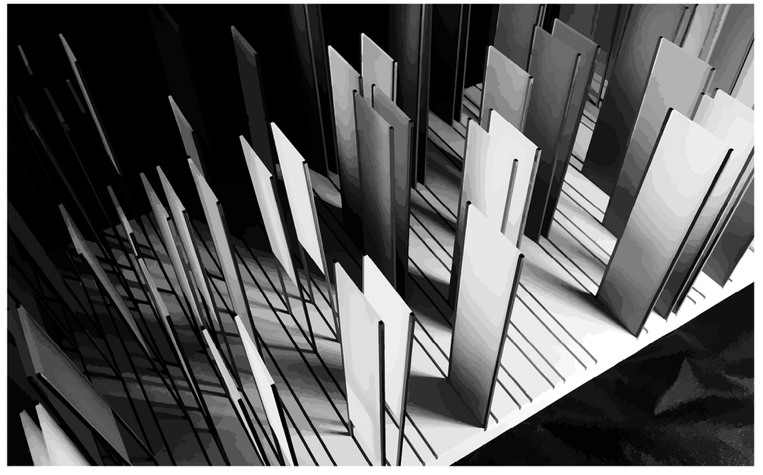
SKYSPACE FINAL





DISPLAY INSTALLATION





ABOVE

Figure 94 . Display Installation Boards & Model .

PERSONAL IDENTITY

Art is Art. Everything else is everything else. Ad Reinhardt

714 Klondike Drive

Buffalo, Wyoming 82834

307.217.3234

holtwilbur@hotmail.com

holtwilbur.wix.com/portfolio

Hometown: Buffalo, Wyoming

ABOVE

Figure 95 . Wilbur Holt Traveling .

PREVIOUS STUDIO EXPERIENCE

SECOND YEAR

DARRYL BOOKER . TEA HOUSE . BOAT HOUSE

STEPHEN WISCHER . TWIN HOUSE . PERFORMANCE CENTER

THIRD YEAR

MILTON YERGENS . MUSEUM . GLASGOW CENTER FOR WRITERS

FRANK KRATKY . STEEL INSTITUTE . CHICAGO YOUTH CENTER

FOURTH YEAR

BAKR ALY AHMED . SAN FRANCISCO HIGHRISE

PAUL GLEYE . INTERBETON DEVELOPMENT BELGIUM ABROAD

FIFTH YEAR

REGIN SCHWAEN . SKYSCRAPER EVOLO COMPETITION

GANAPATHY MAHALINGAM . THESIS

REFERENCES

Ambrose, L. (2012). Chicago Stories: Rubble. Retrieved from https://pageoption.wordpress.com/tag/rubble/.

Briscoe, T. (2015). Lake Michigan Water Levels. Retrieved from http://www.chicagotribune.com/news/local/breaking/ct-lake-michigan-water-levels-met-20150710-story.html.

Cremin, D. (2005). Chicago's Waterfront. Retrieved from https://encyclopedia.chicagohistory.org/pages/1326.html.

De Vries, P. Droog, S. (2010). How to Experience Space through the Senses. Retrieved from http://experiencingarchitecture.com/.

Hensel, M. Menges, A. (2006). Morpho-Ecologies: Towards Heterogeneous Space In Architecture, London: Architectural Association.

Holl, S. Pallasmaa, J. Perez-Gomez, A. (2006). Questions of Perception: Phenomenology of Architecture. San Francisco: William Stout.

Hurt, J. (2012). Your Senses are Your Raw Information Learning Portals. Retrieved from http://velvetchainsaw.com/2012/05/23/your-senses-your-raw-information-learning-portals/.

Kopec, D. (2006). Environmental Pyschology For Design. New York: Fairchild Publications Incorporated.

Menges, A. (2012). Research Pavilion 2012 Robotic Carbon and Glass Fibre Winding. Retrieved from http://www.achimmenges.net/?p=5561

Moravchik, B. Steffen, P. (2014). Great Lake Tides. Retrieved from http://oceanservice.noaa.gov/facts/gltides.html.

Pallasmaa, J. (2005). The Eyes of the Skin: Architecture and the Senses. Chichester: Wiley-Academy.

Rose, J. (1996). The Legacy of the Fair: The Columbian Expo. Retrieved from http://xroads.virginia.edu/~ma96/wce/title.html.

Shaw, C. (2015). Rain Room installation brings Audience & Environment Closer Together. Retrieved from http://www.scmp.com/lifestyle/arts-entertainment/article/1856934/stunning-rain-room-installation-shanghais-yuz-museum.

Simon, N. (2015). What I Learned About Strangers from Jane Jacobs. Retrieved from http://museumtwo.blogspot.com/2015/01/what-i-learned-about-strangers-from.html.

Spiller, N. (2008). Digital Architecture Now. A Global Survey of Emerging Talent. London: Thames & Hudson.

Stark, K. (2010). Stranger Studies 101: Cities as Interaction Machines. Retrieved from http://www.theatlantic.com/technology/archive/2010/09/stranger-studies-101-cities-as-interaction-machines/62315/

Zimmermann, K. (2013). Lake Michigan Facts. Retrieved from http://www.livescience.com/32011-lake-michigan.html.

Zumthor, P. Turner, M. (2006). Thinking Architecture. Basel: Birkhauser.