The image features a black background with several thin white lines that converge towards the top-left corner, creating a sense of depth and perspective. These lines form a large, irregular shape that resembles a stylized letter 'A' or a similar geometric form. In the bottom-right corner, there is a white rectangular area containing the title and author's name.

**REVEALING LIGHT**  
MITCHELL A. DRESSEL



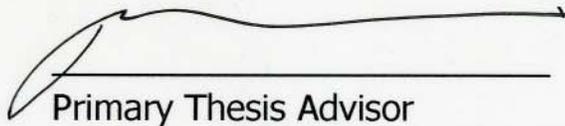
# Revealing Light

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

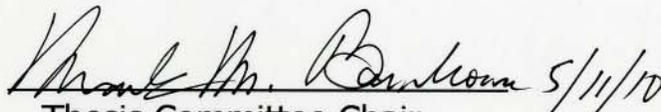
By

Mitchell A. Dressel

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



Primary Thesis Advisor



Thesis Committee Chair

September 2009  
Fargo, North Dakota



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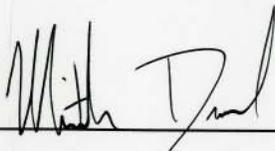
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# **S** **Statement of Intent**



## **Abstract**

How does light reveal? For centuries architects have been using light to express the built environment. Architects have used light to reveal a mood, an object, and even space. A non-denominational chapel seems to express the question to its fullest for design exploration. It does because light is usually associated with spiritual experiences. The site for the chapel will be in the existing power plant on the corner of 6th Ave. S. and Elm St. S. in Moorhead, MN. Which overlooks the river and can easily be seen from Fargo.

## **The Problem Statement:**

How does light reveal?

# Statement of Intent:

**Typology:**  
Chapel

## The Theoretical Premise/Unifying Idea:

### The Claim:

Architects can use light to reveal different aspects of a space.

Architects

Light

Space

Revealing different aspects

### Premises:

Architects use light to achieve psychological, functional, and aesthetic responses in people.

Ideally every space needs a certain amount of light in order for people to utilize it properly.

Space is essentially the thing to be lit for objects and people to be placed in.

There may be essential things to reveal in certain spaces.

### Conclusion:

In order to understand how light can reveal different aspects of a space, everything about the space has to be considered. It is then that one can find the essential amount of light to use in a space.

### Project Justification:

Spaces will always need light, but how much light and where that light should hit should differ from building to building. Light should not just be placing a window that has a few standard sizes in the side of a building. Instead, light should be used as openings of various sizes strategically placed in every room to highlight its objects, uses, or moods.



# P proposal



# Proposal: Narrative

The use of sunlight, aka day lighting, has been one of the major modes of expression for the architect throughout the centuries. They are able to transform and give character to interior spaces. Architects do this by simply controlling the amount of daylight allowed into the spaces by the means of the buildings form, size, position on the land, and the openings in its exterior fabric.

These expressions have a great range in the world today, from the sporadic lighting of Ronchamp by LeCorbusier, to the uplifting lighting of The Church of Light by Tadao Ando, to the simple lighting of a residential home. These lit effects, with their play of light and shadow, are the reaction to the functional and emotional wants and needs of a design.

This beautiful way of using light to glorify an aspect of that space or its ability to captivate a human emotion has been lost with the use of generic and standard size windows punctured into the sides of newly built buildings.

# Proposal:

## User/Client Discription

The main user populations intended for this project are people celebrating landmark events.

The client is the City of Moorhead and Fargo.

## Major Project Elements

Chapel

Other project elements

Dance floor

Brides Room

DJ Booth

Bar

Reception Hall

Wedding Suite

Wedding Planners Office

Reflection Pool

Maintenance room

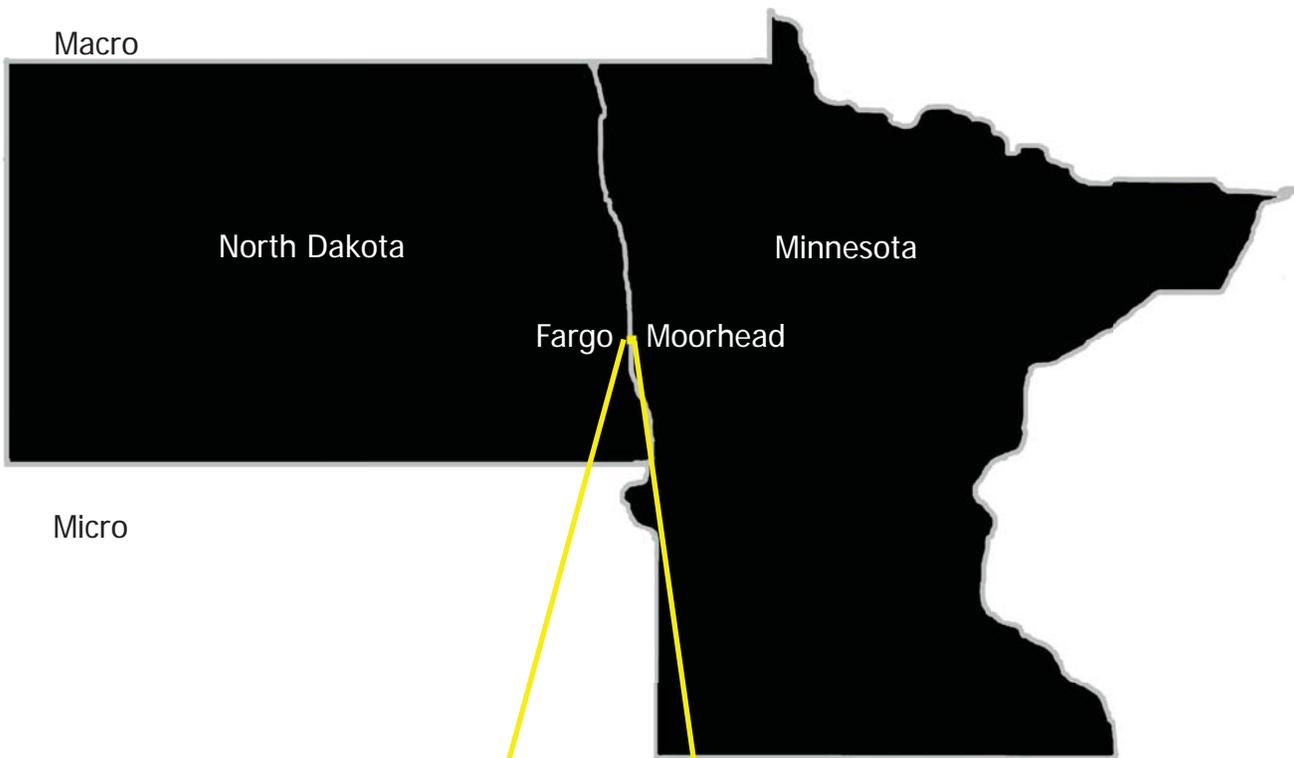
Restrooms

Mechanical room

Electrical room

Horizontal Circulation (corridors)

# Proposal: Site Information



Micro



Bing Map Image

## Site Information

### Region

The Fargo-Moorhead, ND-MN Metropolitan Statistical Area core is formed from the cities: Fargo, Moorhead, West Fargo, and Dilworth. Moorhead is Minnesota's largest northwestern city and Fargo is North Dakota's largest city. The U.S. Census Bureau estimated that in 2008 Fargo had a population of 93,531 and Moorhead's population was 36,012.

### City

Fargo and Moorhead got their names from the directors of the Northern Pacific Railway (William Fargo and William G. Moorhead). Fargo got the nickname "Gateway to the West" after the rail was finished. Moorhead became known as the transcontinental crossing. Having the railway system was a profitable idea for both cities but they also got recognitions for the fact that they border the Red River of the North which could bring goods even farther to be traded or bought.

### Site

The site is in the city of Moorhead, MN. This site is of interest because it is between Fargo and Moorhead which are both in need of a building that can act as a new social and cultural icon. The site is bordered on all sides: to the North 5th Ave. S., to the South 6th Ave. S., to the West the Red River of the North and Fargo, to the East Elm St. S. and Woodlawn Park.

# Proposal:

## Project Emphasis

The focus of this project is to obtain an understanding of how light works, then use that knowledge to reveal different aspects of space with light.

The direction of research will be done in multiple areas to make sure there is a completeness in the information. Areas in which research will be extensively compiled are: the unifying idea, project typology, case studies, light, historical context, site analysis, and programmatic requirements. The theoretical premise will be the guiding force throughout this project making sure all collected information is relevant and usable for a complete presentation.

# Proposal:

## Design Methodology

The design methodology that will be employed to holistically collect knowledge is the mixed method, quantitative/qualitative analysis approach. Within that approach a concurrent transformative strategy will be guided by how much space is essential for a person in their required daily functions. All data collected will be added at multiple periods during the process of the research depending on whether the examination fits with the theoretical premise/unifying idea. Quantitative data will be analyzed locally and measurements will be collected through instrumentation and or experimentation. Qualitative data will be analyzed from direct observation and archival search.

## Plan for Documenting the Design Process

Documentation of the project will have high priority. I will make sure to save, print, scan, organize all notes, sketches, thoughts and ideas of the entire design process. Everything will be collected digitally and in hard copy so that at any time during the design process they will be readily available. This process of documentation will happen weekly so nothing gets left out.

All important information will be compiled into the thesis project book to ensure that future scholars will have it available for them. Also, specific information will be highlighted in the final presentation of the thesis design.

# Studio Experience:

---

## Second Year Fall Semester

Stephen Wisher

Tea House - Fargo, ND  
Boat House - Minneapolis, MN  
Twin House - Fargo, ND

## Second Year Spring Semester

Joan Vorderbruggen

Prairie Dance Academy - Fargo, ND  
Woldorf School - Moorehead, MN

## Third Year Fall Semester

Ronald Ramsay

Drive-In - Agincourt, IA  
Shaker's Stone Barn Restoration - Mount Lebanon, NY

## Third Year Spring Semester

Steve Martens

Children's Museum of Science and Technology - Fargo, ND  
Dinosaur Research Center - Hell Creek, ND

## Fourth Year Fall Semester

Darryl Booker

Highrise Project - San Francisco, CA

## Fourth Year Spring Semester

Frank Kratky

Urban Design - Santadomingo, Dominican Republic

## Fifth Year Fall Semester

Regin Schwaen

Hotel - Fargo, ND





# Program Document

# Research Results and Goals:

## Results from the Theoretical Premise/Unifying Idea Research

Millet (1996) stated:

“Our lives are intimately bound up with light. We literally cannot live without it. It is one of the basic immutable forces of nature. Light is a primary element, animating life here on earth... We take [that] light that enables us to see for granted, but we are dependent upon it in more ways than we perhaps know, psychologically as well as physiologically.” (p. 1)

What we do in the field of architecture is directly dependent on light. Light reveals not only the forms and spaces created through architecture but it also exposes the meanings and the intentions behind the designs.

Millet (1996) proclaimed that:

“When we can understand the intentions inherent in the way a building is revealed in light, along with the techniques for doing so, then we have the basis for forming both our own intentions and the techniques that can realize them.” (p. 3)

“Light is only one of the many aspects of architecture. But light reveals the building, its intentions, its place, its form, its space, and its meaning. Light reveals architecture and, in the best instances, architecture reveals light.” (p. 3)

## Light Revealing Experience

Millet (1996) states that:

“We can only know what we experience. Our experience of light begins in the personal and proceeds to the universal. We learn, in the environment of our childhood, how forms are revealed in light. We learn what forms mean, from the small forms of our toys to the large forms that shelter us. We do this in the light of the particular place or places where we grow up...

The patterns of light with which we grow up, and attract our attention in later times, have meaning for us. Some of these meanings are universal, archetypal images that humanity shares. Some of these meanings are cultural, absorbed through rituals and their settings or simply reflecting an attitude to life. Some of these meanings are personal, associated with particular events or persons. Just as we may pick a certain dress to wear or not wear, because of certain associations, so may particular patterns of light remind us of a place and its associations. Our cumulative experience of light in places is complex, multilayered, and rich.”  
(p. 5)

Every place has its own individual light specific to that spot. The light in any given place has two qualities that will always be with it. Those qualities are the physical aspects and characteristics that make that place different from any other place; and the other is the changes that happens there over time.

Each place also has a *genius loci*, the spirit, which is the place's response to its sensitivity to the light that is present. "The importance of light to spirit of place is evident... in certain places that are memorable for their quality of light. Certain architects... are skilled in their evocation of plac[ing] light." (Millet, 1996, 8)

Just as light is able to reveal the spirit of the place, it is also able to suggest other places and times. Even if there is a loss of nature in the place, light can retain the essence of it through patterns it can cast into the space.

Millet (1996) found that:

"There are [always] thermal realities associated with the introduction of [natural] light into buildings that cannot be avoided: the introduction of heat along with direct sunlight, heat loss through glazing when the temperature outside is lower than inside,... A building that provides both comfort and delight in its locale must respond to these realities." (p. 21)

## Light Revealing Form

Form is not visible without light upon it, and light simultaneously would not be visible without the form it shines on. This is why buildings appear the way they do. Some of the light bounces off the form and the rest is taken in by the form to help give itself shape.

Using light to emphasize a form is a logical choice, but one needs to remember that while this is desired it does not always work. It depends on what is trying to be conveyed.

Millet (1996) states that

“A form in light may be there in our visual field, but that does not necessarily mean that we see it clearly, or in the way intended, if there is an architectural intention attached. For example, forms that stand out clearly in sunlight may fade in the light filtered through clouds of the overcast sky.” (p. 51)

When form and light are placed side by side, light in certain ways can dematerialize a form. For example, if the form was made up of a stainless steel it would reflect the sky and sunlight which in turn would make the form unclear. But having minimal light can also hide the form entirely.

Structure in a building form can also reveal where light is able to enter. Usually, where structure is light will not be and where structure is not there will be light. It then can become a rhythm of light. This sublimely informs, in a way, what the structure of the building is.

On the other hand, depending on what the designer wants to convey in the form, light could also conceal the structure and introduce light where it would be least expected.

“Light is an architectural material, but an intangible one. Like sound and heat, it is dispersed by means of materials and their forms.” (Millet, 1996, 47) These objects, light and materials, are equally dependent on one and other. “Materials are key to understanding light in architecture because they directly affect the quantity and the quality of the light.” (Millet, 1996, 67) In turn, light exposes the different aspects of the materials.

## **Light Revealing Space**

Enclosures are architectural spaces that light plays a significant part. “Our sense of space is dependent upon the way that light reveals the enclosure... [and] when we manipulate [that] light, we manipulate our perception of architectural space.” (Millet, 1996, 93) When experiencing space we use the whole body, not just the eyes, to relate and understand all that is happening; from the environment to the way we move through it.

However if there were to be a change in the lighting there would be a change in the perception of the room. This is because “we perceive the physical structure of the room as [an] unchanging event as we react to changes in the patterns of light.” (Millet, 1996, 94)

Light can be used to unify a space or multiple spaces in how it is dispersed. Spaces will appear unified if light entering them are equally illuminated. Another approach would be to have light from one space carry over into the next space making them seem as if they were one large space.

If the idea is to separate a large space, using light to change the amount that is illuminating the different spots is one solution. Another solution would be to use different qualities of light in each area of the space.

Humans are attracted to light. It grabs our attention and pulls us in. The light could be from a flash of lightning on a dark night or a sliver of light at the end of a hallway. “Light is a practical and poetic means of providing orientation at all scales of the built environment. It can define a focus, reinforce a hierarchical organization of space, or encourage movement along a path or through a space.” (Millet, 1996, 113)

When trying to develop a focus in a space using daylight, one needs to take exact sightings and orientation, as well as specifically chosen materials. It would be thought to be less difficult to create a focus with light inside a space because it is more controlled. In reality, it is a challenge on its own to make sure there is a balance of light so a glare does not happen within the space.

Light invokes movement and people usually follow. The brighter the light, the more we are attracted to it. The brightness of the light is relative to the situation that it is in. If it is in a dark open area the light does not necessarily need to be very bright to be visible. On the other hand, if it is in a place with many lights then the light has to be brighter.

## **Light Revealing Meaning**

Millet (1996) reveals that:

“The natural language of light and dark is a powerful one with which to express meaning in architecture. Light, in revealing architecture, simultaneously reveals the meaning in the building... Light has the capacity to move us... [and] when we are moved, we extend our awareness beyond our current physical state into the realm of the unknown, the unfathomable. Darkness-the absence of light-is part of our experience of light. Just as black is necessary to complete the definition of white, so darkness is necessary to complete the experience of light.

Light can reveal or suppress.  
Darkness, in suppressing visual perception, represents the unknown, provoking many responses [in people]." (p. 135-136)

Luis Barragan understood the need for contemplative light as a get away from the high illumination that encompasses our every day life.

Branford-Smith (1967) found that:

Barragan stated "Architects are forgetting the need of human beings for half-light, the sort of light that imposes a tranquillity, in their living rooms as well as in their bedrooms... We should try to recover mental and spiritual ease and to alleviate anxiety, the salient characteristic of these agitated times, and the pleasures of thinking, working, conversing are heightened by the absence of glaring, distracting light." (p. 74)

Festival lights are usually displayed as pinpoints of light that enclose a shape. The origin of festive lights is unknown but it could have been connected to starlight or fire. Both of these ideas are about one being able to push back the darkness of the night.

Theatrical lighting is used when illusions are desired. They are usually used to create a dramatic aspect for the space. To achieve illusions, all that is needed is darkness and the control of light.

“Metaphorical light suggests that it reveals something other than physical reality. It may reveal an association with another place or with an idea [that] is obviously apparent... Metaphorical light in architecture rests on expressing an idea or a concept and therefore cannot always be readily perceived.” (Millet, 1996, 144-145)

Symbolic light reaches out farther than the metaphorical light to become a known idea. This concept or idea could be anything from a birth, appreciation, or even death.

Lastly, divine light is normally thought to have a religious aspect, but in reality the sky has always revealed its “transcendence, power and changelessness simply by being there. It exists because it is high, infinite, immovable, and powerful. Light has long been connected with the spiritual aspects of life and with the forces that symbolize the sacred and the divine.” (Millet, 1996, 148)



# Research Results and Goals:

## Research Summary

The research conducted through the exploration of this thesis resulted in many new and intriguing ways in which light can reveal architecture. Those new areas were: experience, form, space, and meaning. These areas have been deemed most important because they are the essential aspects that make up architecture as we know it.

The first topic dealing with experience expressed the idea of how one can feel and understand the meanings of a place. Then this thesis discussed how each place has its own distinct light, which is different than any other site. After that, the thesis talked about a site's genius loci or its spirit. Then the discussion jumped into how light can reproduce a natural aspect that may be missing from a site. The topic ended with a conversation of thermal aspects that need to be addressed when putting openings in a space.

The second topic discussed in the research was the revealing of form. It started out with how form is not visible without light upon it and vice versa. Then the thesis talked about when using light to convey something it might not always show what you want because not every day is sunny and cloudless. After that this topic goes into if your form is reflective it could get deluded with the sky. Next the thesis presents how structure can inform where light comes in, how the structure could be concealed and how light appears in places that one would not think it would be. Finally, the topic ends with the idea of how light is a material and how light along with material complement one another.

The third topic talked towards revealing space. This went into the idea that when in a space it is not just the eyes that take in the space but it is a whole body experience. After that the thesis moved into how light can unify and separate space. Then it got into how humans are attracted to light. After that, there was light being the focus of/in a space. The topic finished with how light can create or invoke movement.

The fourth and last topic went into revealing meaning. It began with how darkness is needed to complete the experience of light and moved into six different types of lighting. They are: contemplative, festival, theatrical, metaphorical, symbolic, and divine. Each of which has its own unique characteristics but at the same time seemed to grow on top of one another.

Overall, this research will be the guide for the standard of design and the design itself. It has created opportunities and starting points for the design and insight to the abilities of light.

# Research Results and Goals:

## Case Studies

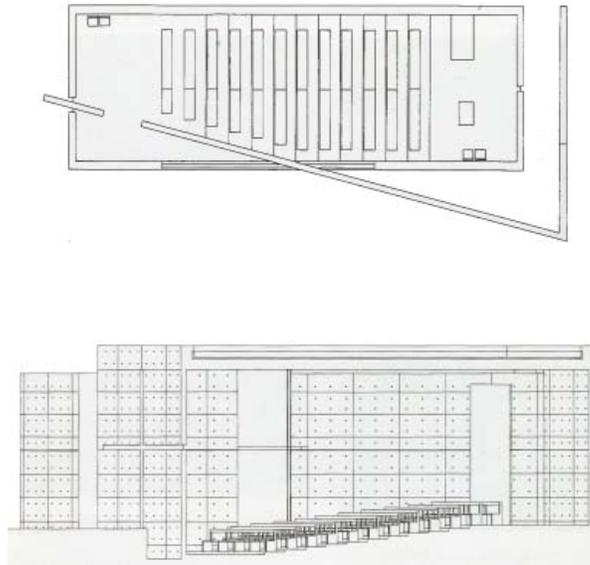
### Church of Light

Architect: Tadao Ando

This church designed by Tadao Ando is actually fairly small in size. The entire building only measures 113 square meters. It resides in a quaint residential suburb of Osaka, Japan. Some of the most distinguishing characteristics of this case study are its reinforced concrete shell and the way Ando brings light into the church through the openings he created. The program elements that are present in this project are a large worship space.

The aspect that this case study shares with the other case studies is its ability to use natural light in a specific way to enhance a space.

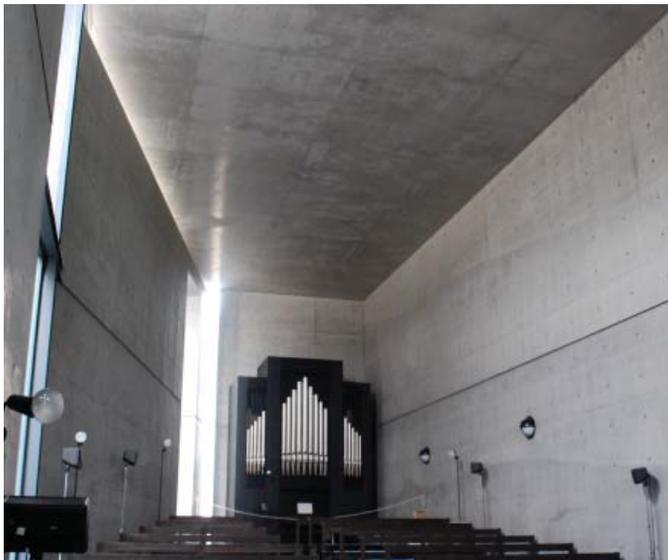
Even with that common aspect, Tadao Ando uses light in this church to create simply and elegantly a humbling feeling for the people that worship in that building. He does this by taking the darkness of the building's concrete box and penetrating it with natural light through three simple openings in two adjacent walls.



Flickr Image



Flickr Image



Flickr Image

The church sits on its site to allow the most southern exposure to pass through its openings not only to light the building but also to obtain its effect in the space. Contrary to a lot of people's beliefs, this church is not placed in the middle of nowhere in a forest. It is in fact built in a suburb of Osaka between residential buildings. For that reason it is a perfect site because it is close to people and is easy to get to.

The structure of the church is a reinforced concrete slab shell. Within the shell, openings have been placed to naturally light the space instead of artificially. That is not to state that there is no artificial light, but that the only lighting of that type is simple and minimal on the East wall. The church's rectangular shape is continued throughout the plan, section, and elevation.

Through this case study, light has shown that it not only illuminates a space. Light can be a dramatic aspect to a space, an iconic object that will be remembered, and have the ability to put one into a specific mood.

# Kimbell Art Museum

Architect: Louis Kahn

The Kimbell Art Museum was designed by Louis Kahn and is located in the cultural district of Fort Worth, Texas. The museum measures 120,000 square feet. This is enough room to hold a small collection of European, Asian and Pre-Columbian works of art, as well as traveling exhibits. Some of the most distinguishing characteristics of this building are its six exterior vault-like forms, which are called cycloids, and the interior skylights on top of those vaulted forms that naturally light the museum. The major program elements in the museum are basic. They consist of a gallery, book shop, auditorium, and an open court yard.

Much like the other case studies this one also uses natural light to enhance its spaces in a new way that was never thought possible for the particular building.

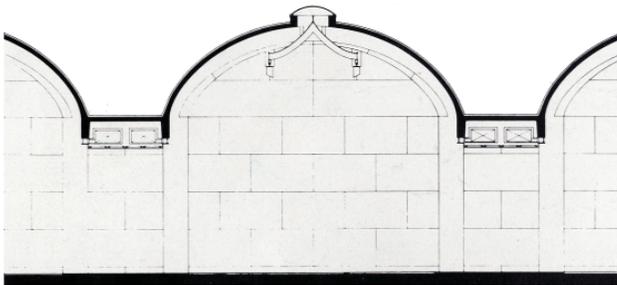
The most uncommon feature this building differs from the other case studies is how natural light is brought into the spaces. Kahn knew that the ultraviolets in natural light are bad for art, but still loved the liveliness and its ever-changing way. So to include light, he used skylights that have a screen underneath that filters the light and reflects it onto the vaulted concrete ceiling. From there, the light trickles down the walls to the floor.



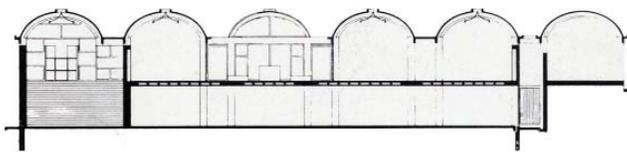


Flickr Image

The museum sits north-south on the site to gain as much southern exposure and natural light as possible through its skylight system. Since it is located in the cultural district of Fort Worth, Texas, it helps not only the culture of the area, but also brings people together socially.

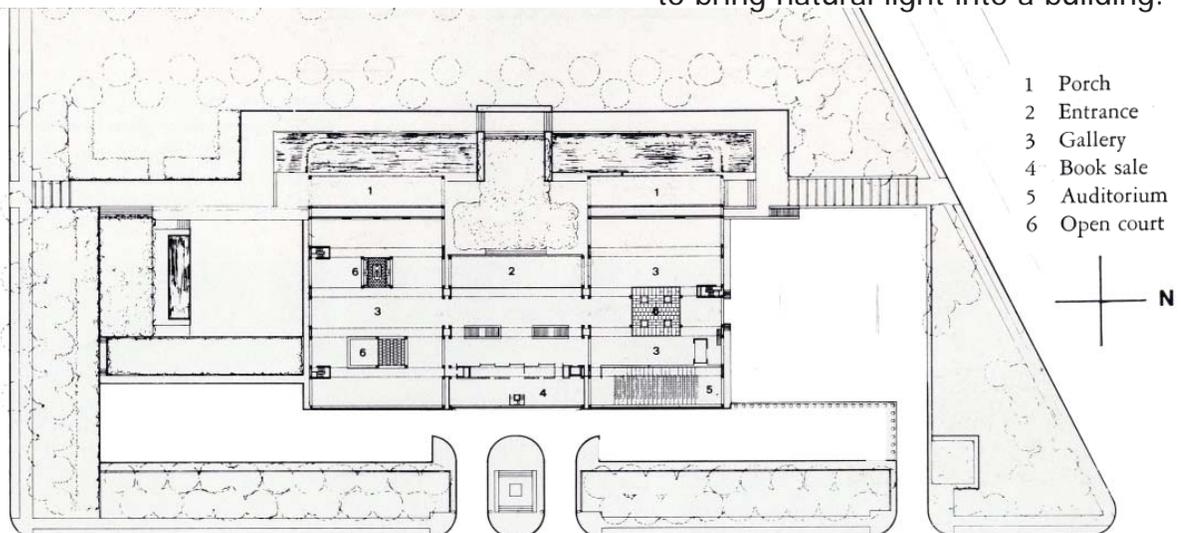


The structure of the museum is made from concrete. The objects that make up the structure for the museum are the cycloid arched vaults. The non-structural walls are travertine, a form of limestone, and the roof is lead. Natural light is the main source of illumination for the spaces and art work in the building, but artificial light does appear where needed to light the building at night. The rectangular spaces show up from plan to section/elevation but it is a little more difficult to detect.



Section

From this case study, natural light has proven to be able to be brought into a building typology that is typically not good for the objects inside and works well. It also has shown that it is possible to find new and creative ways to bring natural light into a building.



- 1 Porch
- 2 Entrance
- 3 Gallery
- 4 Book sale
- 5 Auditorium
- 6 Open court



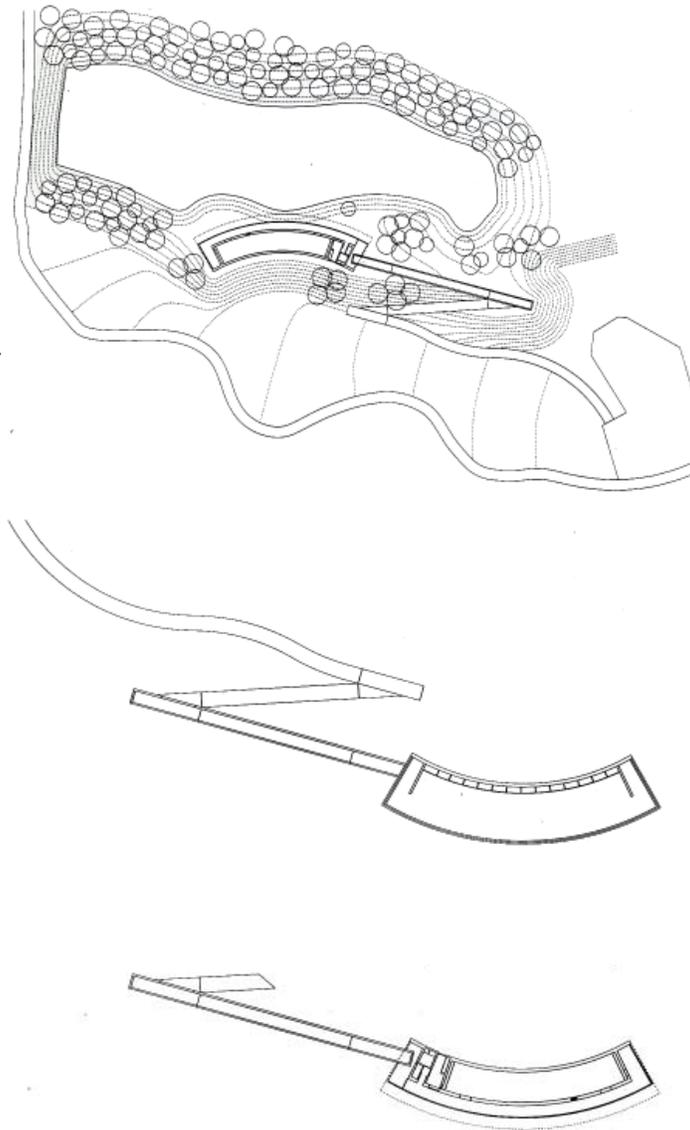
# Daylight Museum

Architect: Tadao Ando

The Daylight Museum designed by Tadao Ando, is not a museum of daylight according to its name. It is actually an art museum for one artist who started painting after the last war. He only painted in natural light and stopped when the light had set. This art gallery is in Gamo-Gun Shiga, Japan. Some aspects of the building that distinguish it are: its roof light in the gallery, the long frosted glass curtain wall system, and the building's shape. The only major program element is the gallery.

Just like in the other case studies this one uses natural light to enhance a space, and does so in a new way.

The uncommon idea in this case study is the train of thought and the way Tadao Ando decided to get light into the gallery space. Ando's decision to keep true to the artist's way of painting only by natural light restricted him to natural light to illuminate the body of work and the building. Ando knew that direct sun light was bad for paintings but believed that paintings were not meant to stand the test of time. To get the natural light into the gallery, Ando placed a circular arc in the roof to allow top lighting.





The Museum is tucked in between a large grouping of trees right next to a pond. The building benefits from the reflection of light off the pond into the building. It is sitting on the site to get as much southern sun as possible. Culturally, this museum holds one of the most popular artists of Japan for all to see.



Most of the structure comes from the back northern wall, while the rest is the curved rectangular gallery. The walls and roof are made of concrete. The hallway is enclosed with the frosted glass curtain wall system. Only Natural light is used for this museum and Ando pulls it into the gallery in a few different ways. One is through the roof openings, another is through a lack of doors in the entrances to the gallery, and finally there are three daylight slots a little over half way down the curved gallery's south wall. The circulation to space circulation is simply one hallway one gallery.



This case study shows that a building does not always need to have artificial light to be able to function. It also provided the idea that one can have a far out there idea as long as it makes sense with what you are designing. Even if the idea is bad for the object. As long as it stays true to the idea behind the object.

# Case Study Series Summary

This case study series was mainly about finding buildings that dealt with the use of natural light in some way or another. Each case had its own unique and creative idea in obtaining this goal. Each one either created a mood, highlighted aspects of its spaces, became an icon, or all of these. All of these cases will become an influence of some kind but they have not changed the theoretical premise or the unifying idea.

The Church of the Light, designed by Tadao Ando, is a building that has become an icon solely based on how the light cuts through the concrete as a cross at the very front of the church. This is true even though there is more beauty to that church than is ever shown through its architectural photography. Everyone seems to be drawn towards the front.

The Kimbell Art Museum, designed by Louis Kahn, is a building that was far ahead of its time. It took the idea that direct natural light is bad for art and used it in a brilliant way. This method not only protects the art from deterioration but also lets people view the art in the light in which it was meant to be viewed. The light shows the colors as people were intended to see them.

Lastly, the Daylight Museum, designed by Tadao Ando, is a building like none other. It also took the idea that direct natural light is terrible for art and tossed it into the trash. Ando instead followed the way of the artist for whom he was designing a museum. The artist always painted when the sun was shining, but when the sun set the artist, too, was done. The museum is only open during the day and has no artificial lighting at all.

Throughout these case studies, light is the main characteristic that resides in all of them. Each wanted to pull natural light into its spaces to enhance either a mood, object, or the space in general.

The main uncommon trait between the three case studies are the systems in which they created to bring natural light into their spaces.

Each site was different from the others, but the way the building was situated on the site was the same in every case. They all were positioned to obtain the most southern light.

All the buildings are meant for people to view, whether it is for silently looking at art or silently praying in church.

# Research Results and Goals:

## Historical Context of the Thesis

In this section of the Program Document I will attempt to establish validity of this thesis project by answering the following questions:

How does this project relate to similar projects undertaken throughout history?

How does this project relate to social trends or developments within our society?

What is the physical and social context within which my project is set?

These questions are important to answer for the thesis project because they will state if the project is able to be built, if the project should even be built, and inform how the project should be built.

Taking these questions one at a time, one can dive into a larger understanding of the project. Let's begin with how this project relates to similar projects undertaken throughout history?

There have been many types of buildings throughout history that have used natural light to reveal different aspects of its spaces, form, mood, and overall meaning. They range from museums and churches to office buildings and hospitals.

Take the Kimbell Art Museum again for example. It is said to be "[Louis] Kahn's offering to light." (Lobell, 1979, 94) Kahn used natural light as the main system of illuminating not only the spaces of the building but also the work that is displayed throughout the spaces. The museum was built by 1972 and was before its time in the innovation and use of natural light.

Jump ahead a few years to 1989 and look at the Church of the Light by Tadao Ando who is yet "[another] master of manipulation of natural light." (Phillips, 2000, 114) Here, too, Ando uses natural light as the main system to light its space. The way in which he plays with light conveys a humbling feeling inside the space, along with an iconic and symbolic identification to the space.

Finally, closer to the present day, we can look at the Hong Kong International Airport designed by Foster and Partners, which was built in 1998.

Phillips (2000) stated

“Despite its deep plan the building is fully daylit from floor to ceiling through side windows and lines of triangular skylights in the [center] of each of the nine barrel-vaulted roofs. The natural light is diffused by suspended reflectors along the roof gangway which provides access for maintenance...” (p. 144)

The next question to discuss is: How does this project relate to social trends or developments within our society?

In today's society to get married a building or space of religious stature or setting is wanted. According to an internet web site by a Sound Vision staff writer “80 percent of all weddings take place in chapels, churches, and synagogues... and about 6,200 weddings take place every day in the United States.”

With those kind of statistics there is going to be a need for a place to celebrate the joining of two lives. Furthermore, to have a place that is nondenominational so that more than one type of religion can enjoy the space. Thus, keeping the building in use the majority of the year.

Lastly, I will end with the question: What are the physical and social contexts within which the thesis project is set?

The site is basically surrounded on all sides. To its North and South are residential homes along with small patches of trees scattered in between. During the morning to mid-day, these are fairly quiet due to the fact that the parents are working and the children are at school. But when school breaks for the day the sound of children fills the air until they reach their homes then it is silent. Eventually, some find their way back outside and the noise which had gone comes back. Once work breaks, the sound of passing vehicles comes into the picture. When they are passing by, their noise takes precedence over the children who have not returned to their homes.

To the East of the site there is more residential buildings but there are some other types of buildings too. For example, there is a karate dojo and a larger building which appears to be an apartment building. Also, there exists a Moorhead water tower directly across the street from the site and one of Moorhead's more people active parks which is Woodlawn Park.

Finally, to the West of the site is the Red River of the North and a water level marker that shows how high the Red gets when it floods. Which in the 100 year flood plan as been marked to be able to get close to the top of the hill that is on the site. But in the FEMA 500 year flood plan the site would flood. During the winter, the site is used by children and their families as a sledding spot.

The site does not get used that often. Winter is the only time that it is visible that people interact with the site.

There does seem to be a homeless person living underneath a part of the cantilever that sticks out over the hill. It would appear that way because of all the personal belongings that clutter one of the two inlets underneath the cantilever.



# Research Results and Goals:

## Goals for the Thesis Project

### The Academic

Natural light should always be considered before the artificial.

This idea has been a strong belief of mine ever since I started my five-year study in architecture. In doing a thesis dealing with light the hope and goal is to influence and inspire future generations at North Dakota State University to want to understand its abilities too.

### The Professional

The main goal for the professional part of this thesis consists entirely of the quality of work produced. This thesis should be at the level and standards of professional work being done by firms all around the country. My abilities as a student should come forth in my presentation and effectively display my ideas in a clear and concise way.

### The Personal

Some personal goals for this thesis are to grow my abilities in knowledge and ideas. Also, I would have this thesis become a doorway into which new ways of thinking and designing come into perspective. Lastly, I hope to obtain a new understanding of natural light and what it is capable of doing.





# S

## ite Analysis

## Site Analysis:

### Qualitative Aspects

When first approaching the site for this project, there was a sense of emptiness and abandonment. The old electrical plant has been shut down, locked up, and fenced in. It just sits there, looming over the residential area and the river, much like a grumpy old man who sits on his porch watching everything and making sure no one or nothing goes on his lawn.

But after getting past the gloomy feeling of the electrical plant, the site's true beauty rose to the surface. Behind the site to the East is Woodlawn Park, which during the summer is packed with people playing a variety of sports. People playing basketball, baseball, and even a sport that is just catching on, this sport is called frolf. Frolf is much like the sport of golf but it is played with discs and they are thrown into baskets with metal chains attached.

To the North and South of the site are the residential homes that at the time of the factory being in use, the homes for some of the workers. Now, they are more than likely owned by new families. At the site it seemed like nobody was home, even though cars were in driveways. It was quiet except for the occasional passing car, but even that noise was minimal.

The West side of the site has the hill atop which the existing electrical plant sits, the Red River of the North, and the view from Moorhead that connects to Fargo.

The hill is basically the site's topology. The part that the plant sits on is flat, but when that area ends it connects to a hill that slopes down to the Red River. This is the part of the site that does not seem like it is in use. In winter; however, the hill becomes full of life. Children from the homes in the area come and make use of the hill. Sled lines travel from every inch of the top of the hill down to the walking path like the streaks raindrops leave when moving down a window.

Next is the Red River of the North. It is not the cleanest-looking water in the world, but that is due in part to the clay over which the water flows. Despite that aspect of the Red River, it is itself an aspect of the site that needs to be respected.

Lastly, the best view from the site peers over into Fargo. The view seems so great because it is the only one that gave it some context and an overlook of the surrounding area. It is framed by trees within the site and the mighty Red River of the North.

When leaving the site the feeling of a looming figure was diluted but the sense of emptiness and abandonment stuck.

# Site Analysis:

## Quantitative Aspects

### Soils

The site is in Clay county of Moorhead, Minnesota. Its soils are in three of the ten classes of soils. They are: Plastic silt, Non-plastic clay, and plastic or organic clay. "In Minnesota, the water table is generally close to the land surface, typically within a few tens of feet in much of the state." (MN Department of Natural Resources, 2009.)

The most critical problems with the subsurface of the site is its high water table. Moorhead's location is next to the Red River does not help the site keep water down. This is why flooding occurs almost every year during spring when the snow melts and drains into the Red.

### Utilities

An old shut down electrical power plant on the site naturally creates set utilities either on site or close to it. On site is a large electrical storage shed, and the site across the street has a water tower. Also, because the site is in a residential neighborhood, there is phone, internet, and of course electricity.

## **Vehicular and Pedestrian traffic**

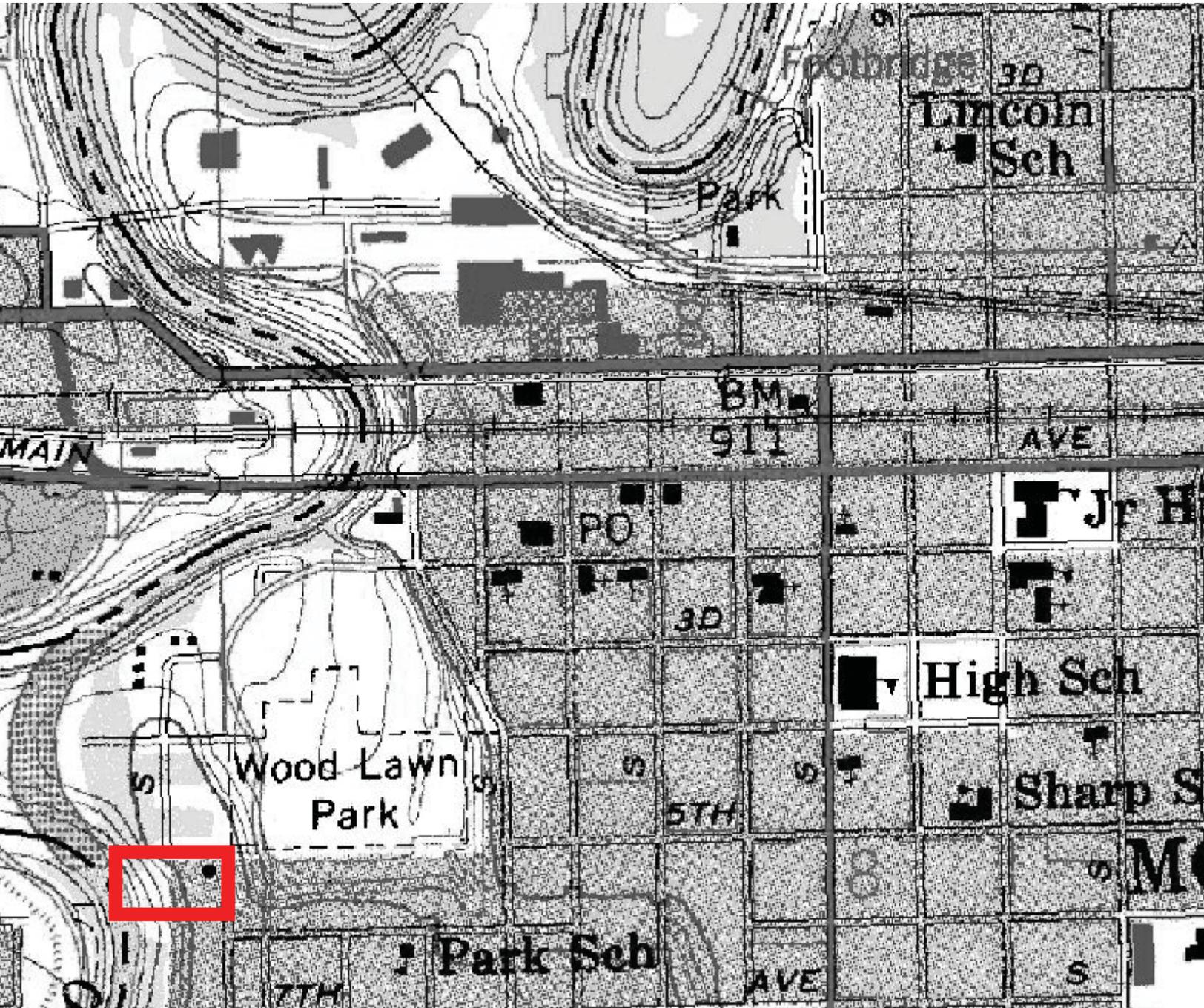
Since the site is at the end of a road and in a residential community, the vehicular and pedestrian traffic is mostly done by the people that live in the community or live close. Otherwise the only other vehicular traffic would be school buses or house call workers.

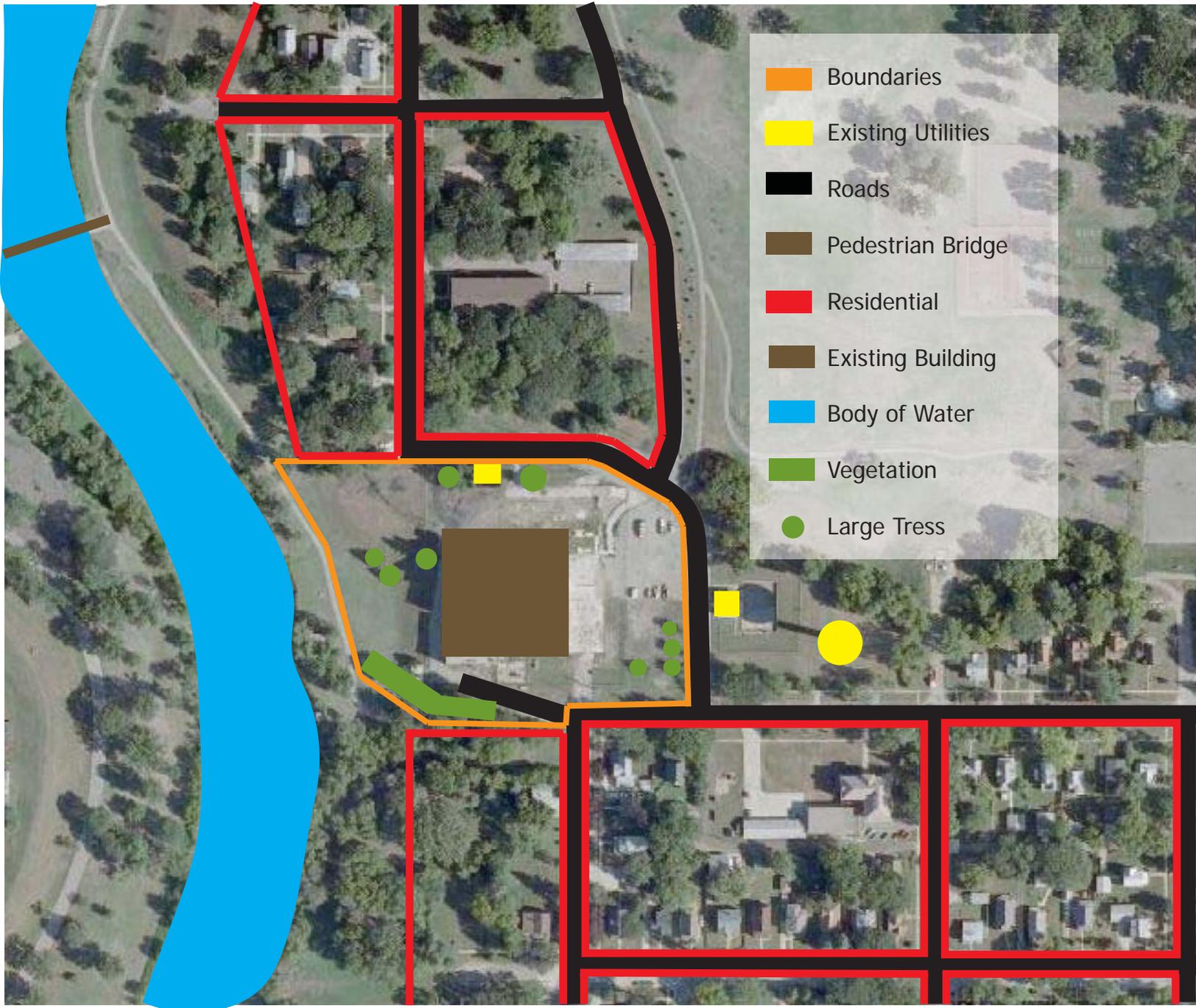
## **Topographic Survey**

The front half of the site is sloped under 4%, which to some seems flat but helps with drainage of water off the site. On the back half of the site, the slope to the river becomes a little more steep and gets to be around a 10%.

## **Site Character**

The site's location next to a river makes some erosion next to the water's edge, but there are no signs of erosion on the site. When the water rises every year after the snow melts, it does get a muddy water coating over the grass towards the bottom of the site. Vegetation on the site looks healthy and long lasting. It helps having a natural water supply next to the site.





## Site Walk-Around





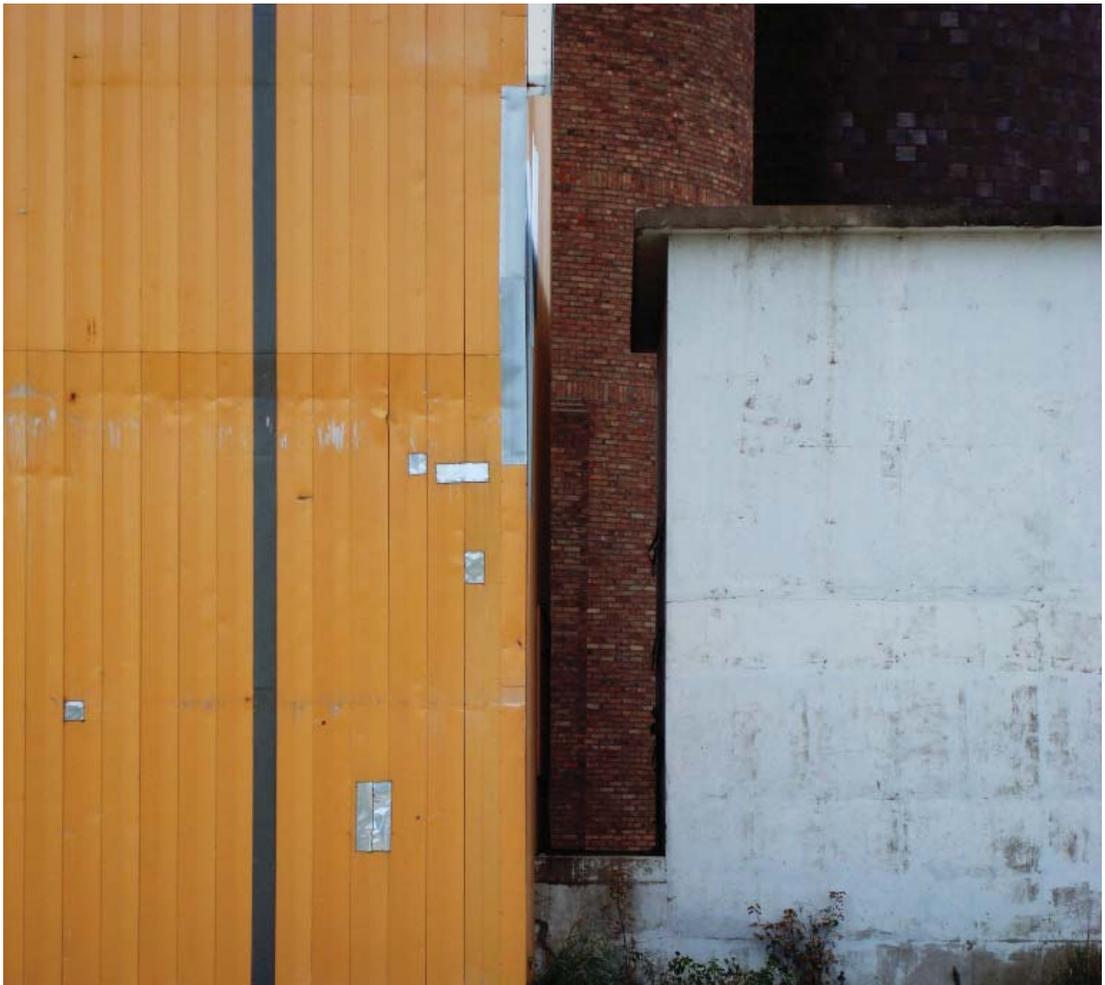






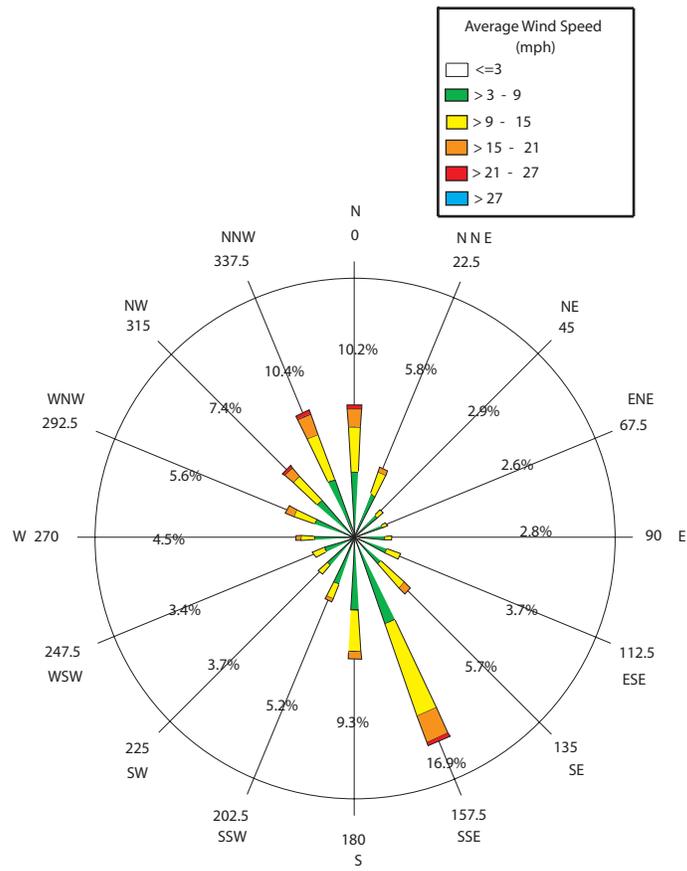
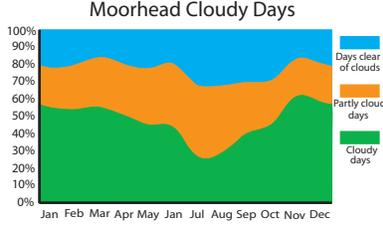
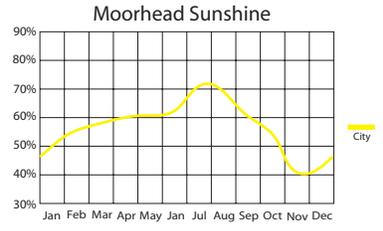
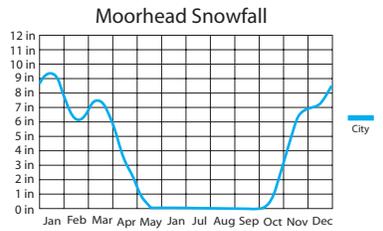
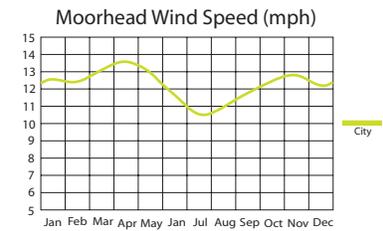
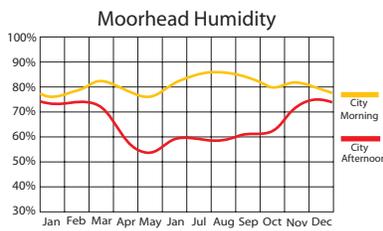
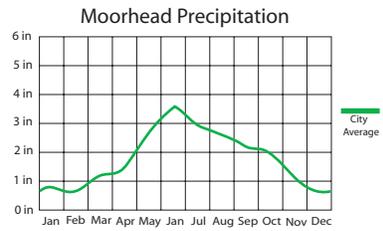
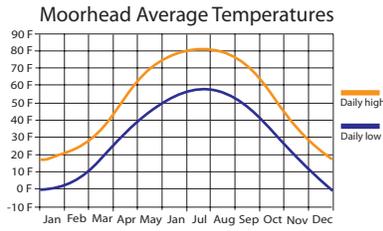


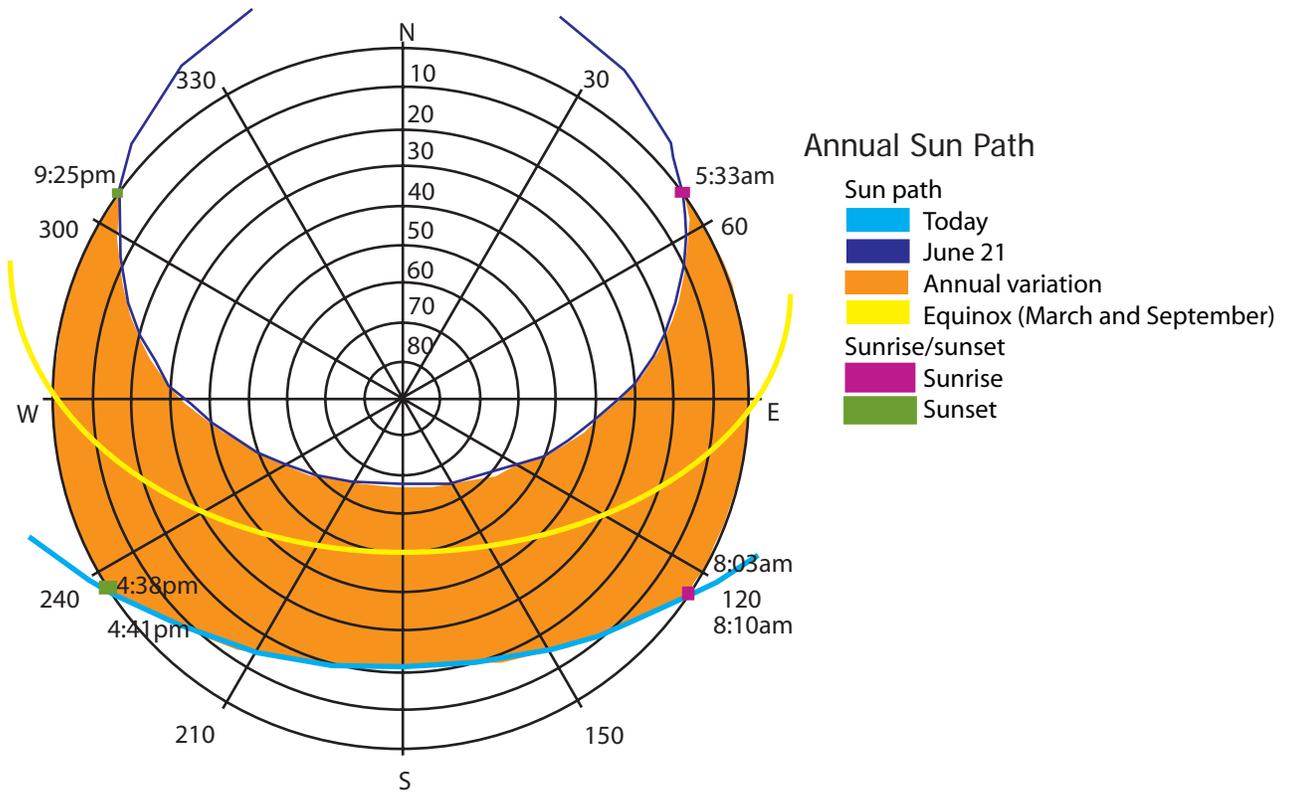




# Site Analysis: Quantitative Aspects

## Climate Data





## Programmatic Requirements:

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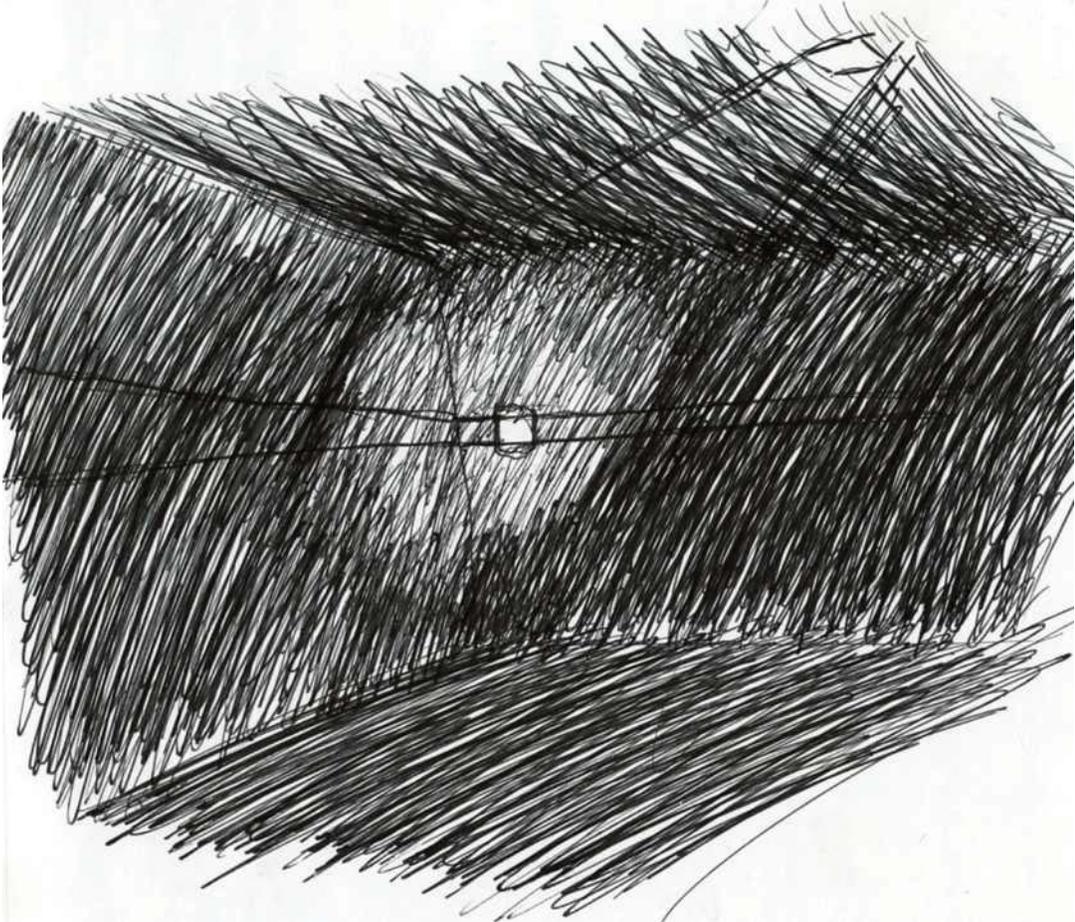
Chapel	3,600 sq. ft.
Dance Floor	2,430 sq. ft.
Garden	3,216 sq. ft.
Bar	716 sq. ft.
Reception Hall	3,403 sq. ft.
Wedding Planners Office	945 sq. ft.
Wedding Suite	1,658 sq. ft.
Reflection Pool	1,188 sq. ft.
Kitchen	1,466 sq. ft.
Bride's Room	308 sq. ft.
DJ Booth	638 sq. ft.
Upstairs Outdoor Patio	1,640 sq. ft.



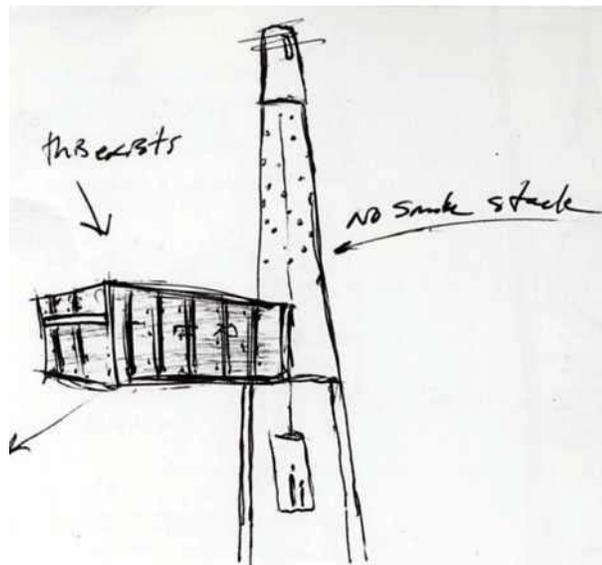
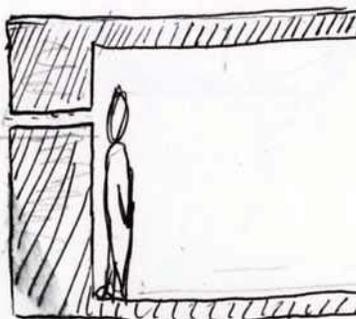
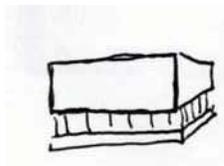
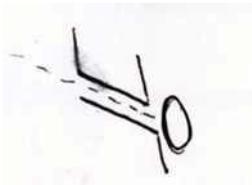
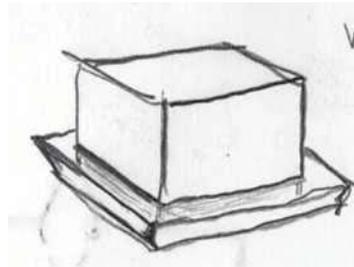
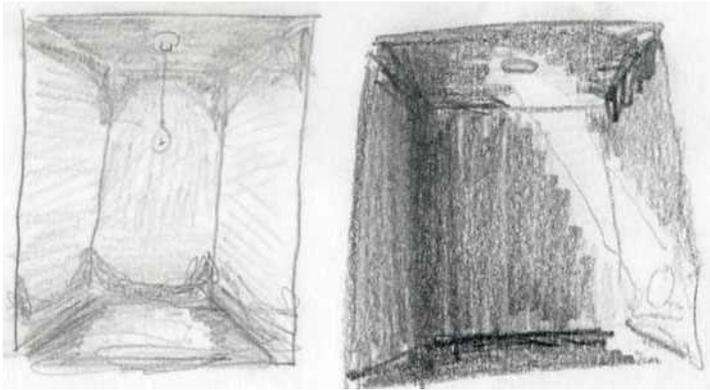
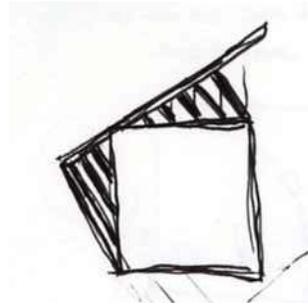
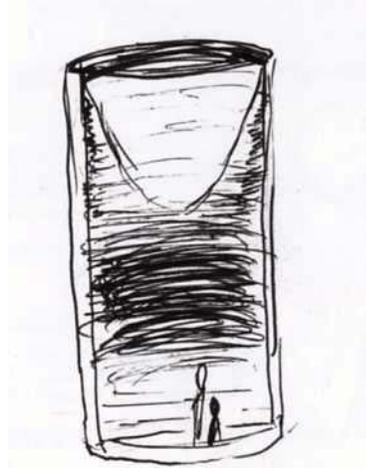
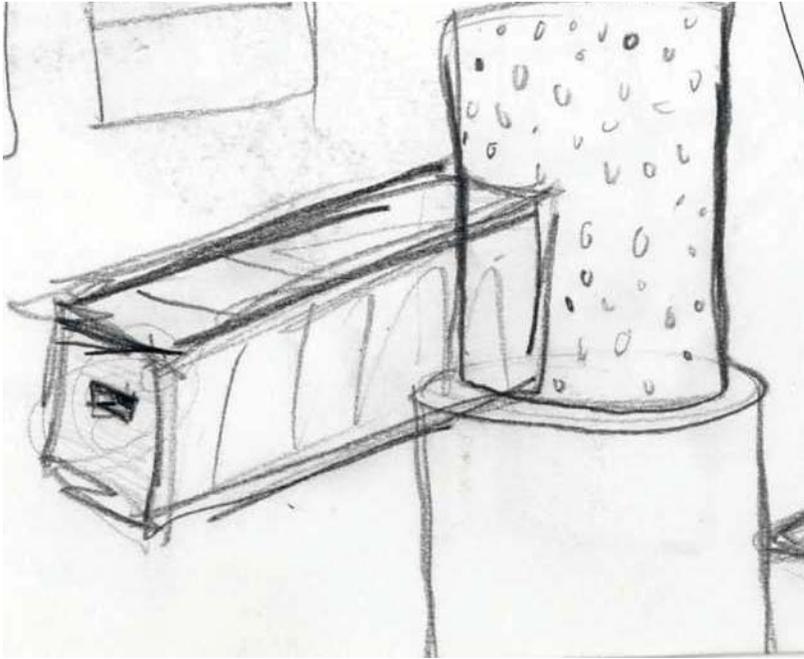


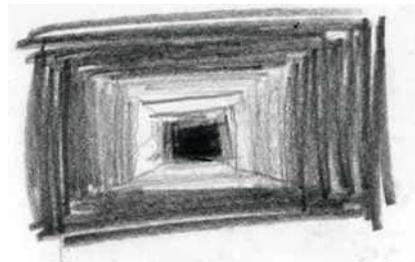
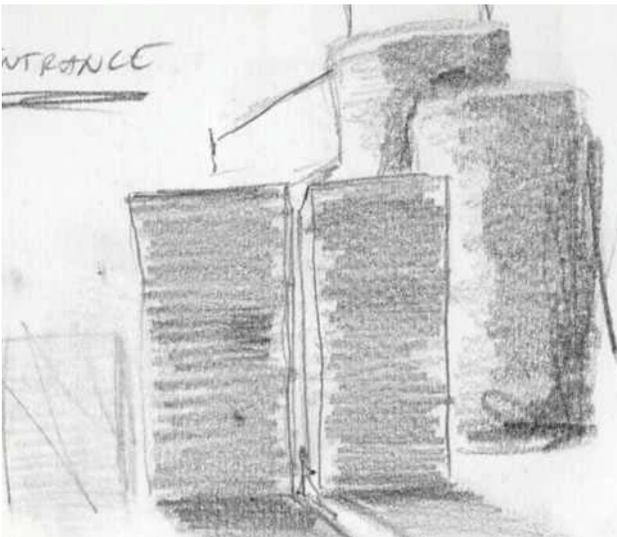
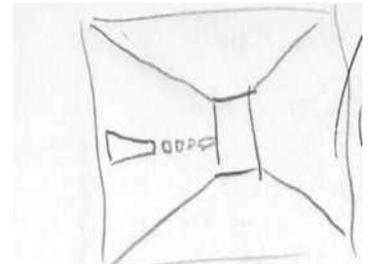
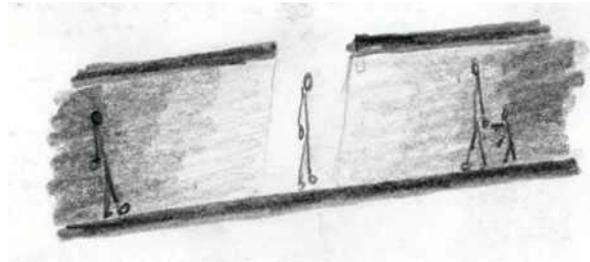
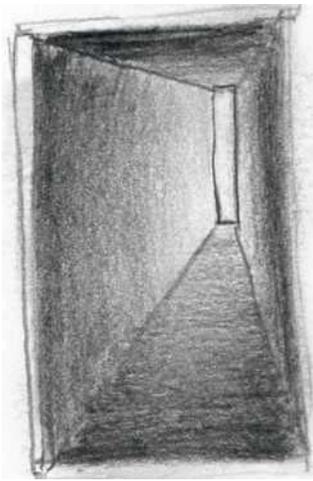
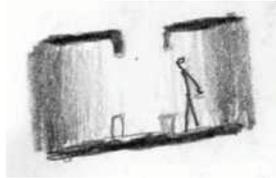
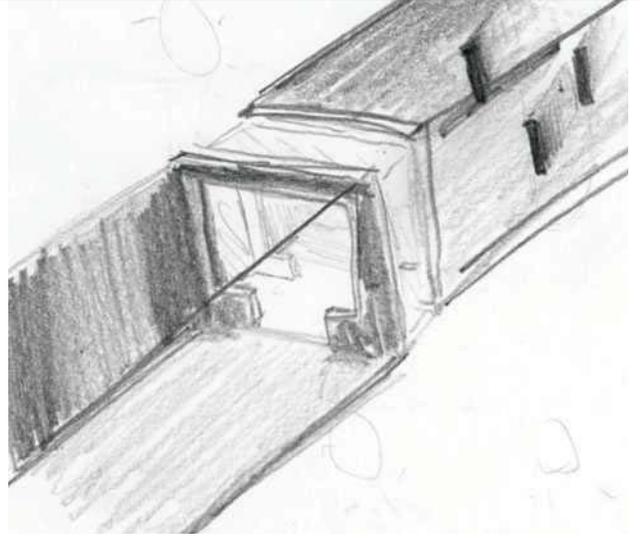
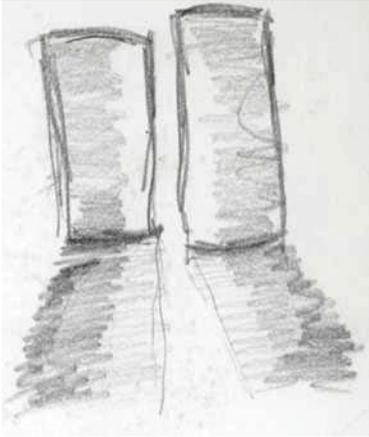
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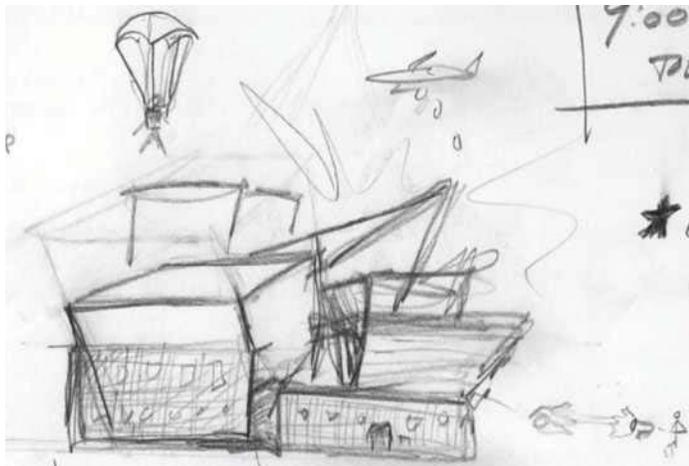
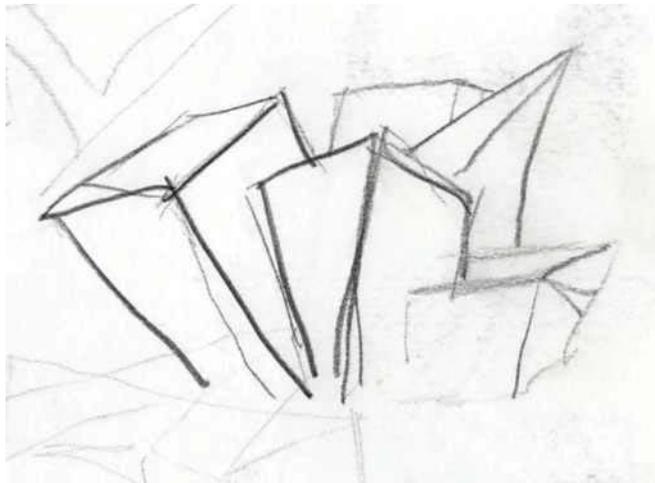
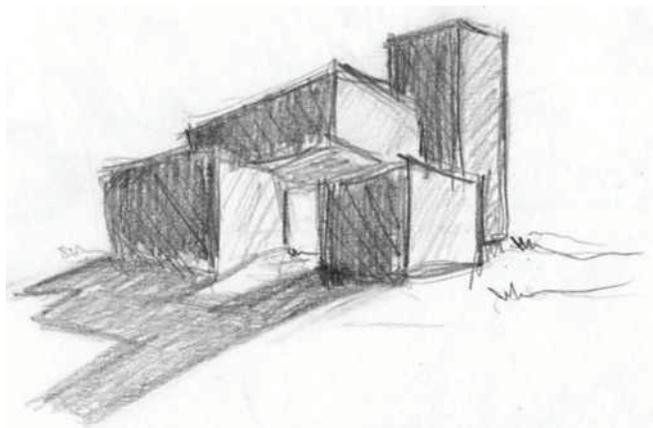
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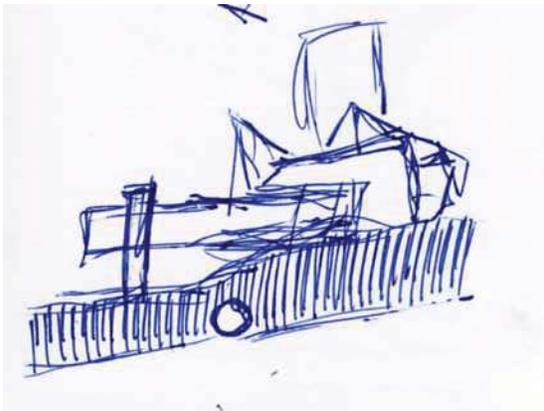


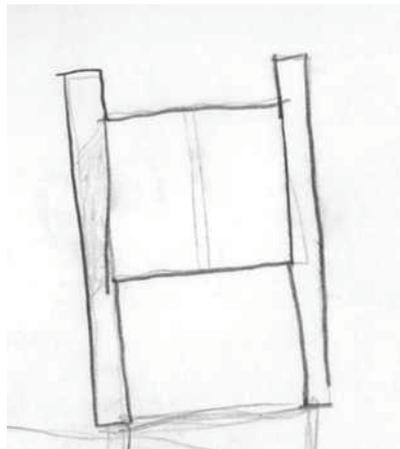
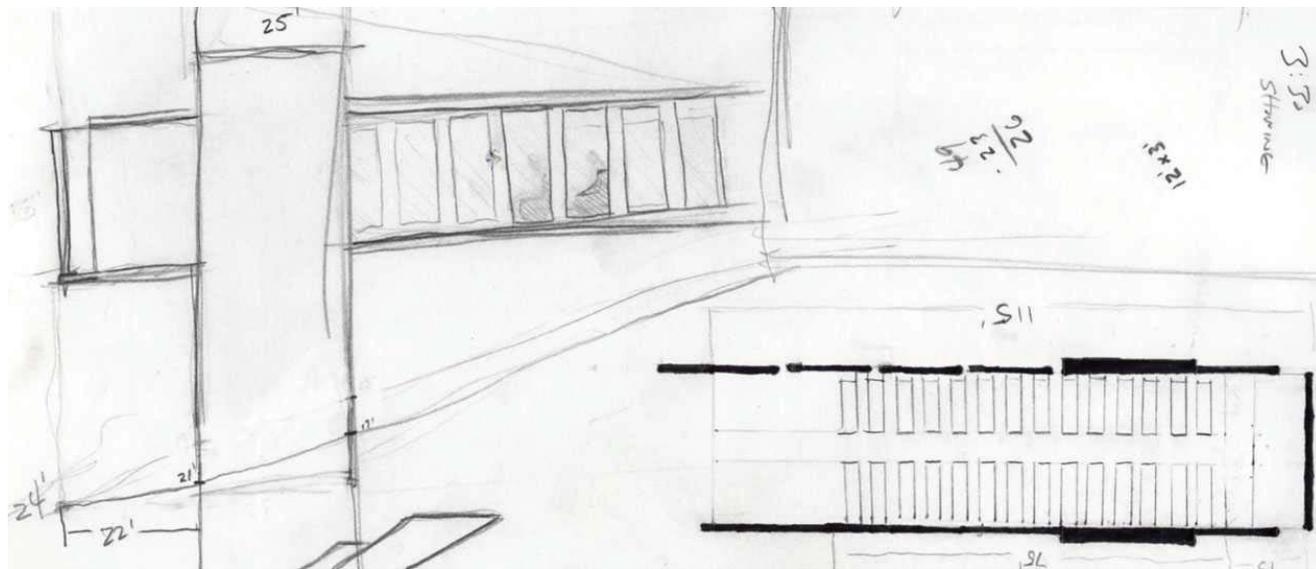


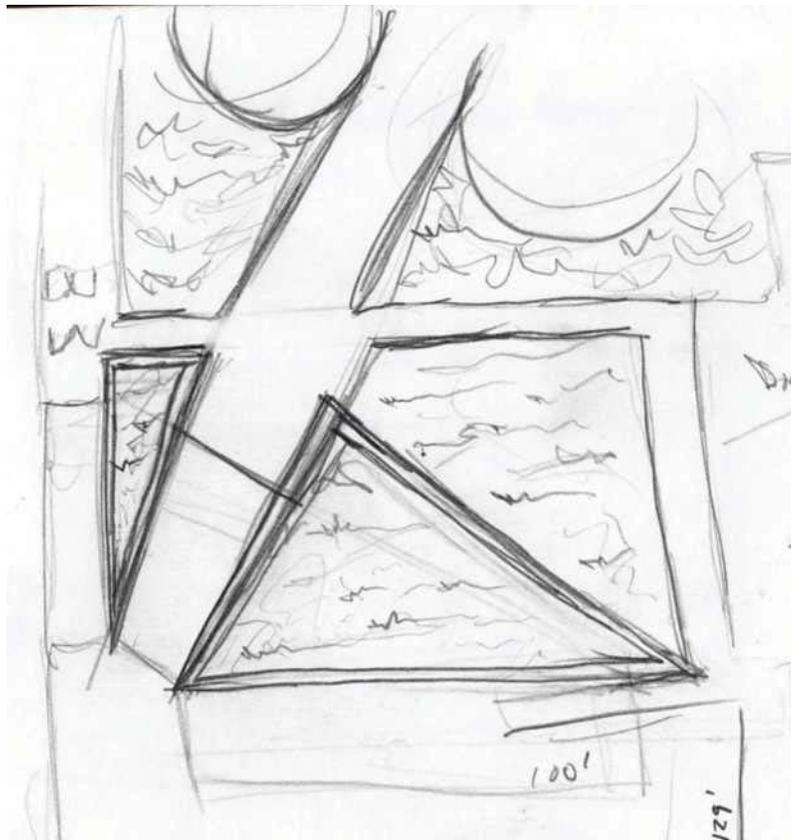
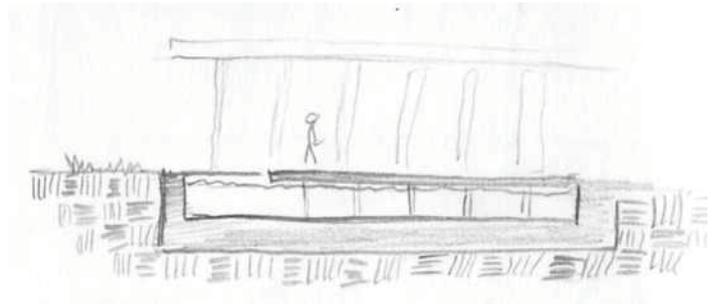
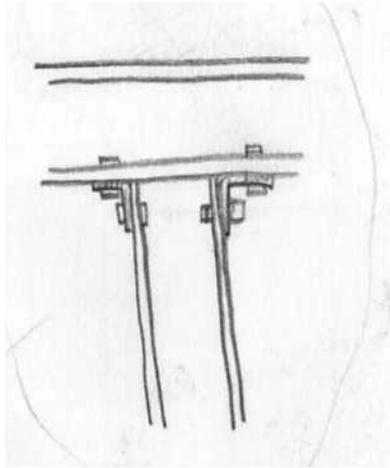




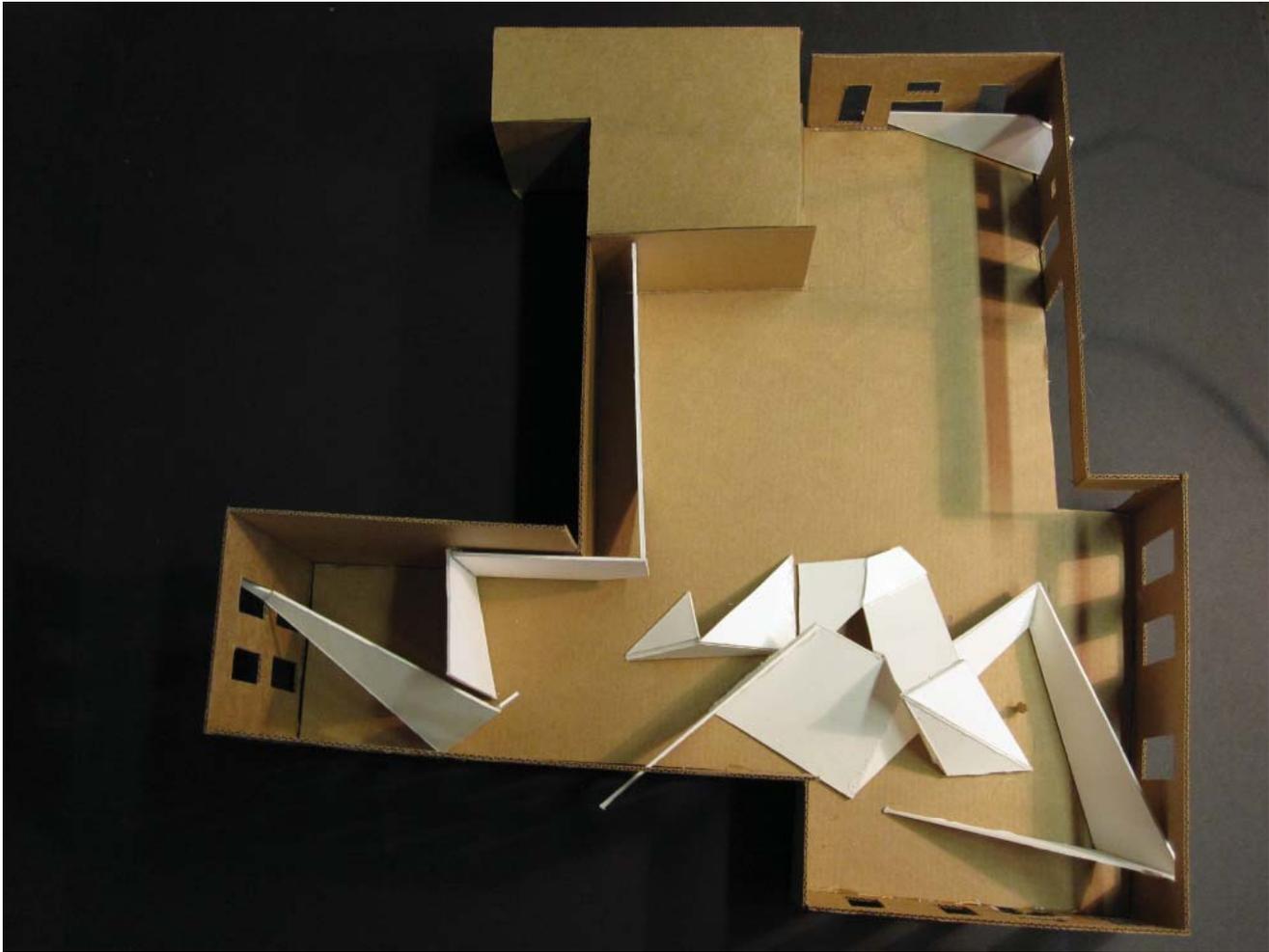


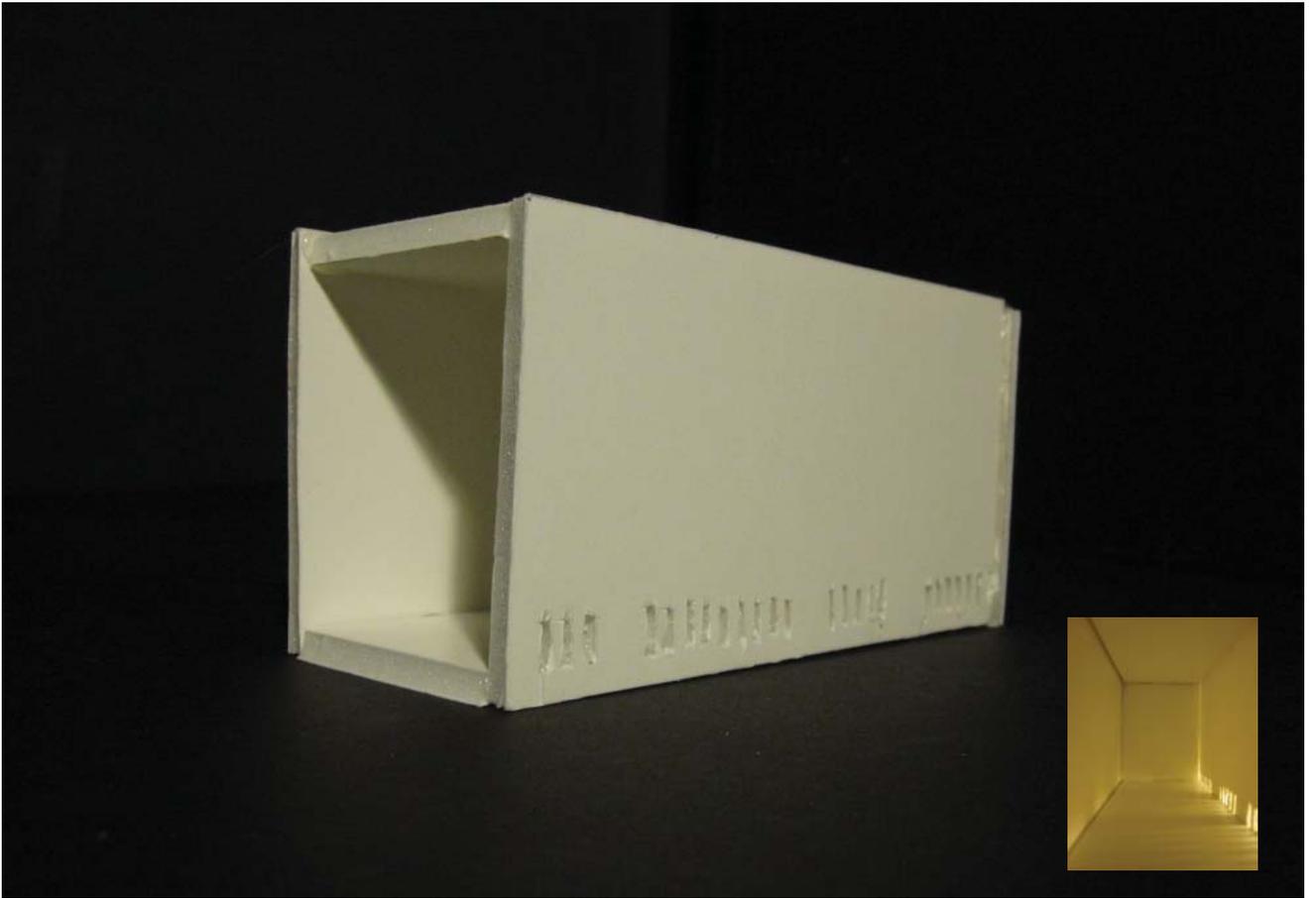


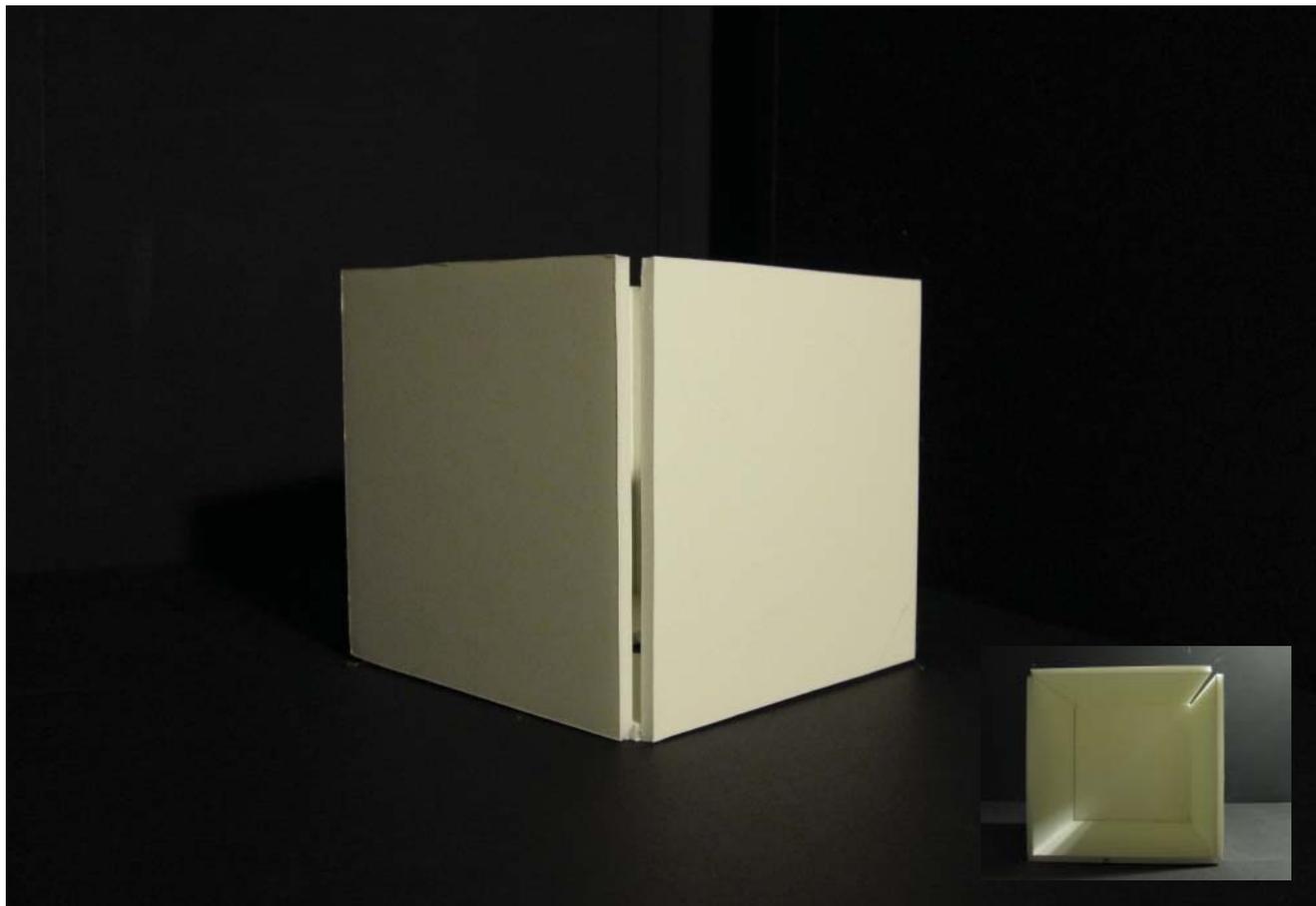


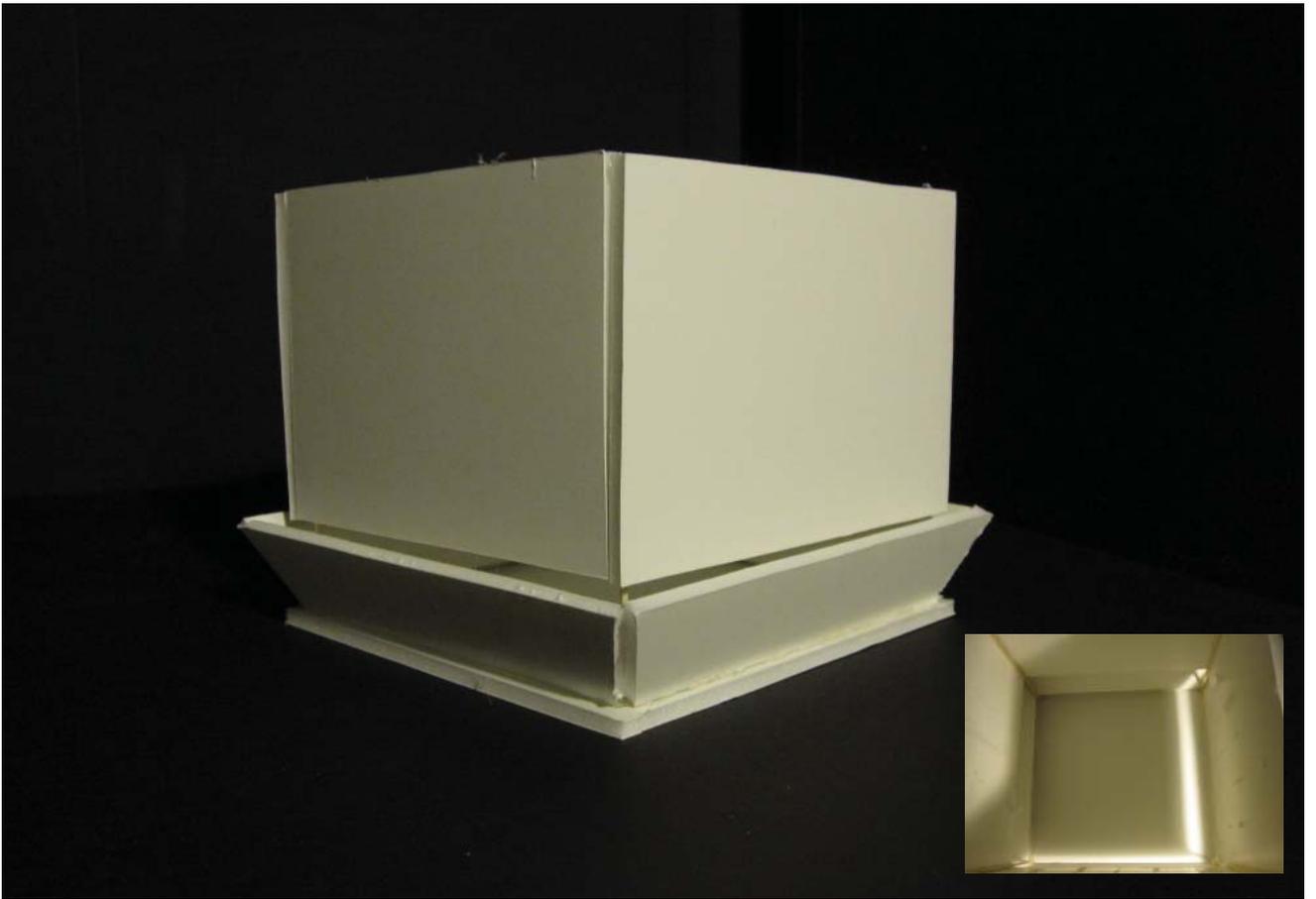


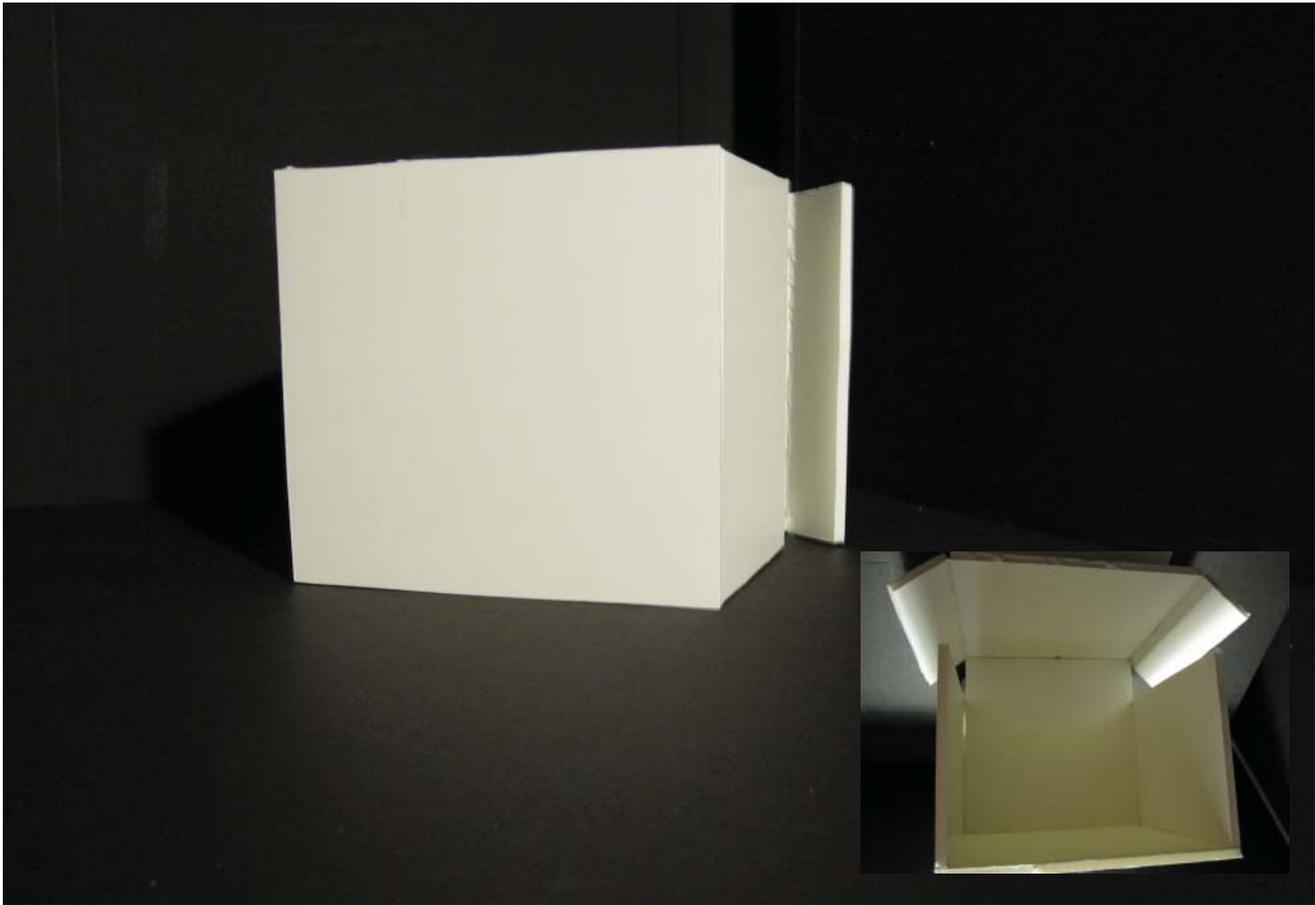
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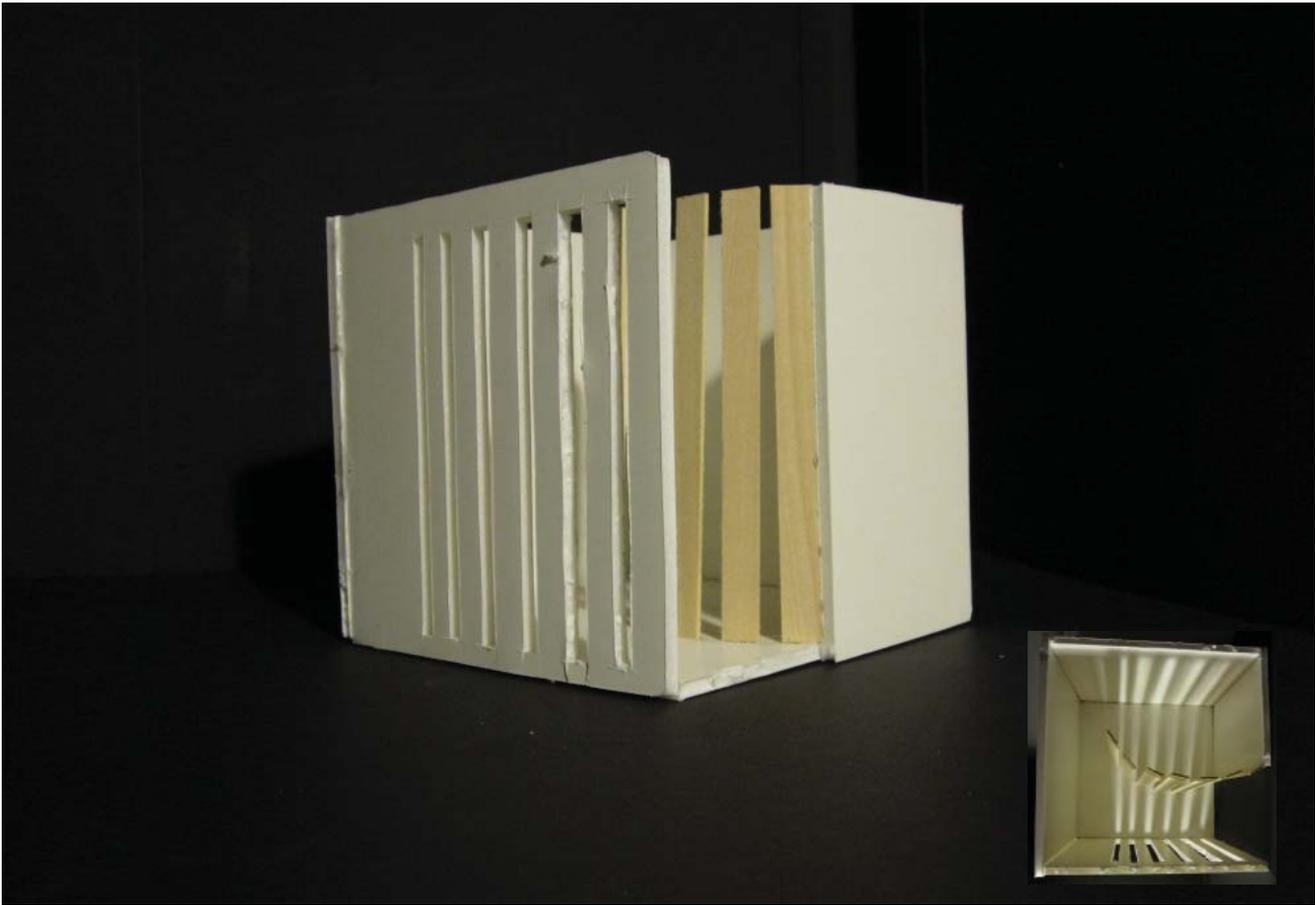


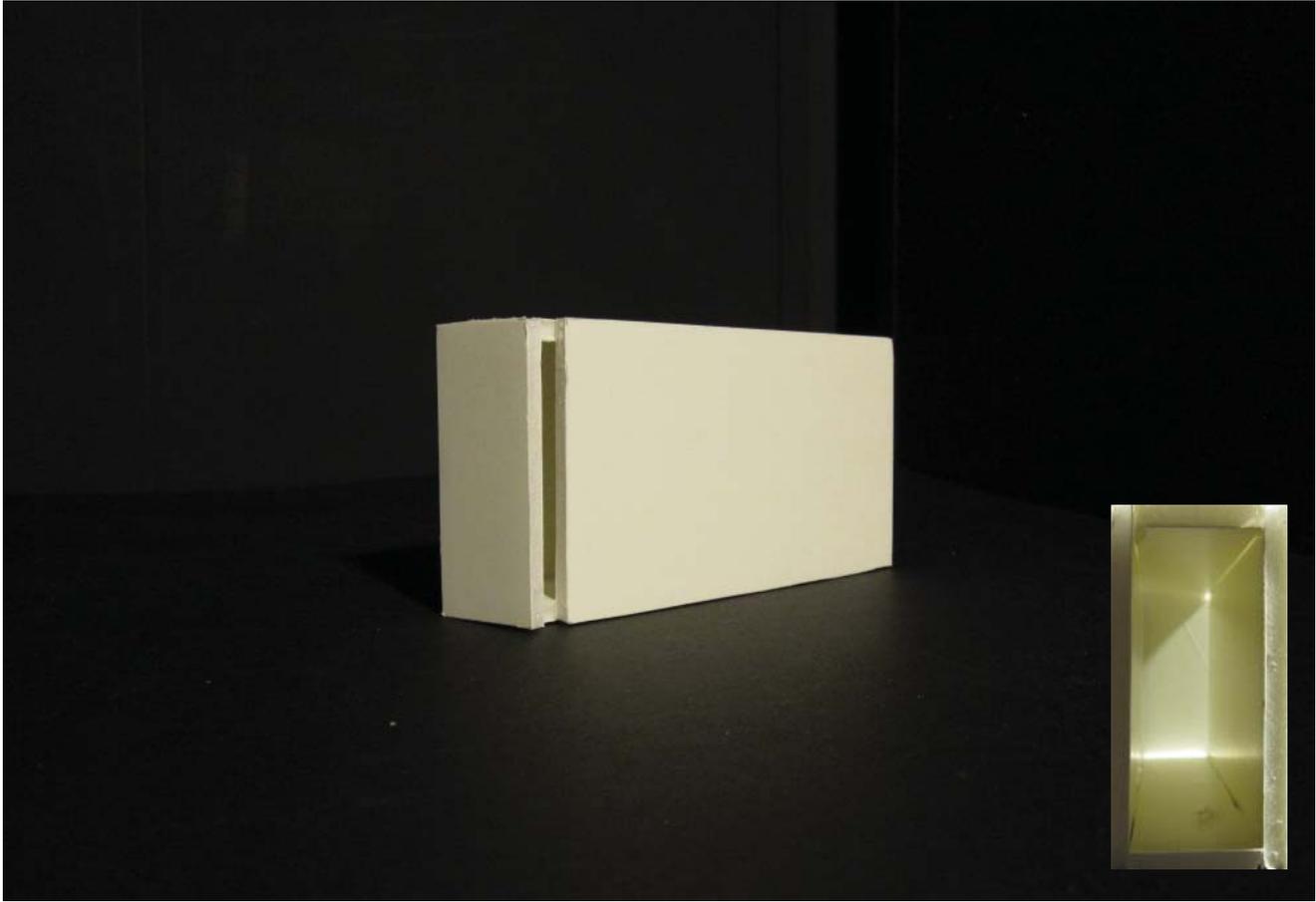


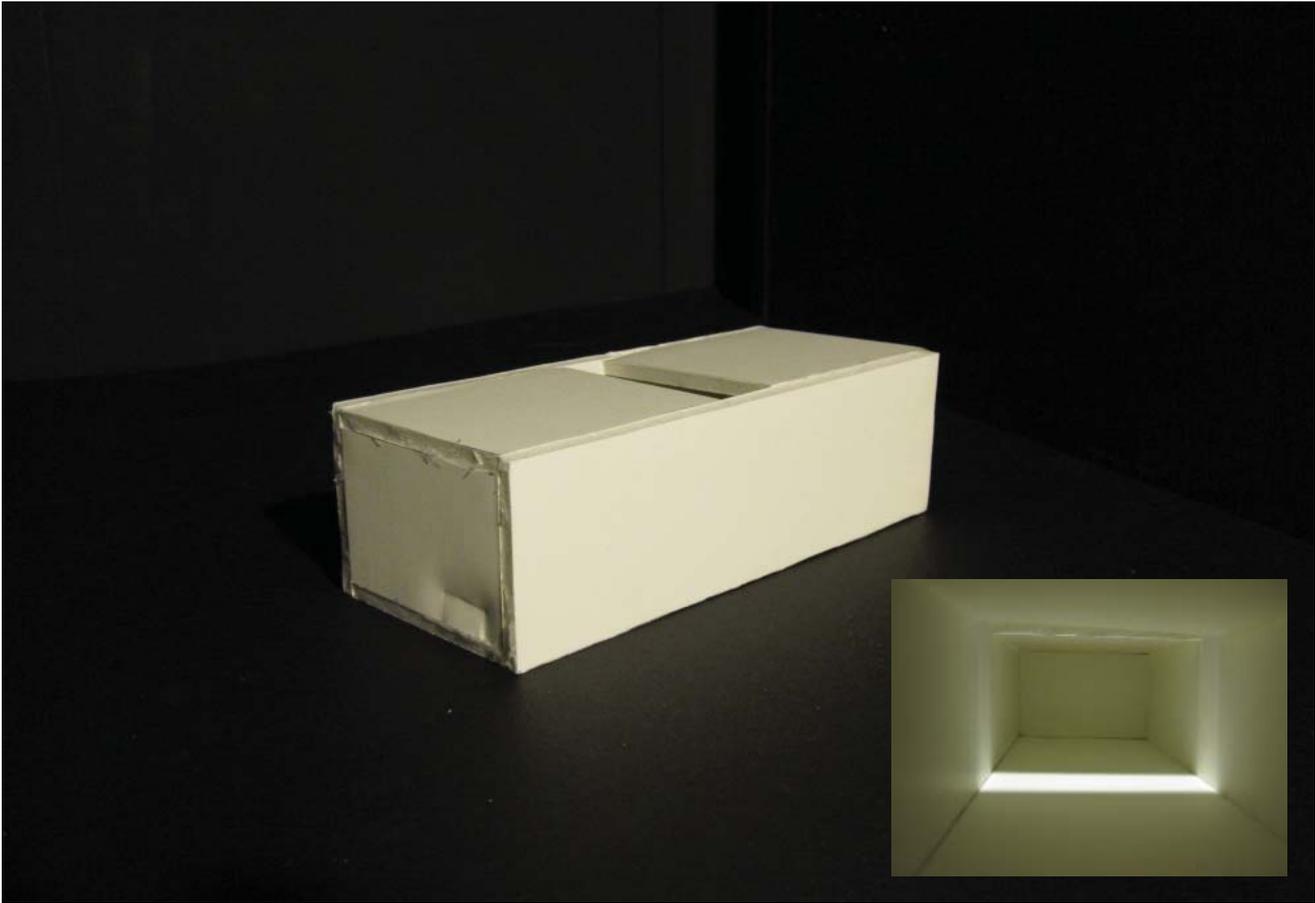


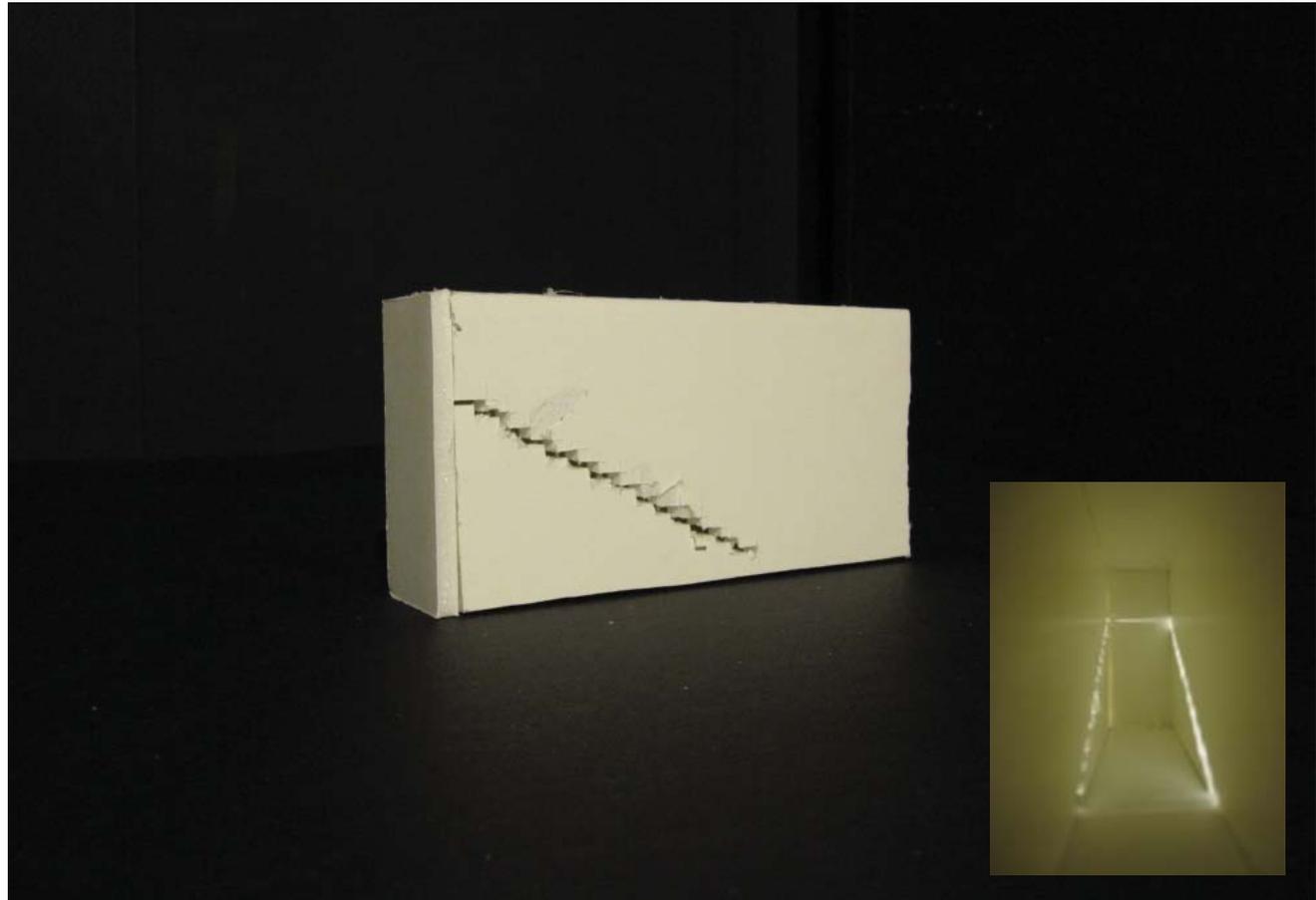


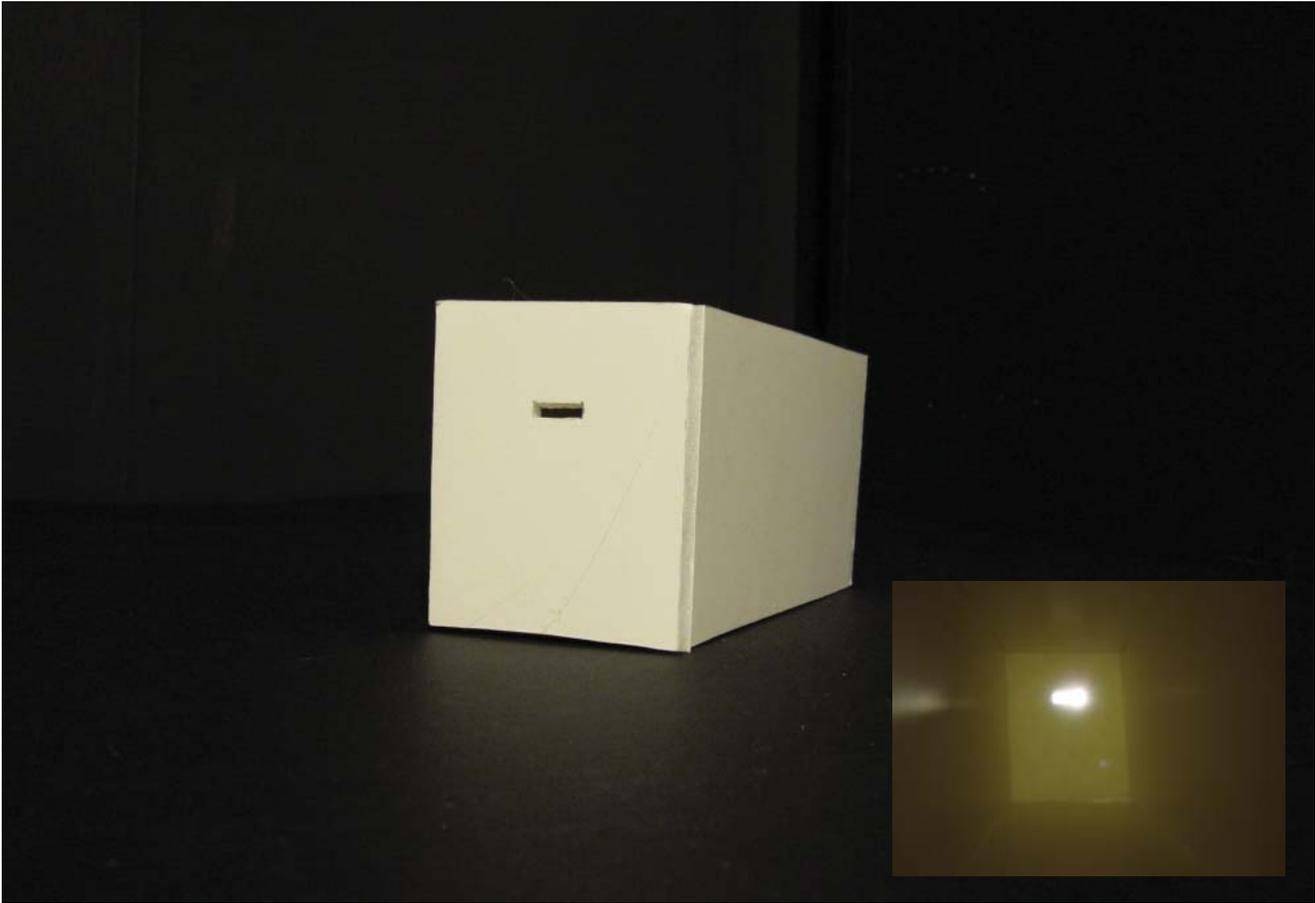


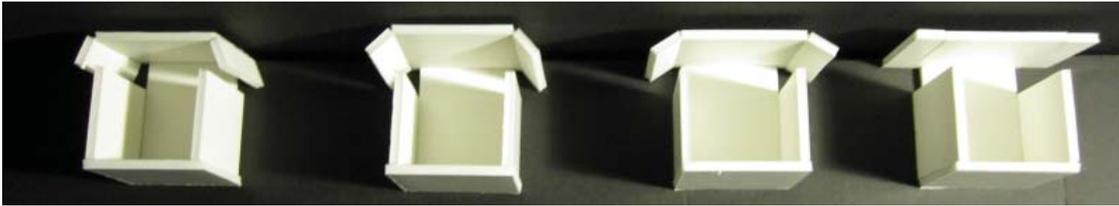
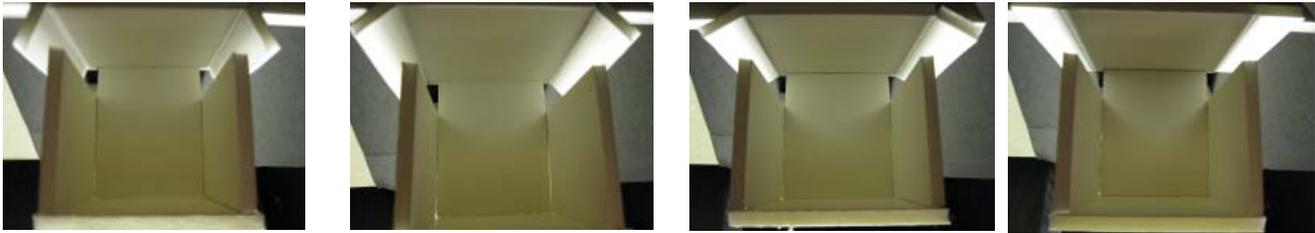




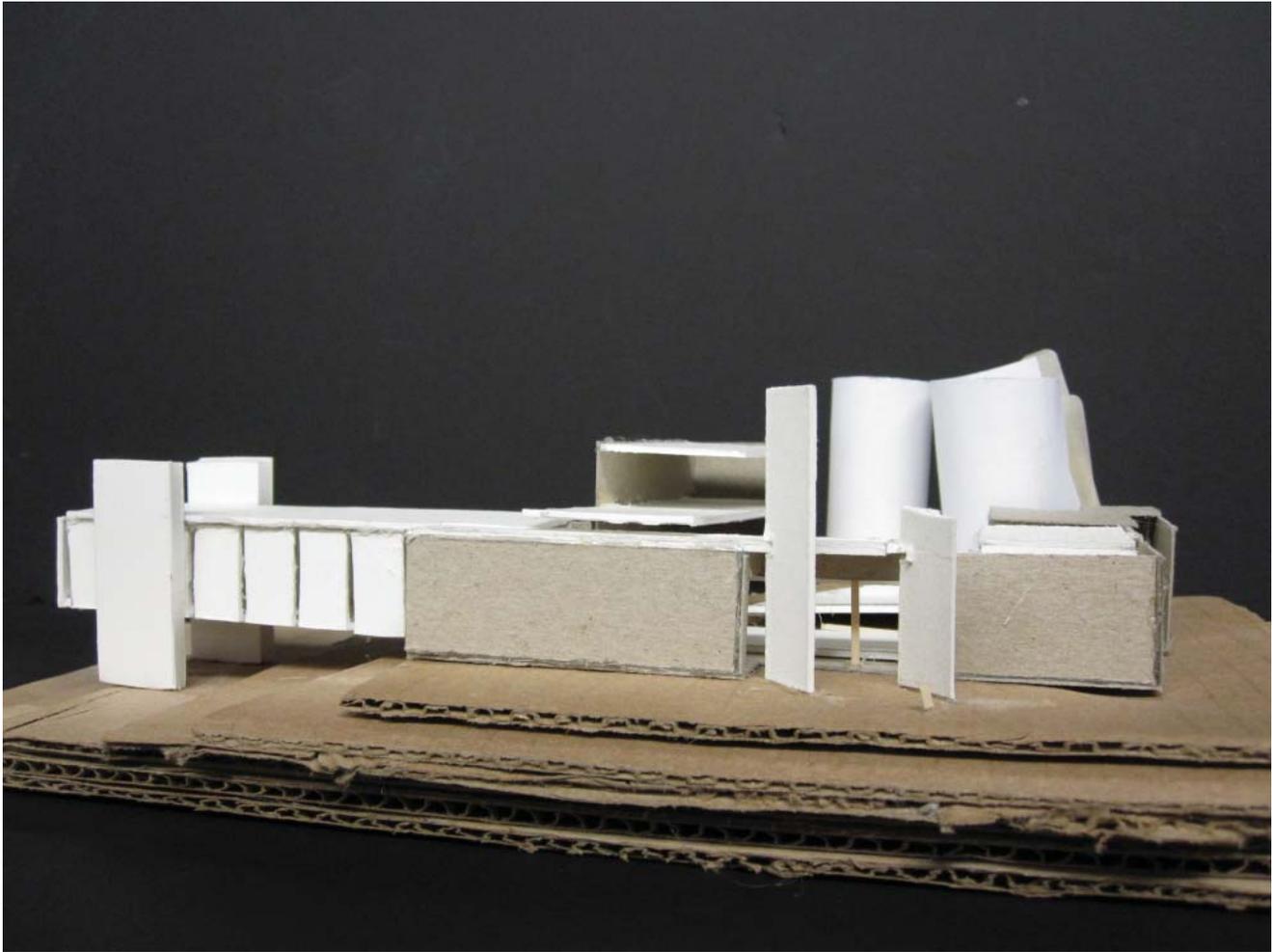










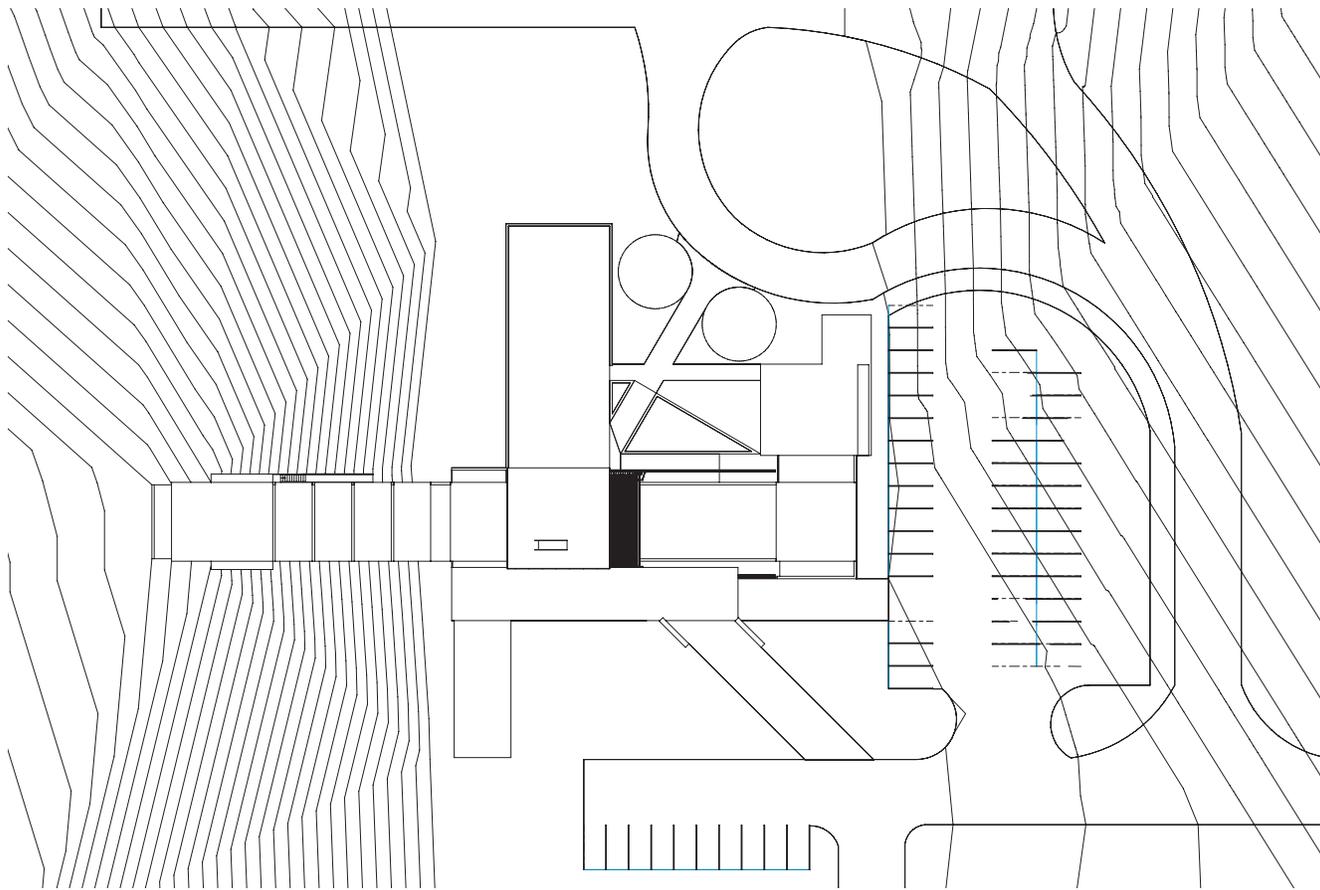




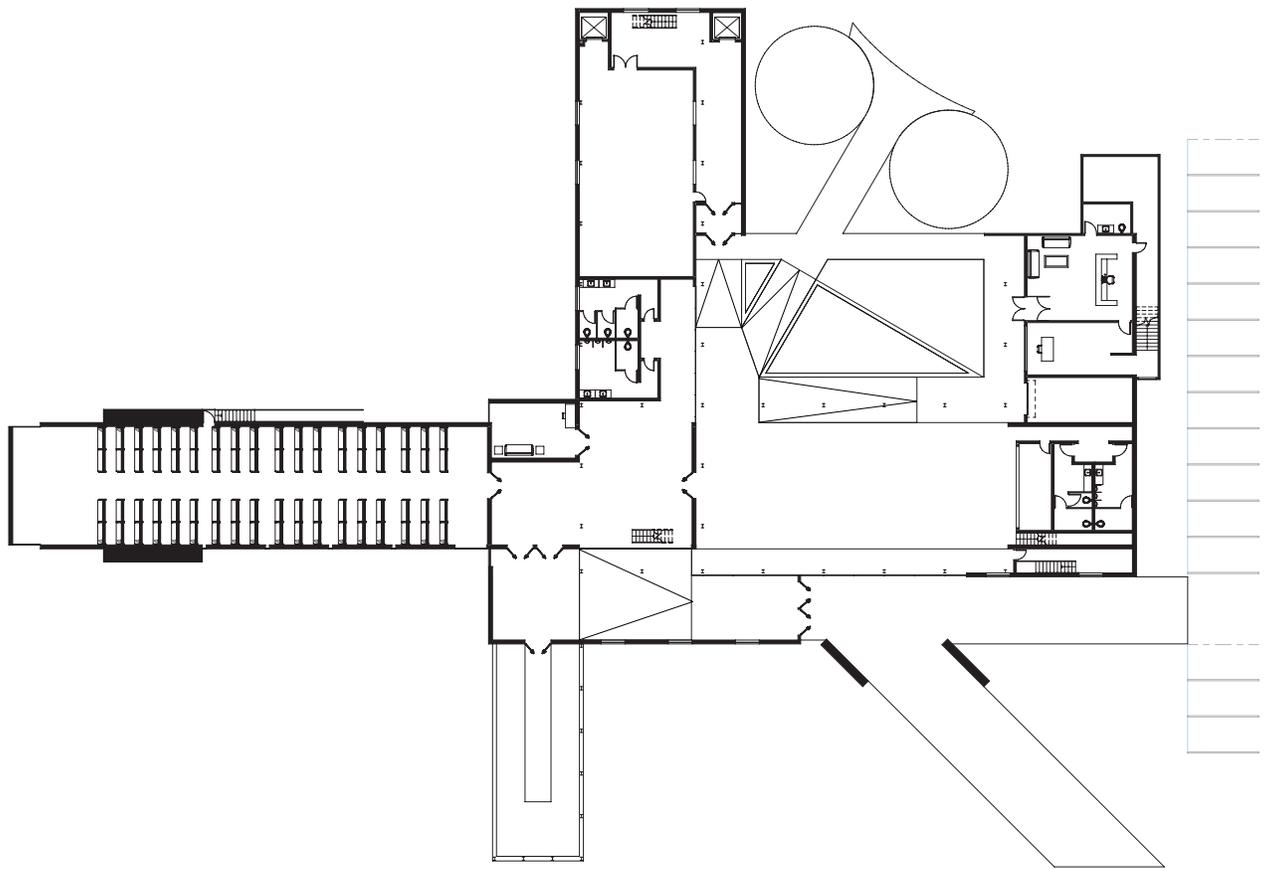


# **P**roject Solution Documentation

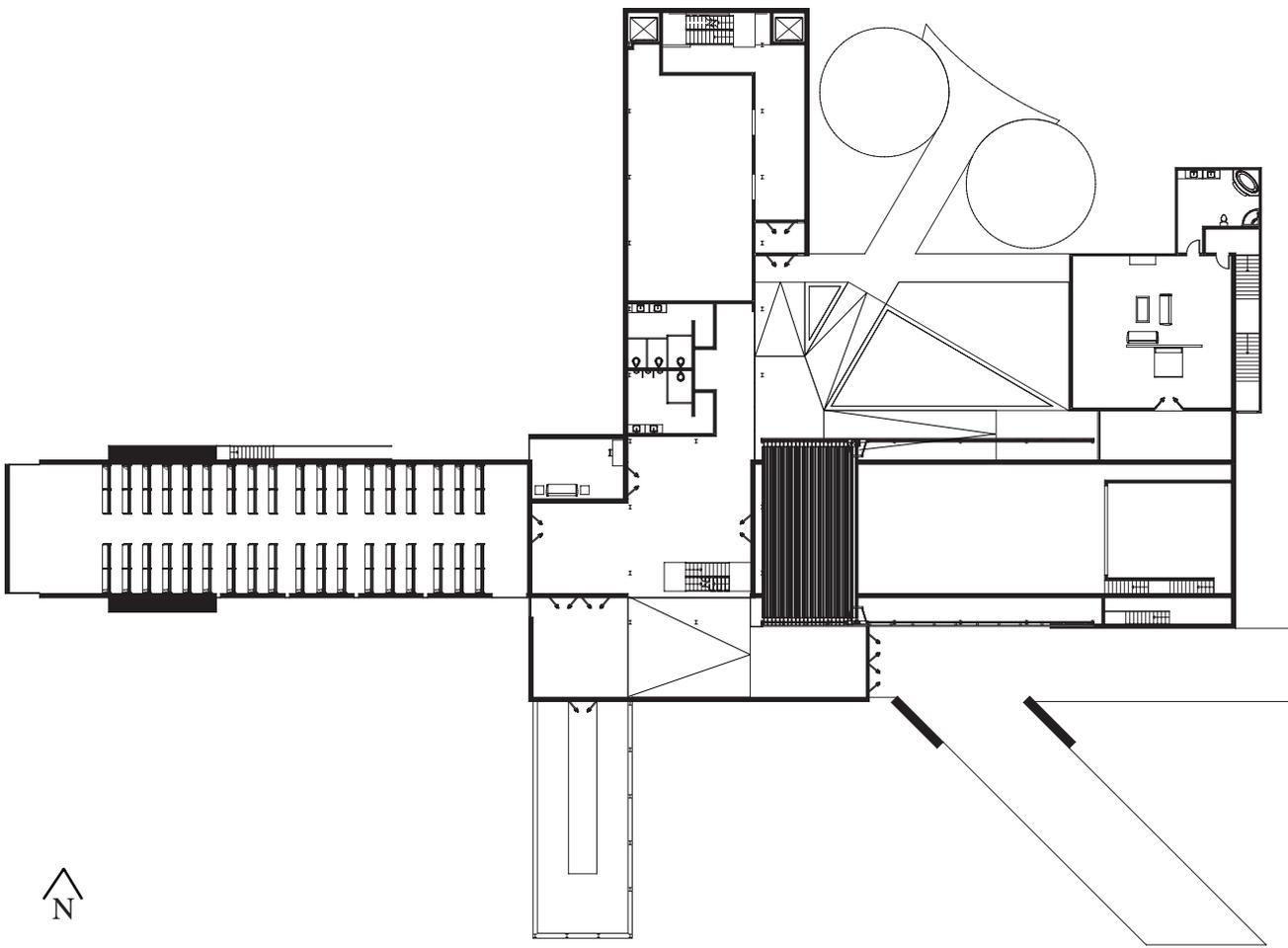
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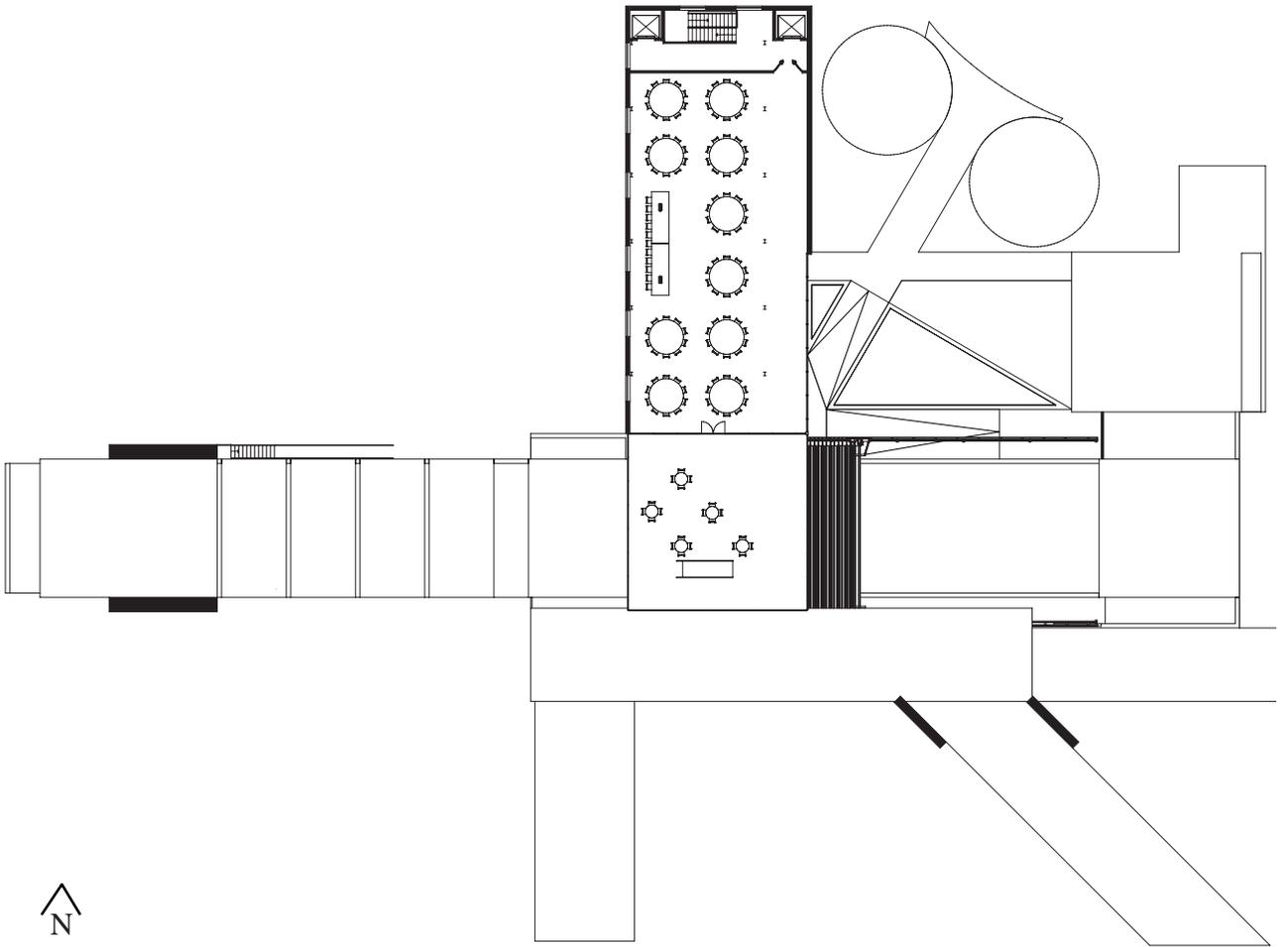
Site



**Chapel Floor**

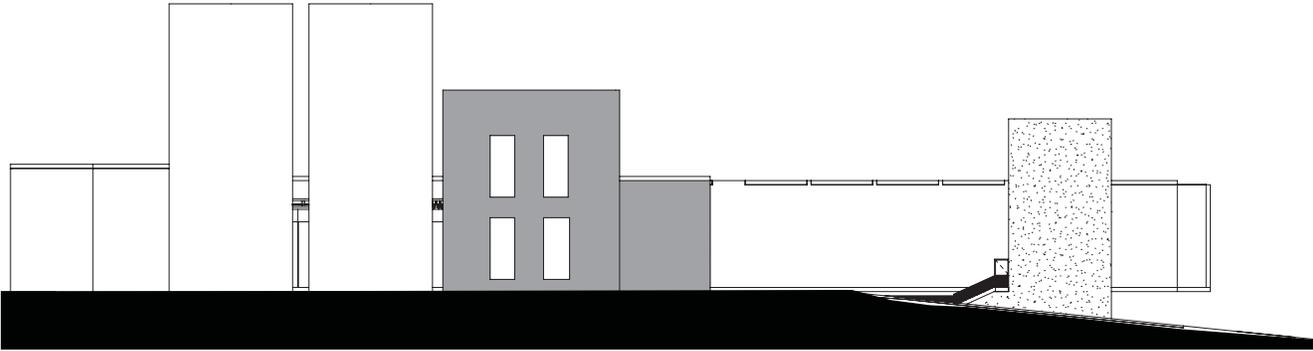


Wedding Suite/ DJ Floor



**Reception Hall**

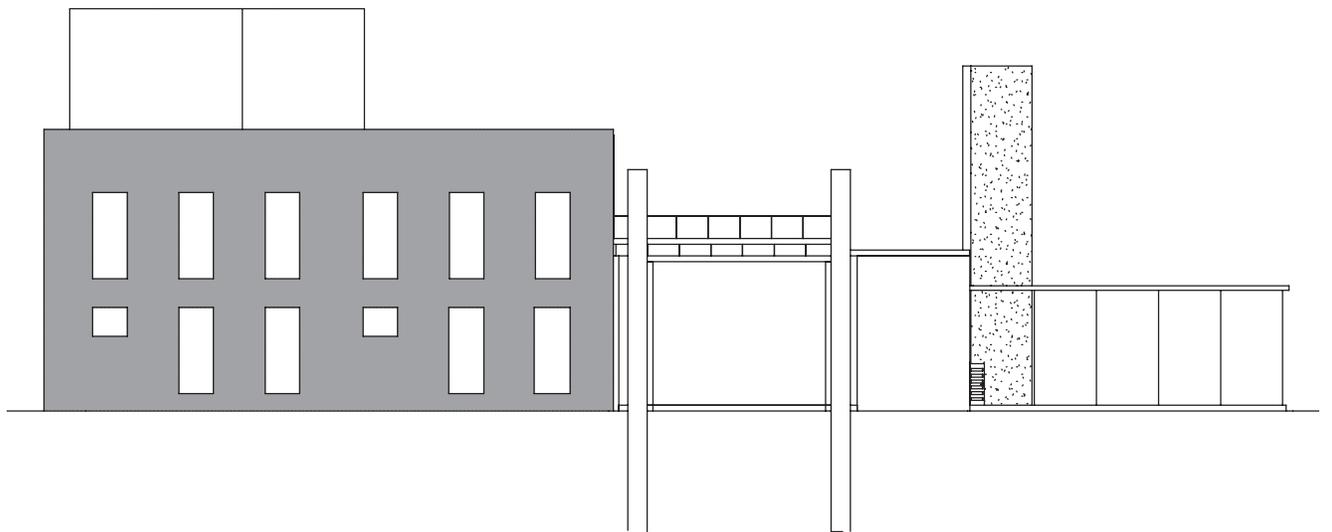
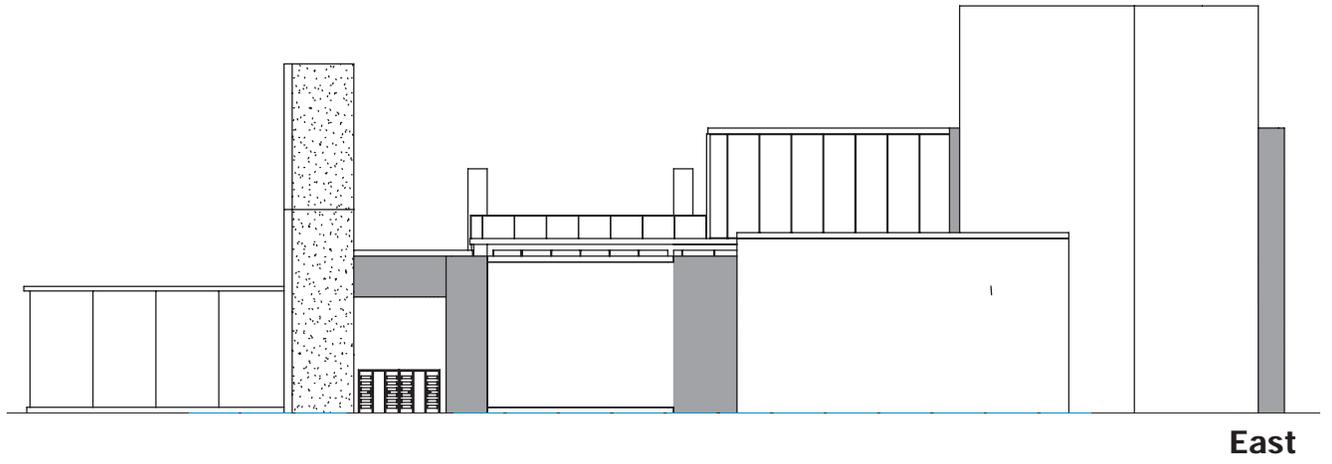
# Final Elevations:



North



South



## Final Renderings:



**Exterior Entrance**



**Entrance**



**Chapel**



**Dance Floor**



**Garden**



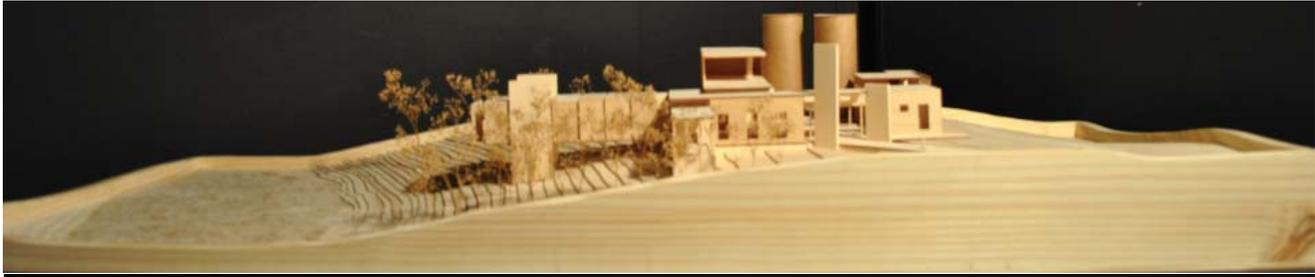
**Garden**



**Reception Hall**



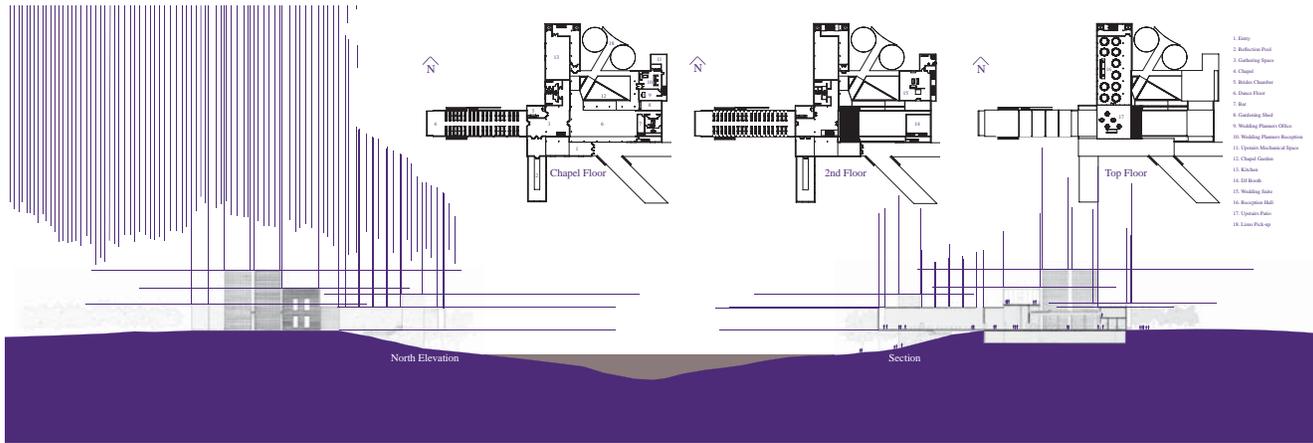
# Final Model:

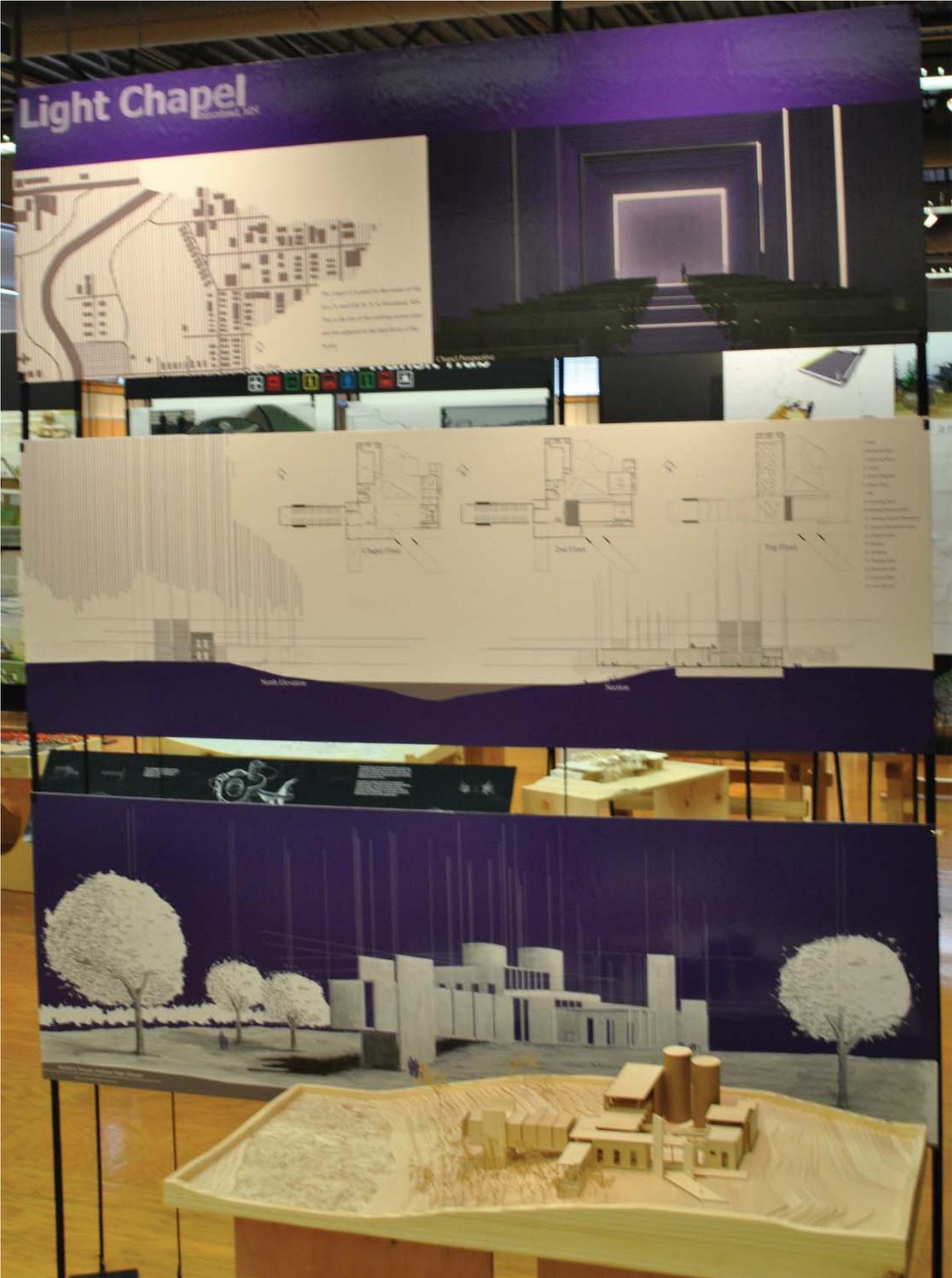




# Final Boards/Installation:

## Light Chapel Moorhead, MN





## Reference List:

Phillips, D. (2000). *Lighting modern buildings*. Woburn, MA: Reed Educational and Professional Publishing Ltd.

Millet., M. S. (1996). *Light revealing architecture*. New York, NY: International Thomson Publishing, Inc.

Mondello, B. (2008, November 24). *A History of museums, 'the memory of mankind'*. Retrieved from <http://www.npr.org/templates/story/story.php?storyId=97377145>

Michel, L. (1996). *Light: the shape of space*. New York, NY: International Thomson Publishing Inc.

Lobell, J. (1979). *Between Silence and light*. Boulder, Colorado: Shambhala Publication, Inc.

Colby, B. (1990). *Color & light: influences and impact*. Glendale, California: Chroma Productions.

Gross, M. (2002). *Light & life*. New York, NY: Oxford University Press Inc.

Banford-Smith, C. (1967). *Builders in the sun: Five Mexican Architects*. New York, NY: Architectural Book Publishing Co.

Sound Vision staff writer (2010). *Statistics on Weddings In the United States*. Retrieved from <http://www.soundvision.com/info/weddings/statistics.asp>

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