Virtual Space in a Physical World

Devin Krugerud | Design Thesis 2012 - 2013

Virtual Space in a Physical World

A design thesis submitted to the Department of
Architecture and Landscape Architecture of
North Dakota State University

By

Devin Krugerud

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

Mark M. Bamhouse May 8th, 2013
Primary Thesis Advisor

Mark M. Bamhouse May 8th, 2013
Thesis Committee Chair

September 2012
Fargo, North Dakota

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ABSTRACT

Any designed space in the physical world has the ability to give its users choices to make decisions on. It is an architects responsibility to learn new methods of design and new ways of delivering their design intent. This thesis project: "Virtual Space in a Physical World" will research the strategies used to develop online video games and social media networks and how they can be used to strengthen an architectual space. By exploring methods of virtual design intent it is possible that environmental designers in the physical world can learn to further understand the needs of their spaces' users. This, in turn will allow a designer to encourage a more sustainable way of life.

The architecture is a steel and glass exposition center for the surrounding community. The site is located in St. Paul, Minnesota at the intersection of Wabash Ave. and Glendale St.

The research for this project will be done using a mixed method quantitative qualitative approach and a concurrent transformative strategy.

KEYWORDS

EXPOSITION
INTENT
VIDEO
GAME
SOCIAL
NETWORK
MINNESOTA

PROBLEM STATEMENT

How can spaces designed for use in video games and social networking interfaces be used to enrich spaces designed for use in the physical world?

Statement of Intent

STATEMENT OF INTENT

Typology
An exposition center for the Minneapolis and St. Paul area.

Claim
By using the same design strategies practiced in video game and social media development, an architectual space can be designed to illuminate important possibilities for decisions.

Actor	Architect
Action	Use of Design Strategies
Object	The Space Itself
Manner	Illumination

Premises
Actor
A person has no choice but to respond to the choice they are given within a particular space.

Action
The intent of the design is what will decide the overall composition of the space therefore laying out the options a user has to choose from.

Object
It is the choices given in that space that will offer a person the choice to make a decision inside and possibly outside the space.

Manner
The illumination of important possibilities for making decisions will occur in spaces designed this way.

Unifying Idea

By using the already well practiced design strategies of video games and social network interfaces the intent of a design can be further developed into the composition of a physical space.

Project Justification

The human mind is constantly making decisions based on the options presented to it. Video games are a perfect example of actions being taken based entirely on parameters given within that virtual space. By applying this basic concept to spacial design in the physical world an environmental designer's aspirations, such as community, beauty, and sustainability, can be passed down to the users of their space more effectively.

Proposal

NARRATIVE

This thesis project is an exposition facility for computer software and hardware development, digital entertainment, and many other types of technology in St. Paul, Minnesota. It is an architect's job to encourage the public to live environmentally friendly, sustainable lives. The design of space has the capacity to do this on its own. The effectiveness of that space's design intent, however, is entirely up to the designer.

No matter where an individual is, the space around them controls the decisions they make. If the space they're in is comprised of four walls and a door, the choices set before them are sparse. Do they walk through the door or don't they? In complex spaces like an auditorium the number of possible choices a user can make increases dramatically. How does a designer highlight certain aspects of a space in a way that would encourage its user to make particular decisions? Video game and social network designers have developed impressive means to achieve this end. It is clear that in a virtual space, the user is limited to the constraints of the program. What about that space allows the user to somehow still believe they are making their own choice? If an architect could harness this power of a limited freedom in their designs, what sort of choices could they lay before the users?

Technology, in all of its glory, has existed on this planet since the day Man picked up a stone. It is ever present, ever evolving, and ever growing. Some say there's too much of it. Others can't get enough. By now it's safe to say technology isn't going away. How many people can go without seeing some form of internet generated material for one day? The Web is everywhere. Eventually it will be everything. As much as the world gets out of it, how heavy does this "magical" space weigh on the planet? The servers used to run the various parts of the internet require massive amounts of energy while emitting extremely high temperatures into the surrounding environment. This is just one small branch of the rapidly growing tree of technology. With more technology comes heavier energy loads on the entire planet. How can the weight of technology be lessened? If technology developers can learn to focus their efforts on researching and designing more sustainable and energy efficient products, what sort of impact could be made? How can environmental designers make their impact? Can spaces be made to encourage more sustainable living habits?

In order to help keep efficiency and sustainability in the forefront of technology developers' minds, architects must develop a strong understanding of not only an average human brain, but also that of a complex, highly educated human brain. Luckily most brains are structured in the same way. Certain brain processes are sufficient for intentionality (Searle, 1980). This means people have the potential to stand for something. What better intent than to stand for a sustainable way of life? These design strategies will be researched and implemented into a usable program for an ever evolving exposition space.

There will always be a need for technology. That does not give the planet an expiration date, but it does demand further investigation of technology developers. By studying simulated freedom and the human mind, the development of this project will strive to disclose the inner workings of design intent and its effects on an ever evolving user.

CLIENT/USER

Expo Center

The exposition center will be a place of gathering for technology developers, digital entertainment producers, students, and the general public. As it is designed for people that spend much of their time on a computer, a certain level of technological savvy will be expected of the space when it is built and for many years to come.

MAJOR PROJECT ELEMENTS

Offices

Employees will need space to design, research, market, and compile their work.

Presentation Spaces

Often times the separate parts of a system must come together in one space to synchronize information. Separate departments will use this space to present and gather ideas from each other. It may also be used for presenting to investors and students.

Server Room

In order to accelerate the design and research process a data center will be needed to house various computers and cooling towers.

Large Presentation Spaces

For presentations to the public and to students.

Large Area Floor Space for Conventions

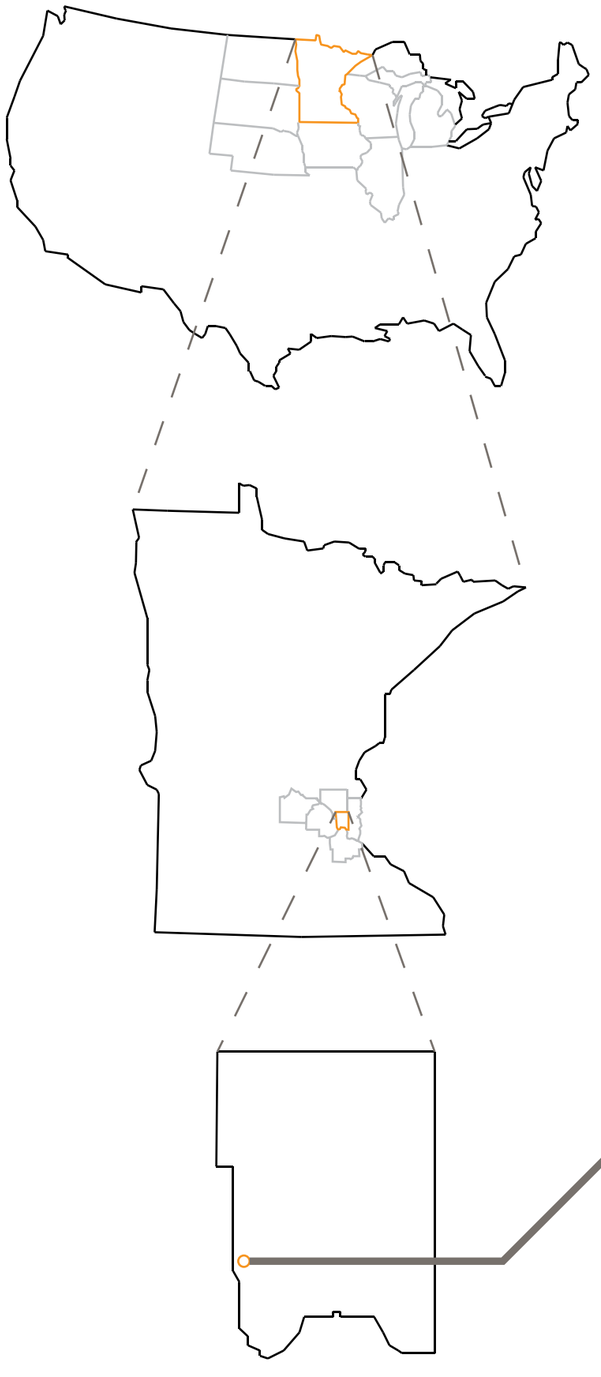
This space must be large enough and dynamic enough to encompass multiple simultaneous presentations for the public.

Public Entertainment Areas

A place for the general puplic to come and enjoy the latest forms of digital entertainment.

Internet Cafe/Bar

A place for people to gather with each other physically or via the web while enjoying refreshments.



SITE

The site of the project is located in St. Paul, Minnesota at the intersection of Wabash Ave. and Glendale St. It is comprised of a vacant lot that over looks Interstate 94 and Highway 280. With University Ave. and the Metro Transit Lightrail just one block north of the lot, the site is near a central hub of activity. The University of Minnesota lies several blocks north west and is only a short walk away. This will allow connections between the expostion center and the university to be made with little effort.

The contours created by the crossing highways mark the boundary between residential and commercial. Because of its axial location, the site provides a wide range of views from canopied neighborhoods to the Minneapolis skyline.

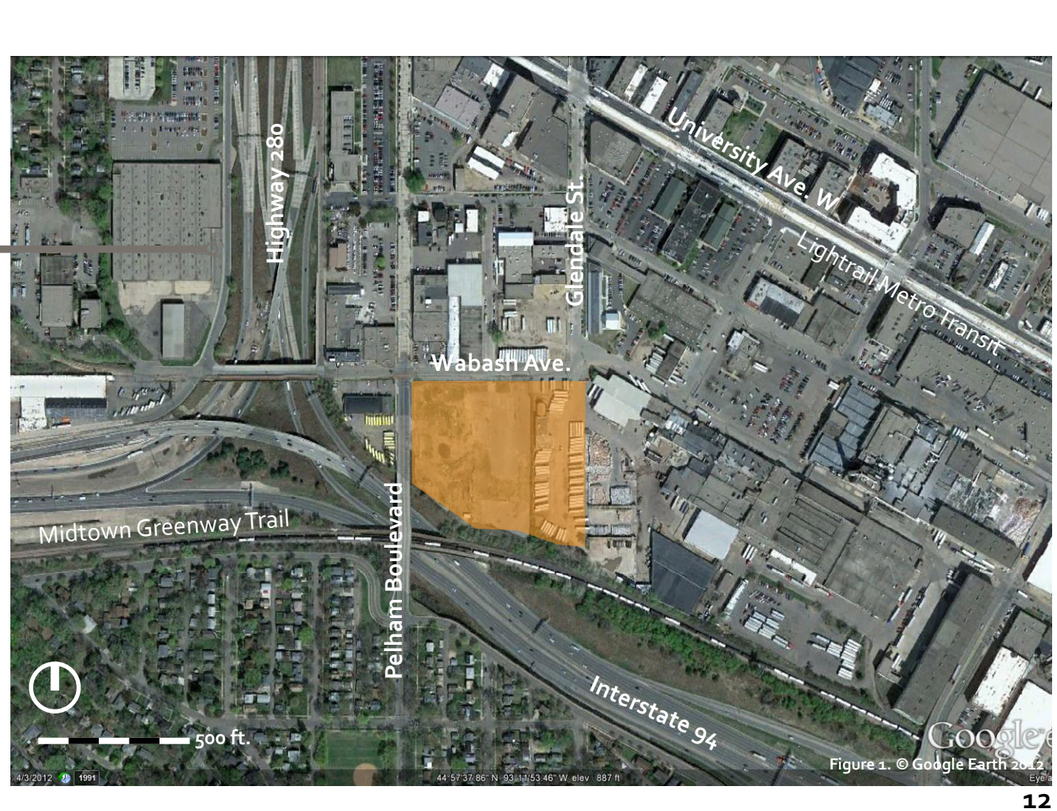


Figure 1. © Google Earth 2012

PROJECT EMPHASIS

The emphasis of this project is to encourage a more sustainable way of life for technology developers and the general public by means of spatial development.

PLAN FOR PROCEDING

Research Direction

The research for this thesis project will be conducted through case studies and through documentation of actions in virtual and physical spaces. The focus of the research will be on the Unifying Idea, Project Typology, Historical Context, Site Analysis, and Programmatic Requirements.

Design Methodology

The method of research will be a mixed method quantitative qualitative approach. This will allow research and documentation to occur simultaneously. During any form of research conducted emerging lines of research must also be given attention to further the development of the project. Data will be collected from single person and online group interviews, digital analysis, and graphic analysis. A concurrent transformative strategy will be used to gather both quantitative and qualitative data. This data will be integrated and analyzed throughout the research process depending on the requirements of the examination of the unifying idea.

The quantitative data will be gathered through archival searches

The qualitative data will be gathered through online interviews, virtual and physical observation, and archival searches.

Documentation Plan

All data will be compiled digitally. Photos, sketches, recordings, videos, and their references will all be documented and saved to one primary workstation. This data will then be compiled and uploaded to North Dakota State University's Institutional Repository.

DESIGN SCHEDULE

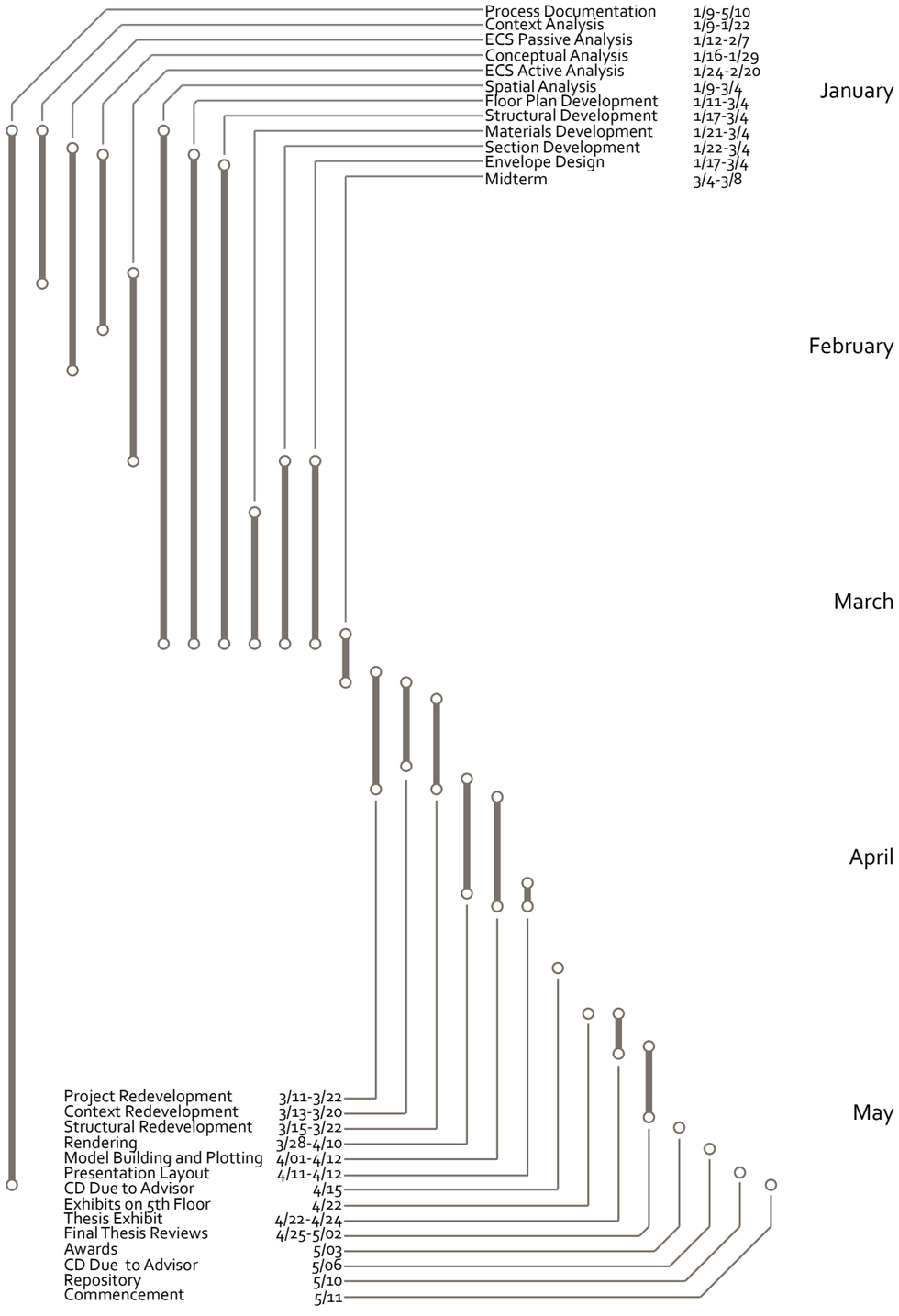


Figure 2. Devin Krugerud 2012

PREVIOUS STUDIO EXPERIENCE

Fall 2008
Joan Vordebruggen
- Tea House
- Boat house

Spring 2009
Megan Duda
- Dwelling
- Dance Studio

Fall 2009
Steve Martens
- Alaskan Sattellite School
- Airport

Spring 2010
Ron Ramsey
- Shaker Barn
- Downtown Chicago Apartments

Fall 2010
Bakr Ali Ahmed
- Highrise

Spring 2011
Don Faulkner and Frank Kratky
- Marvin Windows
- "Boom-Bust" Urban Redevelopment

Fall 2012
Mark Barnhouse
- Water Research Experiment Facility

Unifying Idea Research

For far too many years the video game industry has been looked down upon. It is seen primarily as a source of entertainment. True as that may be, there are aspects of video games that are often overlooked. They are rarely used as tools for further development in other industries. There have been, however, many studies done that focus on the impacts video games have on the individual player, groups of players, and people affiliated with players. Technology has come a long way thanks to the gaming realm. Development of virtual realities and user interfaces grew tremendously after the first video game was released. Through these studies it is easy to see that there is more to this digital universe than just buttons and lights.

Why do people play video games anyway? What separates them from the rest of the entertainment world? Research shows that people play games not so much for the game itself as for the experience the game creates (Lazzaro, 2004). This means that people are playing to create experiences for themselves that are otherwise more difficult to create. Fear, surprise, anger, and disgust are all standard emotions that can be brought on by all types of entertainment media including video games. The few important emotions that video games almost exclusively elicit include: fiero, the personal triumph over adversity; schadenfreude, gloating over the misfortune of others; and wonder, an over whelming improbability. Some of these avenues of expression require days, week, or even years to

develop in a real world situation. In video games it takes minutes. Is the expedited delivery of emotion to a user the answer? Instant gratification.

What can architects take from this? Due to the evolution of manufacturing and material use there are already structures that strike wonder into the minds of users. Rem Koolhaas and Ole Scheeren's CCTV Headquarters in Beijing, China captures this emotion fantastically with its two-way cantilever 637 feet above ground (OMA, 2012). Wonder, however, is not the challenge. Fiero is the goal. At a GDC China talk Nicole Lazzaro spoke on 'The 4 Fun Keys.' She felt that fiero was particularly key in game design (Carless, 2009). How does architecture challenge its users so that they have the opportunity to feel a sense of accomplishment? Perhaps a visual puzzle that requires a specific viewpoint to be solved, or the spaces are laid out to invoke competition between users. Maybe the user has the ability to change the space in a dramatic manner. When the user is given the opportunity to create their own experience in a space the space itself can be more enjoyable and efficient. Some of the most successful video games have caused their players to experience emotions all across the board. A game designer's ability to transmit the desired experience to a player is becoming easier each day with advances in computer technology. "...you can't even imagine everything we are able to do today," said Joakim Svärling at a gaming and architecture seminar in Stockholm (Gaming and Architecture 2008, 2008). It's only gotten better since then.

Some fear the great advancements in technology. They say the human race is becoming something entirely different from what it was meant to be. Some believe all of this readily available technology is transforming its users into "cyborgs". a cyborg is a human who has certain physiological processes aided or controlled by mechanical or electronic devices (Farlex, 2012). It is difficult to imagine a modern day business man or woman without their cell phone. It's difficult to imagine anyone without their cell phone. The internet has found its way into the most private areas of an individual's life. What does that say about today's culture? Today's human? Although the word cyborg is relatively young, the idea is as old as mankind. The use of the wheel so long ago brought cyborgs into existence. "You know, anyone who wears glasses, in one sense or another, is a cyborg," says Evgeny Morozov. "And anyone who relies on technology in daily life to extend their human capacity is a cyborg as well" (Schmemann, 2012). The use of tools to achieve a feat otherwise unacheiveable is the trademark of human kind. Virtual reality is arguably the strongest form of expression that a machine has to offer. If there were any technology that deemed men and women cyborgs, it would be virtual realities and the social networks within them.

These advances have benefitted industries other than entertainment of course. The perpetual struggle for a more realistic virtual environment has pushed hardware and software developers to new levels. Clients demand very detailed visual aides. The time for total virtual immersion is fast approaching. Already there are entire governments investing in computer generated environments. "China has put a lot of money into virtual worlds to house their financial systems," said Paulette Robinson, assistant dean for teaching, learning, and technology at the National Defense University (Smith, 2010). These virtual spaces are being used to evaluate global security challenges in a safe, cost effective manner. She went on to explain that soon the internet will be a 3-D environment. People will be using an avatar to move through information (Smith, 2010). Gaming devices like the XBox Kinect and Wii U have amazing motion sensing capabilities that allow the player to interact with objects and characters in video games without a touch screen or controller. The human body is the controller. If this could be applied to the design process in an architectural project, clients would be able to move through and experience a project long before the foundation is even poured. They would gain the ability to directly modify the design simply by reaching out their hand and pushing a wall back or lowering a section of the floor. A great deal of time and money will be saved when these ideas become reality.

That has been the goal. The more user friendly a tool is, the more it becomes a part of every day life. The designer's of Facebook have been working to better understand the expectations people have of their computers. Facebook wants any user to be able to drop in to any other user's Time line and immediately understand the visual language and know how to navigate (Boyd, 2011). Running online software that is used worldwide has to be usable by all the different types of people on the planet. Over the years of Facebook's existence the designers honed their understanding of universal information. To them time was what everyone understood in the most similar way. That was the thought process behind their redevelopment of the Facebook user interface (UI). Their work in that area alone may very well be the reason they are so successful. The website is easy to navigate and hard to step away from. It holds massive amounts of information. Not entirely useful information, but information nonetheless. All of that information can be found and accessed with only a few clicks of the mouse. Bringing these strategies into the world of architecture could push the client designer relationship even closer. If the client has the capacity to navigate a set of complex drawings, they then are likely to have a better understanding of the design. Considering how much information can be ignored by a client, it is paramount that they gain the ability to explore all of the details to the utmost extent. Even the idea of a time line interface that the client could use to sift through

the concepts and developments of what they are paying for. Given the ability to pinpoint spans of time where certain efforts were spent could teach the entire team involved in the development of a project better time and spacial management skills. This may very well lead to more cost efficient dealings for everyone. Pair this with the idea of spatial exploration through virtual reality, and the collective wealth of information at everyone's fingertips would be almost unfathomable. A constant streaming of project development updating to the mobile devices of the client, the design team, and the construction manager, with an interactive time line, progress report, and environment. No room would be left for confusion.

When the first video game was released to the public, few thought much of it. It was merely a toy to be cast aside when finished. The industry grew, however, and became one of the largest avenues for entertainment today. Not just that. Thousands of companies have grown from the design strategies used for games. Three dimensional computer generated environments are more complex and are continuing in that direction. User interfaces evolve with the users. The closer these strategies are brought to the world of environmental design the stronger architects and landscape architects will be.

SUMMARY

Production never stops. Every day a new device, a new idea, a new way of order. Video games and architecture are both modes of expression. They each require a stretch of the imagination to produce. They both strive to master visual stimulation. Each is a product that must be sold at some point, and with that each must evolve and grow in order to survive. As the world's technology develops, so must the industry of architecture.

Designing spaces to invoke a sense of play or competition could encourage users to live more environmentally freindly lives. If the spatial game leads to a green space of sorts, that is. Testing these spaces could be done quite easily with a video game.

Video games have drawn on the many typologies architecture has existed in over the centuries. The massive built structures have a way of tying themselves to a particular geographical time and place. What has architecture gained from the video game industry? The virtual environment that a design rests in before construction has become more and more complex with the ever expanding strength of computer generated environments. The social interaction in these spaces has also changed the way digital spaces are formed. This information can be used in architecture to strengthen ideas and better understand the spaces the project lies in. This can help designers and clients communicate their desires faster and more efficiently.

Combining the design strategies of architecture, video games, and social network interfaces, designers can better express their ideas. The stronger development of an idea will lead to a stronger product, thus leading to a stronger industry and profession all together.

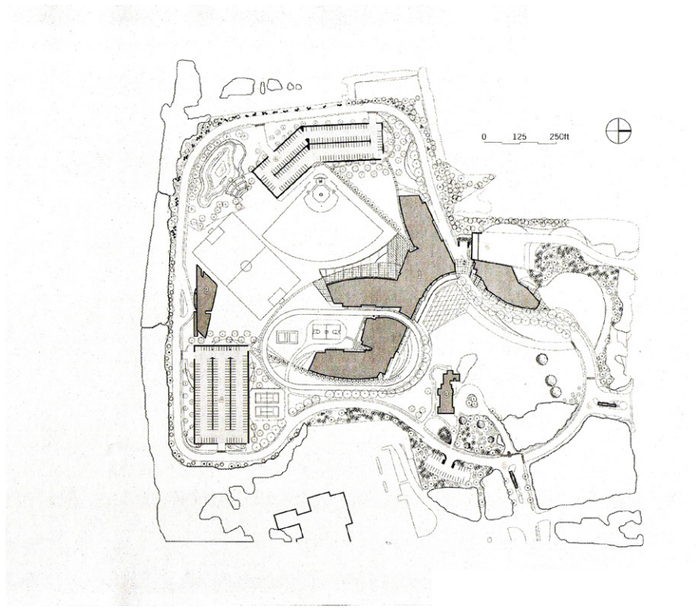
Typological Research

Reebok
World Headquarters
NBBJ

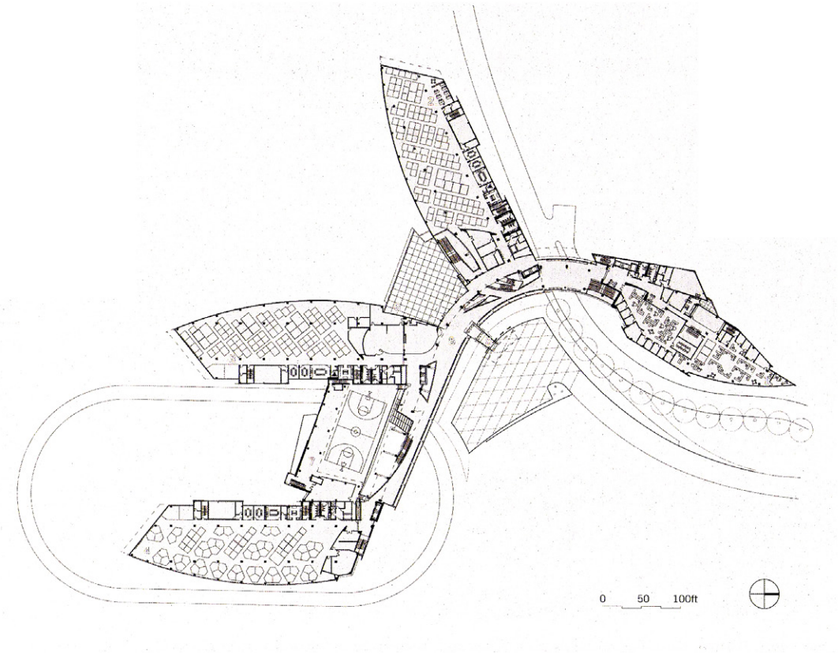
Type: Office Headquarters
Location: Canton, MA
Completion date: June 2000
Size: 522,000 Sq. Ft.

This project was chosen primarily for its attention to physical activity. Every space seems to have express visual excitement wherever the user is. Competition is all around the landscape. Visitors and everyday users have no choice but to take in the idea of competing with one another physically and mentally.

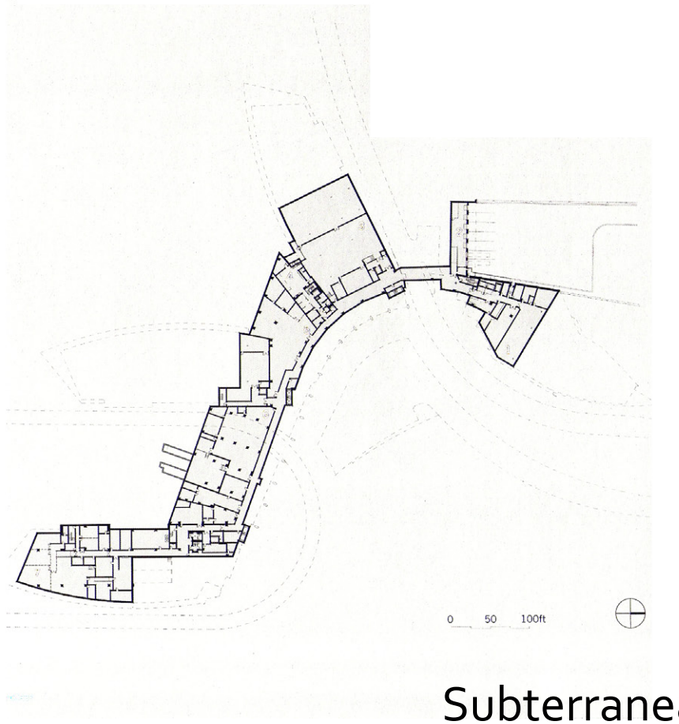
From the beginning of their design process, the architects wanted a long sweeping span of glazing for this project. The walls of glass took many different forms until they reached the most expressive of the clients needs. Extraordinary measures were taken to create a unique facade. The combination of concrete, aluminum, and glass makes for a fantastic visual medley of deep grays. The spaces that make up the landscape of the project consist of various sports arenas including tennis courts, basketball courts, a baseball field, a soccer field, a volley ball court, and a four lane track that leads under the building. The entrance of the build is raised almost asking us to step up to a higher level of competition in order to enter Reebok's world. Throughout the building pockets of activity arise from various shading techniques and the radial layout of structural columns. You're almost always washed in sunlight as you move through the building. The building expands and contracts when moving from one section to the next. Although much of the design is dedicated to athletic spaces, there are still rooms dedicated to product development and presentations.



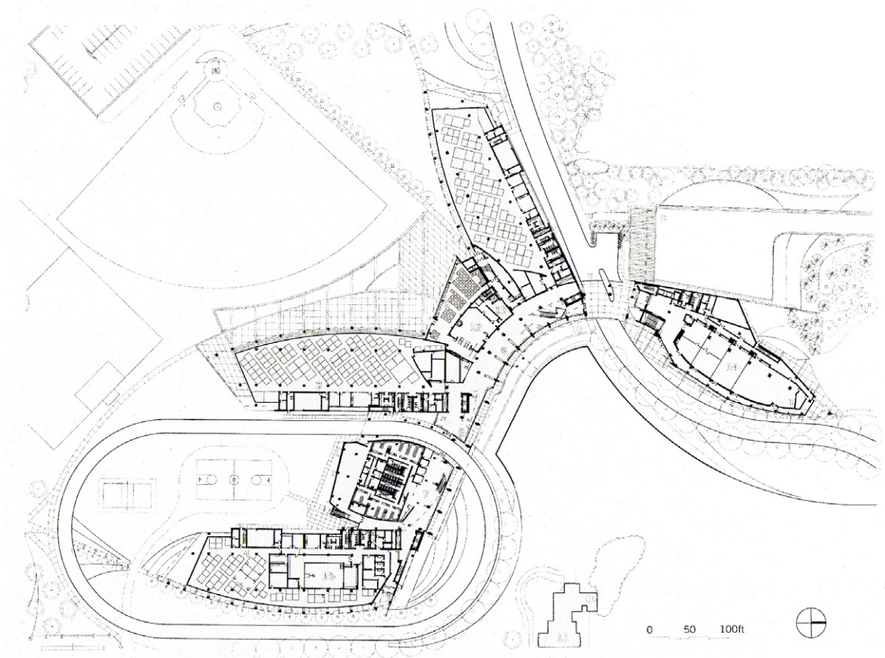
Site



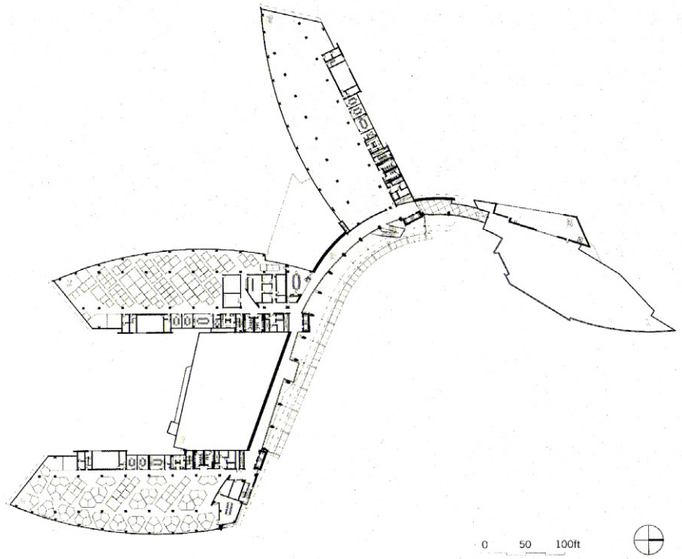
Second Floor



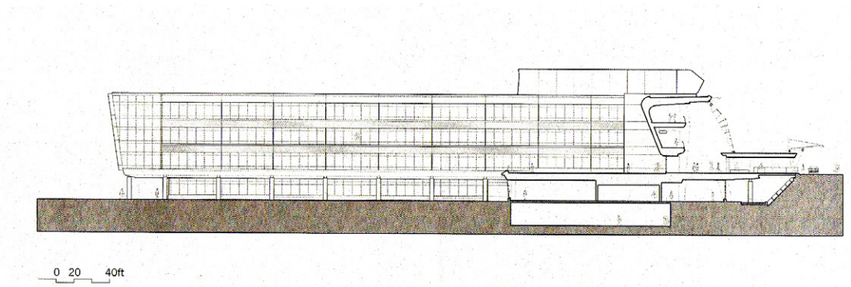
Subterranean Level



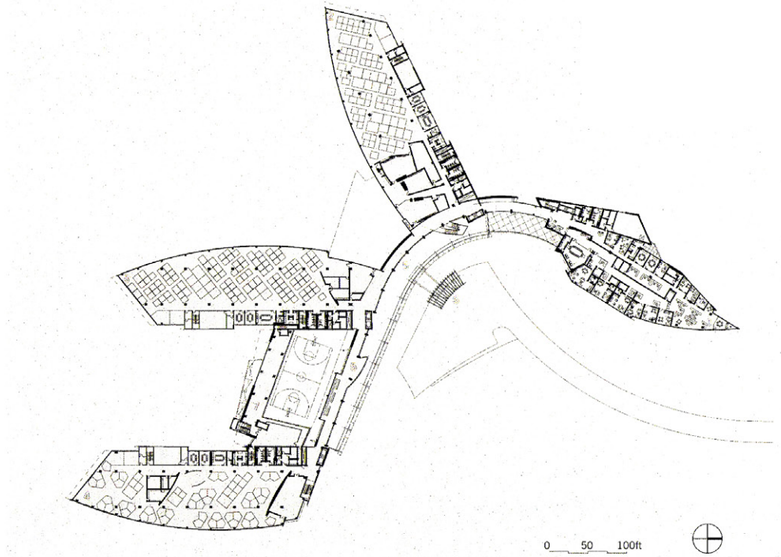
Ground Floor



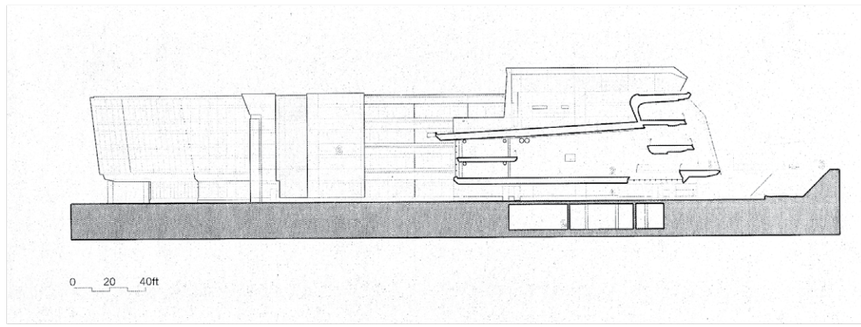
Fourth Floor



Section/ Elevation

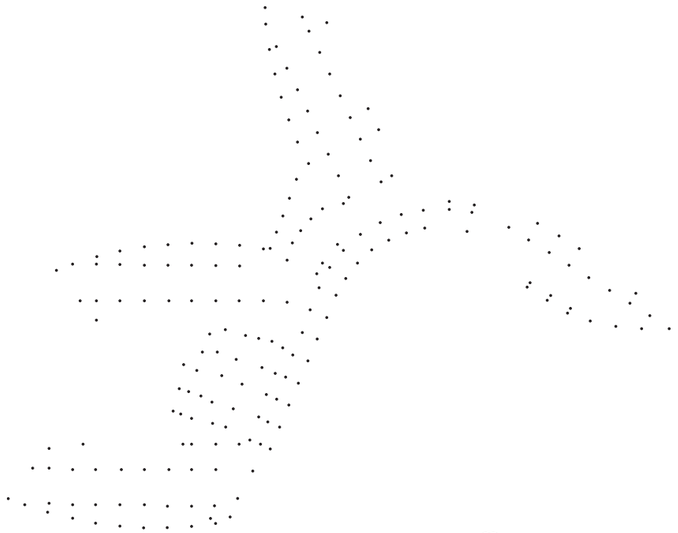


Third Floor

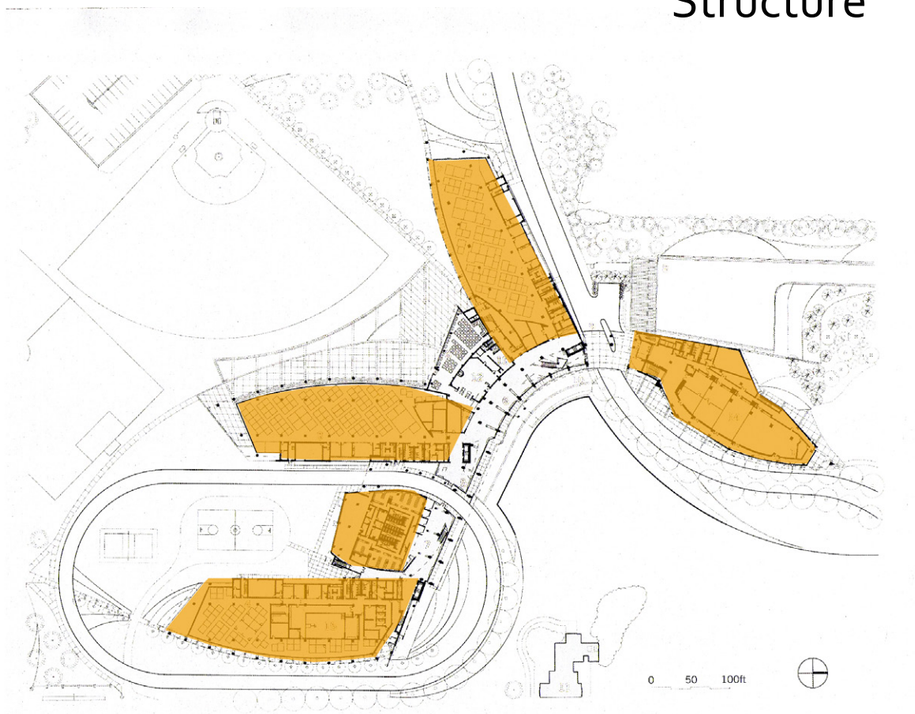


Section/ Elevation

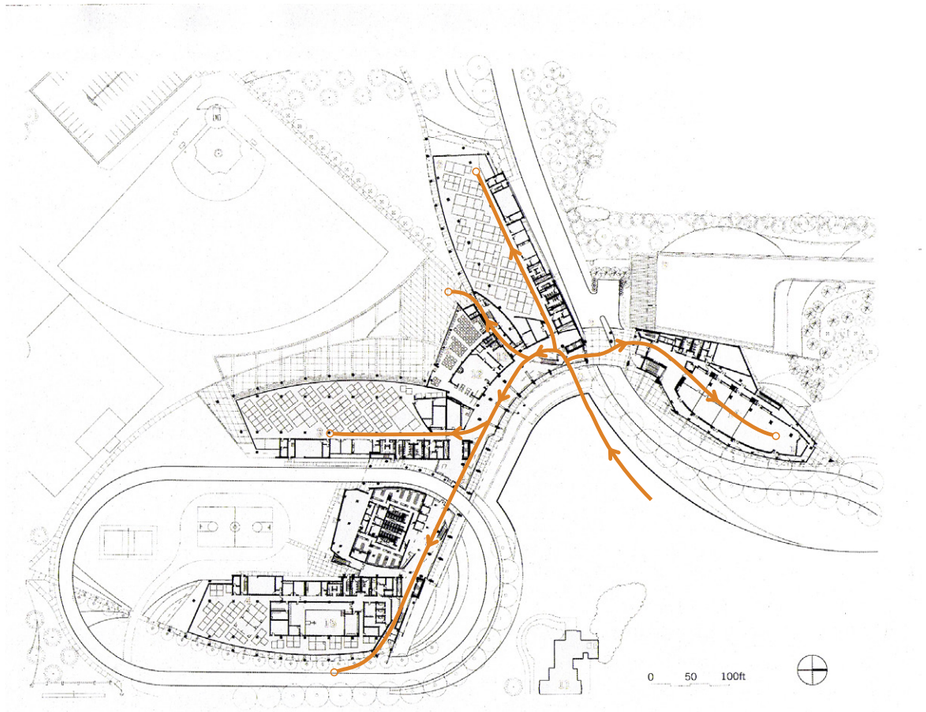
Graphic Analysis



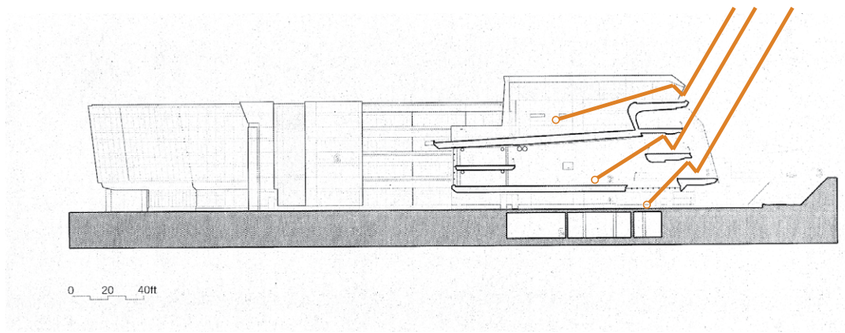
Structure



Massing



Movement



Light

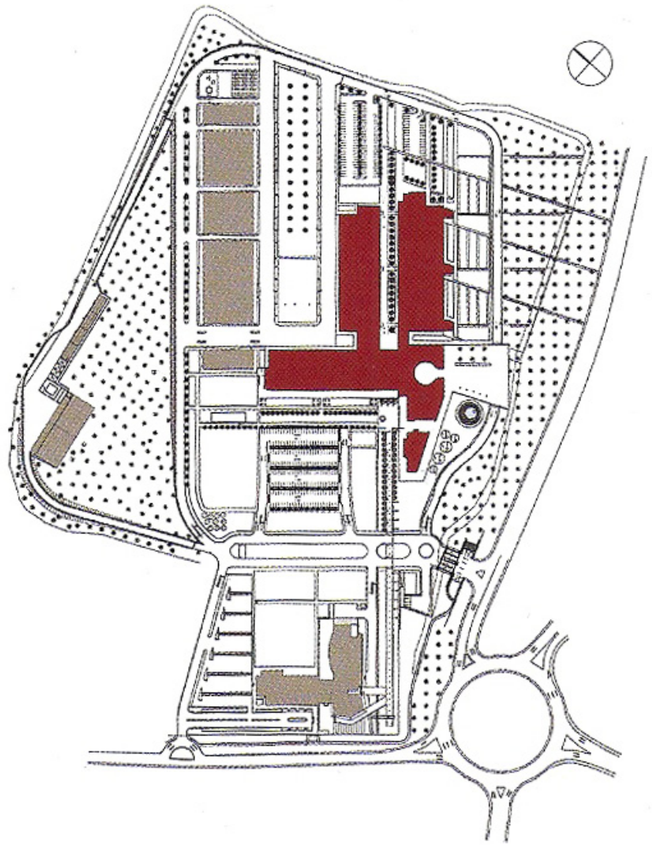
Repsol YPF Technology Center (CTR)
Leo A Daly

Type: Laboratory/ Research Facility
Location: Madrid, Spain
Completion date: 2001
Size: 312,000 Sq. Ft.

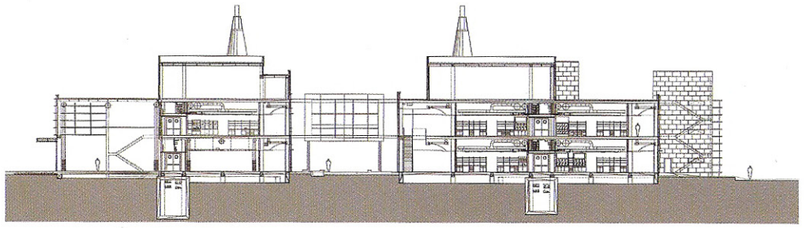
The Repsol Technology Center was chosen to study for its proximity to a high traffic freeway and a railway. It also sits near a technical university much like my site in St. Paul. The building separates private from public with excellent material choices and linear organization.

The building is one of two on a campus for an oil and gas company called Repsol. The campus was designed to consolidate the company to one geographic location. It was set on the edge and apart from a n expanding technology park to express the city's economic growth. The technology center presents a large void for its entry which then opens into a cylindrical courtyard to invite users in. Long interior corridors are washed with indirect natural light. Each space is designed with a strong artistic expression by material and form. Intense detail to interior design is evident with the choice of material color for particular spaces. It is always clear where we are going and how to get there as we exit one space and enter another. This will be important for the design of public spaces within a building designed primarily for research and technology development.

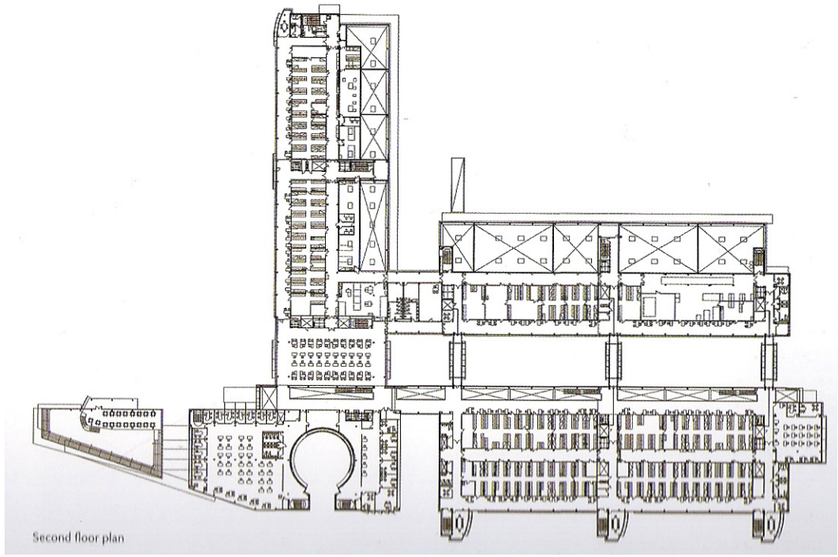
The open courtyards amidst the laboratory spaces provide pleasant interruptions of green space. The building is clad in dark tinted glazing with Spanish limestone stacking vertically to counteract the building's horizontal form. Where needed, the glazing sits behind tall stainless steel sunscreens to shield from undesired glare. The campus as a whole is a monument to the city and to the study of laboratory architecture.



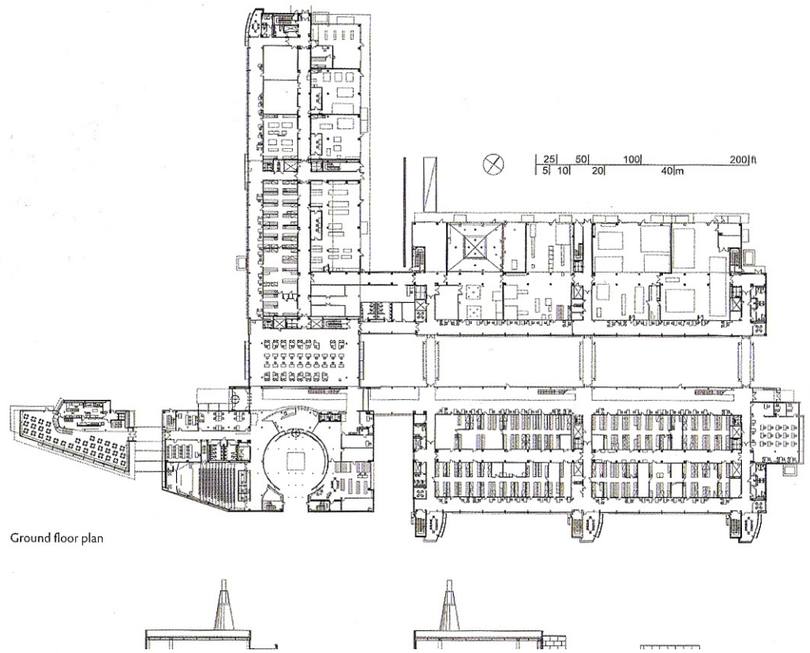
Site



Section/ Elevation

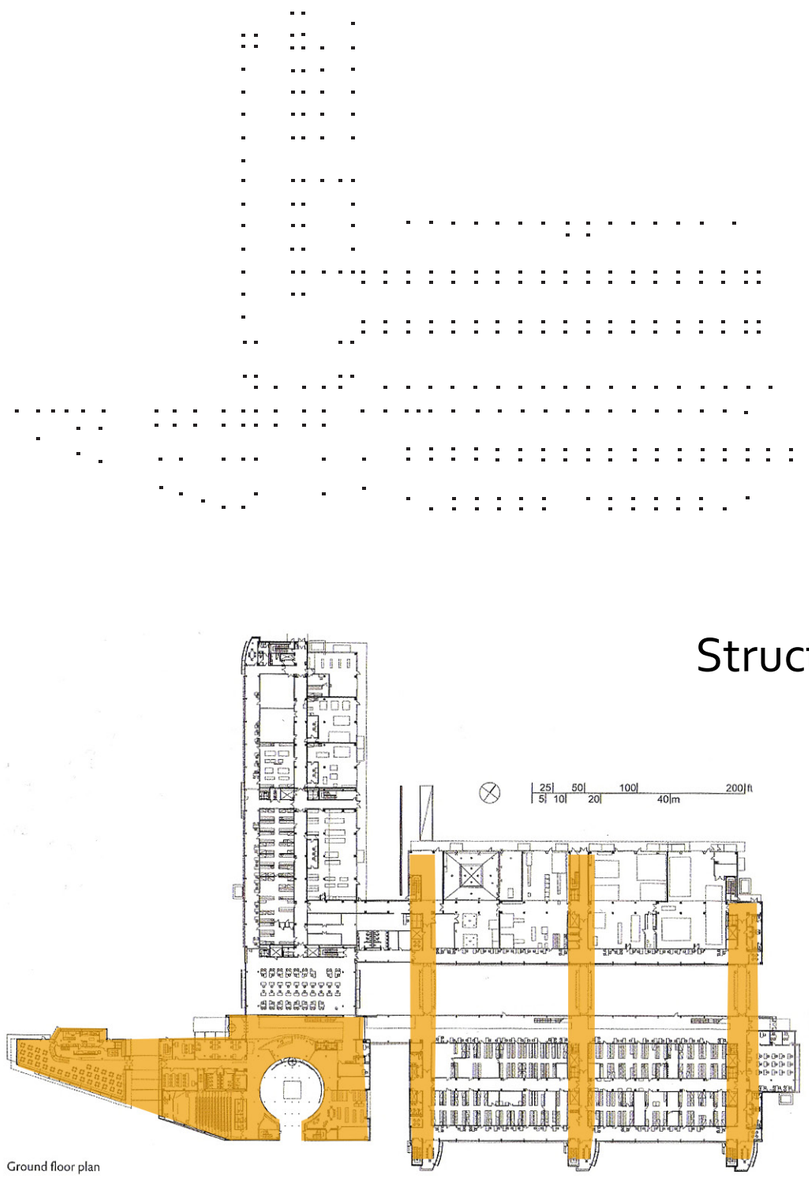


Second Floor

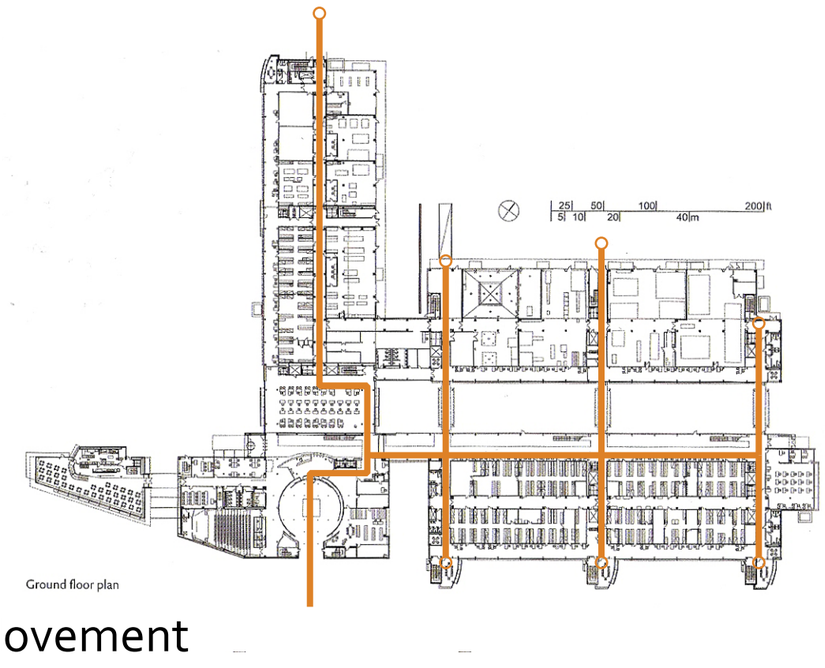


Ground Floor

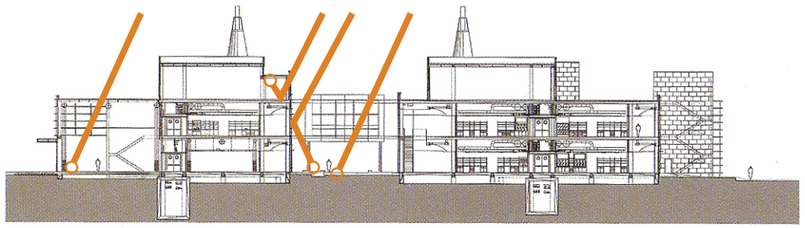
Graphic Analysis



Structure



Movement



Massing

Light

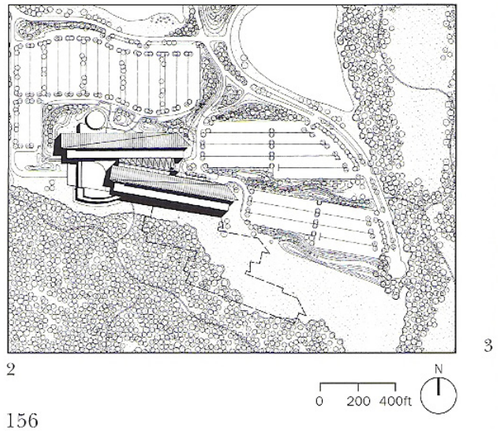
Grainger, Inc. Headquarters
Perkins & Will

Type: Office Headquarters
Location: Lake Forest, Illinois
Completion date: 1999
Size: 800,000 Sq. Ft.

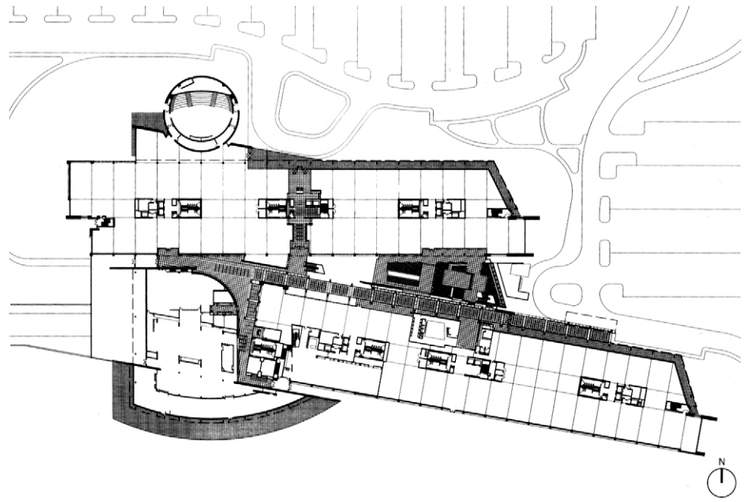
This project was chosen for its great use of sunlight. Almost every room is covered in indirect natural sunlight. All of the glazing on the building was designed with some type of shading device to reduce glare for all users. Long cantilevered awnings stretch out over the pathways that lead to the entrance. The entrance occurs at the intersection of the two masses that make up the project. The open center of each mass is made up of green space mixed with granite and calm reflecting ponds. The base of the green space is intersected with various common spaces for chance encounters. Perimeters of the courtyards are made up of balconies looking down over the greenspace and offices that look out onto the great landscape that is northern Illinois.

Long spans of limestone and fabricated structural steel make up the exterior. The large intersecting granite blocks seem to hold the building up on their own.

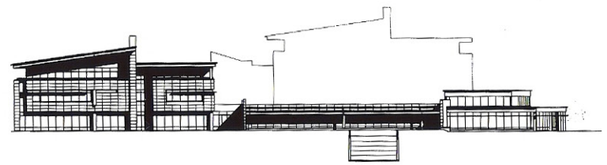
The project is sited in the landscape with great care to the natural environment. Parking is shaped to disrupt the natural tree lines as little as possible. Custom channels are designed to connect large bodies of water where needed. The quite linear design of the project finds a way to fit naturally into the organic shape of a peaceful ecosystem.



Site

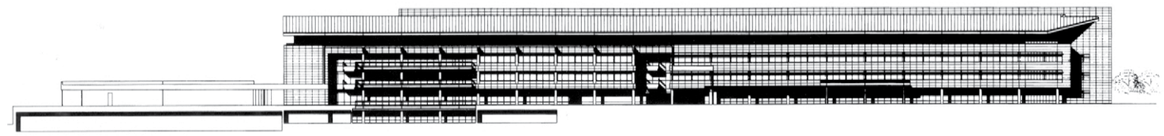


Floor Plan



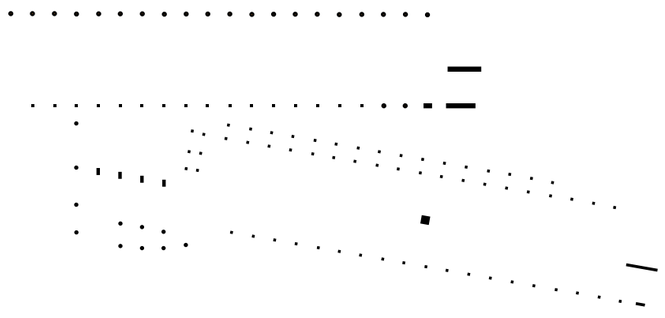
Section/ Elevation

Section/ Elevation

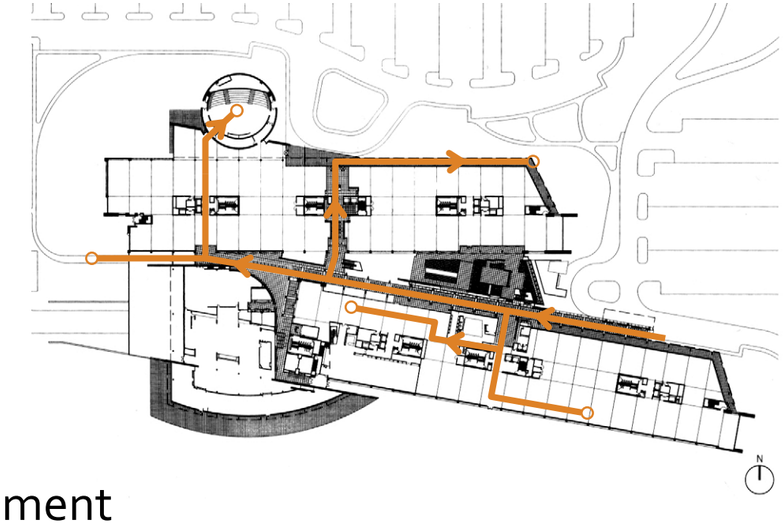


Elevation

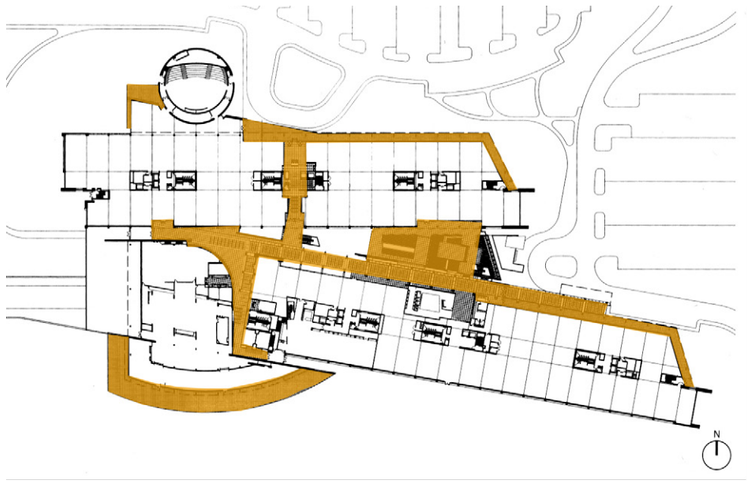
Graphic Analysis



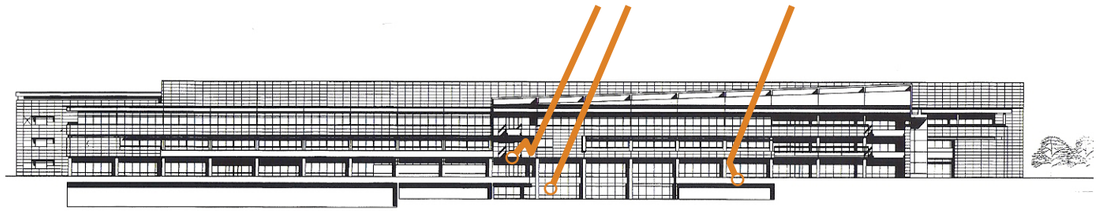
Structure



Movement



Massing



Light

Summary

The three case studies were chosen to focus on particular problems that may arise when developing my design in a site that experiences such wide ranging and rapid temperature changes. Each of these projects employ large curtain walls to capture ample sunlight while dealing with a fluctuating climate. I will need to develop a stand alone shading system so as to avoid thermal bridging throughout the building. The combination of concrete, stone, and various types of metal panels will work well in the downtown St. Paul area. The advancements in metal panel seals and connections will be a great asset to the skin of my design.

The studies hold in them various spaces for informal interactions as well as formal presentation space. Each will be needed in my design. I plan to incorporate the office spaces along the perimeter of my design in the upper levels much like they are in these projects.

The entrances to these buildings all seem to face to the east. This works nicely as the facade of the building is light when people arrive to work, and darkened by shadow when they leave. The silhouette of the structures fades behind them as they make their way home.

Some of the sites in these studies are located on the edge of industrial parks, while others are on the edge of tree lines. My site is wedged between the edge of a bustling downtown community and a busy freeway intersection. How these projects handled their borders will help in deciding what to do with mine.

Material choice, spatial hierarchy, site development, and many other factors will decide the final composition of my design. In studying these projects it will be much easier to employ the details needed to create a complete, well integrated research and design facility.

Historical Context

Games have been with us a long time. Humans inherently feel the need to compete. Wether it be with themselves, another human, nature, the laws of physics, or artificial intelligence we all have a bit of fight in us. That small trait is largely the reason we have progressed so much over time. I hardly think I would be able to deliver this project if it weren't for the competition between technology producers. Technology itself has come light years since the development of competitive play. The demand for more realistic environments has yet to cease. The virtual space that gamers can put themselves in has also been with us for many years. Just because virtual reality came late in the world of games doesn't mean an alternate reality to play in wasn't already there. Games have been an asset to the planet in more ways than one.

As far back as 3500 BC evidence has been found that proves mankind's insatiable urge to challenge one another. One of the earliest forms of board games was dug up amongst the ruins of a long lost city in the southeast province of Sistan, Iran. The unearthed game of backgammon was made of 60 pieces from turquoise and agate, and had a rectangular ebony board (*Burnt City,* 2007). Many games were created merely to pass the time and the victor was decided almost entirely on luck. That was until one of the first strategy board games , Xiangqi, came to be. The game was born in eighth century China and is known today as Chinese Chess (Old Chinese Chess, 2012). Chess spread across the world in different forms and uses. Its evolution into the game as we know it today ended near the beginning of the fifteenth century

(Hooper & Whyld, 1992). The game has tested minds of the young and the old, the quick and the dull. It has been used to strengthen war strategies and settle sibling rivalries. Thousands of board games have been created since then. Snakes and Ladders, Checkers, Monopoly, and Trouble are some of the popular ones. More recently these board games have been merged with the digital world to create more easily accessible gaming environments. Once electricity came about, the groundwork for revolutionary forms of gaming and social interaction was laid. The first electrical game created was in 1947 by Thomas T. Goldsmith Jr. and Estle Ray Mann. They called it the cathode ray tube amusement device. It recorded and controlled the quality of an electronic signal (Cohen, 2012). Although this device used a monitor to display its data, this was not considered the first video game. Several years after the cathode ray tube amusement device was invented, two programmers independently developed their own electronic games. Alexander Sandy Douglas designed an artificial intelligence (AI) for a game called *Noughts and Crosses.* Shortly after Willy Higinbotham created *Tennis for Two*. Together these games took credit as the first video game (Cohen, 2012). If only they had known where their inventions would lead. With the invention of the internet games could be played between opponents thousands of miles apart. Competition would never feel the same again.

Imagined environments have undoubtedly purposed themselves in more than just games. Plays, cinema, novels, paintings, sculptures, music, and environmental design all require an imagined space to some extent. The first cities required great understanding of people's needs. Before they could even consider laying the foundations of a building, ancient Indian designers had to imagine themselves and others using the land and spaces day to day, month to month, and even year to year. Eventually they developed a method of design that used anthropometric measurements for everything from windowsill heights to street widths (Dagens, 1985). The English translation of that method is called the Mayamata. Plans were first drawn in the sand. There was no other way to transfer ideas in the beginning. Ash on stone, charcoal on stone, ink on papyrus, ink on paper, lead on paper; two-dimensional expression has for thousands of years been the optimal mode of expression for architecture. Modelling has great visual appeal, but it often takes much longer to develop than a drawing. The process of conceptualization has also been practiced primarily through ink, lead, paper, and physical modelling. Ideas were struggling to show themselves due to time and material constraints. This all changed with the development of computer-aided drafting (CAD). Because of the great advances in computer technology in the 19060's CAD software was able to excel. *Sketchpad* designed by Ivan Sutherland was the first true CAD software (CAD Software History, 2004). After Sutherland's design,

mainstream CAD was inevitable. At first it seemed too much. The software was used to design small mechanical parts. Custom levers, bolts, and anything that fastened. Eventually someone decided to use CAD in an architectural design. The line work was strong. Plans and elevations were easily represented with the software. Perspectives, however, were still presented by means of ink, graphite, or paint. The computer's abilities had not reached an acceptable rendering performance until just recently. Now CAD renderings have the ability to shock and awe viewers. With the click of a button, a work in progress can be transformed into a work of art. Who was there first? Who had been at the forefront of computer aided production before environmental designers mustered the courage to venture into the realm? You guessed it… video games. Virtual realities have been an interesting fantasy for many. They are the foundation of modern day video games, but where did they start? Is a virtual reality merely the space our imaginations inhabit. If that's the case, children should be deemed the masters of the virtual realm. What of ancient Norse Mythology? Did they not believe that if they fell in battle they would be carried by a valkyrie to a great hall of heroes called Valhalla? Multiple beliefs hold that there is a place where good and evil reside outside of the physical realm. There are then, of course, millions of stories played out by means of song, theater, novel, and however else information can be transferred. Postures of alternate realities are nothing new. They have become exponentially easier to express , though, with the evolution of computers. High definition imaging has thinned the line between fantasy and reality. Of all the arts that computer generated realities are employed in, video games have always been at the frontlines. One of the first 3D environment games created was *Battlezone* by Atari. The same game was also designed as a training exercise for the U.S. Army called *The Bradley Trainer* (Bradley Trainer, 2012). Thirty two years later with the release of *The Elder Scrolls V: Skyrim*, the exponential growth in computer generated environmental design is undeniable. Whether it's between two video game developers or two high school football teams, it is clear that competition can drive the human spirit. Over thousands of years many different forms of competition have developed to challenge the wits and resolve of those who dare to compete. It doesn't matter where the competition is held: In real life, in game, in our minds. The virtual worlds we find ourselves in today owe their existence to the competition of computer generated design software developers. Thankfully that contest rages on to this day, and so I sit in anticipation for what these digital masterminds will show us next.

Goals

It is my aim, with this project, to strengthen the ideas of architectural design and to accelerate the progression of our understanding of the digital environment. Along with that, I hope to expand my knowledge of the profession of architecture.

The ways we design, develop and present our ideas have always been subject to change. Only now those means seem to change and multiply more quickly. The internet has democratized design as much as the printing press democratized knowledge. If I can help introduce a new, more engaging method of design, then I will have achieved my main goal. As CAD technologies and computer programming continue to develop, a design software will emerge that can be used and explored by means of a more user friendly interface. What that interface will be, I don't yet know. How can we know? We can only push the technologies we now have to their limits until a greater, faster, and more efficient technology evolves.

New ideas bring new apprehensions. Venturing into new design software is exciting and frightening at the same time. There is no gauge to hold yourself to when trying to perform something for the first time. I hope to learn more about today's digital environment than I have ever learned. If I dig deep enough I intend to find an avenue of design that has been sparsely traveled. The age of shock and awe is behind us, I know, but remnants of that time do remain.

Who can say that what we produce is adequate? Is the mere volume of consumption a fair enough verification of our efforts? Perhaps the final word of a highly acclaimed critic can suffice. Maybe the only opinion that holds any weight at all is our own. Finally, with this project, I would like to satisfy my need to produce an idea worth recognition. There are those who fear the inevitability of fading from relevance. Time has great power over us. Many have dared to compete for a place amongst the great names of history, and many have failed. My goal not only for this project, but for the rest of my life, is to also take up that challenge. I will not be forgotten.

Site Analysis

The site is located almost directly in between Minneapolis and St. Paul Minnesota overlooking an intersection between Highway 52 and Highway 280. On an empty lot at the corner of Pelham Boulevard and Wabash Avenue there are views that look over the treetops that cover nearby single family homes to the south. To the west stands the downtown Minneapolis skyline. The east presents downtown St. Paul's subtle skyline.

There are a few existing buildings that surround the proposed 300,000 square foot site. A small yellow school bus lot sits just across the street to the west. Beyond that a supply depot and some warehouses. To the north a storage facility and a cluster of small business buildings. Further up the hill lies University Avenue where a growing downtown community also resides. Along that street new additions to the city's light rail are being implemented. A few blocks north west is the University of Minnesota campus. That will be great for up and coming IT students to visit the facility. To the east are more small businesses as well as a large truck yard for a paper and cardboard packaging company. Finally to the south beyond highway 52 and a partially abandoned railroad, the beginning of single family homes. Just a few blocks further south and we hit a small golf course. There are few obstructions for views, and I'm pleased with the wide open southern edge of the site.

There is no protection from wind, so I will have to incorporate my own means of wind defense from the north. Most pedestrian activity is from runners just passing by. Much of the pedestrian traffic lies a couple blocks north so it wouldn't be vary hard at all to pull it a bit toward my site. Vehicular traffic will however be noisy. Pelham Boulevard and the intersecting highways are very busy.

The soil of the site consists of silt loam to silty clay loam down to about two feet. It then becomes a mixture of coarse and gravely sand. There is little to no slope save for the edge that dips down into Highway 52.

I chose the site for its diverse views in each direction and relative close proximity to The U of M and the expanding Minneapolis, St. Paul urban area. I know the site holds many challenges as well as opportunities for a great piece of architecture. I hope to encounter them all.

Figure 3. Devin Krugerud 2012

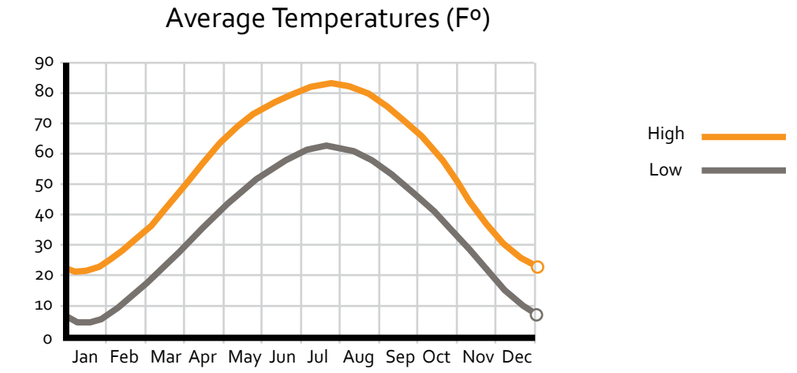
Figure 6. Devin Krugerud 2012

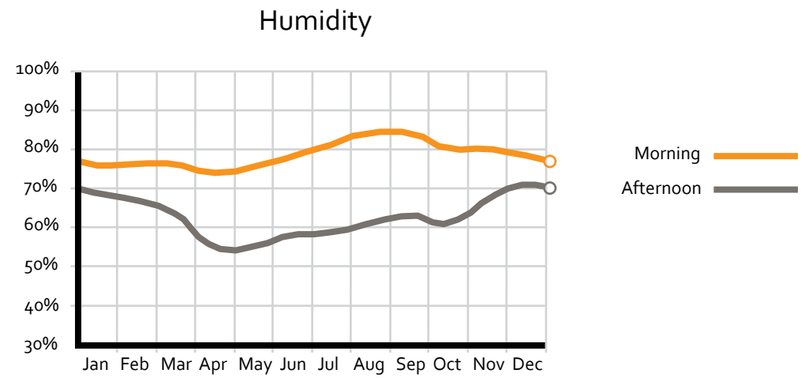
Figure 4. Devin Krugerud 2012

Figure 7. Devin Krugerud 2012

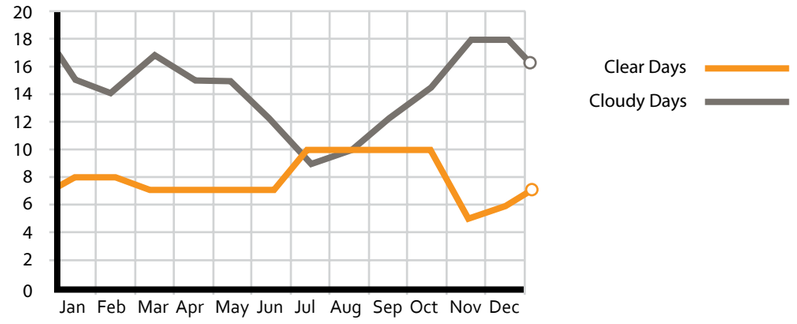
Figure 5. Devin Krugerud 2012

Figure 8. Devin Krugerud 2012

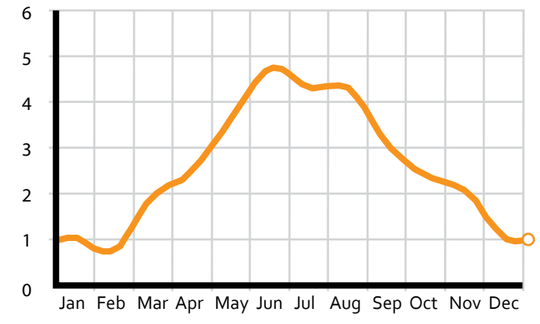




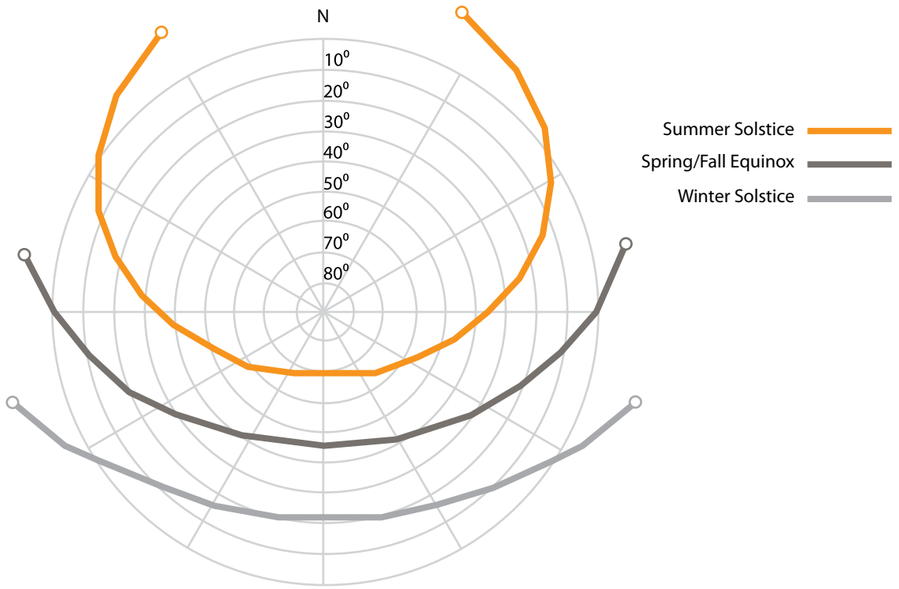
Cloudy Days



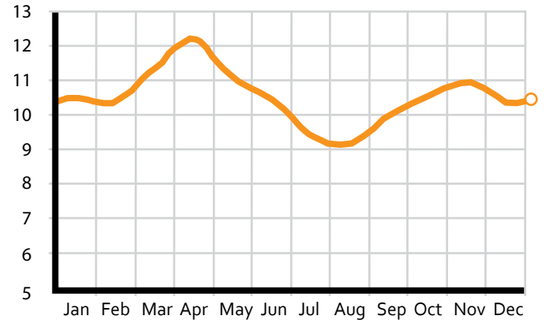
Precipitation (in.)



Sun Paths



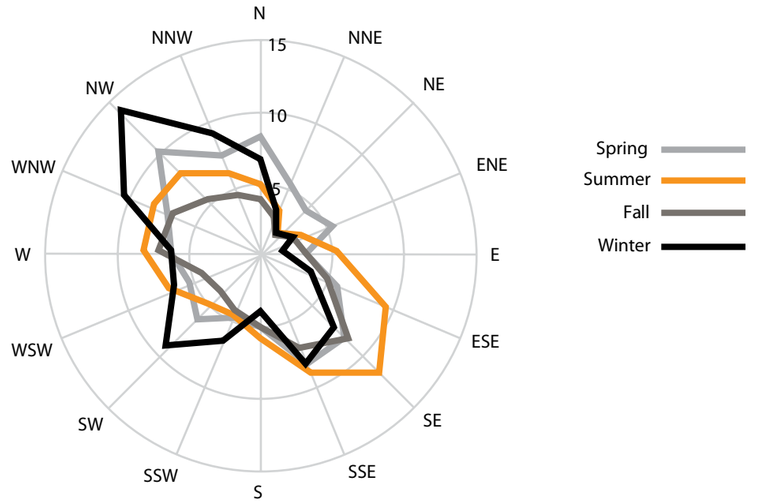
Windspeed (mph.)



Noise

Traffic

Wind Direction (mph.)

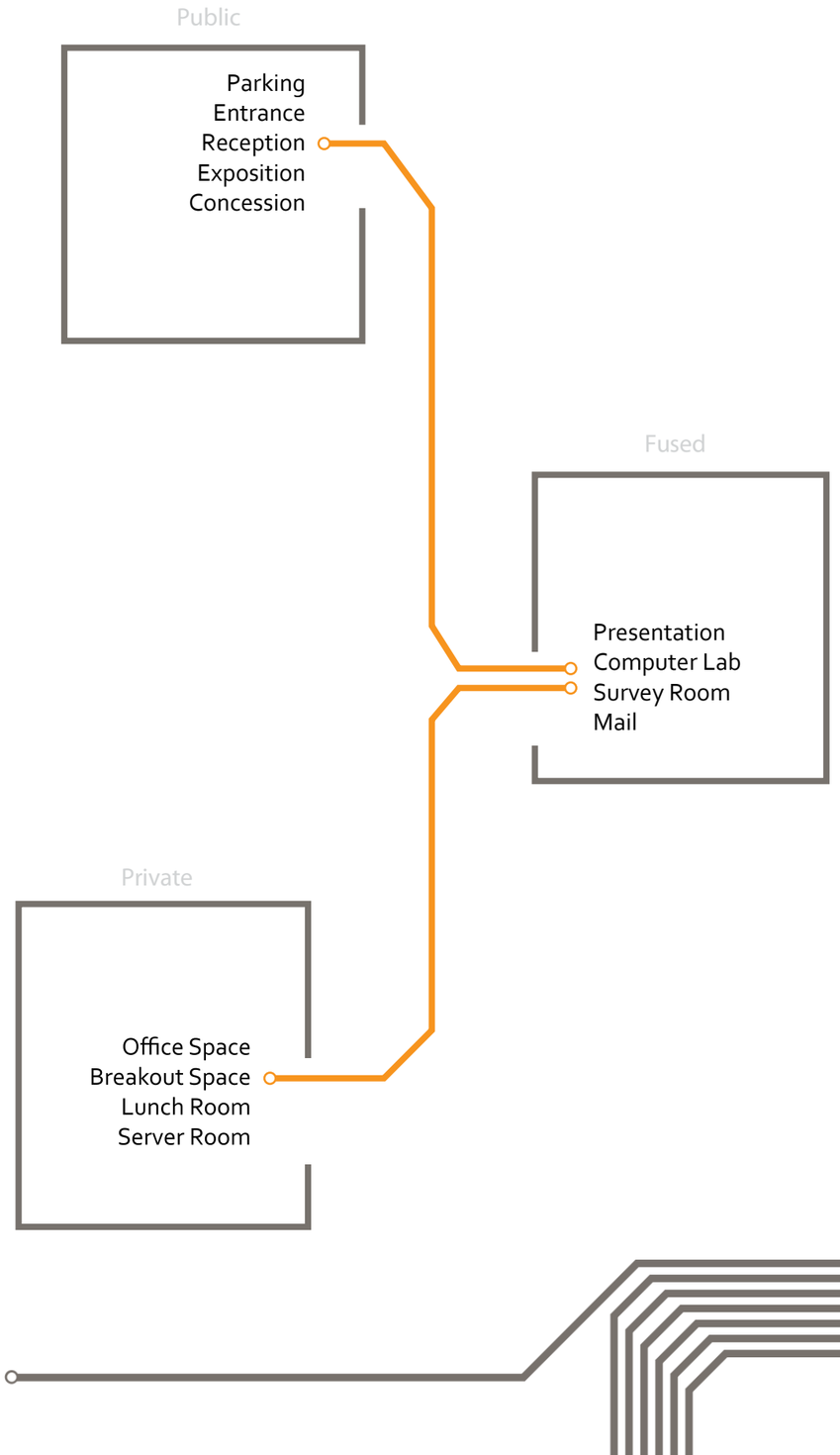


Programmatic Requirements

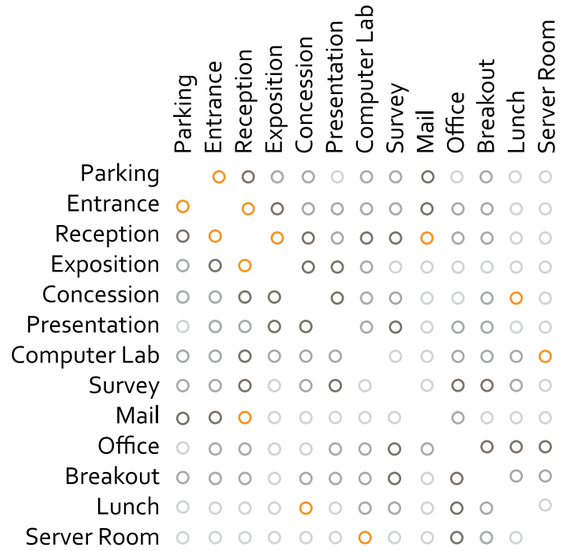
Exposition:	15%
Presentation:	10%
Office:	10%
Computer:	10%
Breakout:	10%
Lunch:	10%
Circulation:	10%
Conference:	5%
Research:	5%
Survey:	5%
Public/Green:	5%
Concession:	2%
Reception:	1%
Mail:	1%
Server/Mechanical:	1%

Total: 25,000 Sq. Ft.

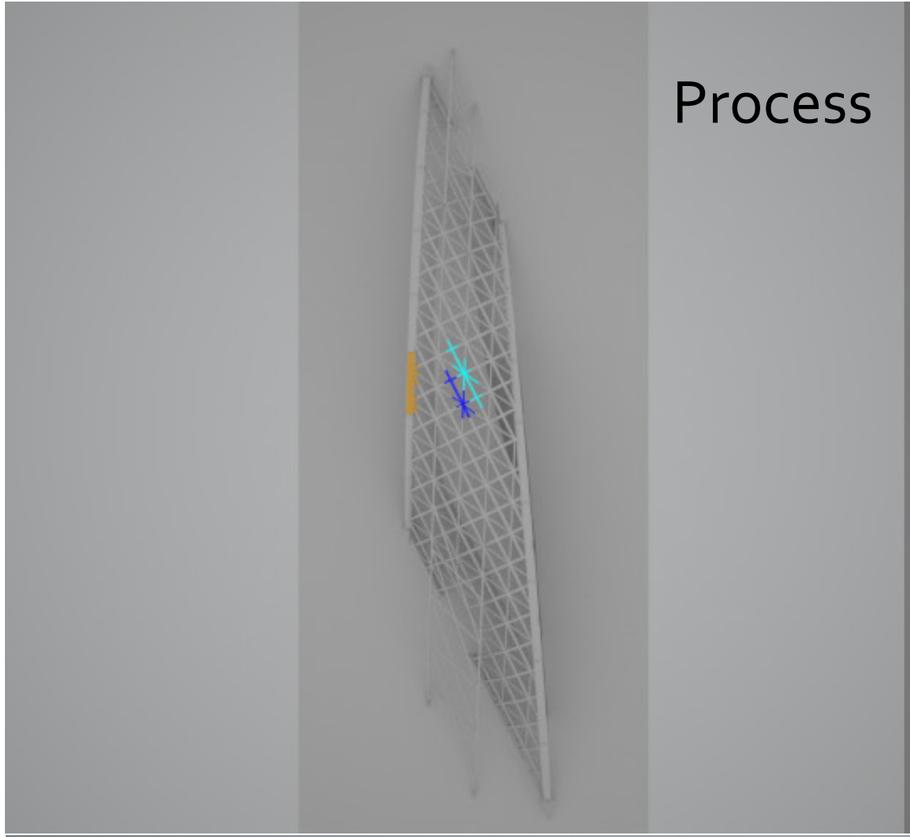
Interaction Net

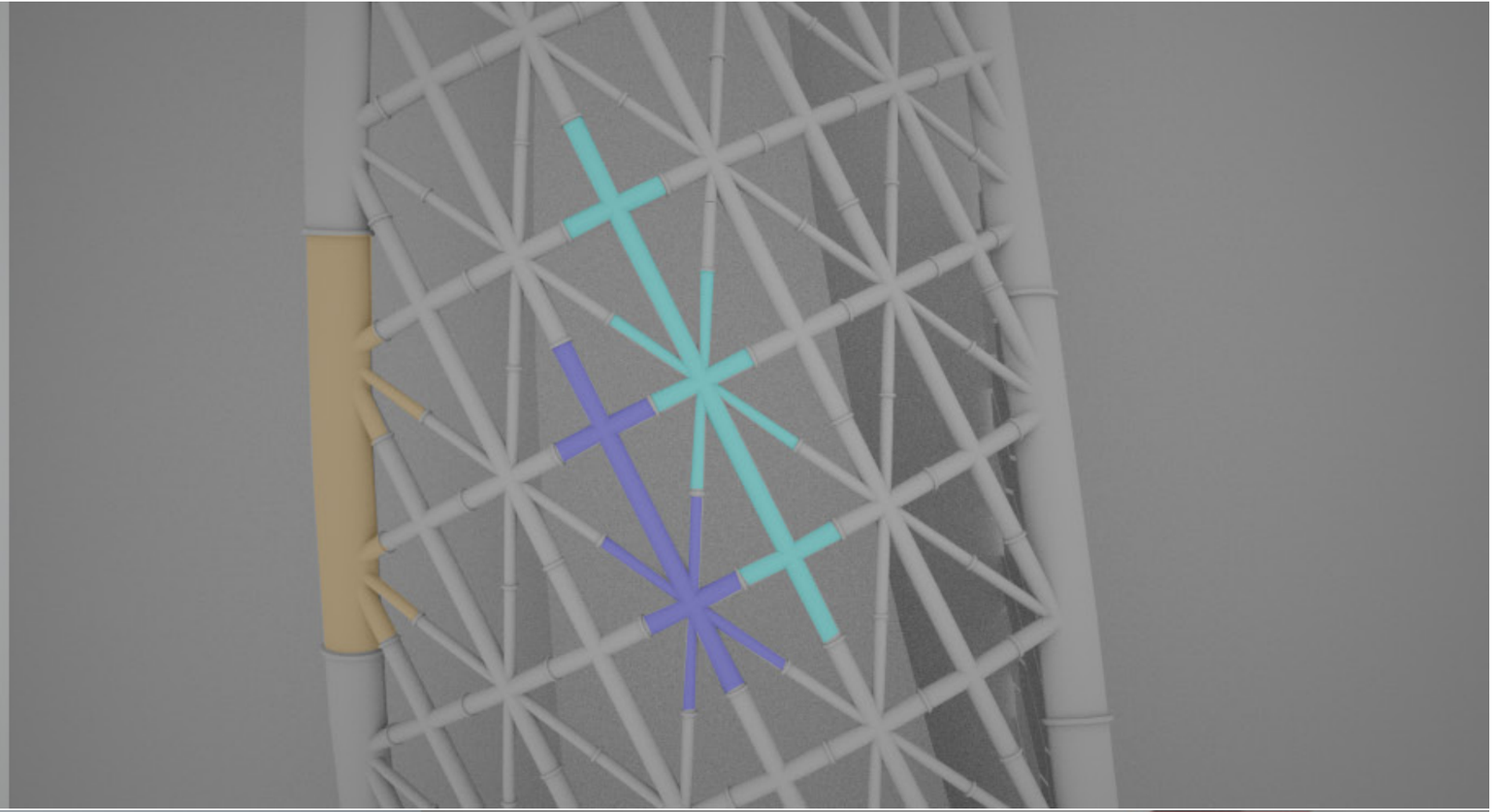


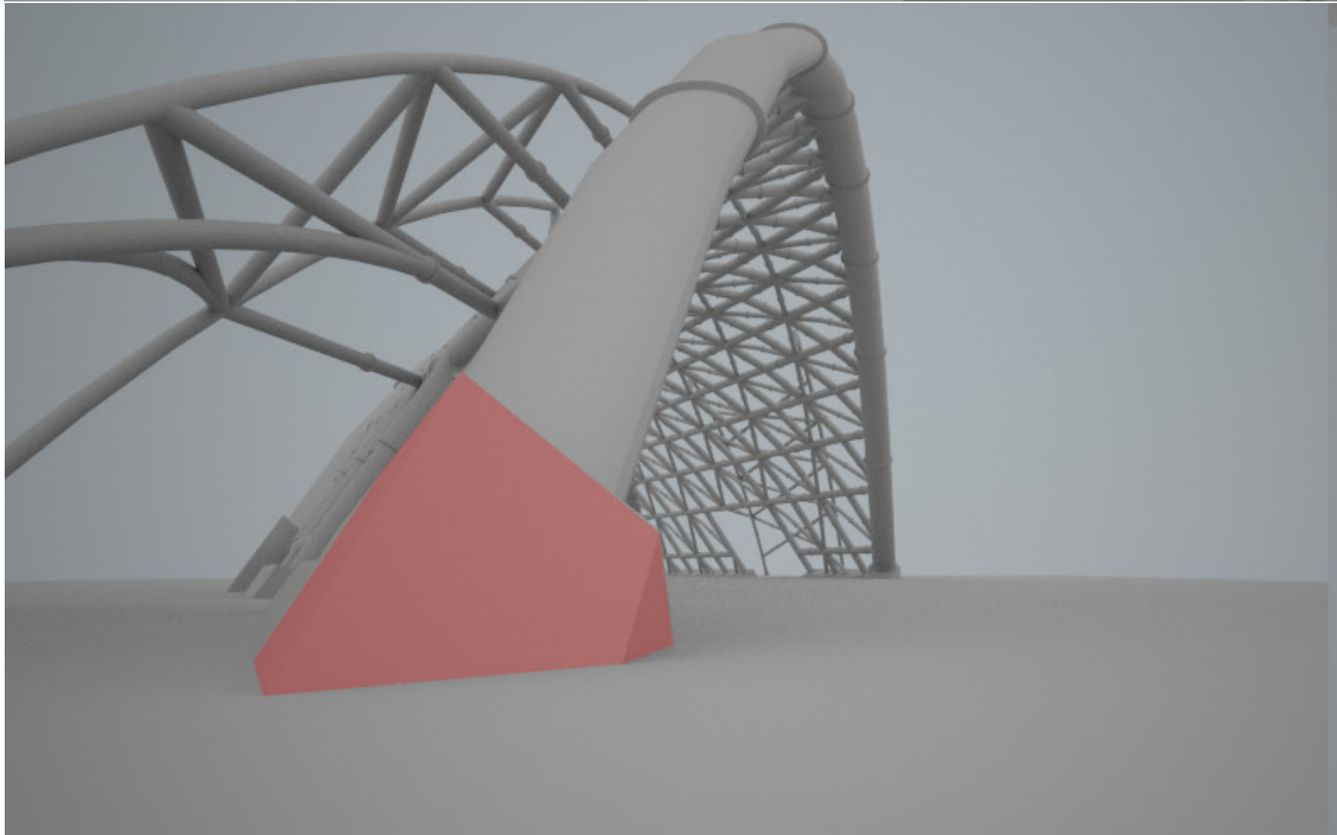
Interaction Matrix

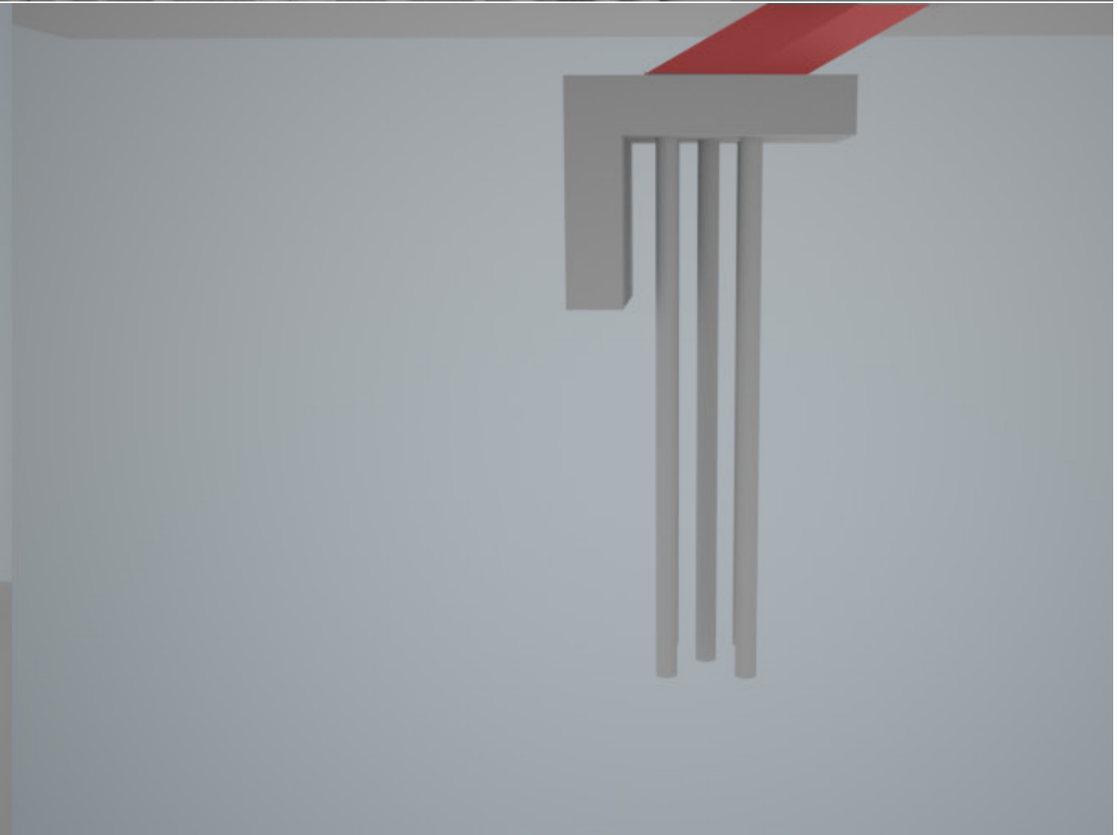


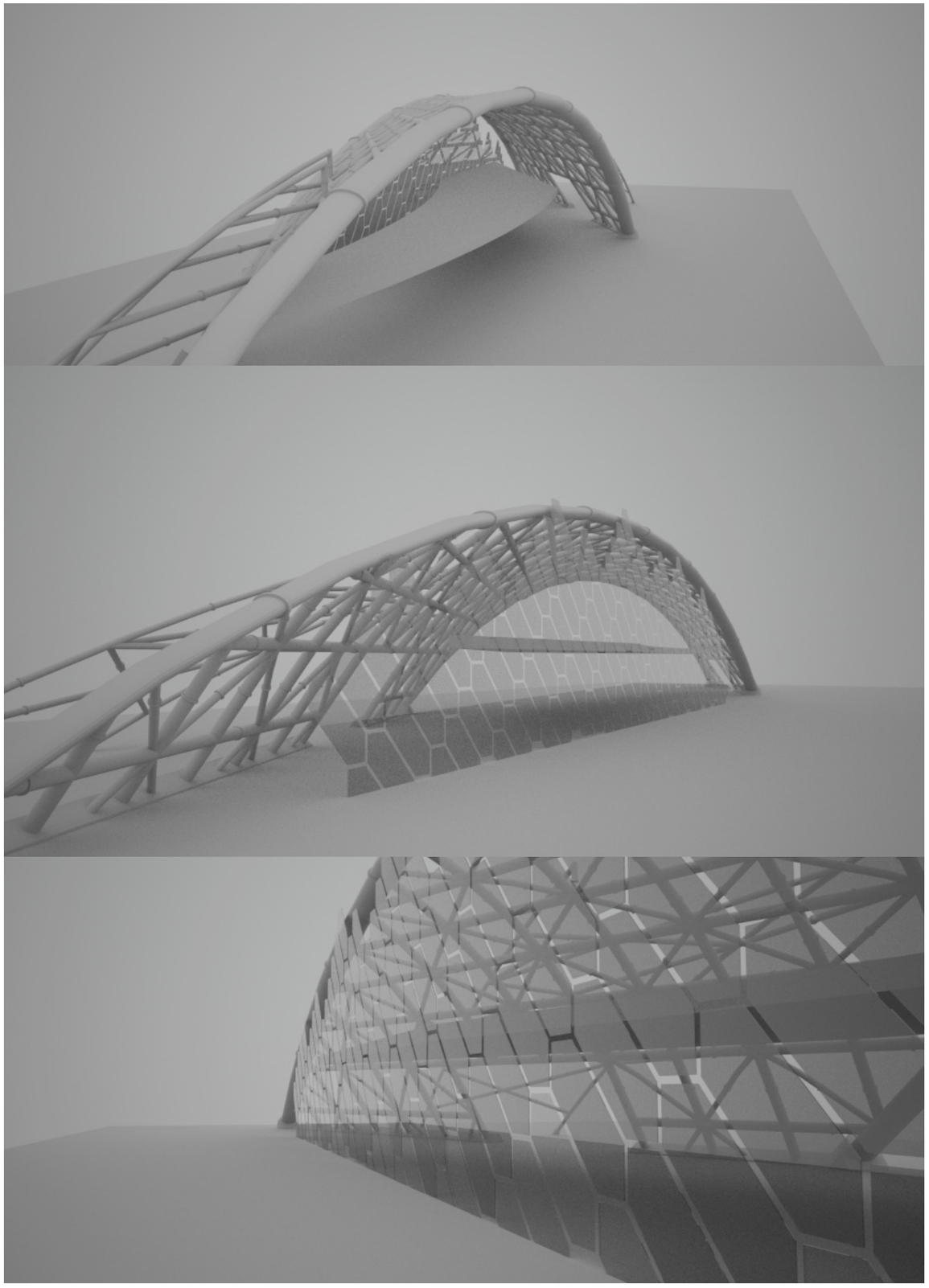
Process

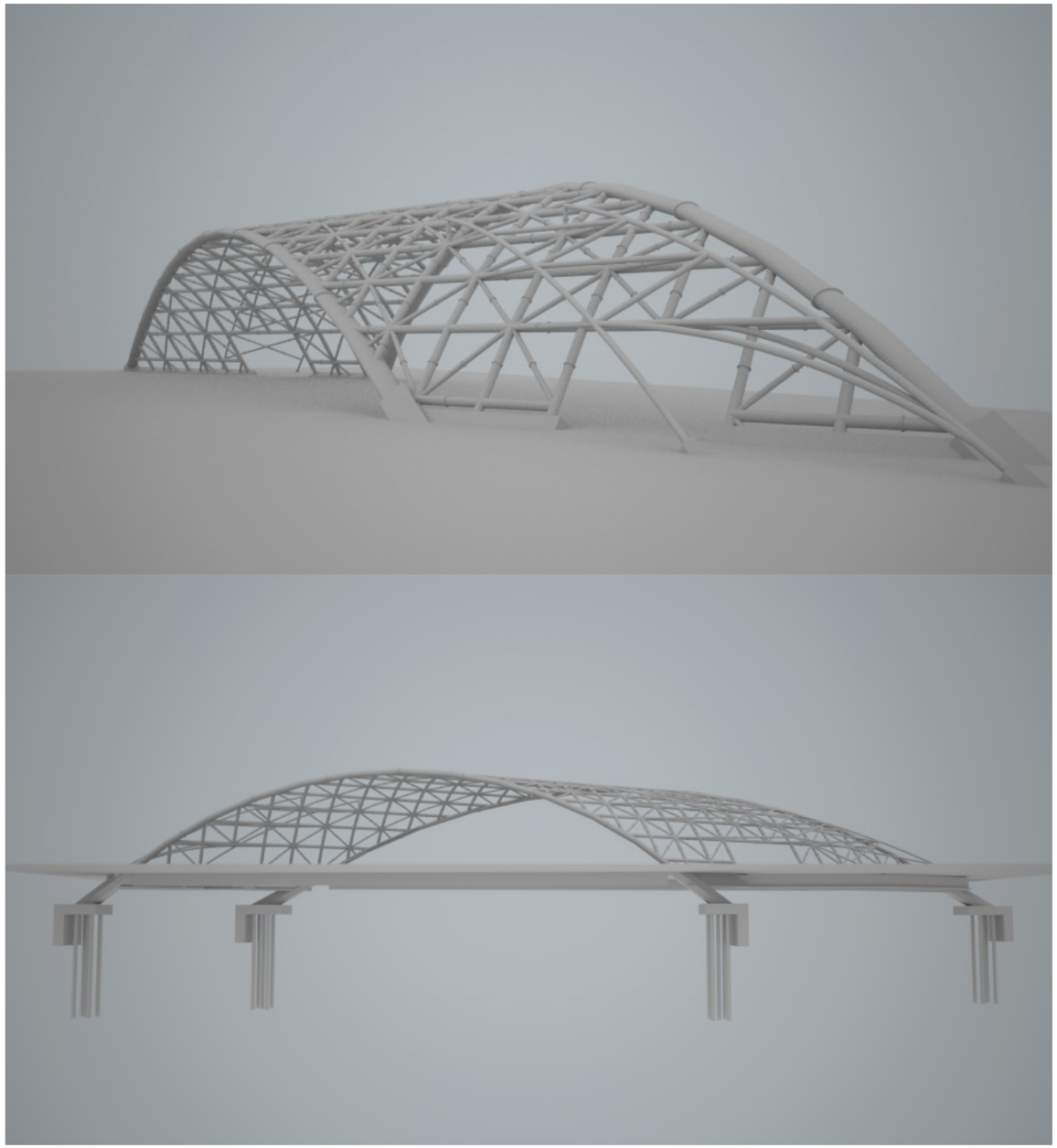


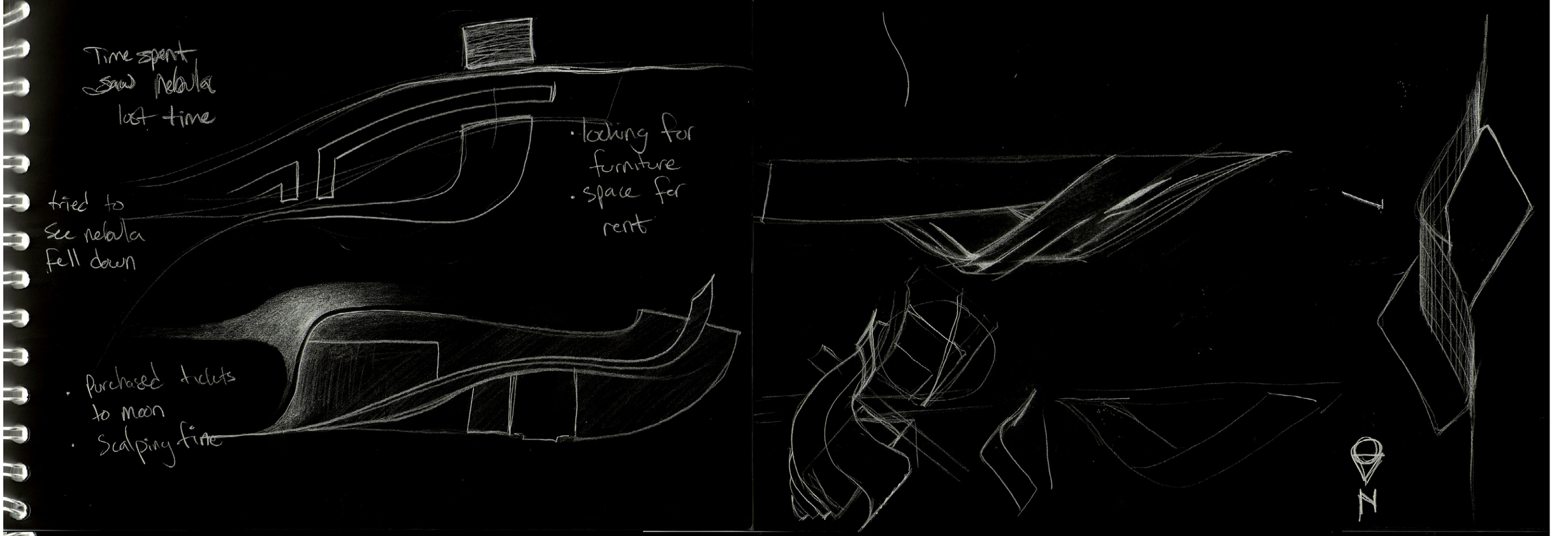


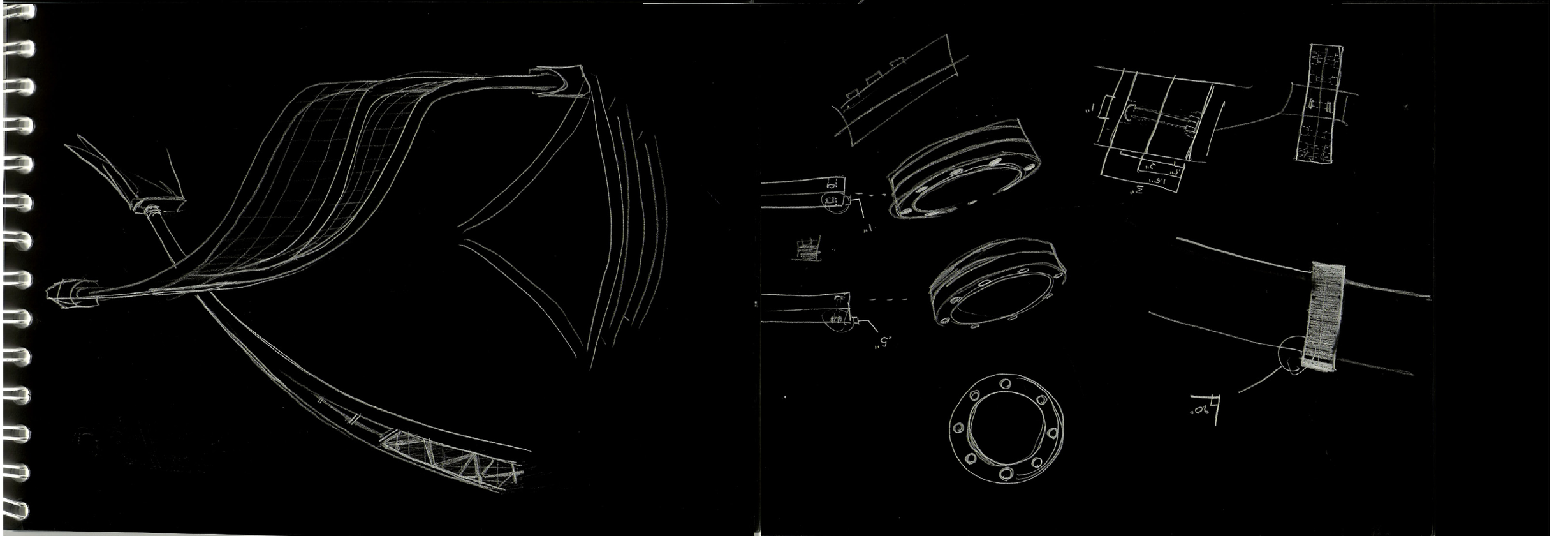









Time spent saw Nebula last time
tried to see nebula fell down
· looking for furniture
· space for rent
· Purchased tickets to moon
· Scalping time



100 wells

Coral
silver
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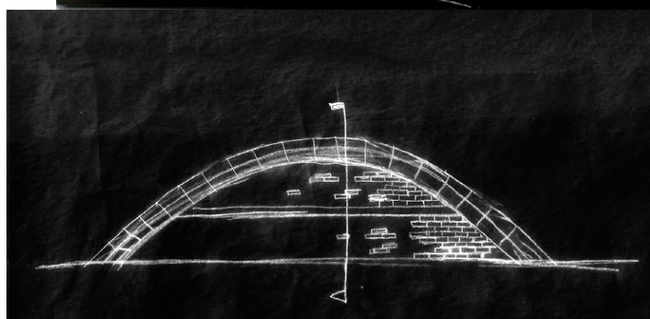
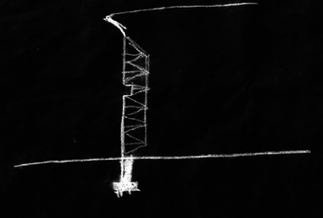
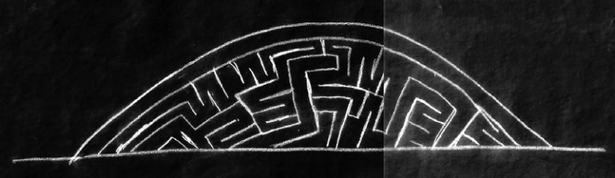
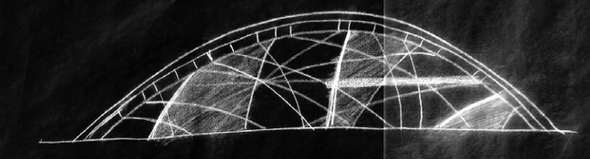
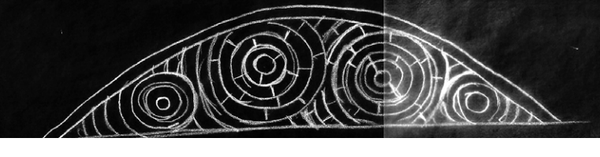
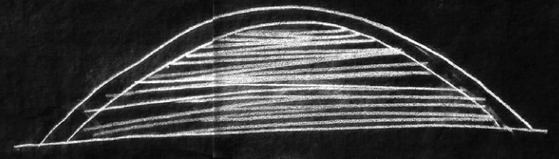


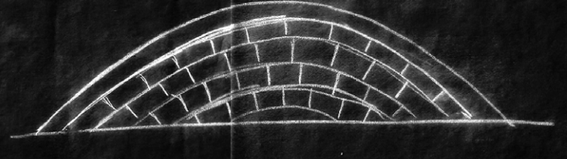


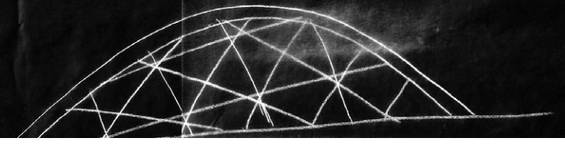


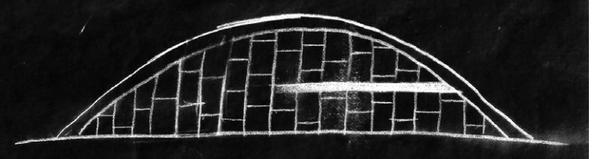


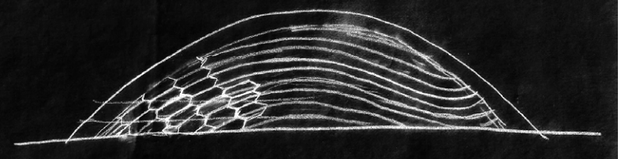


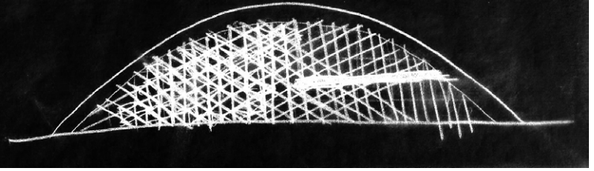


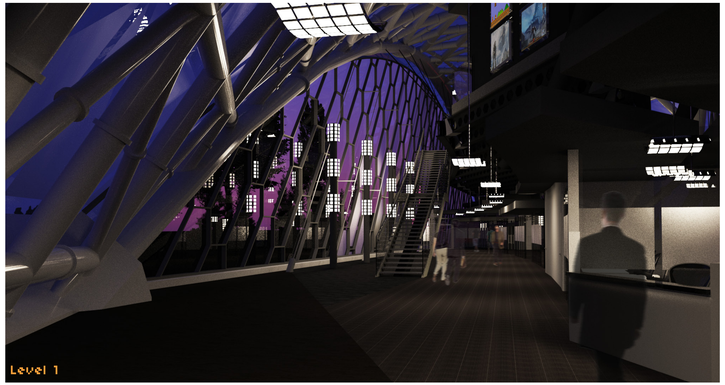


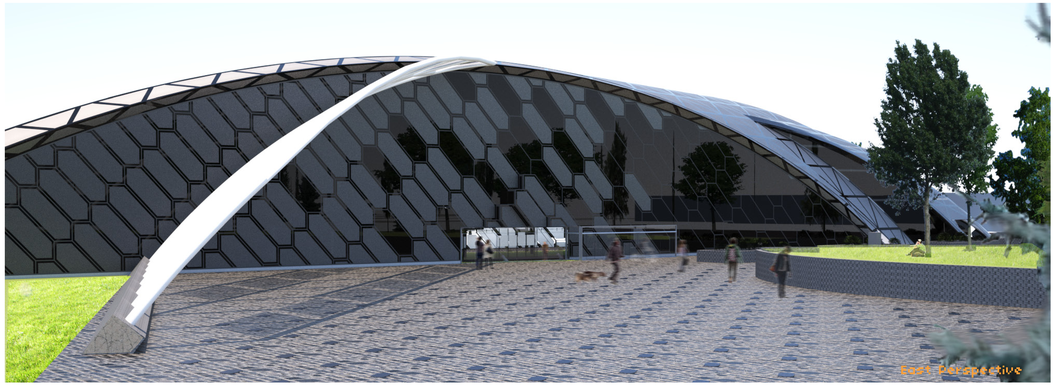


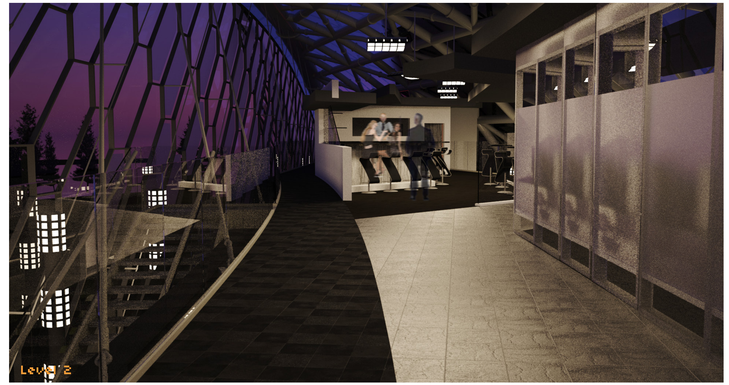


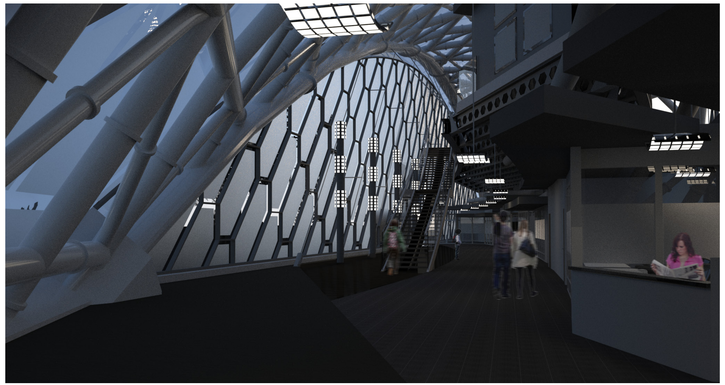


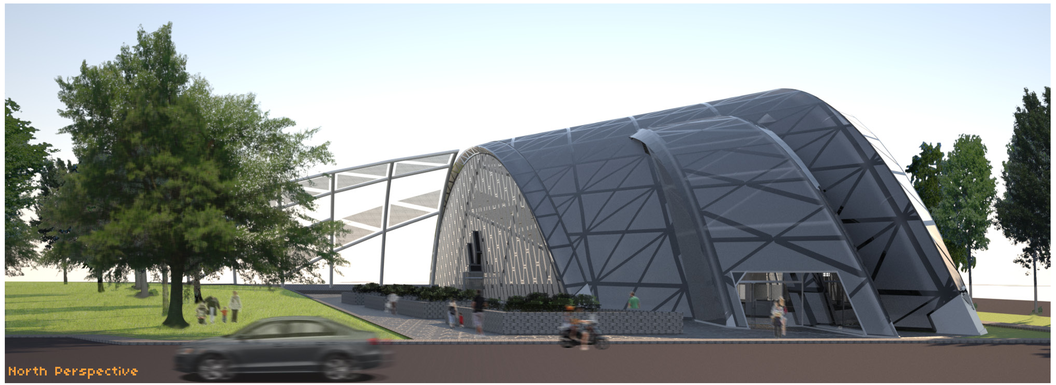


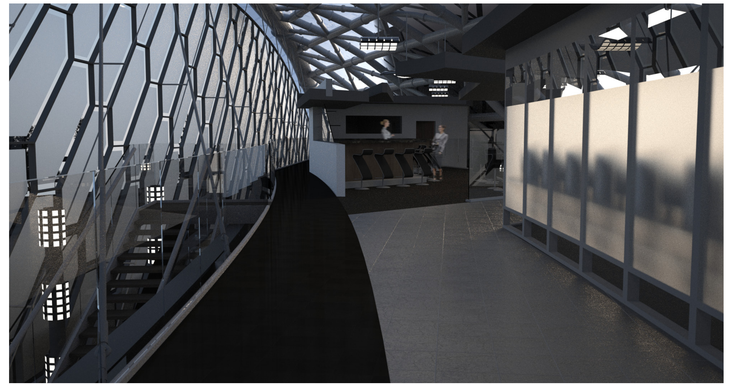

Level 1

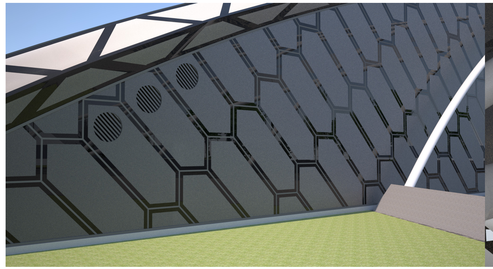

East Perspective


Level 2

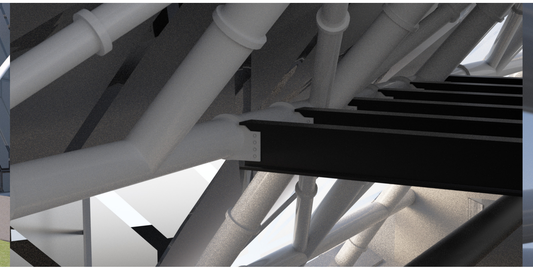



North Perspective

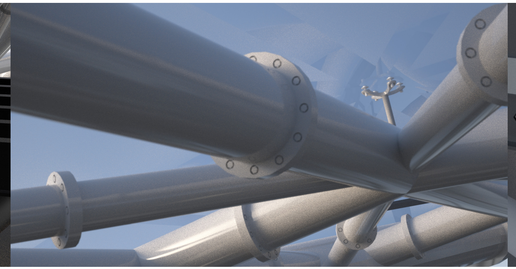




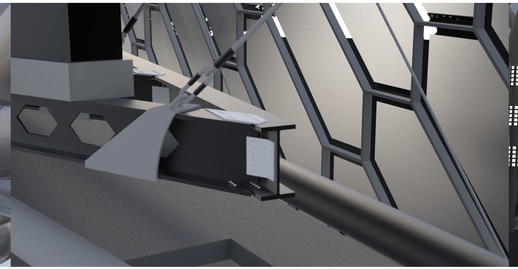
Intake



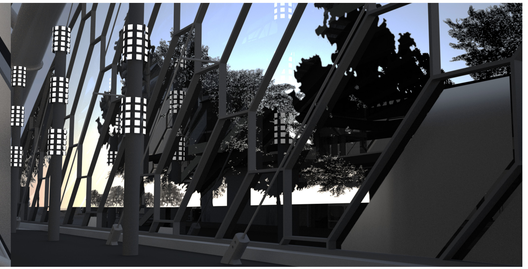
Level 2 Lateral Bracing



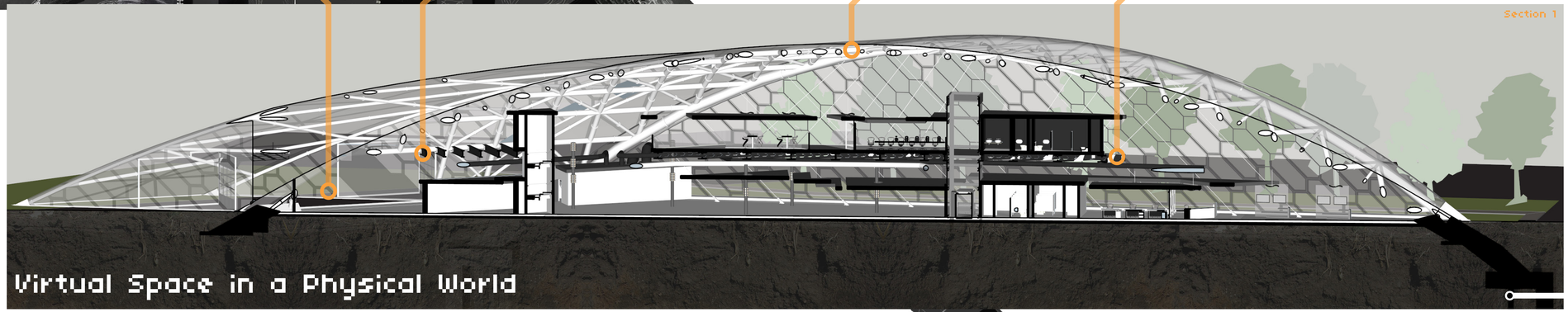
Superstructure Connections

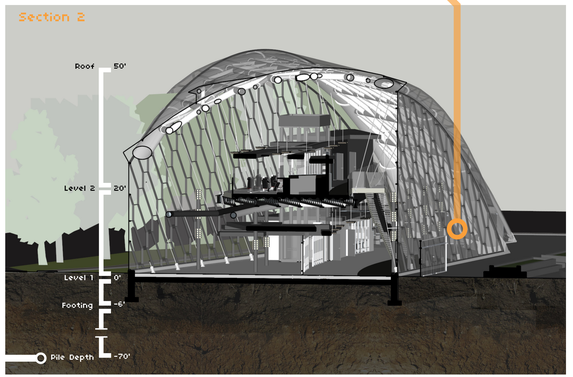


Level 2 Suspension Assembly

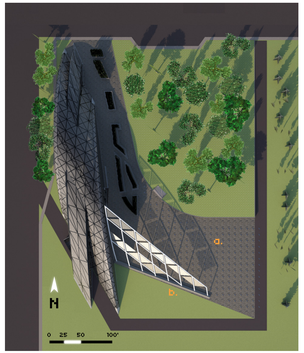


Glazing Structure



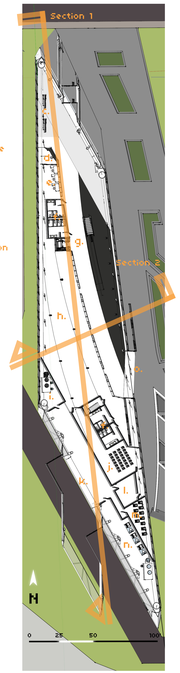


St. Paul, MN



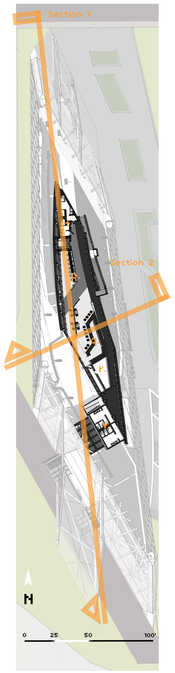
Site
a. geothermal
well field
b. shading device

Level 1
c. lounge
d. reception
e. administration
f. toilets
g. elevator
h. exposition space
i. HVAC exhaust
j. presentation
space
k. loading area
l. storage
m. server room
n. HVAC intake/
pump room
o. movable partition
to courtyard



Level 1

Level 2
p. computer lab
q. bar/cafe
r. kitchen



Level 2

Department of Architecture and Landscape Architecture, NDSU
ARCH 772, Design Thesis, Spring 2013
Devin Krugerud
Professor Mark Barnhouse
Virtual Space in a Physical World, Exposition Center, 27,400 sq. ft.

Software Used:
Sketchup 8,
Maxwell Render,
Adobe CS5,
Google Earth
Model Library Used:
3D Wharehouse

What do we need? What makes us who we are? What does it take to satisfy our oldest desires? For some all it takes is a spark of imagination. Others require something more.

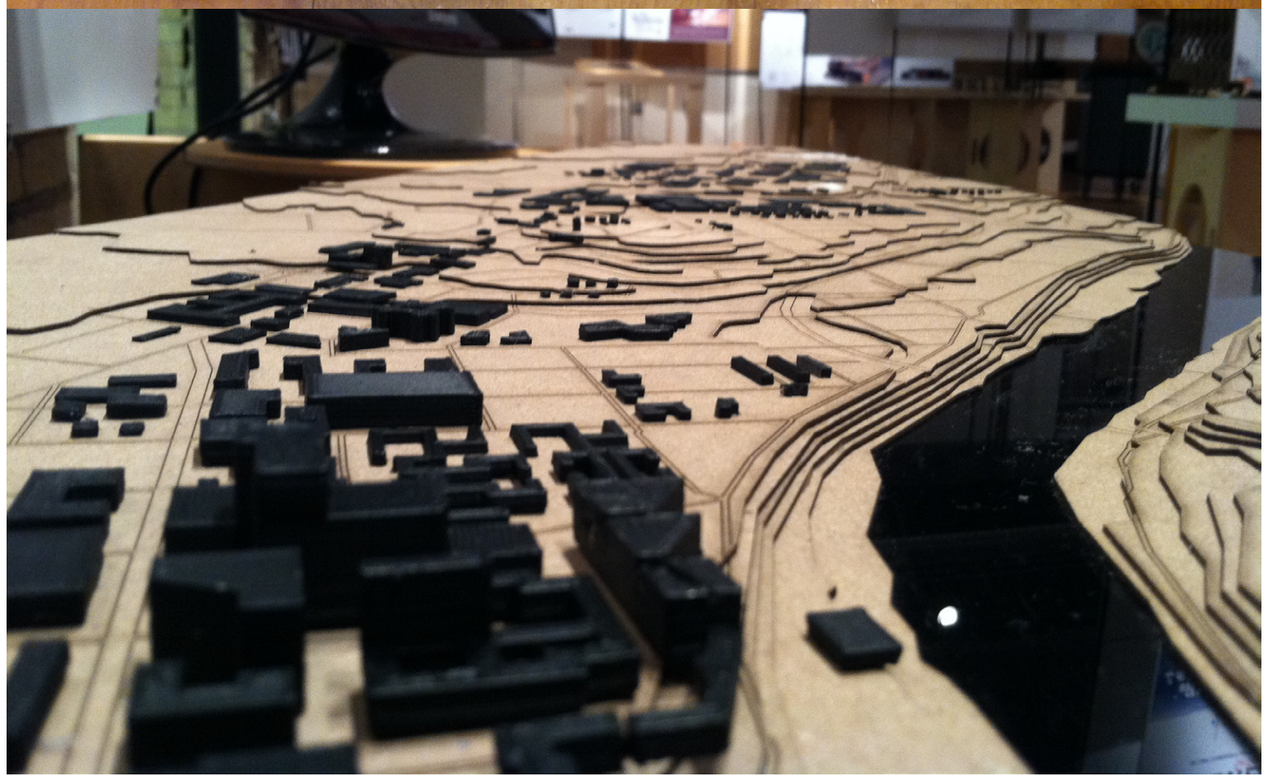
As technology evolves that something more becomes more feasible. In the pixelated realm of a video game anything is possible. Wonder and inspiration are the play things of video game developers.

This small exposition center reflects my exploration of steel, glass, and various techniques of video game design. The building's systems yearn to be understood by any who dare to try.

When video games emerged the field of architecture gained a powerful ally. The expression of ideas became exponentially easier as computer generated environments became more and more realistic. This brings us back to where we started. Our primal need to express what we feel. We want to be understood. Our ideas will be heard.


Virtual Space in a Physical World


started. Our primal need to express what we feel. We want to be understood. Our ideas will be heard.
Level 1
Level 2
N
1" = 500'



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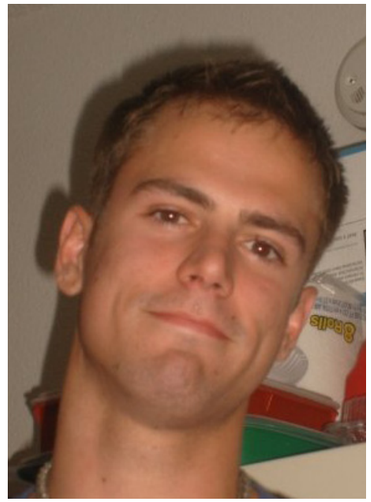
PERSONAL IDENTIFICATION



120 Broadway N
Fargo ND 58102

612.597.1170
d.krugerud@gmail.com
Plymouth, MN

"How the Helheim did i get up here?"