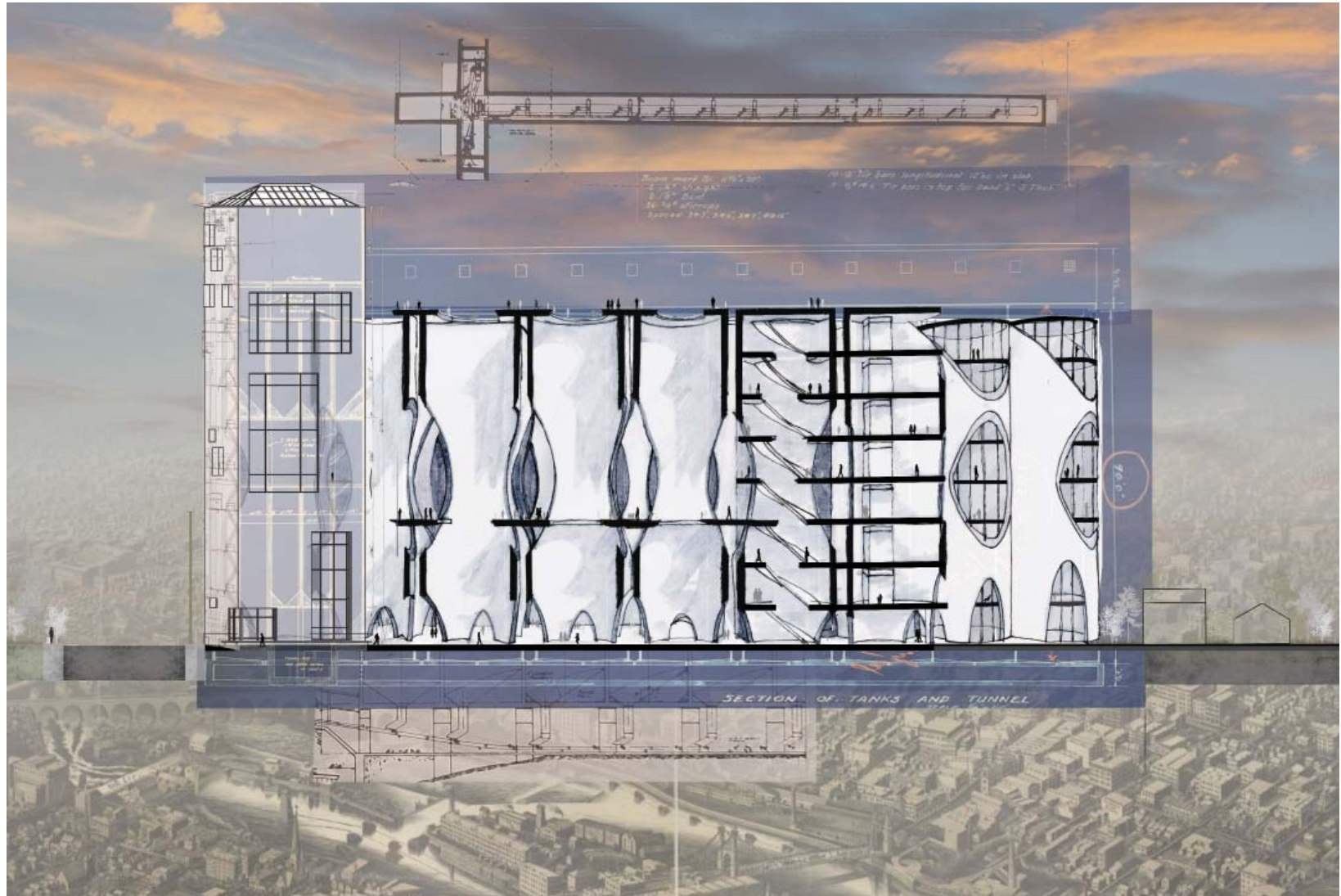




An Artifact of Industry

Preserving Minnesota's industrial heritage, through the rehabilitation of concrete grain elevators and silos.

Jenna Hegedus - Graduate of 2018



Signature Page

A Design Thesis Submitted to the
Departments of Architecture & Landscape Arhcitecture of
North Dakota State University

Jenna Hegedus

As Partial Fulfillment of Requirements
For the Degree of
Master Architecture


Primary Thesis Advisor

Thesis Committee Chair
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Thesis Abstract

This thesis project is to promote the value of Minneapolis, Minnesota's cultural heritage through the rehabilitation of concrete grain elevators and silos. With the vacancy of many of these structures at a rise, the re-use and re-functioning of these industrial machines is necessary for the preservation of cultural heritage.



Figure 1 - SW Perspective of Site

Narrative of the Theoretical Aspect of the Thesis

Through an architectural design project, can desolate industrial buildings be refunctioned to become a productive and inhabitable part of a community, while also interpreting its historical significance?



Figure 2 - Historical Map of Minneapolis, Minnesota

Project Typology

The typology of this project focuses on the urban setting that has grown around these industrial artifacts, and rehabilitating the structure to better serve and function for the surrounding communities.



Figure 3 - In-between



Figure 4 -The Bunge Elevator

The Typological & Precedent Research

The Typological & Precedent Research

Introduction

The collection of case studies represents the ideals that will be reflected on the rehabilitation of a concrete grain elevator and silo. Most of the ideal are reflected in each study, but some with specific features that will be analyzed further.

The sense of a sites heritage and culture is an important aspect of the design to study, it is what allows a community to connect to the space. Understanding the history of the building and its capabilities is important, floor plans and spaces can be studied to discover these possibilities. The reuse of the concrete grain elevator and silo structure is priority, studying structure with the same or similar materiality will be important for considering the rehabilitation project.



Figure 5 - MOCCA Interior



Figure 6 - "A" Mills Lofts



Figure 7 - Mining Plant

Zeitz MOCCA, Cape Town, South Africa

Zollverein Coal Mining Plant, Essen, Germany

The Lime Works, Faversham, United Kingdom

A Mill Artist Lofts, Minneapolis, Minnesota

Zeitz MOCAA

Cape Town, Africa

Typology

Adaptive Reuse

Scale

9,500 square feet

Material

Concrete



Figure 8 - Cape Town Grain Mill

Cape Town has a long history of supplying and trading goods, both regionally and nationally, so the adaptive reuse project of the concrete grain silos was a fitting tribute to the heritage of the surrounding communities. The silo opened in 1924, its first shipments was to Europe, the ship carried over 6 tons of grain. This was an economic boom for Southern Africa. The silos closed in 2001, for the lack of demand.

The grain silos stand at 180 feet tall, and is an icon of the Cape Town skyline. The structure is a representation of Africa's industrial history and a symbol of their cultures economic progress, it has been defined as a historical monument.



Figure 9 - Cape Town Water Front

The grain elevators were used as a transportation facility, the grain was weighed, cleaned, bagged, stored, and distributed, all from the Victoria and Alfred Waterfront.

Structure
Basement Level

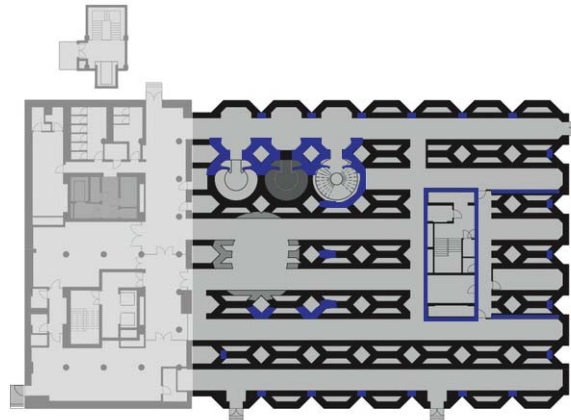


Figure 10 - Floor Plan

Circulation
Ground Level

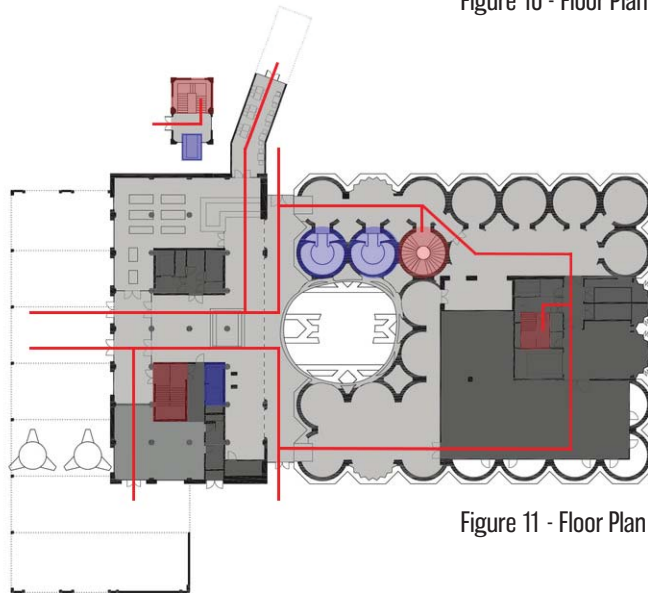


Figure 11 - Floor Plan

Spacial Organization
Level Two

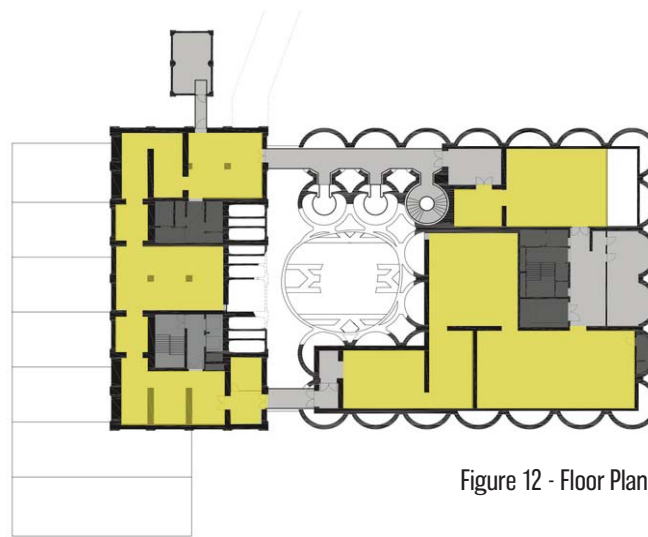


Figure 12 - Floor Plan

Natural Light
Level Four

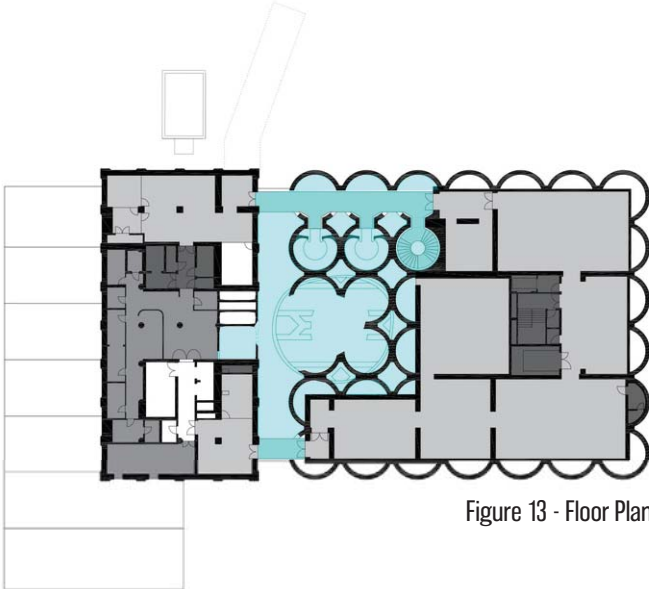


Figure 13 - Floor Plan

Building Systems
Level Five

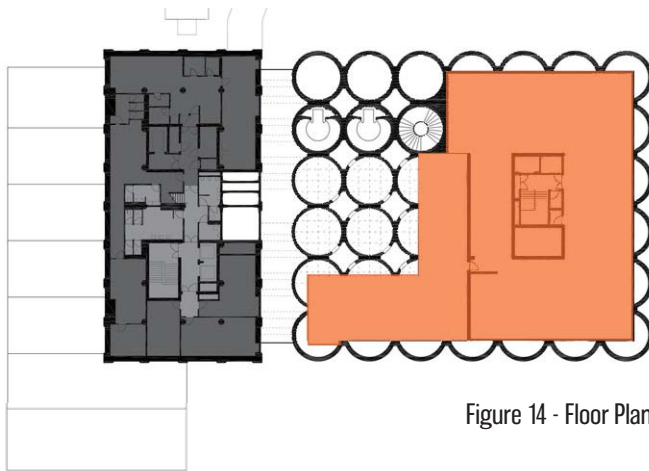


Figure 14 - Floor Plan

Green Space
Level Six

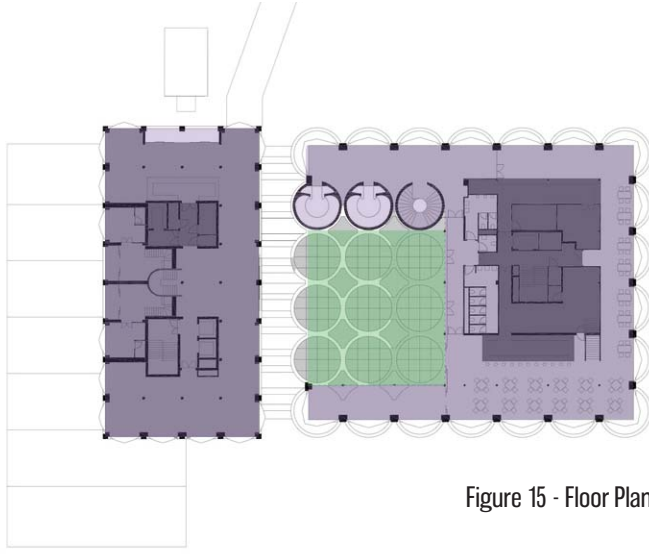


Figure 15 - Floor Plan

Zeitz MOCAA

Cape Town, Africa



Figure 16 - MOCAA Render

In 2013 Jochen Zeitz and V & A Water Front decided to invest in the vacant silo and grain elevator, with the goal of creating a new function for this structure. They teamed up with Architect Heatherwick, who saw this project as an opportunity to invent new ways of supporting the mass with sculptural structure.



Figure 17 - MOCAA Bar Interior

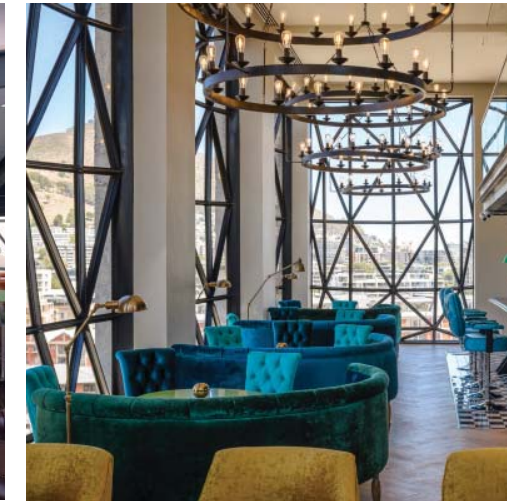


Figure 18 - MOCAA Restaurant Interior



Figure 19 - MOCAA Bath Interior



Figure 20 - MOCAA Silo Construction

Functions

This redeveloped function of the silos is the host of Africa's first contemporary art museum, and the grain elevator is a high-end hotel. Other amenities include; roof top garden, conservation labs, book shop, restaurant, bar. The goal of the project was to maintain the relationship with the industrial past of the site.

Conclusion

The Zeitz MOCAA is a strong case that helps illustrate the possibilities of recycled concrete structures. It also encourages my design solution to maintain some of the aesthetic of the original grain silos and elevator.

Zollverein Coal Mining Plant

Essen, Germany

Typology

Conservation

Scale

.7 square miles

Material

Concrete/ Steel



United Nations
Educational, Scientific and
Cultural Organization



Figure 21 - Entry to Plant

From the 19th century till the late 20th century, Zollverein Coal Mining Plantation was one of the largest coal distributors in the world. To support the needs of its' nation during WWI, the plant had to increased its productio, which increased the industry overall. Zollverein ran its coal production until 1986, because of the dramatic economic shift from coal to oil.

"Sheer Practicality," was the inspiration for the two architects, thus the aesthetic of the coal plant would reflect the modern movement. moving away from expressionism and toward cubism and functionalism

The United Nations Educational, Scientific, Cultural Organization (UNESCO) in scripted The Zollverein Coal Mining Plant in 2001, this means that the plant is to be conserved because of its educational, scientific, and cultural significance in the world.

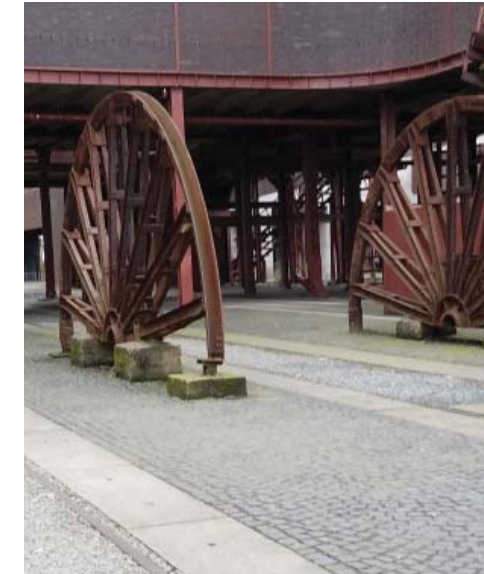


Figure 22 - Fragements



Figure 23 - Rail Courtyard

The buildings on the industrial campus of Zollverein are significant because of their representation of modern architecture, the mining heritage of Germany, and the role the plant played in the coal economy of the world.



Figure 24 - Campus Map

Architects Fritz Schupp and Martin Kremmer designed the plant with a Bauhaus program, this is a group of separate buildings that functioned together as a whole.

Zollverein Today

Essen, Germany



Figure 25 - Reflective Pond

Today the Zollverein Coal Plant hosts many events, programs, and tours to people at both regional and national level. The events range from concerts, to markets and beer festivals. There are biking tours, children tours, the plant hosts family brunches and tours every Sunday. The coal plant has transformed its function to serve the needs of today’s community, while also respecting the visual integrity of its original state.



Figure 26 - Light Party



Figure 27 - Market Festival



Figure 28 - Local Brewery



Figure 29 - Event Center

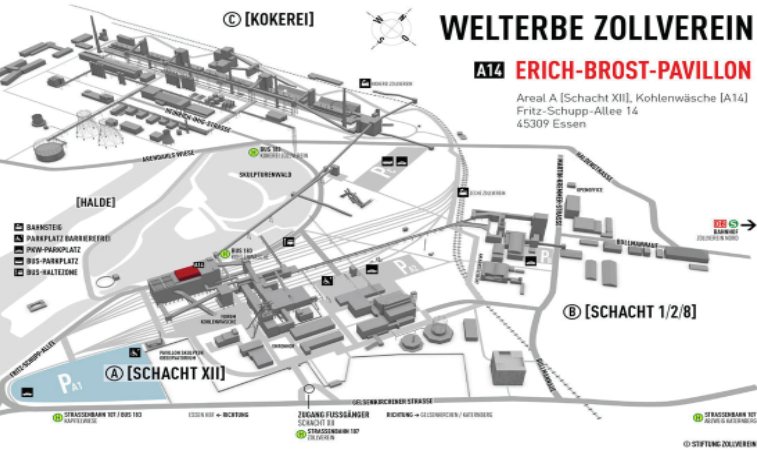


Figure 30 - Map of Site

This precedent demonstrates the influence and effects of organizations who promote conservation and protection of historical artifacts. The story of the Zollverein Coal Mining Plant also shows the functional rehabilitation of a historical site, by transforming its function the plant became a focal point and host to its surrounding communities.

The Lime Works

Faversham, United Kingdom



Figure 31 - Original Structure

These two water towers with a connecting corridor structure, were built in the early 1930's. They acted as an experimental water softening plant, till 1942 when it was abandoned because of World War II. The plant closed in 1946 because it was too expensive to run, it sat vacant until 2002. Construction for the plant to be converted into a residential dwelling started in 2005.



Figure 32 - Aerial View of Residence

The structure of the Water Plant is concrete, through time this material has preserved, which allowed for the new owners to use it as the only structural element for the home. The only exterior architectural element added are the glazing wrapping the base of both the water towers. The dwelling allows for 4 bedrooms, four bathrooms, roof terrace with pool, a sauna, and lounge room.

The Lime Works

Faversham, United Kingdom



Figure 33 - Residence Today

Though the shape of foot print of this home quite challenging, the square footage of this project was maximized, providing larger and quality spaces.

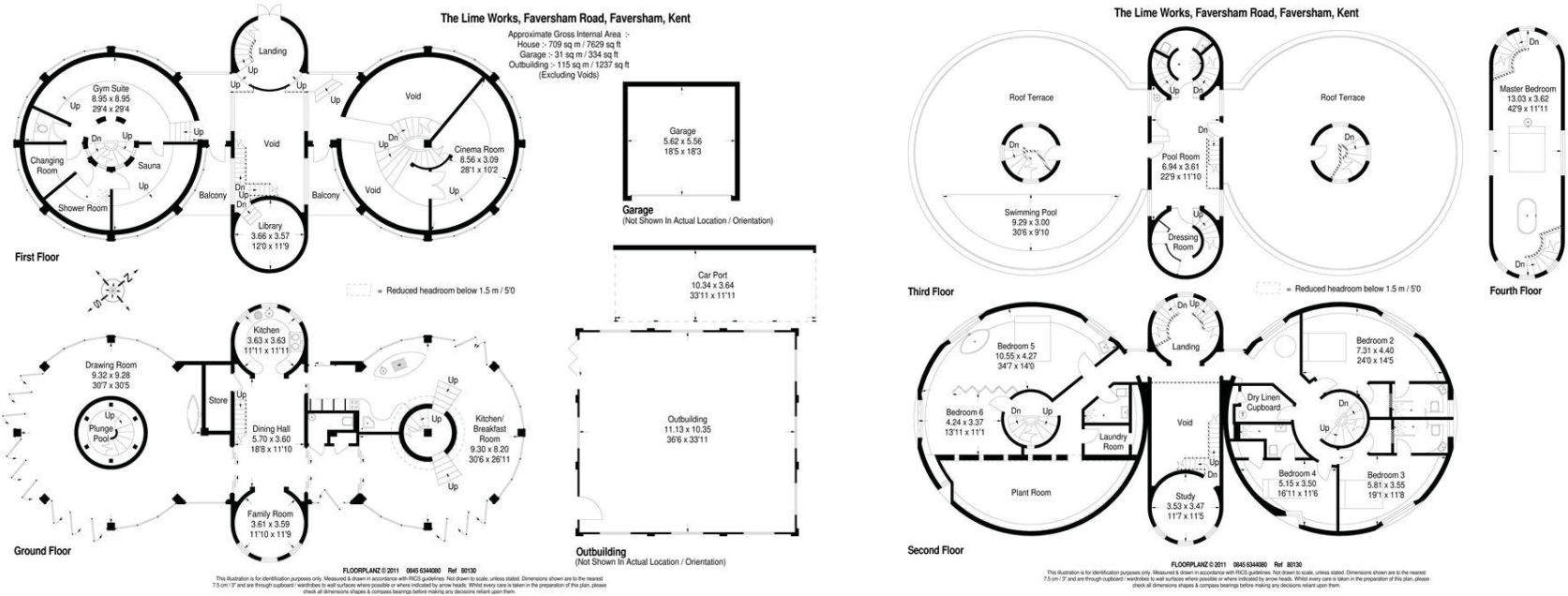


Figure 34 - Floor Plans

This president study displays a challenging adaptive re use project of an industrial structure being reintroduce as a family dwelling. Despite the challenging floor print, the designers cre-ated a new use for this old structure, while also maintaining the integrity of the original form.

This concept challenges the design to maintain key characteristics of the original form when it comes to reintroducing the grain silos to their community.

“A” Mill Artist Lofts

Minneapolis, MN



Figure 35 - Mill Post Card

During the industrial boom of the mid-west, the Pillsbury A Mill opened in Minneapolis, Minnesota during the year of 1881. The machinery and architecture of this complex was state of the art, and the production and design was shining moment in industrial architecture. The mill is located right off the Mississippi River, and receives all its energy and power from the St. Anthony Falls. The Pillsbury A Mill ran until 2003, when the plant shut down. In 2011 the structure was put on the National Trust of Historic Preservation's list of 11 most endangered historic places. Soon after this building was purchased by Dominion Inc, a developing company within the Midwest. Their goal was to rehabilitate and turn this structure into affordable housing for artists and craftsmen

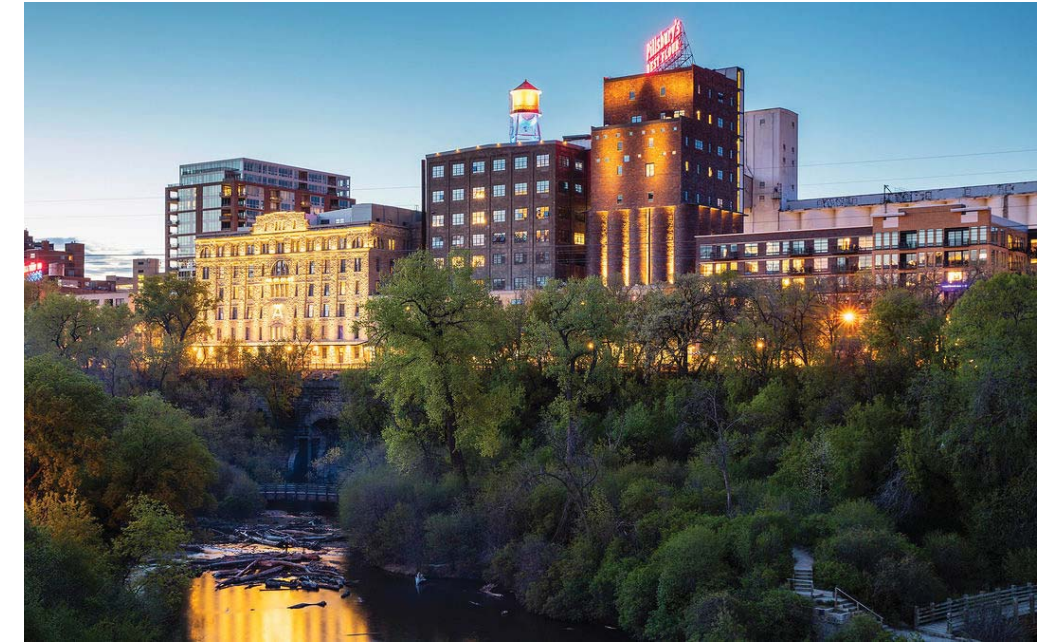


Figure 36 - Mill Today

Dominium repair the hydro power infrastructure, that would provide regenerative energy to the entire complex, the floor joists were all repaired and replaces where needed, and the stone work was cleaned. The developer had a \$150 million budget for the project, they hired on BVK architecture firm, and together they converted the old mill in to artist lofts and studio spaces. This apartment is for individuals who make lets that \$40,000 per year, there is an income cap per unit, making sure the lofts get rented to the people who qualify for them.

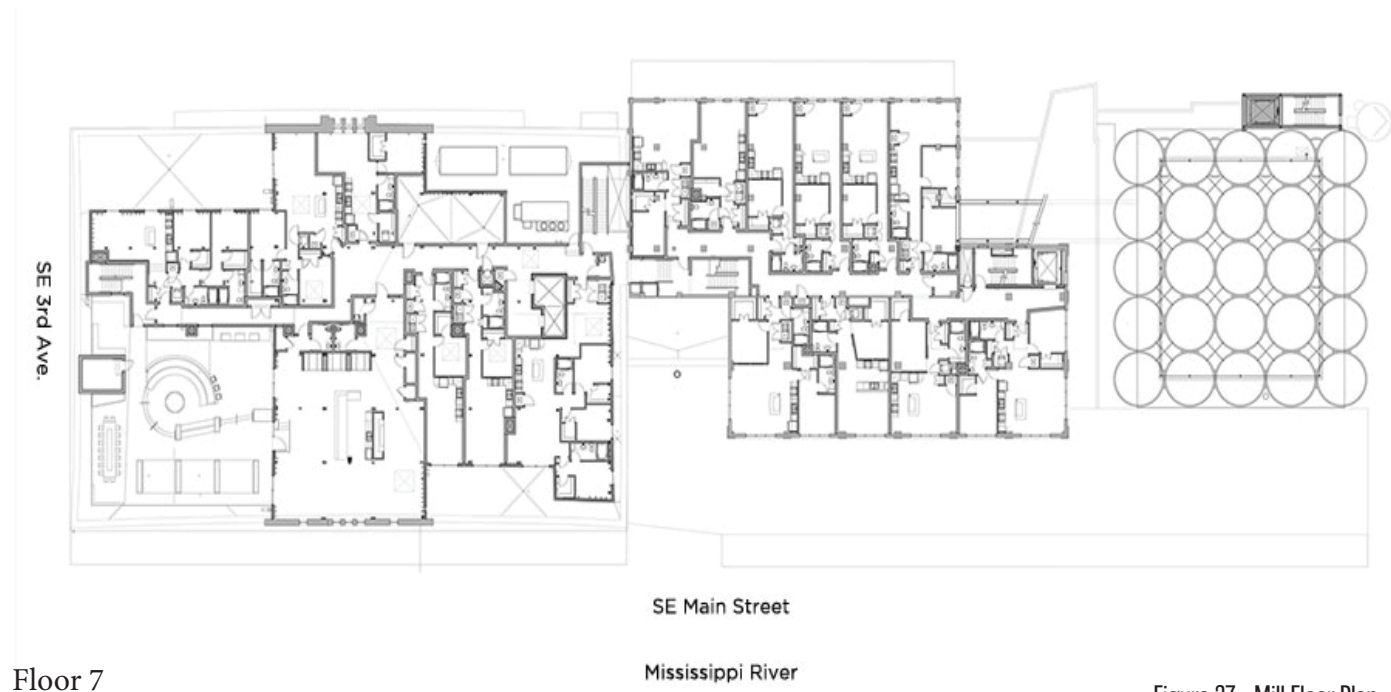


Figure 37 - Mill Floor Plan

The amenities include, clay studios, paint studios, dance studios, photographing studios, instrumental practice studios, display and showcase spaces, gallery shaped, lounge spaces, kitchen spaces for hosting events, recreation space, etc. The units range from lofts, to 4 bedroom units.



Figure 38 - Mill Apartment



Figure 39 - Mill Ceramics



Figure 40 - Mill Entry



Figure 41 - Mill Painting



Figure 42 - Mill Apartment



Figure 43 - Mill Gallery

This space is a perfect example to how we must react to these vacant industrial structures, not as a nuisance, but as an opportunity. The reuse of this building not only revitalized this wonderful location on the Mississippi River, it also prevented much waste, that would be created had the structure been demolished. This precedent study is representative of the rehabilitation that I would like to perpetrate on other silos throughout these urban settings.

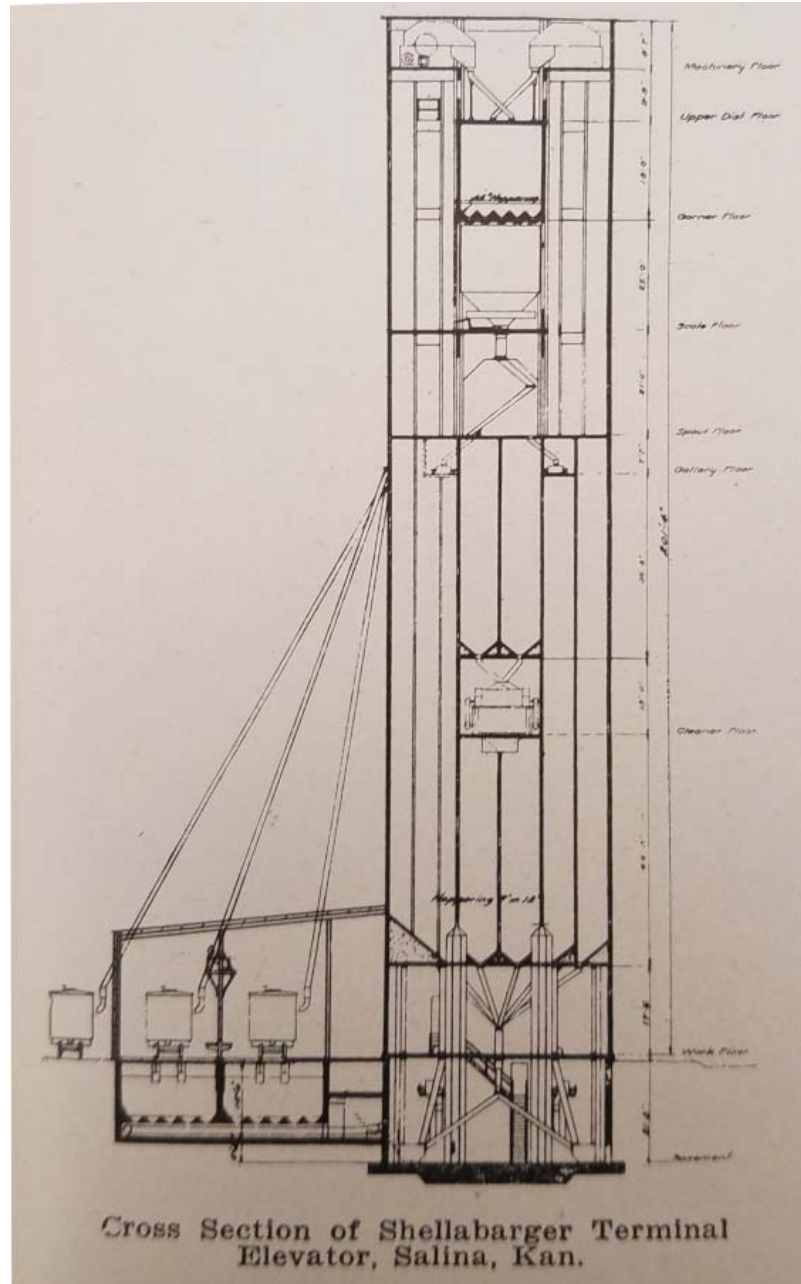


Figure 44 - Section of Grain Elevator

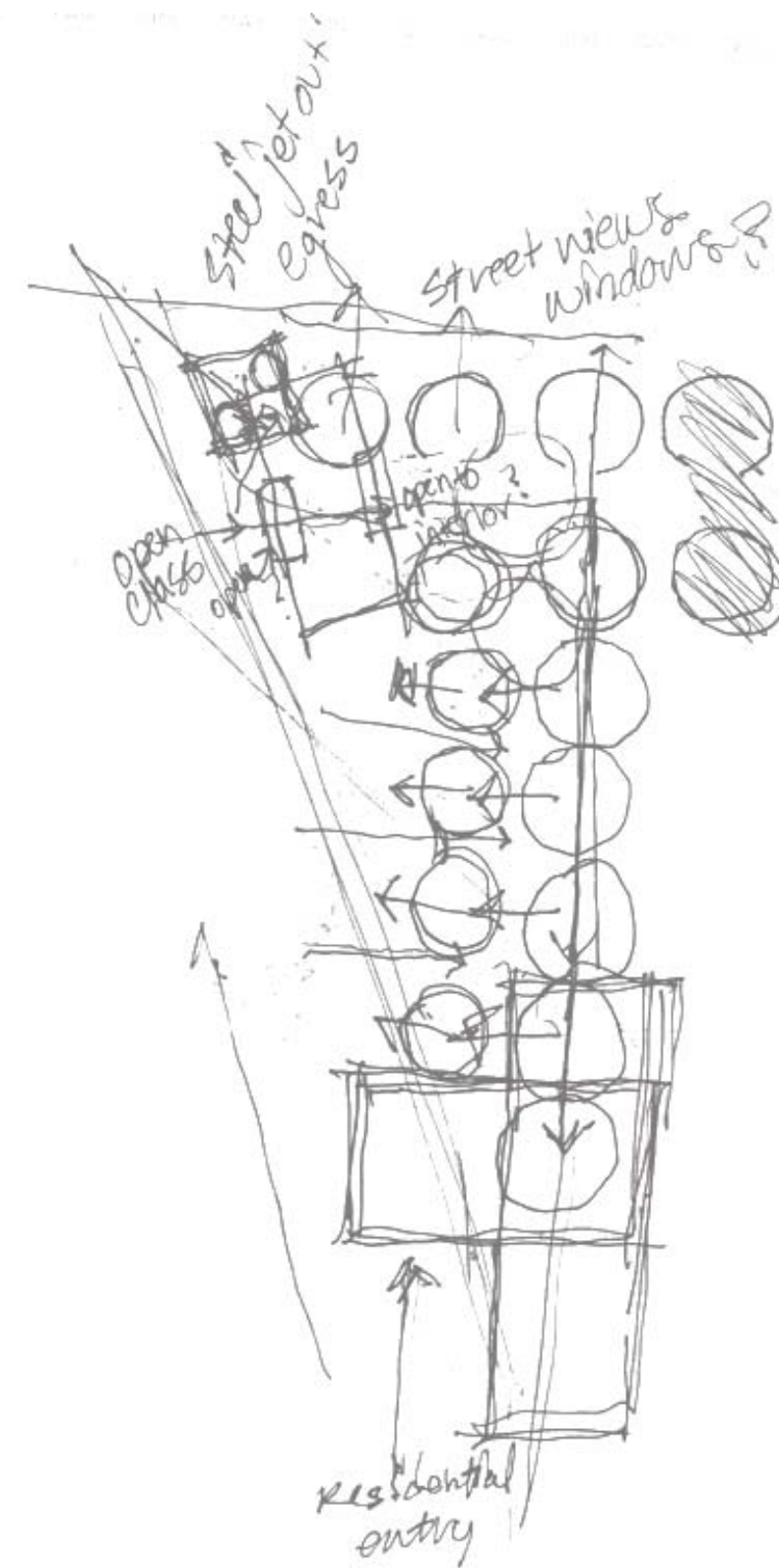
The Typological & Precedent Research

Conclusion

The commonality between these precedent studies is the transition of the structures functionality and its rehabilitation, to better serve its surrounding communities. The importance of giving these buildings new life is to commemorate the cultural heritage that grew around them, and to repurpose the structures original function.

The Zollverein Coal Mine, for example, accomplished national recognition, by UNESCO, for their efforts of conserving a place that holds great heritage to the German people. The Lime Works residential structure represents a successful transition from past function to present function. Zeitz MOCAA displays the structural possibilities for vacant concrete silo and grain elevators. The MOCAA also represents the Cape Town communities pride of their heritage and willingness to take it upon themselves to modernize the function of this old structure, and to fit the city's current needs. A Mill Artist Lofts, represent another approach to revitalizing vacant and industrial structures, with also finding the community's needs, affordable living.

These studies demonstrate the progress, value, and commemoration of a city's cultural heritage. The effect of these precedent studies on the theoretical premise were very encouraging. Cities and the communities that fill them, enjoy these adaptive reuse projects, the transformation and reintroduction of the structure is captivating on both regional and international scales. The past is dependent on its physical artifacts, to not only share their story, but to also be a symbol of a time in one's culture. The importance of these precedent studies is no just how successful the rehabilitation projects were, but also how greatly valued they are by their surrounding communities.



Major Project Elements

Major Elements of this project includes rehabilitation of a vacant concrete grain elevator and silos within a direct urban context. The rehabilitation must function as both a reflectance of the community as well as its historical significance. The design will include spaces for the community to explore the industrial structure, and allow a change in scale to better relate to the structures original intent. Inhabiting the silos will be demonstrated through small dwellings. This design project is meant to provide spaces for the public to celebrate their heritage.

Figure 45 - Programmatic Sketch

User/ Client Description

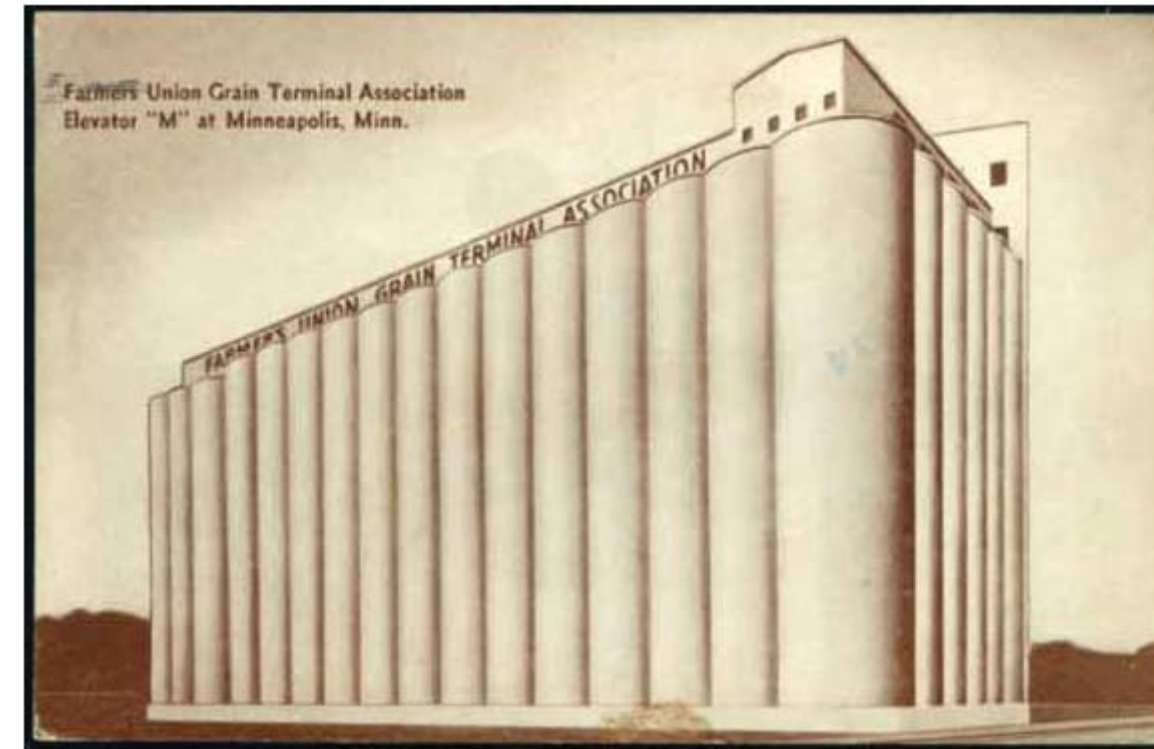


Figure 46 - Image of Orginal Silo

Client: The city of Minneapolis, represented by the historical society of Minnesota

Decision Makers: Representatives of the historical society of Minnesota

Community advisors: City planning departments of Minneapolis, Restoration and preservation groups of the Minnesota area, members of the public, and the parks department of Minneapolis.

Users: As of now, the users of this site will be community members of all types. The project will continue in hopes that there will be a place for everyone to enjoy on this site.

Demographics will be necessary to see who the direct public is and who will be in direct access of the space, with the site being next to the transit, the site will be more accessible to greater numbers of different people.



Figure 47 - Twin Cities

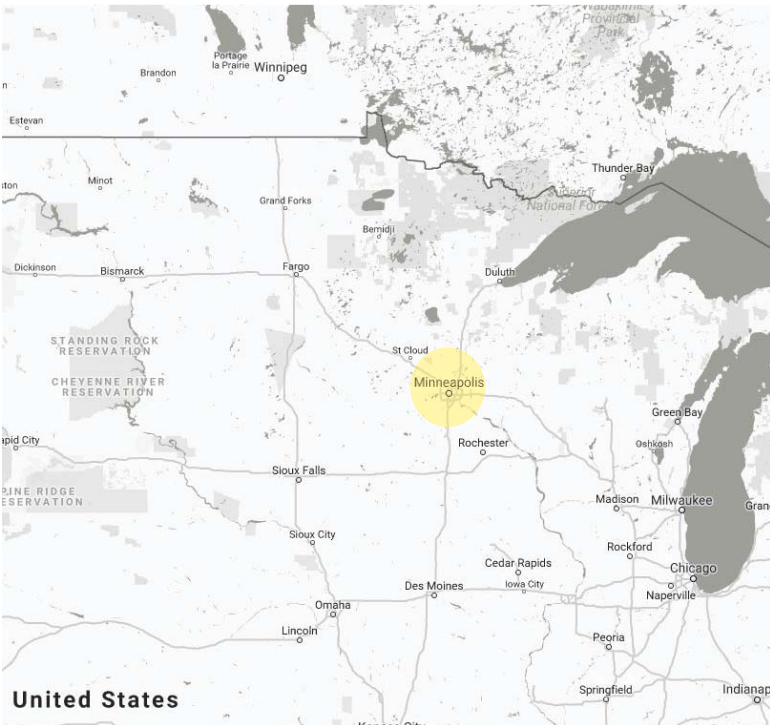


Figure 48 - Minnesota

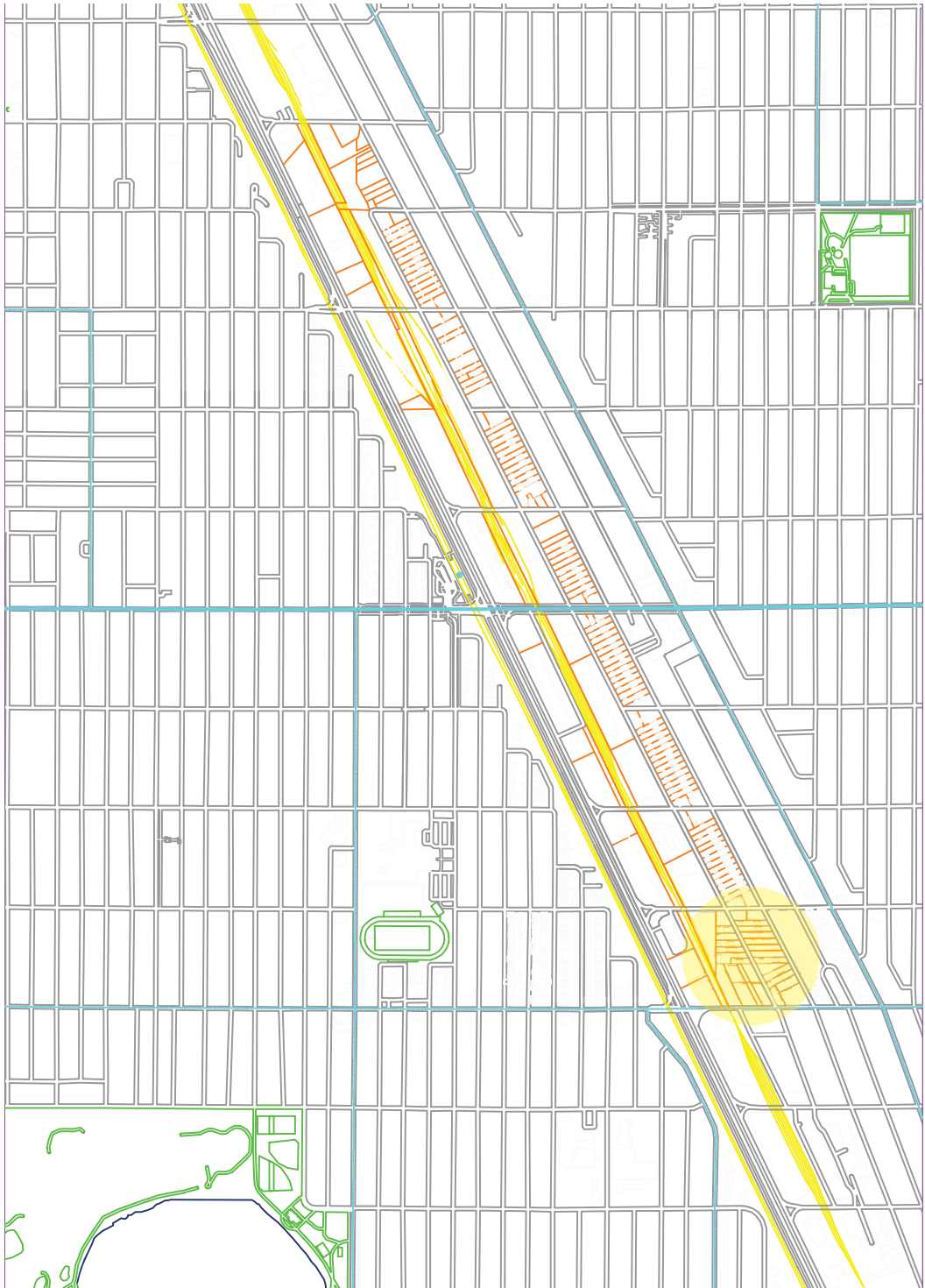


Figure 49 -Map of Hiawatha Avenue

Site

Some of Minneapolis's historic grain elevators have been demolished to make way for new urban projects, this displays a movement of the industrial districts being rezoned to residential and commercial uses. This purposes the question, what will happen to the industrial structures once they are vacated, will they be demolish, or will the structure be reused for future develop-ments of the area?

Site Address: 3333 41st St. E. Minneapolis, Minnesota

Currently on the site is an old grain elevator that has been vacant for over a decade. The site is surrounded by single family homes and small businesses of industry. The site is on the east side of Hiawatha Avenue, the new Metro Transit Blue Line is on the west side of Hiawatha Avenue. The current plan of this area is to develop affordable apartments, and commercial space for smaller businesses. It is important to solve this issue of demolishing local historical artifacts, and not incorporating them with new design projects. This site was chosen for the reuse of the current structure on the site, this is where I will apply my thesis statement; of valuing these historic artifacts and incorporating them into these future design projects of the Hiawatha Corridor. Straight North of the site is downtown Minneapolis, the university is straight east. With the site being position right next to the Hiawatha light rail, it's a perfect location for people to live, who work in the city but can't afford to live in the city.



Figure 50 -Map of Site

Project Emphasis

Adaptive re-use will be the emphasis of this design project, being able to incorporate both historic and modern ideas, materials, and structure, to create a holistic design that is respectful the its past but is also representative of modern culture. The current site has an existing structure that represents a part of Minneapolis's history when it was the milling capitol of the world, this structure will be incorporated into a new design. This incorporation is representation of the value a society should have towards its history and heritage. The concept of frugal comes to mind when we find a new use for something, this concept has been left behind for the worst and it is this adaptive re-use design project that will bring frugality back to our culture.



Figure 51 - A Mills Plaza

Goals of the Thesis Project

Academic

I intend to create a design project that allows others, pursuing on adaptive re-use project, to reference and encourage the re-use of socially historic significant structures.

Professional

I plan to design a project that can re-use materials and structural members from buildings that no longer serves a community, and incorporate them with modern design technology.

Personal

I hope to learn the cultural importance and implications of preserving and re-using historical artifacts of our community.



Figure 52 - Stone Arch Bridge

A Plan for Proceeding
Documentation of Design Process

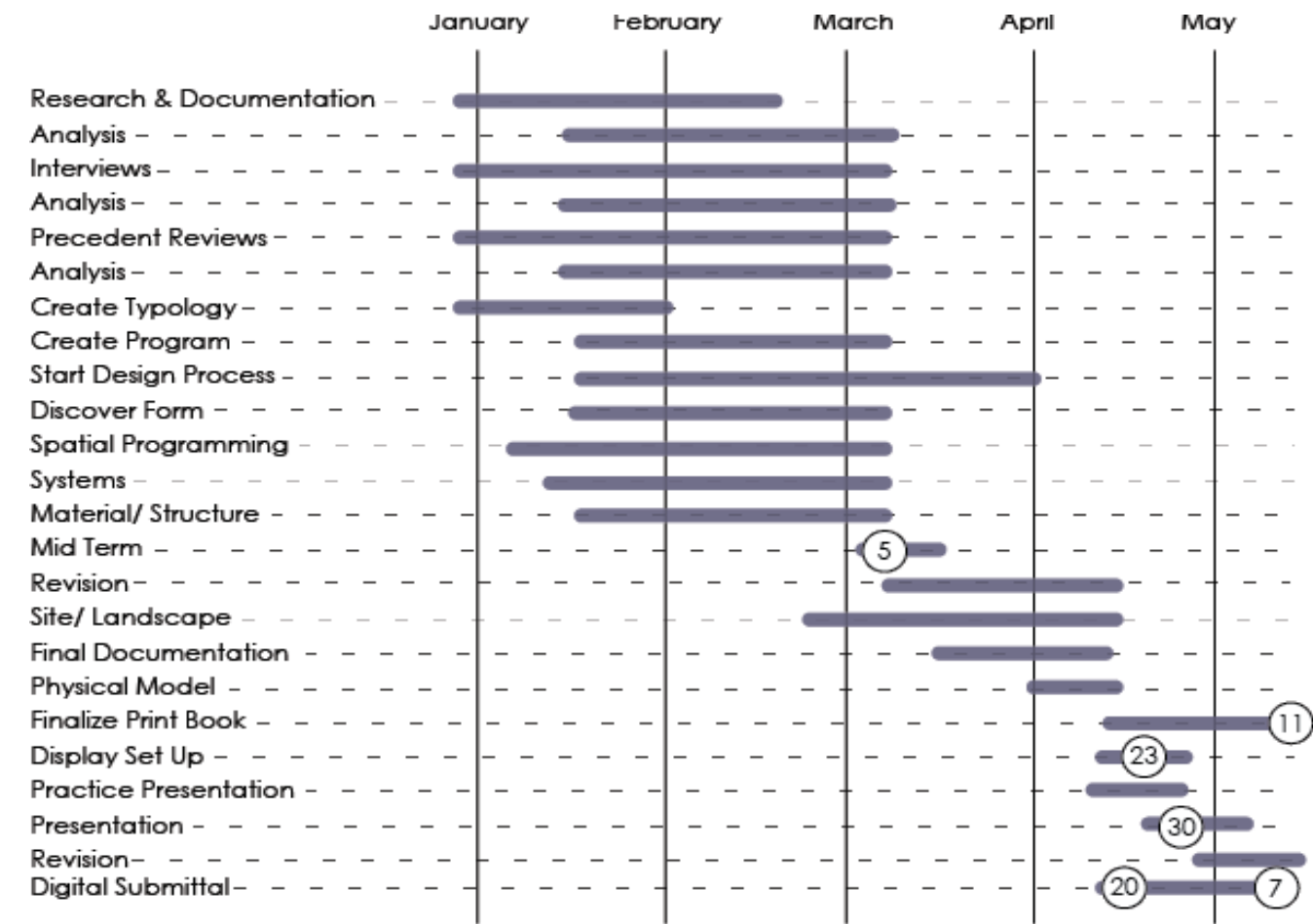


Figure 53 - Design Process Schedule

Documentation of this design process will continue through the entire semester. Documentation will vary in methods; sketching, physical models, digital models, simulation programs, images and journal entries. The final project will be documented in a digital format, the process will be organized digitally and printed in a book format, and a 3D model of the design will be created. All the process and final documentation will be back up digitally for submittal and stored on both an archive and an external hard drive

A Plan for Proceeding

Research Direction

Extensive research must be done to understand what makes an artifact significant, and to understand how cultures value these symbols of heritage. The research will begin by learning about the surrounding community of Hiawatha, finding where their needs and values lay. This will help guide the typology of the project to be most effective and useful to the people that are impacted the most. From there, research of how an artifact becomes historic and the protection it receives from the government will be discovered. These research topics will help answer the underlying question; why is it important for our communities to protect of physical heritage from demolition? Answering this question gives concrete evidence for validating the reason for this adaptive re use project.

Design Methodology

The methodologies will determine the qualitative research that will guide the design. Reviewing and assessing precedent studies first, will allow the project to make mistakes or be inspired before the iteration process begins. Collecting contextual information, demographic data, and climate conditions will also the design to be designed to perform at a sustainable level. Using programs and technology to create stimulants to see the structure perform, taking surveys to understand the community's values needs, and researching to further understand the community's heritage and history. The final design will be influenced entirely by the results of the research. The process of the design will include creating multiple iterations, studying, and spatial programing to discover the most appropriate and influential design.



Figure 54 - Silo 12 SE View

Research

Results from Theoretical Premise/ Unifying Idea



Figure 55 - Silo 4 Plaza View

Research Introduction

The research for this thesis will demonstrate the number of concrete elevators and silos there are in southern Minnesota's urban settings, and will establish the surroundings of which these structures are located. The purpose of this investigation is to establish an understanding of the amount of structures there currently are, and to stimulate conversation of the issue.

The issue is this: As industries move out of city centers, their structures are left behind, the issue lays with what happens next to these already established buildings, and the areas neighboring them. Tearing them down, is not only is wasteful of materials and energy, but is also a waste in the history of the structure and the cultural that has been formed around it. There are three arguments here as to why these buildings must be rehabilitated and reintroduced to their cities.

Economy, Heritage, and Environment.

Through this research, I hope the viewer will be able understand that this issue extends to more than just one concrete elevator and silo, but to numerous. The waste that comes for the demolition of these structures is profound, through my research we will see that demolition can no longer be an option for the future of these structures.

From this research I hope to choose a site for my thesis project, that will be of best influence to the surround communities and representative of the new era of preservation.



Figure 56 - Silo 6 Elevator

Concrete Grain Elevator and Silo Research Process and Analysis Guide

1. The study started by researching the locations of existing concrete grain elevators and silos throughout the Twin Cities and marking these locations on a map.
2. Further research was done to understand the current conditions of the elevators and silos, their functions, and the context that surrounded them.
3. The elevators and silos were grouped into four sections on the map, based on location;
 - a. North Map
 - b. University of Minnesota Map
 - c. Hiawatha Map
 - d. St. Paul Map
4. These grouped locations allow for a better understanding of the surrounding context of each elevator and silo visited.
5. What was recorded by photography and recordings at each site:
 - a. Photos of the exterior structure
 - b. Entry conditions to the site and structure
 - c. Surrounding context of the structure
 - d. Conditions of the structure and surrounding site
 - e. Qualities that made the structure and surround site unique
 - f. The structures program/ current use/ vacancy
6. Analysis of each of the elevators, silos and sites:
 - a. What is the historical, current, and future use of the structure and or site of the structure?
 - b. What is the current physical conditions of the structure and or site of the structure?
 - c. Is there cultural or historical significance to the structure and or site of structure?
 - d. Are the unique qualities of the structure and or site of the structure influential to the surrounding context?
 - e. What is the surrounding context? Elaborate on sense of place, culture heritage, physical attributes.
7. Decide which of the sites from the four maps will be further elaborated.

Concrete Grain Elevator and Silo Research

This map represents the four areas of study for the research project. Within these four areas are locations of concrete grain elevators and silos that are still standing with in the Hennepin County. This map is significant in illustrating the different areas, as well as the distinctive characteristics of each analysis.

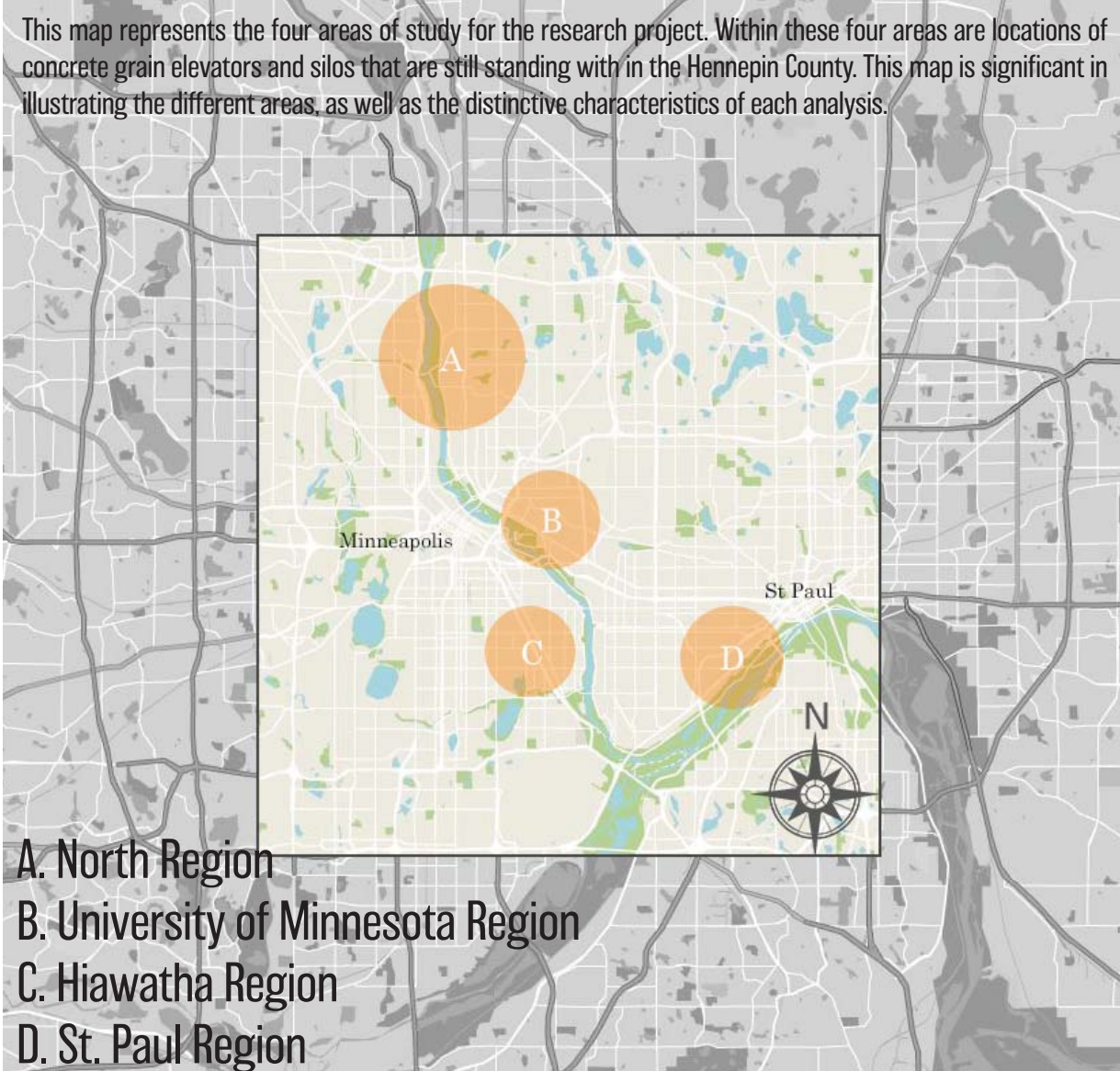


Figure 57 - Map of Sites Visited

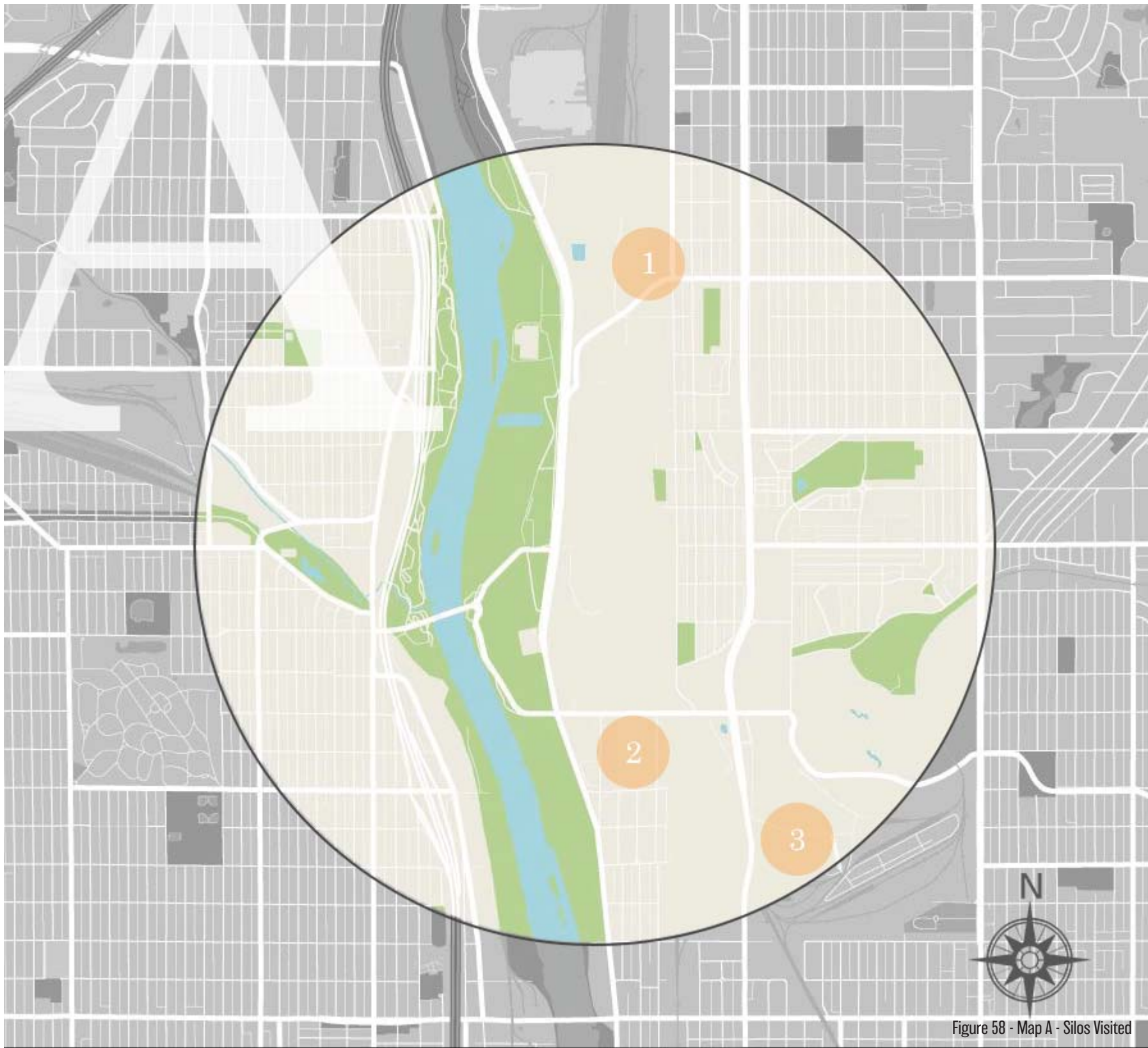


Figure 58 - Map A - Silos Visited

A. North Region

The North Region Map contains three concrete grain elevators and silos that were visited and studied. The Mills are within a I2-Medium Industrial District, and are all along the BNSF railway, this is for the use of moving industrial products around the Midwest. The surrounding zones of the Silos are R3 Multifamily Districts. Major roads include I-94, and University Ave North East. The sites are on the east side of the river.

The North Region needs green spaces, especially for the multifamily family zones. The single-family zone has the largest amount of green space, but this is not assessable to the people living in the denser communities. It seems from the zoning map that there's redevelopments along the river, this is zoned under R1A and R1, this is single family residences. The lack of public space for the denser community is an issue, especially in those natural settings of parks and walkways along the river.



Figure 59 - Silo 1



Figure 60 - Silo 2



Figure 61- Silo 3

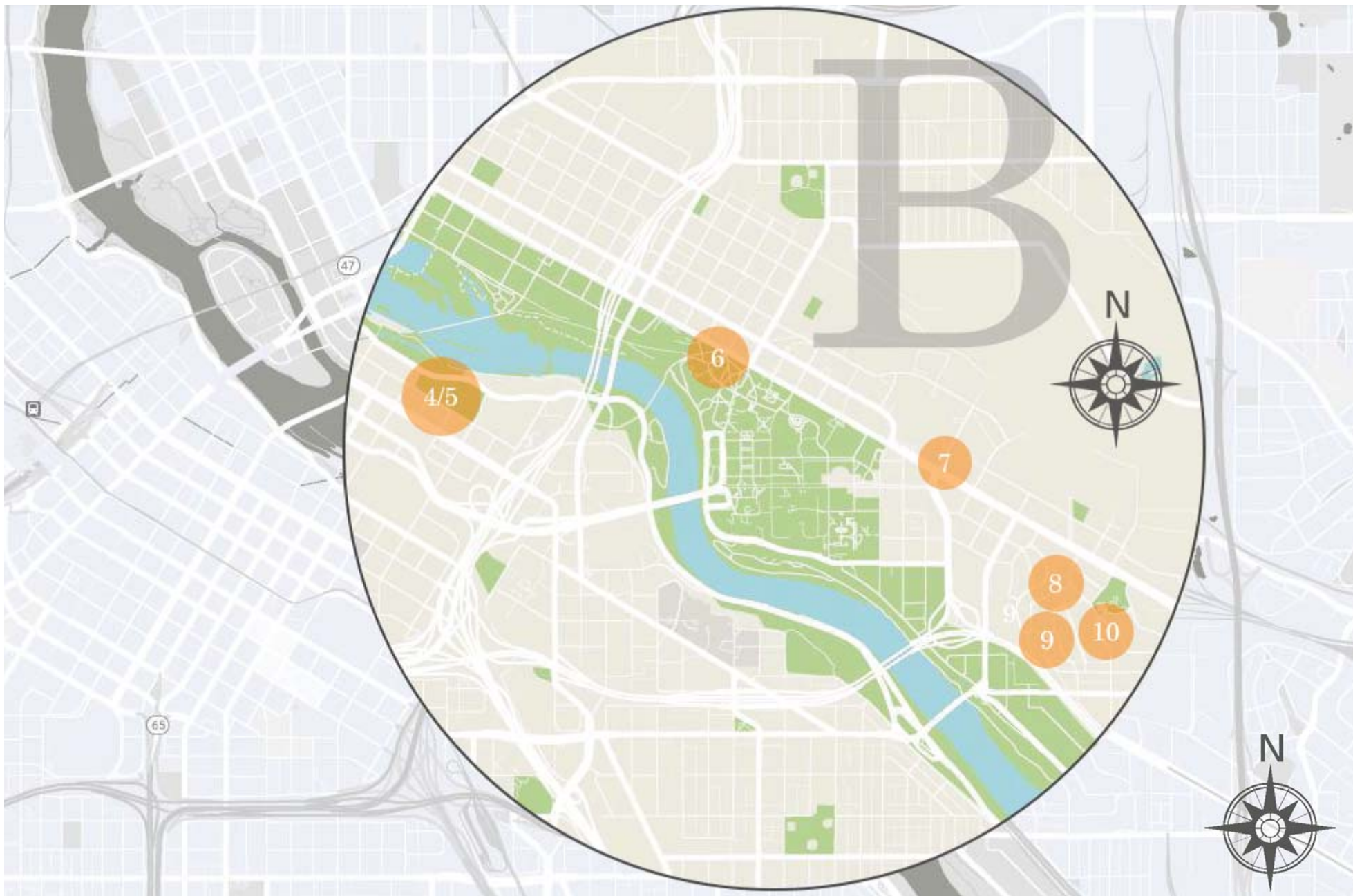


Figure 62 - Map B - Silos Visited

B. University of Minnesota Region

The area surrounds the university of Minnesota has many vacant concrete elevators and silos within the areas surrounding the rail lines directly east of campus. The university plans on demolishing many of these silos near the rails to build their athletic village. The more iconic of the silos is the large united crushers silos (silo 9), because it is the largest silo to be seen from the highway 94. The Metro Transit line runs throughout the area allowing for great accessibility to the site. Most of the surround land of the silos is vacant as well. There is a great opportunity to rehabilitate these structures to function for both the university's needs as well as the surrounding community. Over half of the structures that did exist on this site, have been torn down to make way for the new athletic village.

Moving west on the map, the existing silos within the urban context directly on the river, have been rehabilitated into artists' lofts and studio spaces for the artists of Minneapolis, Minnesota. The material of this silos is significant in the construction methods for building these industrial structures. The Mills elevator and silos are historically significant and represent a part of Minneapolis heritage. They mirror the Mills city music just west of the river. These structures have both been rehabilitated to better serve the surrounding communities while also reflecting their heritage.



Figure 63 - Silo 4



Figure 64 - Silo 5



Figure 65 - Silo 6



Figure 67 - Silo 8



Figure 69 - Silo 10

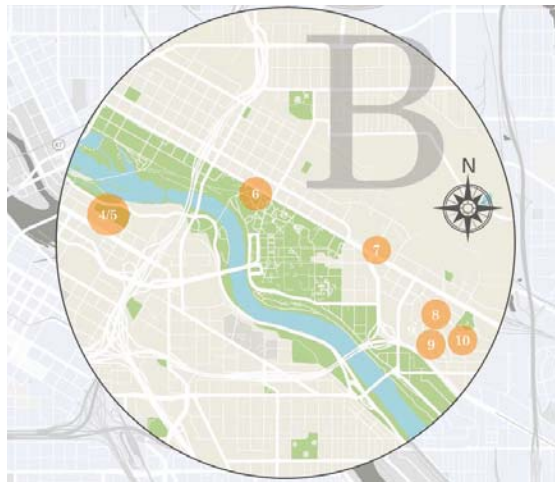


Figure 66 - Silo 7



Figure 68 - Silo 9



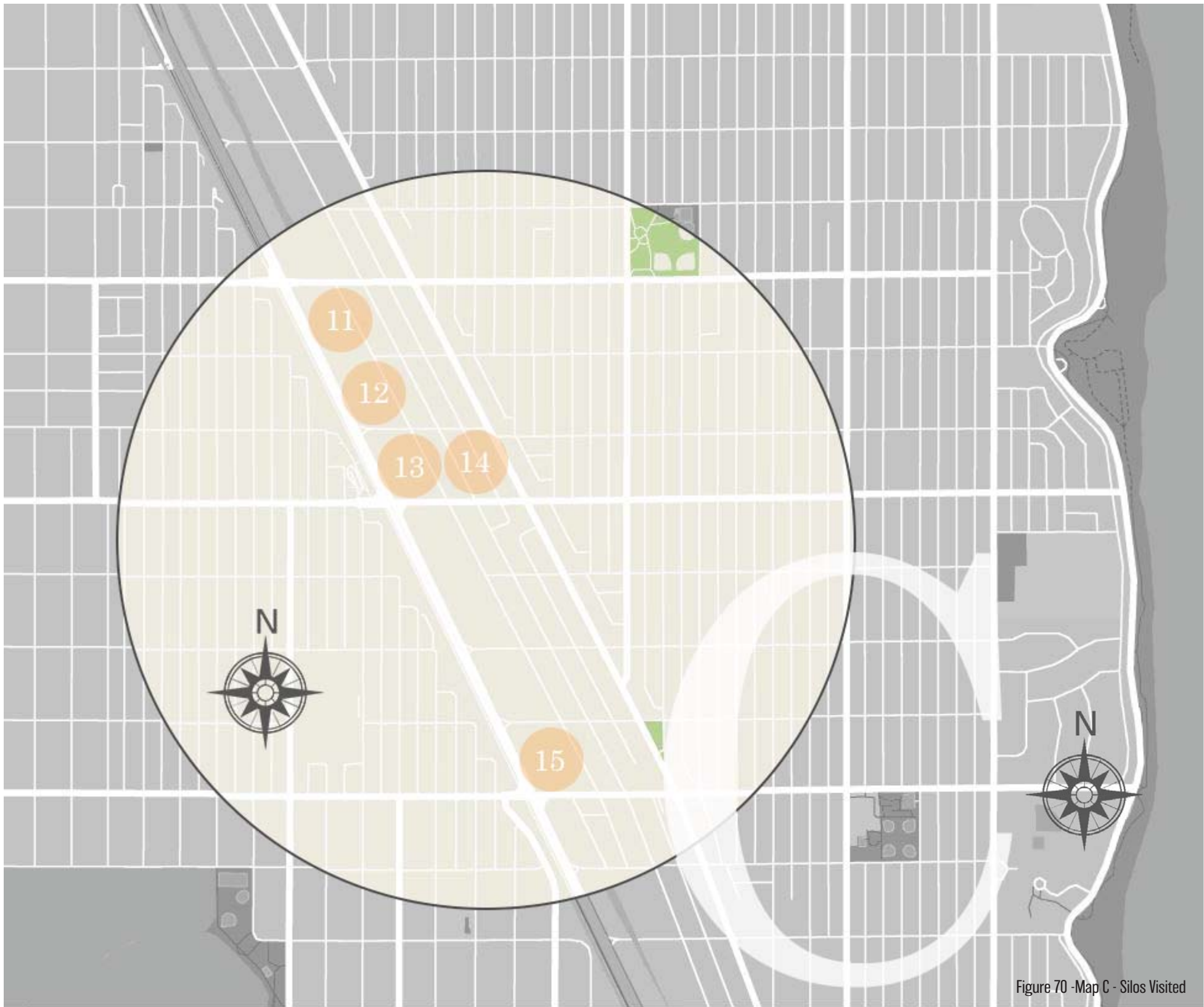


Figure 70 - Map C - Silos Visited

C. Hiawatha Region

The Hiawatha Avenue corridor has been a part of the Minneapolis's city plan since its establishment. The avenue runs five miles north and south, making this a major area for flowing in and out of the city. To the east of Minneapolis is the Mississippi River that allows a connection from the mid-west to the coastal lines of the east. The corridor has become the home of many industrial businesses, for easy access to both the rail tracks and the water barges. Surrounding this avenue are many single-family and multi-family residential homes. The difference in scale from the concrete grain elevators and silos to the residential units is severe. The structures bring a sense of places when driving down Hiawatha, and are iconic to the region of Minneapolis. Currently there are five structures along the avenue. Silo 15 currently is vacant, and is owned by a developed who had bought the structure in hopes to rehabilitate it into residential apartment units. The other four structures are currently in use by General Mills. The implementation of the Metro Transit Blue Line along Hiawatha creates an urgency to rehabilitate this highway into a more pedestrian and scalable transit stop.



Figure 71 - Silo 11

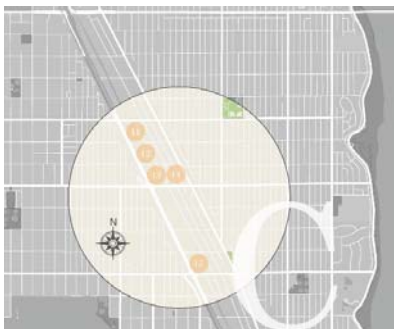


Figure 72 - Silo 12



Figure 73 - Silo 13



Figure 74 - Silo 14



Figure 75 - Silo 15



Figure 78 -Map D - Silos Visited

D. St. Paul Region

As I traveled through the St. Paul region of the maps, I noticed that the urban density was significantly lower, and the roads were not as busy as previous maps were. After these two silo visits, I decided that these structures did not fit the criteria for answering this thesis question. Silo 16 was farther from St. Paul's center, and was still being used for its original unction. Silo 17 only had its Concrete Grain Elevator remaining, and its silos had been demolished. The Elevator remains as an artifact and a representation of the grain mills that functioned on the water front of the Mississippi River.



Figure 76 - Silo 17



Figure 77 - Silo 16



Figure 79 -Top of The Elevator

Conclusion

During my exploration I learned the aesthetic and cultural value that these historical artifacts bring to our culture. The height of the structure and the variation of vertical scale, the contrast of light that bounces of the curves of the silos creating patterns within and out of the structure, and the repetition of structure making a seemingly simplistic design. From this adventure I conclude that my study of rehabilitation must be applied to a vacant silo that is within an urban context. The rehabilitation of the structure must directly effect a community in order for the project to be as influential in demonstrating the importance of historical artifacts.



Figure 80 - Desolate Heritage

Research Literature Reviews

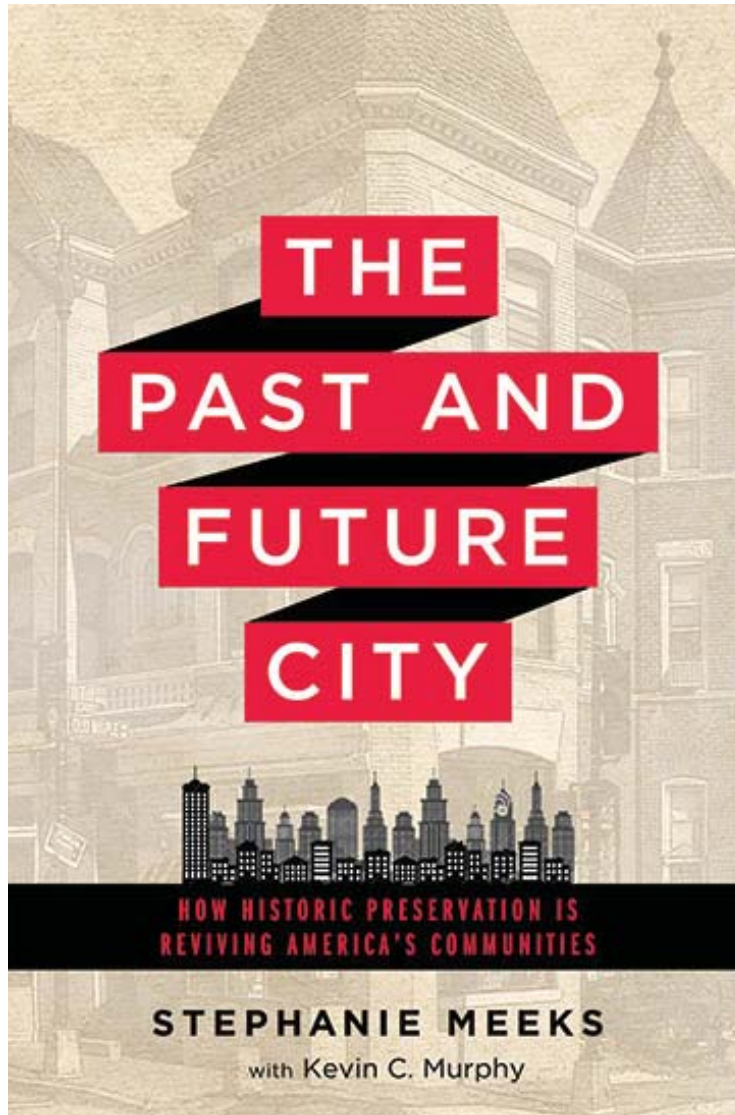


Figure 81 - Book Cover

The Past And Future City

By: Stephanie Meeks & Kevin Murphy

Stephanie Meeks wants to mend the link between the National Trust of Historic Preservation and the cities and communities in need of rehabilitation and preservation. Through her book, Meeks validates her claims with creditable resources and data, past theories and ideologies, and current issues and examples of today. The goal of this text is to understand the changes in historic preservation and how it is necessary is the recovery of our cities and our planet.

Chapter 2:
Older, Smaller, Better:
How Older Buildings Enhance Urban Vitality

Preservation has transitioned from the cultural value to understand and studying the economic value. Her resource is The Economics of Historic Preservation, by Donovan Rypkema. The Preservation Green Lab studied three cities, Washington, San Francisco, and Seattle, they quantified Jane Jacobs claims of historical places benefitting the surrounding neighborhoods. Meeks states, “The power of older buildings is far more than just aesthetic. They are tremendous engines of economic growth, vitality, and quality of life.” Not only did Preservation Green Lab quantify the observations of Jane Jacobs, but they published a report, Older, Smaller, Better, showing people what they can do to retrofit their small their buildings to be more energy and cost efficient. Preservation Green Lab used GIS technology, to keep track of data collected, and to make the data comprehensible and available for the public. Meeks goes on to describe the research and analysis done by Preservation Green Lab, and the findings from their analysis of their data stream. What Preservation Green Lab found was that neighborhoods with a combination of old and new buildings have a “hidden density” this being there are more commercial square foot than areas with just new buildings. Their findings aligned with Jane Jacobs ideology, that progress and innovation depends on the inspiration of historic culture. Meeks finishes the chapter out with examples of cities that have been positively affected by applying Preservation Green Lab’s methodology. Meeks speaks about the scale of the data sets and methodology, and how they can be applied to any city scale. In conclusion, Meeks thinks that for all cities to be successful and thrive, effective public policies must be put into place for these historic buildings to be revitalized and reused through the nation.

Chapter 4:
Buildings Reborn:
Keeping Historic Properties In Active Use

Meeks is trying to redefine preservation in this chapter. She uses quotes of people to make the point that historic buildings are not just buildings that are preserved as a piece from the past, but should be maintained and used. For these buildings to survive, they must be used to be valued by the public. Meeks is pushing the idea that, “Preservation is not just keeping old buildings around, but it is about keeping them alive, in active use, and relevant to the needs of the families and cities that surround them.” The chapter continues as Meeks shares cases studies of the rehabilitation of buildings functions, and the structures successes in doing so. “Find these lost spaces, reawaken them, and let them breathe life into our communities anew.” P161

Chapter 6:

**The Greenest Buildings:
Preservation, Climate Change, and the Environment**

In this chapter, Meeks shares many sources, facts, and ideas on the topics of preservation, climate change, and the environment. Meeks presents the issue, how it has changed through time, introduces the resource and the changes that are being implemented, and gives examples with all her arguments. Written below are topics and issues that Meek addresses throughout this chapter, her approach to the issues and their resolutions, makes it easy for readers to understand and allows analysis through the examples.

Meeks biggest source is the Nation Trust of Historic Preservation and their program Preservation Green Lab. This program has collected data from four cities in the US: Chicago, Atlanta, Phoenix, and Portland, studying the full life-cycle of different types of buildings, from the extraction of the materials to the transportation through the years the building is used. This data was then compared to the environmental impact of either building reuse and renovation, versus building demolition and new construction. Throughout the chapter Meeks uses this data to prove her ideology of the connection between preservation and the environment.

The National Trust’s Preservation Green Lab’s, *The Greenest Building*, published in 2012, is used as a source for understanding the full life cycle of a building. This was a study that was completed and published by Preservation Green Lab. The data shows that even if a new building was constructed to be net zero, it would take between 10-80 years to commend the carbon it released through the construction process. Meeks introduces retrofit as the first step solution to preservation. The concern of small business owners is affordability, Preservation Green Lab’s, *Save Energy, Money, and Jobs*, published in 2013, backs this notion with its data. Meeks concludes that retrofitting is ultimately the cheaper, safer, and economical choice when it comes to updating historic structures.

The US Department of Energy supports the program America Saves, created by the National Trust of Historic Preservation. This program allows small businesses around the nation to participate in improving the energy and economic performance of their building. This opportunity allows for long term savings when these businesses occupy existing buildings. The National Trust is concerned with the nation’s current energy codes, how they are only applicable to newly built structures. The Nation Trust is pushing for reforms of these codes, which would allow these older structures to reach their highest sustainable potential, and not just big energy pits.

USGBC (United States Green Building Council) is beginning to make alterations to their LEED requirements, seeing that existing buildings are being used, retrofitted, and or rehabilitated in effective and sustainable ways. In 2012 the alterations included giving credits for “whole building reuse” challenging people to take on these existing structures.

Meeks introduces the idea of “city steam” and how it is making a comeback. This was a city-wide energy provider that was commonly used up until the 1950’s when suburban sprawl was becoming common. Meeks suggests if citywide systems are to be reutilized, they could be combined with newer technology, over all creating a more sustainable neighborhood. Combining energy saving strategies of the past (forgotten principles), technology of today, and application to existing structures, Meeks believes the planet will see a great reduction in carbon admissions.

Chapter 7:

**The Future and Past:
Livable Cities and the Future of Preservation**

Meeks Closes the book with her thoughts of moving forward with preservation and why it is necessary. Urban policy can create amazing opportunities for historic places, but the connection between the community and the system have been stigmatized as a difficult and costly route. Meeks suggests, this connection must be mended, for preservation and adaptive reuse is the only way for our country to move forward, and it starts with small cities. This movement of mending the connection has already started, the National Trust of Historic Preservation has started a campaign, “This Place Matters,” allowing historic places to be promoted through social media with this catch phrase. Meeks believes that these places of historic significant become stuck in the system of preservation, and need to be released for work to happen. Through the Preservation Green Lab’s studies, Jane Jacobs observations and studies were quantified and proved. Now we know that preservation and rehabilitation is the only way forward for cities, Meeks wants to serve these cities and their cultural heritage justice, by giving the places that matter a new purpose, to better serve and reflect their communities.

Project Justification

As the human population continues to grow, the reuse of buildings and regenerative energy will become necessary for cities to function, stay healthy, and thrive. This idea of progressing cities while being mindful of the environment, economics, and cultural heritage, has been studied and quantified by the Nation Trust of Historic Preservation's, Preservation Green Lab. The application of Preservation Green Lab's data, to the study of concrete grain elevators and silos, will prove the significance of these silos, to the historic fabric of Minnesota, the environment, and the economic gain. The reuse of concrete grain elevators and silos will be the necessary step towards progressing the function, health, and economy in cities with such great industrial history, such as Minneapolis, MN.



Figure 82 - MOCAA Rooftop



Figure 83 - Site in 1950

Historical, Social, and Cultural Context of the Thesis

Historical Context of the Thesis

History of Minneapolis and the Flour Mills

Minneapolis Minnesota grew itself around the Flour Mill Industry in the late 1800's. Its population grew from 4,049 citizens in 1849, to 250,000 citizens in 1865. The economy thrived off its industries such as lumbering, sawmilling, farming, and flour milling. St. Anthony Falls was the area of which these mills grew, the regenerative hydro power from the falls was used to generate energy for the mills use. The Pillsbury “A” Mill, was the largest mill of its time, in 1881, and the only mill to be designed by an architect. This mill was celebrated, by community members and visitors from around the stated, for its cohesive aesthetic between industry and architecture. By 1905 Minneapolis Minnesota was the largest flour producer in the states, and the center of milling from the years 1880-1930.

Today Minnesota’s Milling Heritage is celebrated by the Mill City Museum, hosted in the historic Washburn “A” Mill. The Municipal Elevator still sits on the Mississippi, and is used today and a venue and restaurant. The Pillsbury “A” Mill have been converted to affordable housing for local artists of the area of the twin cities. There are still many of these grain elevators and silos surrounding the areas of Minneapolis Minnesota, varying from old to new, and vacant. These concrete elevators and silos are cultural artifacts of Minnesota, they represent the beginnings of the economy and represent the significant role our state played in our nation’s history.



Figure 84 - Minneapolis Industry



Figure 85 - Pillsbury “A” Mill

Significances

Minneapolis, Minnesota’s history of establishment is important to my thesis project because it demonstrates the significant role that the flour industry played in the growth of the city. Not only did the mills create economic growth within the state, but also created the cities culture that grew around these structures. This cultural heritage goes back to the beginning, as populations grew in great amounts, immigrants entrusting that there was a future of agriculture and industry within this state. As time comes and goes, artifacts remain, and it is our obligation to share their stories with futures generations.

Historical Context of the Thesis

The Architectural Progression of Today's Concrete Grain Elevators and Silos



“Flat Houses”

Grain was first stored in single story facilities, the grain was stored in burlap sacks.



“Wood Elevators”

These structures were designed to advance the mobility of grain, from the farmer to the mill.



“Terminal Steel Elevator”

These structures were built in immediate response the high demand for grain.

Farmers

1. Grow and harvests grain
2. Stores in flat house during harvest
3. Transport to local elevator in town.



Grain Elevator

1. Grain elevator in town collects farmers grain
2. Weighs, cleans/ dries, and sorts Grain
3. Pays farmer by weight
4. Stores grain till the train comes to bring to an area of export in the city.



Grain Elevator & Silos

1. Grain is brought in to city by train, truck, or barge.
2. Grain is again cleaned/ dried, weighed, and sorted
3. The grain stays here till is exported

“Revolution of Transportation”

The connection of the farmers to the rest of the world created a demand for larger quantities of grain to be grown, stored, and exported at a faster rate.

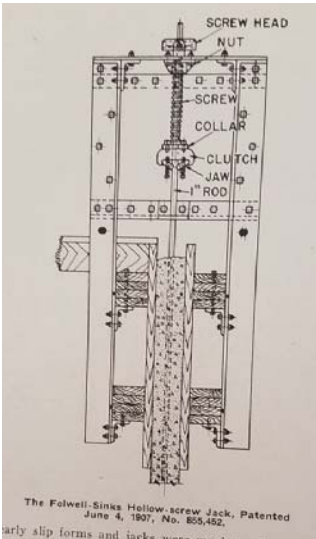


Figure 86 - Slip Form Section

Slip Form

This concrete method was created for the ability of silos to be formed by one continuous pour of concrete. This method of monolithic pouring would now prevent moisture from entering the interior of the silo through joints and cracks.

Country Elevator

Connected smaller farming communities, to the larger industry of milling. These elevators were constructed from wood planks in a cribbed formation or a classic wood studded formation. Today they are mostly made of steel.



Terminal Elevator

Located in cities at intersections of railways and ports. With the need to store larger quantities of grain, the construction materials and forms improved from wood, to steel, and to eventually reinforced concrete or coated steel.

Terminal Steel Elevator Silo -1895

The Storage bins were housed in brick buildings. Lack of insulation caused condensation and rust within the storage bins, resulting in mold and insects to compromise the grain.



Terminal Stone Elevator and Silo

This change in material did solve the issues that came with steel elevators. The manufacturing of these large storage bins were expensive and labor intensive, making them inefficient to the necessary demand of mass storage of grain.

Terminal Concrete Elevator and Silo

This material forever changed the construction methods of the grain elevator and silos. Not only would reinforced concrete allow for a controlled environment to store the grain, but it would also lower the construction price and speed up the time to build the structure.



Figure 87 - First Concrete Silo

First Reinforced Concrete Silo
1899 - Minnesota



Figure 88 - Concrete vs. Stone

Left: Concrete Silo, Right: Stone Silo

Social Context of the Thesis

Historic Preservation Ideology

Historical figures, speaking on the ideology of preservation, are deeply influential to the topics of both history and culture in terms of this these. These figures speak on the importance of preservation, and why it necessary to do for future generations. These ideologies also help establish a definition for historic preservation and cultural heritage. The significance of these ideologies to this thesis is to understand the past views of historic preservation, and the intention of enriching our cultures for future generations.

By reviewing the ideologies of John Ruskin, William Morris, and Eugene Viollet, and *The Seven Lamps of Architecture* by John Ruskin, I hope to prove the significance and need to preserve the concrete grain elevators and silos throughout urban setting of Minnesota.

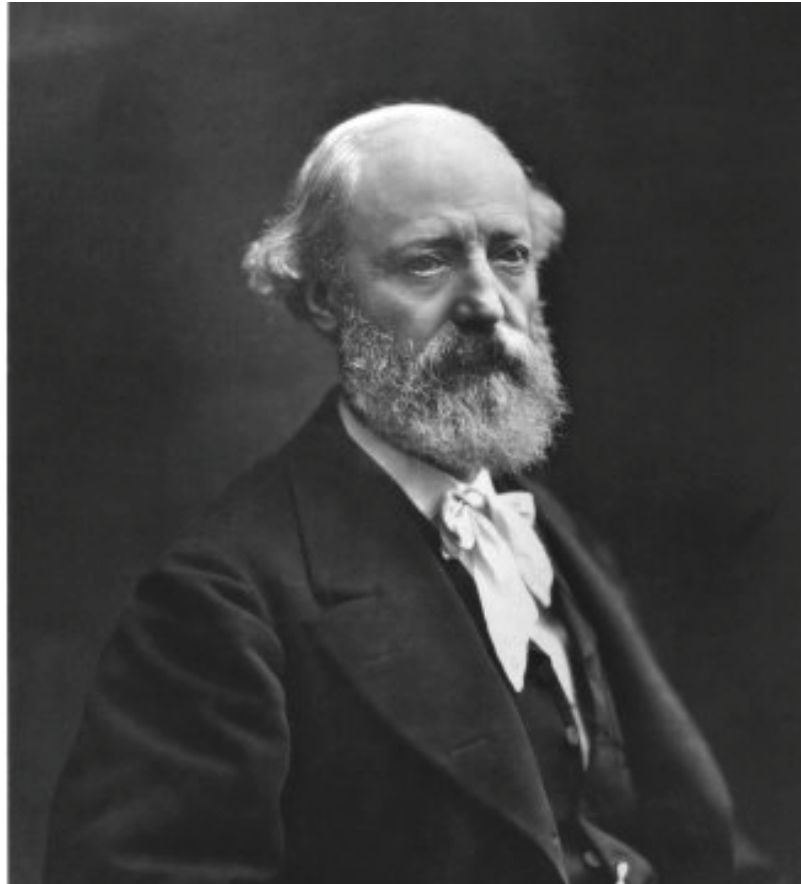


Figure 89 - Portrait of Eugene Viollet

Social Context of the Thesis

Eugene Viollet Ideology

Eugene Viollet was a Parisian native who grew up in a wealthy family who valued the arts and sciences of humanity. From a young age, Viollet understood the value of architecture and its history. When Viollet was 24, he received a position on the Commission of Historic Monuments, in Paris, France. The ideology of this commission was the ability of buildings and monuments to represent a nation's history at a national scale. This would then teach the country of France about their heritage, and offer a union within politics. This was to be done by restoration, and in Viollets favor, to Gothic architecture. This is the beginning of Viollets developed definitions of restoration and preservation. He applied his theories on his own projects, this included one of his well-known restorations, Notre Dame in Paris, France. Viollet believed that restoration and preservation would do more damage to the original piece, but if the structure is considered to still be of use, then it is to be restored. Preservation is a tactic to be used when there is nothing else to make of a structures ruins, and is done for mere historical significance. Viollets plan for restoration would be to return each piece to its original strength and beauty, even if pieces were of different time periods, each generation was to be represented.

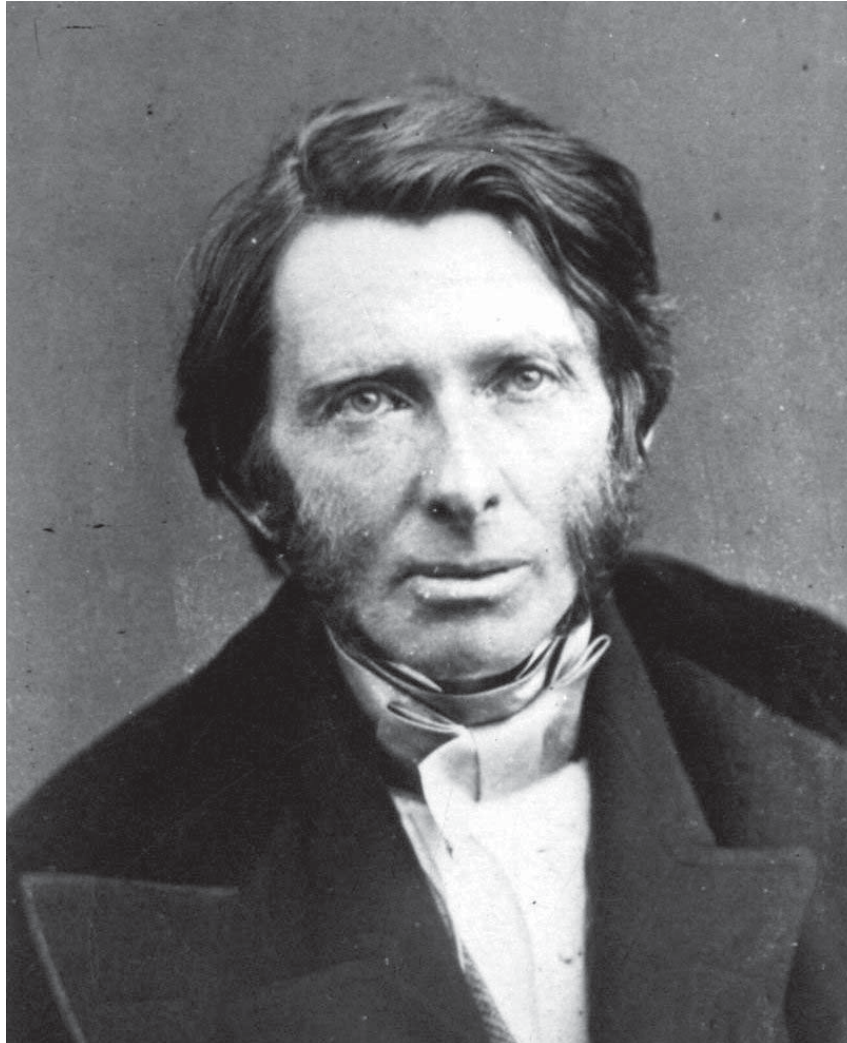


Figure 90 - Portrait of John Ruskin

Social Context of the Thesis

John Ruskin

John Ruskin was a London native, who grew up with the love of art and travel, thus inspiring his love of architecture. Ruskin grew to become a well-known modern art critic, and soon became an influential writer. His famous works were, *Seven Laps of Architecture* and *Stones of Venice*. He was well respected and influential of his time and of future generations. In *Seven Laps of Architecture*, Ruskin speaks about respecting the past, for the generations before us live there, wiping them away will then too wipe their spirit and memory away. Ruskin disagrees with restoration, he believes that it is impossible to recreate the past, instead people must take care of their buildings so there is no need to restore. This is how he would lead to define conservation and preservation, as the maintenance and up keep of the historical artifacts that were passed down from our ancestors. John Ruskin was a London native, who grew up with the love of art and travel, thus inspiring his love of architecture. Ruskin grew to become a well-known modern art critic, and soon became an influential writer. His famous works were, *Seven Laps of Architecture* and *Stones of Venice*. He was well respected and influential of his time and of future generations. In *Seven Laps of Architecture*, Ruskin speaks about respecting the past, for the generations before us live there, wiping them away will then too wipe their spirit and memory away. Ruskin disagrees with restoration, he believes that it is impossible to recreate the past, instead people must take care of their buildings so there is no need to restore. This is how he would lead to define conservation and preservation, as the maintenance and up keep of the historical artifacts that were passed down from our ancestors.



Figure 91 - Portrait William Morris

Social Context of the Thesis

William Morris

William Morris grew up under the impression that he would become a minister, this was until he joins a group of young men who talked about art, philosophy, and politics. Morris attended Oxford, where he listened to many of Ruskin's lectures. Ruskin's ambitions soon changed to becoming an architect. Later in life Morris was introduced to Ruskin, and would soon after discussed their thoughts on art, architecture, and politics. Morris's ideology of architectural restoration and preservation was heavily influenced by Ruskin, believing that historical artifacts kept stories of the past alive. Destruction of these pieces for economic gain did not sit well with Morris, he believed that these places were irreplaceable, and there was a loss of historic evidence. Not only did Morris believe that they were historical evidence, he believed that these artifacts represented human life, society's, communities, culture. In 1877 William Morris created the Society for the Protection of Ancient Buildings, in the United Kingdom. This society still works today on preserving historical artifacts that represent community's heritage.

Social Context of the Thesis

Conclusion/ Analysis

From my research and analysis of these three “Principals of Preservation,” I would conclude that each of their definitions of preservation and rehabilitation are true. It is interesting to me that they all have the same goals and values when it comes to historic preservation, but each have individual methods for achievement. Viollet, Ruskin, and Morris, all want important pieces of history to be passed on for future generations to commemorate and appreciate what their ancestors left for them. I do agree with their views on this, these artifacts are representative of cultural heritage and have historic significance. The ideologies I take with me through my research for thesis is Morris’s ideology on preservation; the ability to accept the changes and additions of an existing building, and to preserve and maintain the building for the use of future generations to come.

The concrete grain elevators and silos of the Minnesota’s urban settings, tell a story of the foundation of the state, and the culture that grew around them. These are historic artifacts. Using Morris ideology of preservation, I would like to maintain these structures, and rehabilitate them for uses that better suit today’s needs. Through research and design analysis, these concrete grain elevators and silos will not only be preserved, but rehabilitated to function for today’s needs, while also keeping the cultural heritage integrity of Minnesota’s industrial past.

Cultural Context of the Thesis

Today’s Preservation

Preservation has been transforming its meaning since the early years of the 21st century. What used to be the protection of cultural heritage and historic artifacts, is evolving into the vast movement known as, “green building.” Green building is defined by The Trust of Historic Preservation’s Green Lab as, “supports environmentally responsible and resource-efficient building design with the aim of reducing greenhouse gas emissions and other negative environmental impacts.” Not only is preservation necessary for the protection of cultural heritage and historic artifacts, but is now also necessary for sustainability of our environment.

Preservation Green Lab was created by the National Trust for Historic Preservation, to research and quantify the sustainability of preserved spaces and newly constructed spaces. This research was published in 2011 by Preservation Green Lab, The Greenest Building: Quantifying the Environmental Value of Building Reuse. This report is changing the way the public is viewing both newly built construction method and re-use building methods, and their impacts on the environment.

Preservation Green Lab went into the research wanting to quantify the environmental impacts of reused buildings, and compare them to newly constructed buildings. There methodology would be a Life Cycle Analysis (LCA), of a 75-year life span of both reused and newly constructed buildings. The impacts were categorized into four parts; climate change, human health, ecosystem quality, resource depletion. The study would focus on 6 different building typologies; single family, multifamily, commercial building, urban village and mixed-use buildings, elementary school, and warehouse conversion. These typologies and impacts would be tested in 4 different climates; Portland, Phoenix, Chicago, and Atlanta.

Cultural Context of the Thesis

Conclusion/ Analysis

What Preservation Green Lab Found was that adaptive reuse of existing structures we at most times less percentage of negative impact on the environment. The amount of percentage can differ based on materials used on project. Also, PGL found that warehouse conversions to multifamily homes were never positively impactful on the environment, because of the materials necessary to build small homes with in a warehouse.

Preservations next research goals are to establish how builders, small business owners, and homeowners can retrofit their structures to further the progress of sustainable living and lower the environmental impact of buildings.

Today's definition of what preservation is, demonstrates why it is necessary to act in the protection of Minnesota's concrete grain elevators and silos. Demolish, like most have been in the past, cause for additional physical waste, additional carbon emissions emittance, and over all the waste of the embodies energy. These structures must be reused, there is no other ethical option.



Figure 92 - 41st E in Snow

Site Analysis
Discovery of Site and Understanding Its Context
3333 41st St E Minneapolis, Minnesota

The massing study demonstrates the existing context surrounding the silos. It shows the heights of the structures, the sizing and zoning of the plots, and the typology of the buildings. From this study we understand that the single-family residents are zoned for high density residential units and not single-family homes. The massing is displayed in figure 2 if there were denser living units. The west side of the site is zoned for light industry and the existing structures are a McDonalds, strip mall, and carwash. Running down the center of the block is the S00 Train Tracks, that are no longer in use.

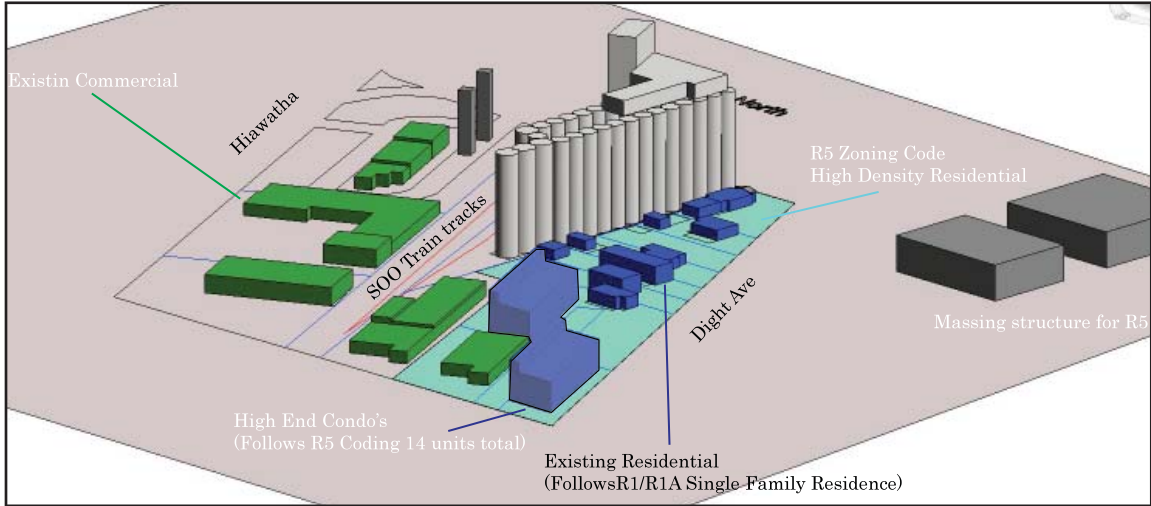


Figure 93 - Zoning Study

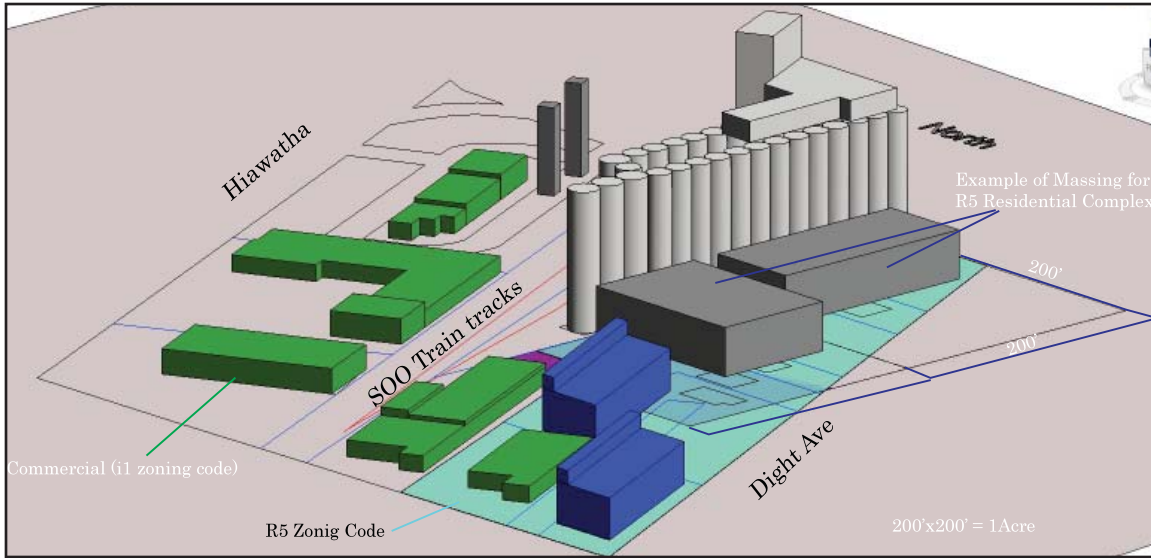


Figure 94 - Zoning Study 2



Figure 95 - Site Images

Site Analysis

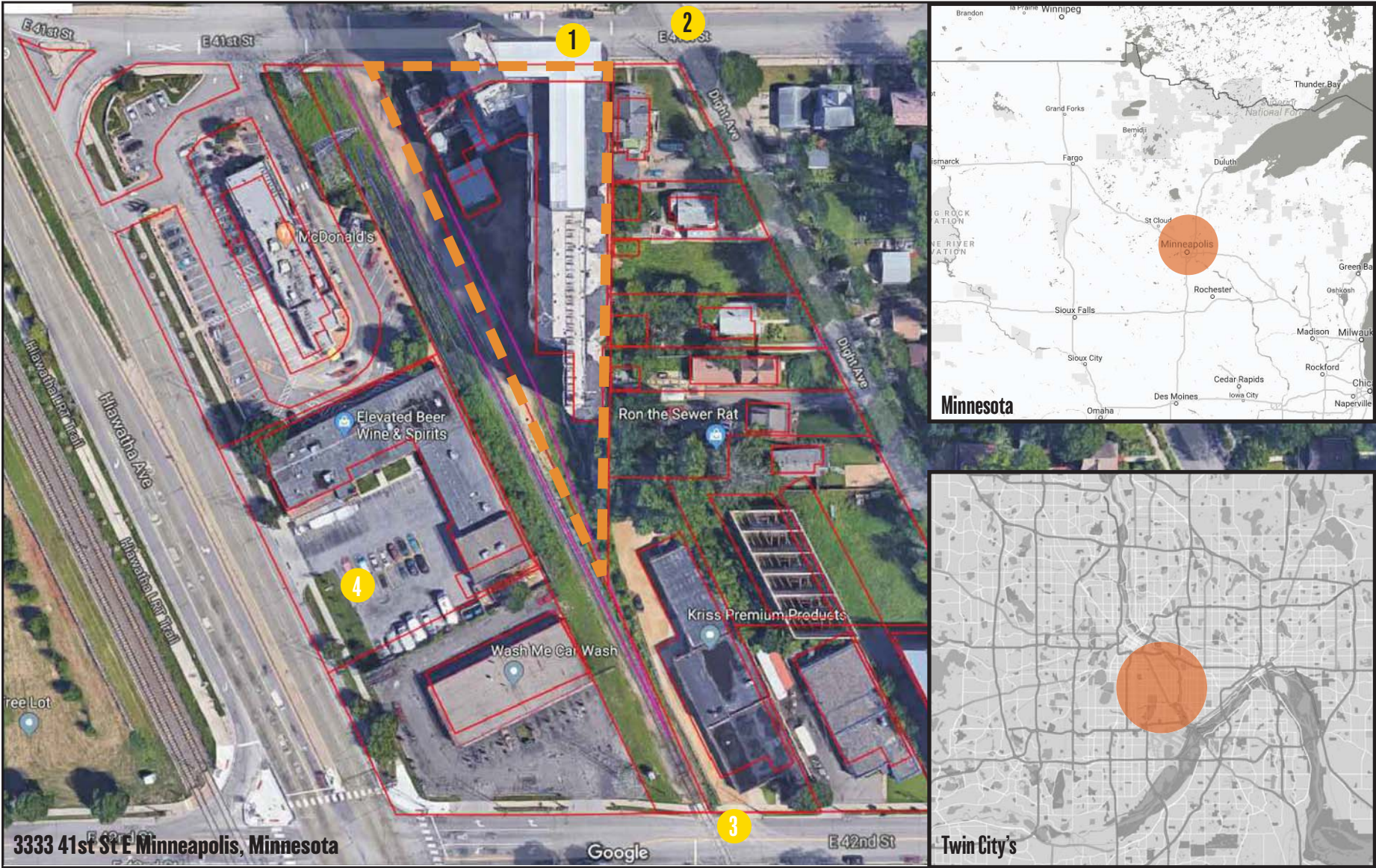
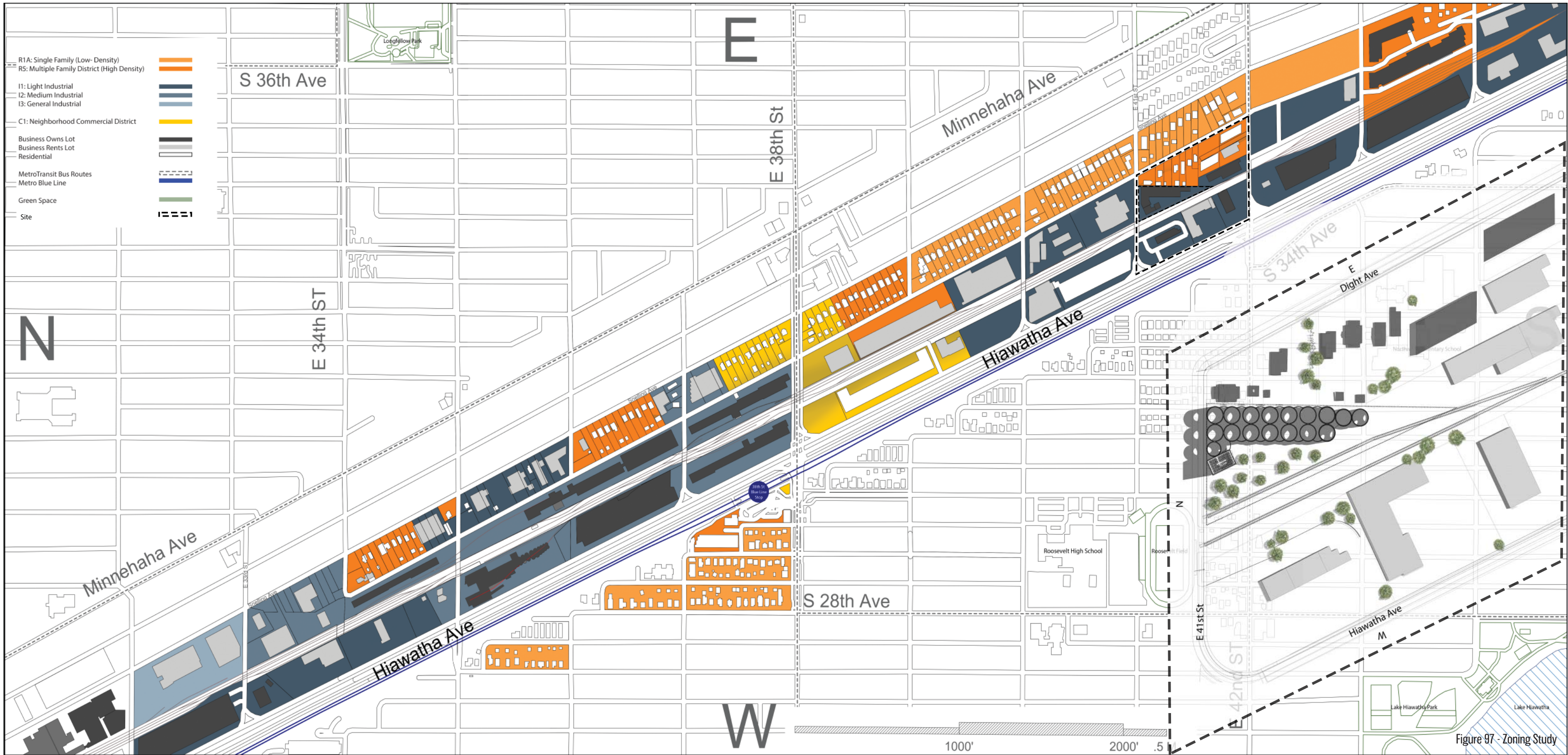


Figure 96 - Site Map Google Maps



Site Analysis Zoning/ Building Use Studies

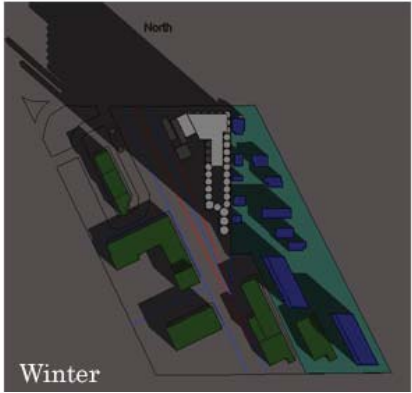
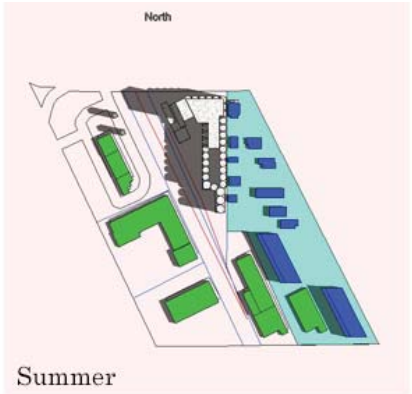
This exercise was necessary for understanding the context of Hiawatha Avenue, and the surrounding typology of its structures. Creating this map also allowed me to choose a site along this corridor, as well as the functions that it would need to provide for the surrounding community.

What I discovered is that there is a lack of high and medium density residential structures, though the land is zoned for those codes. There is also not enough public space for residence to go to, nor soft or hard scape. That last piece of information I gather was that the community is made up of small business owners who rent their office spaces. From this information I set the parameters for the typology of this project to focus on including into the new functions of this structure.

The rehabilitation of this structure will focus on catering to the programs of public spaces, as well as medium to high density residential units.

Site Analysis **Shadow Study**

The concrete grain elevator and silos are within direct context of the surrounding area, and because of its mass in size and material, the visual influence of this structure to the site is great. The Silos stand one hundred and five feet tall, the elevator stands one hundred and forty feet tall, and the surrounding homes and businesses average between fifteen to twenty-five feet tall. Understanding the difference in scales of the structures, it was necessary to study the cast shadows of the grain silos and elevator and how it affected the quality of space and light. From this study I concluded that light and how it interacted with the structure, would be a major design component when it came to manipulate it. The types of voids that were cut, and placement would be important to not just the users outside of the space, but also with in the space.



9:00 AM Shadow Study

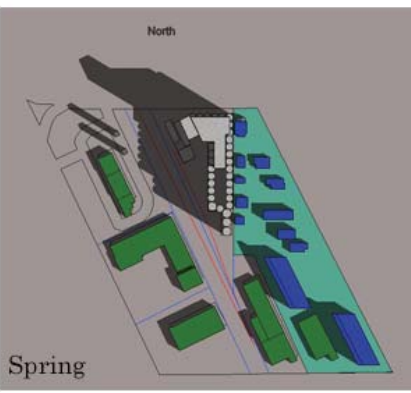
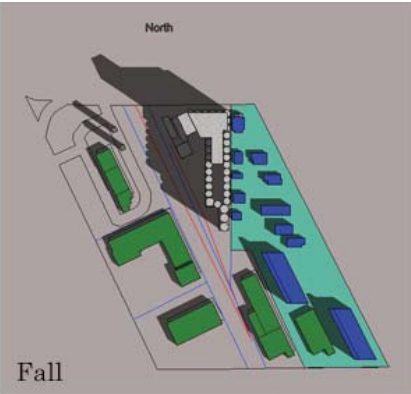
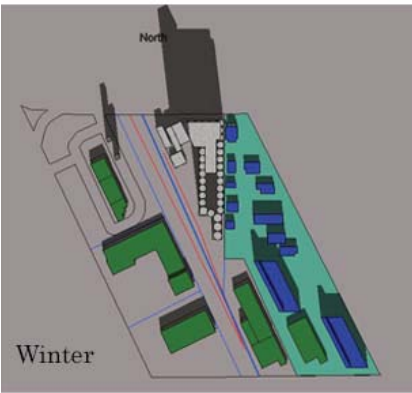
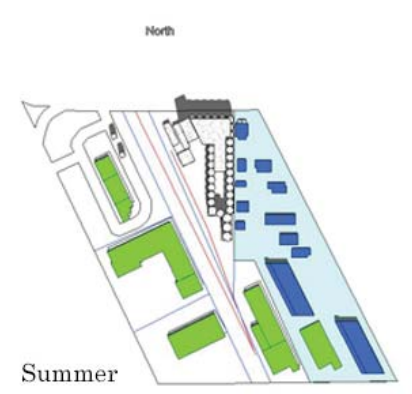


Figure 100 - Sun Study 3



12:00 PM Shadow Study

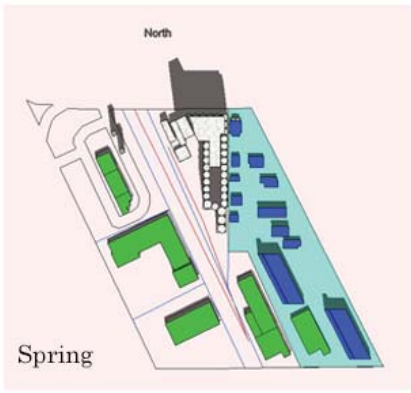
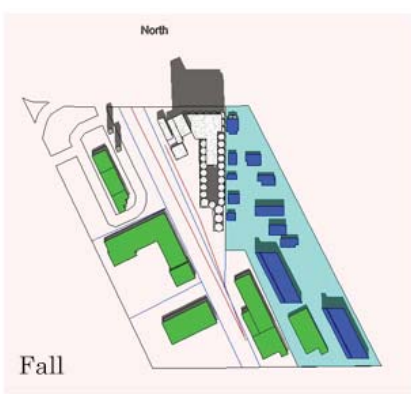
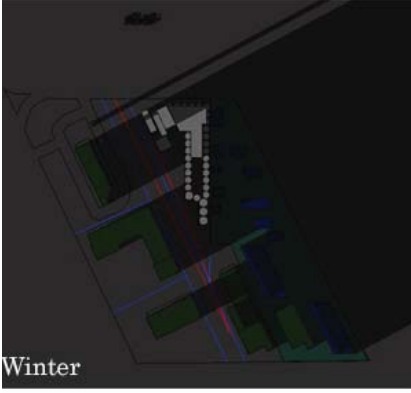
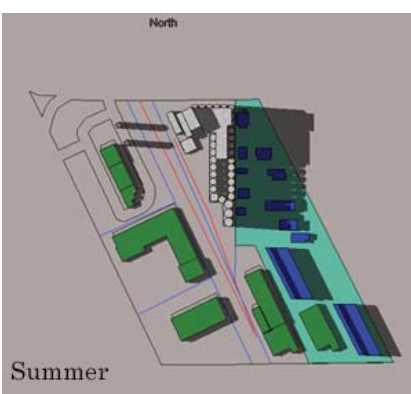


Figure 99 - Sun Study 2



5:00 PM Shadow Study

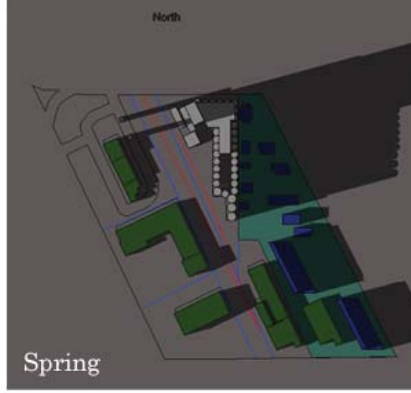
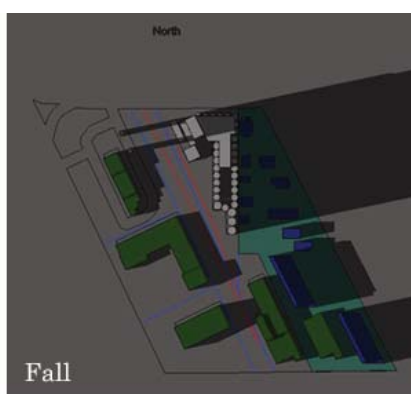


Figure 98 - Sun Study 1

Proformance Criteria for Thesis Project

This project is dedicated to rehabilitating a structure of great cultural and historical significance. The project is meant to expose these significances architecturally, and provide the community with quality public spaces. The public space will interpret these stories, while also allowing for new ones to be made. The rehabilitation project of this structure, will also include multiple unit housing, meeting the medium density code for residential housing. The purpose of this function shows the quality of space that these structures provide for people to inhabit. The space of the site, elevator, and silos, will be the limits for this project. Because of the verticality of the industrial structure, the space for the residential units will exceed the four-story maximum for the medium density code. The public spaces will be interactive on ground, fourth, and roof terrace levels. These allow for maximum views and interpretations of the structure.

Refer to **Site Analysis Zoning/ Building Use Studies** for further information.

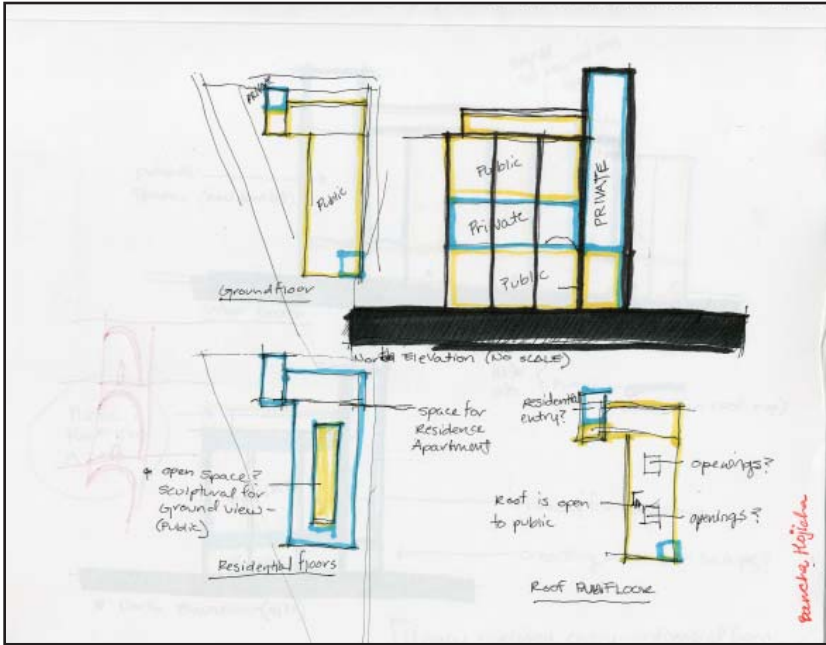


Figure 104 - Program Sketch 4



Figure 103 - Program Sketch 3

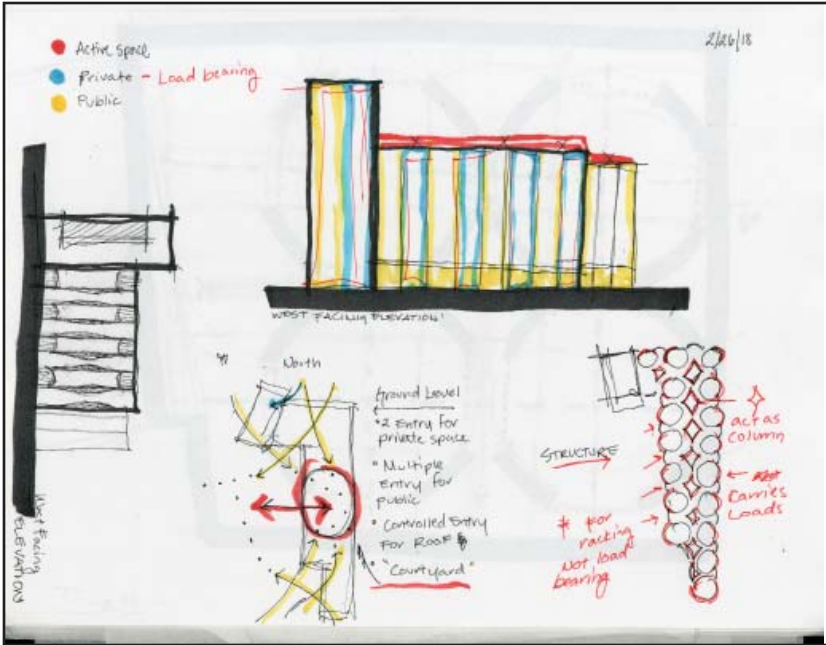


Figure 102 - Program Sketch 2

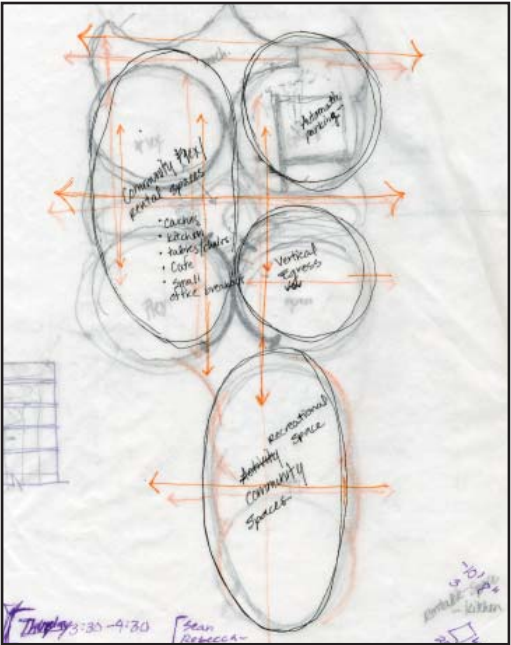


Figure 101 - Program Sketch 1



Figure 105 - SW Perspective Rendering

Design Solution **Research, Process, Final Iteration**

Design Solution **Introduction**

Through an architectural design project, can desolate industrial buildings be refunctioned to become a productive and inhabitable part of a community, while also interpreting its historical significance?



Figure 109 - Sanborn Map 1892

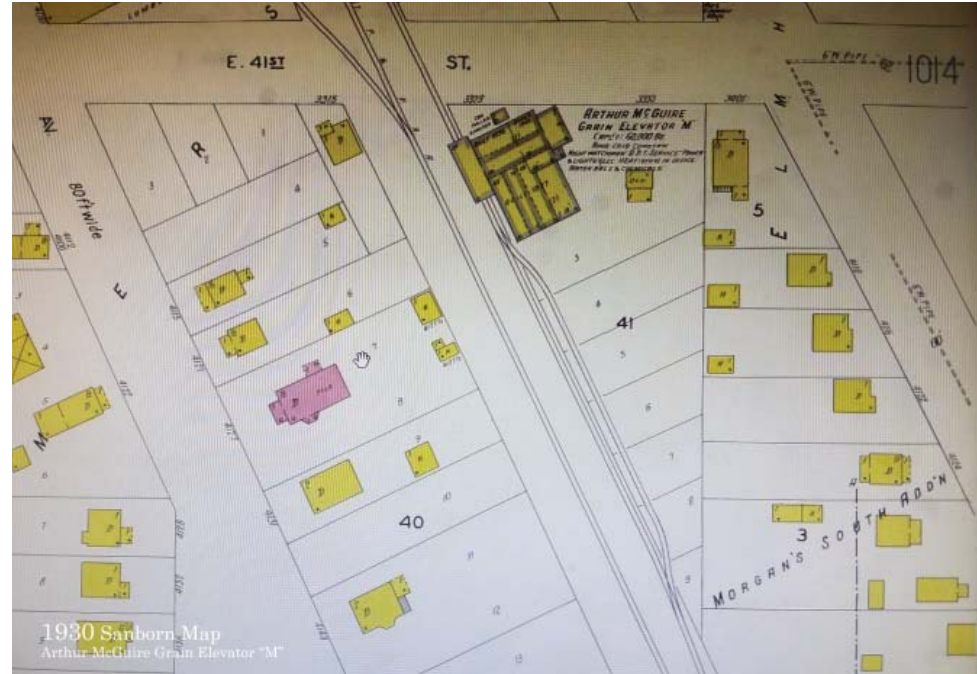


Figure 107 - Sanborn Map 1930

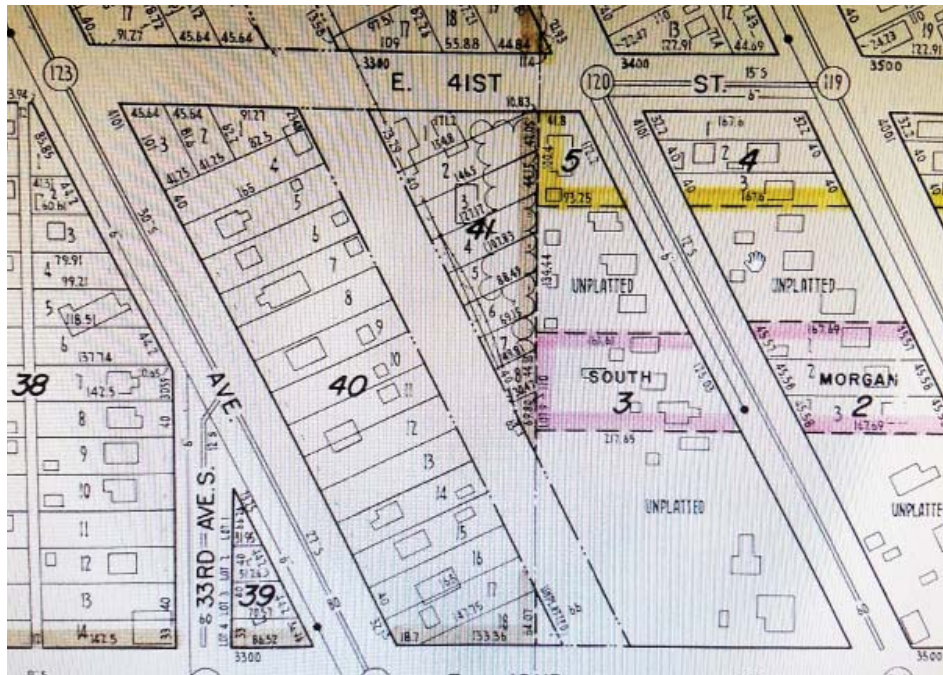


Figure 108 - Sanborn Map 1940

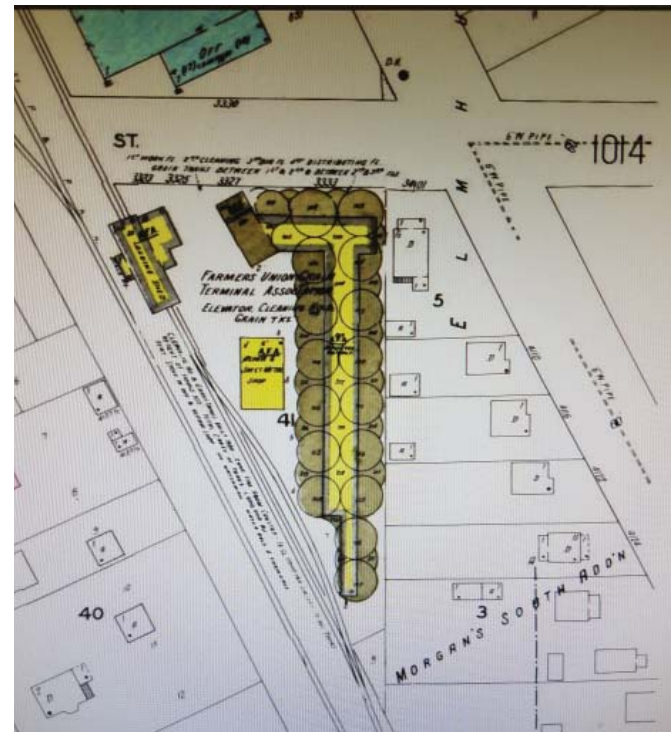


Figure 106 - Sanborn Map 1952

- Figure 81 - Book Cover
- Figure 82 - MOCAA Rooftop
- Figure 83 - Site in 1950
- Figure 84 - Minneapolis Industry
- Figure 85 - Pillsbury "A" Mill
- Figure 86 - Slip Form Section
- Figure 87 - First Concrete Silo
- Figure 88 - Concrete vs. Stone
- Figure 89 - Portrait of Eugene Viollet
- Figure 90 - Portrait of John Ruskin
- Figure 91 - Portrait William Morris
- Figure 92 - 41st E in Snow
- Figure 93 - Zoning Study
- Figure 94 - Zoning Study 2
- Figure 95 - Site Images
- Figure 96 - Site Map Google Maps
- Figure 97 - Zoning Study
- Figure 98 - Sun Study 1
- Figure 99 - Sun Study 2
- Figure 100 - Sun Study 3
- Figure 101 - Program Sketch 1
- Figure 102 - Program Sketch 2
- Figure 103 - Program Sketch 3
- Figure 104 - Program Sketch 4
- Figure 105 - SW Perspective Rendering
- Figure 106 - Sanborn Map 1952
- Figure 107 - Sanborn Map 1930
- Figure 108 - Sanborn Map 1940
- Figure 109 - Sanborn Map 1892

Design Solution Research - City Planning for Minneapolis

This study of Minneapolis's City Planning History was significant in understanding the original intent of Hiawatha and the how it changed over time. I started the study by visiting the Minnesota Historical Society in St Paul MN. I studied these changes in zoning and land use, by the Sanborn Fire Insurance Maps that had been updated over time, and the zoning maps that were made by the city over time.

What I found was that in 1892, Hiawatha was designated to be a pedestrian corridor, that would have a large park that would take up four existing blocks directly east of the existing grain silos. What I also learned was that a grain elevator did not appear on the site till 1930, and at this point it was a smaller grain elevator, like the "Wood Elevators" (pg 83). In the 1940 Sanborn Fire Insurance Map, there is visibility of the Concrete Grain Elevator and Silos that exist today. The year of 1952 We get a more detailed map of the location of the silos, new structures on the site, and materials and heights of the structures. Through the timeline of maps, the addition of single family homes and commercial structures.

What was most valuable from this exercise was seeing the progression of development, and how todays Hiawatha compares to the original plan for the Historic Corridor.

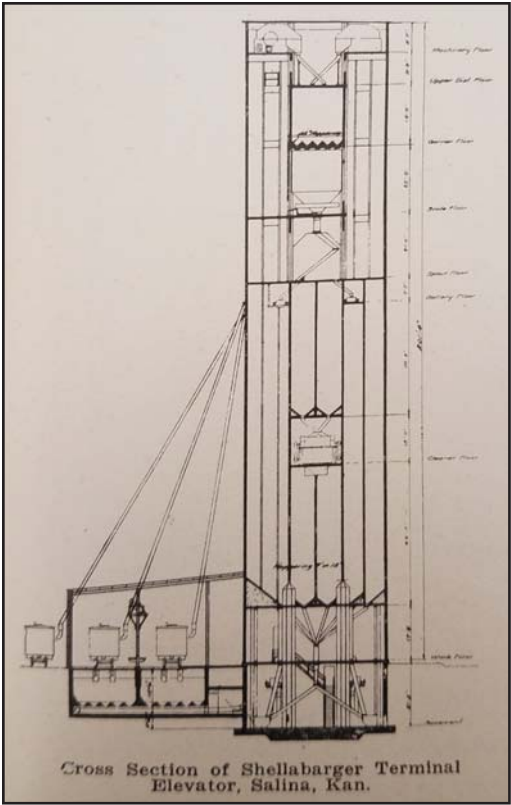


Figure 107 - Elevator Section 1

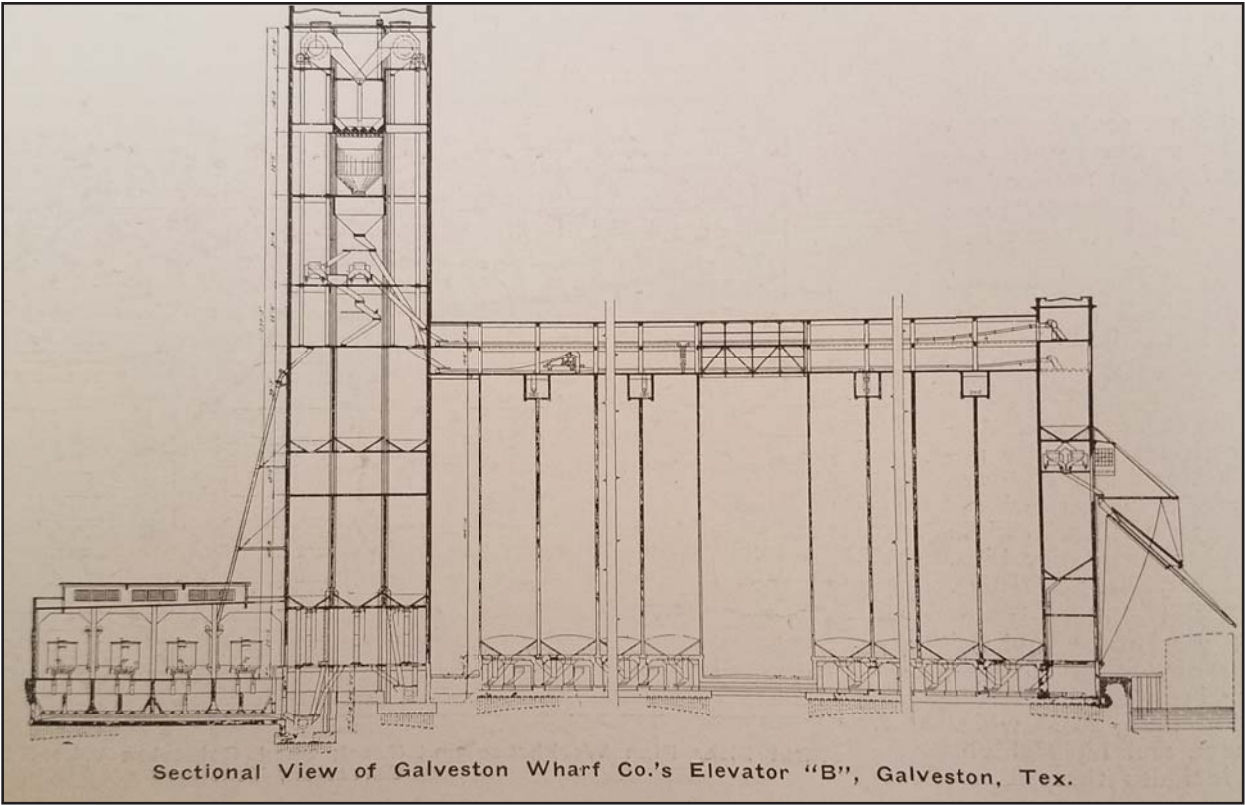


Figure 108 - Elevator Section 2

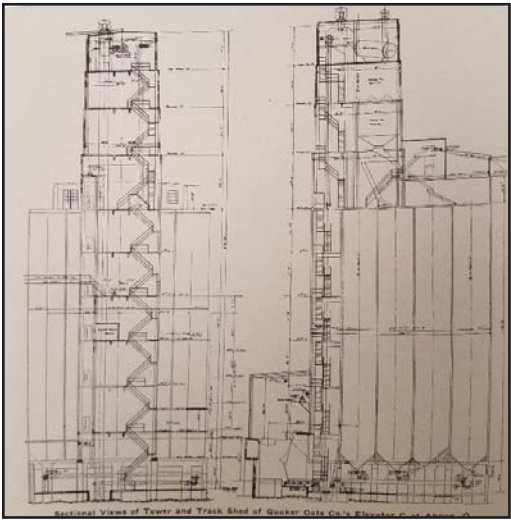


Figure 109 - Elevator Section 3

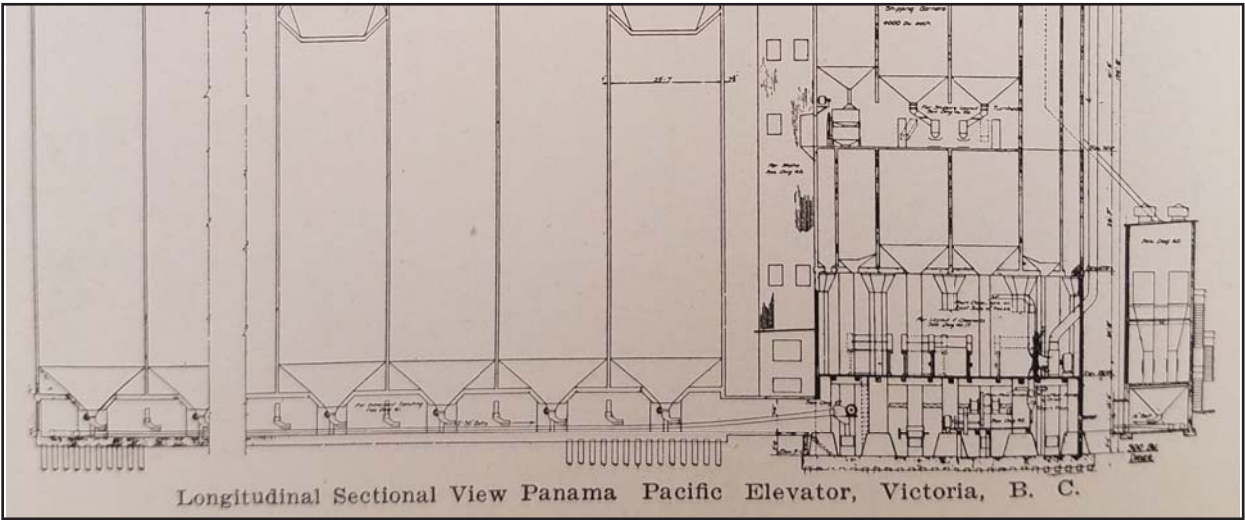


Figure 110 - Elevator Section 4

Design Solution Research - Grain Elevators In Section

This research study was sparked by the need to find the existing concrete grain elevator and silos original floor plans, but the adventure brought me to the Architectural Archive Library on the University of Minnesota's Campus, and what I ended up discovering was a book that gave me more insight on how these industrial machines function and architectural drawings of the secondary machinery within.

These images are from the book, Grain Elevators of North America Fifth Edition. The book studied about ten silos that were specific to Minnesota, my site unfortunately was not one of the silos studied. I did study silos that looked like mine, to understand how the structure and machinery may have been designed. This research study was significant in helping me understand the working of this industrial artifact and how I could expose this through the final design.

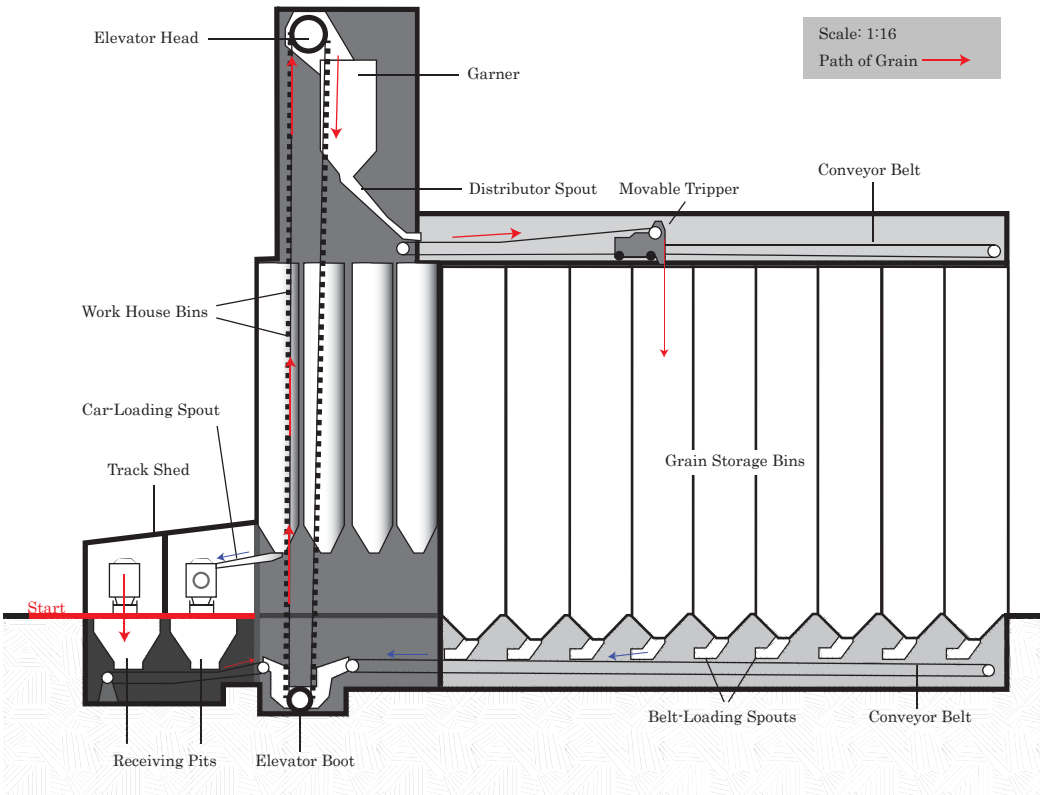


Figure 111 - Diagram of Elevator

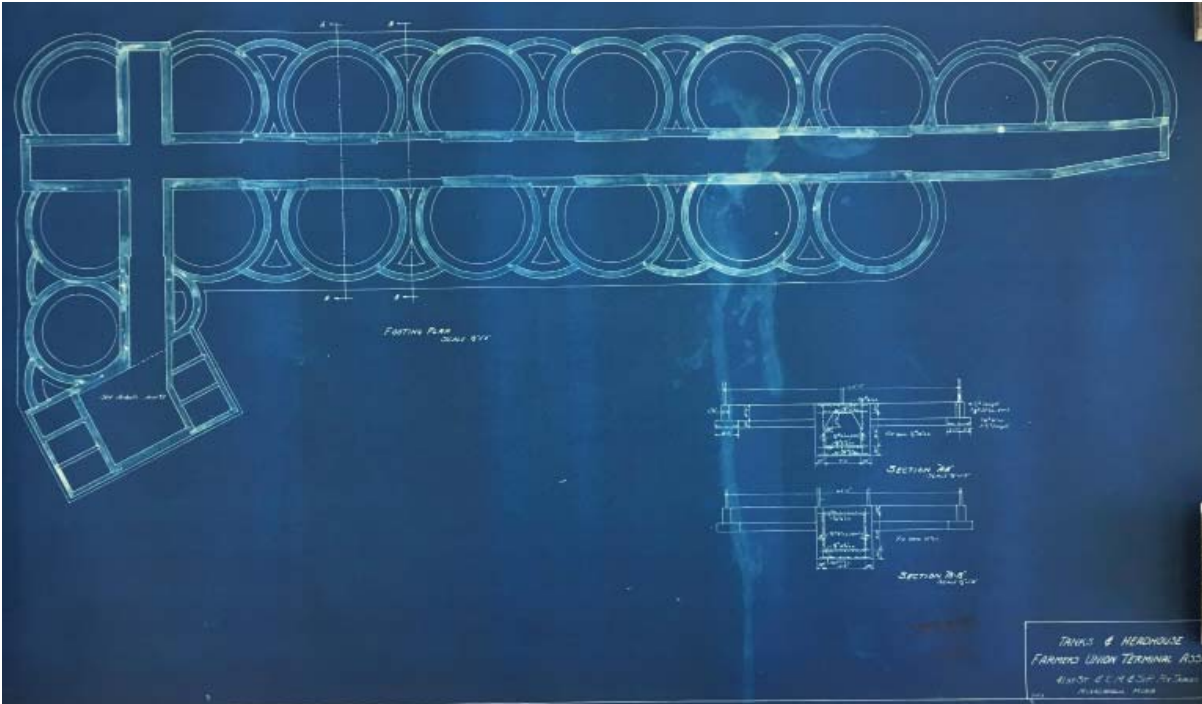


Figure 112 - Original Plan 1

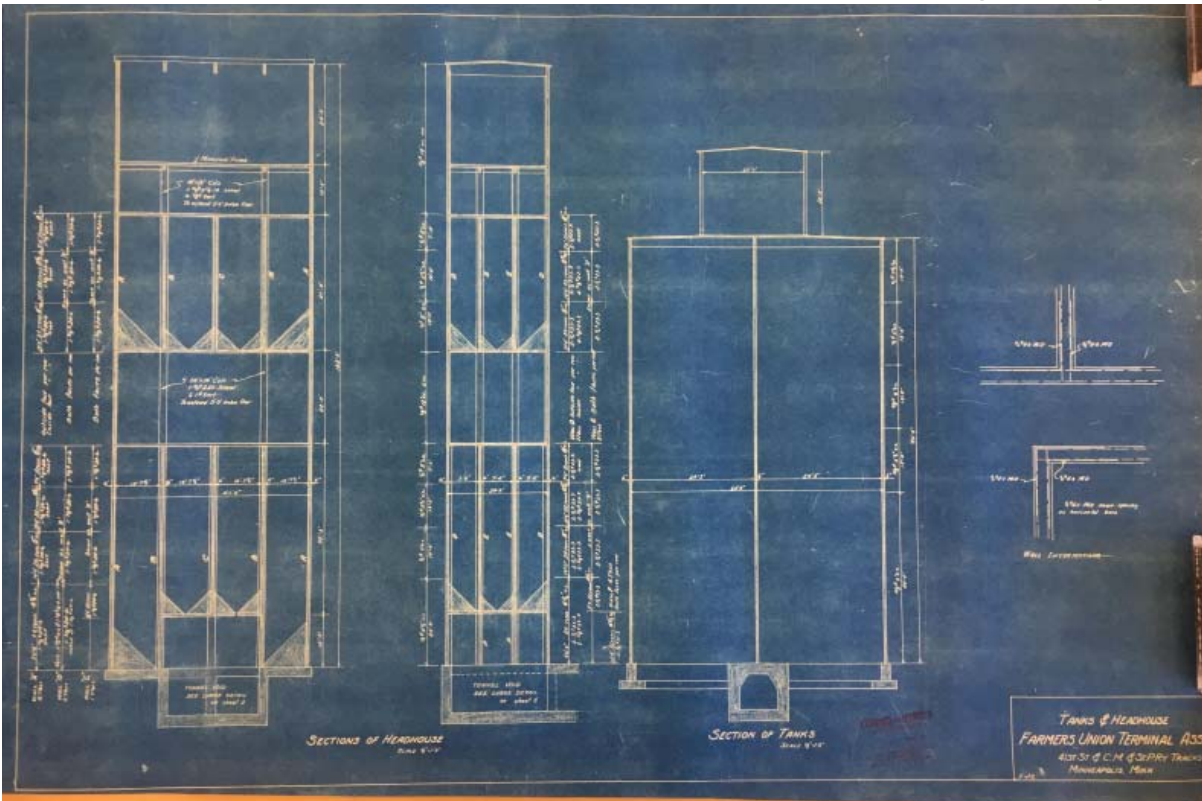


Figure 113 - Original Plan 2

Design Solution Research - Original Floor Plans

The original floor plans of the silo were found later in my research, by Northwest Architectural Archive Elmer L. Andersen Library on the University of Minnesota's campus. From these drawings, the exact dimensions of the structure would help me model and draw, understand the foundation, and how the machine worked. The drawings would as help me understand how the voids that were to be made, and how would the cuts would affect the structure, and if there would need to be addition concrete added to support itself.



Figure 114 - Original Plan 3

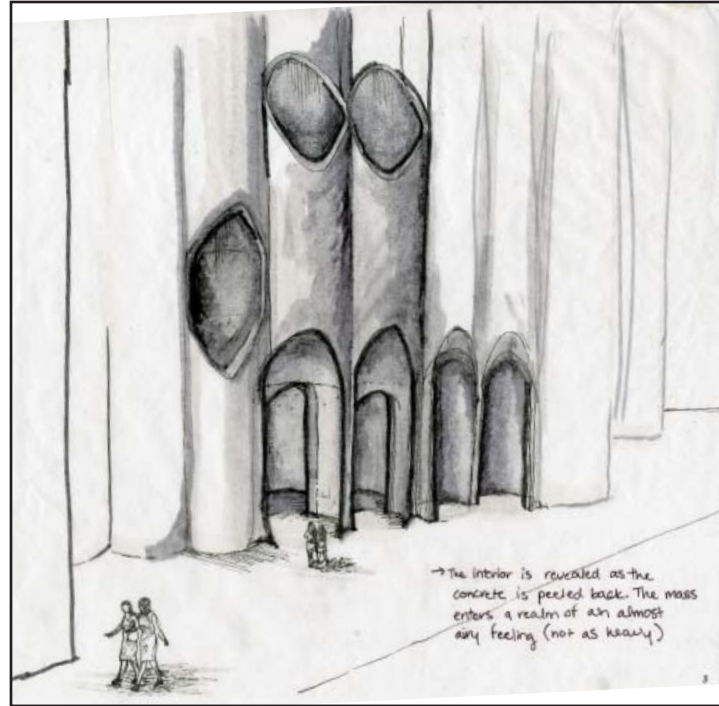


Figure 115 - Light Sketch Study

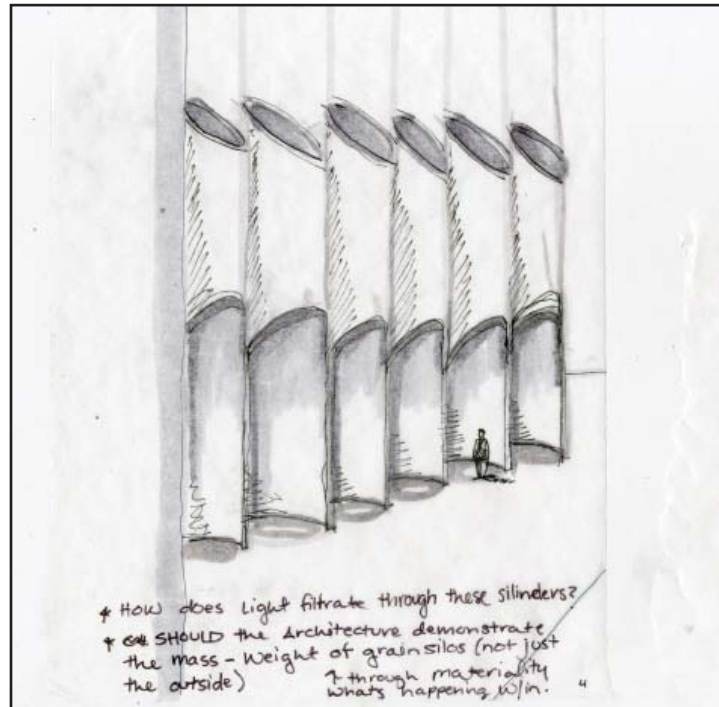


Figure 116 - Light Sketch Study 2

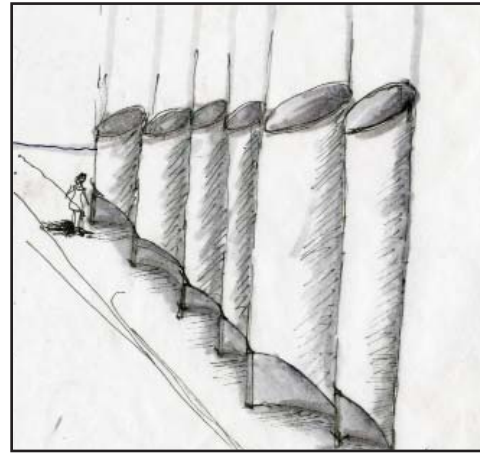


Figure 117 - Light Sketch Study 3

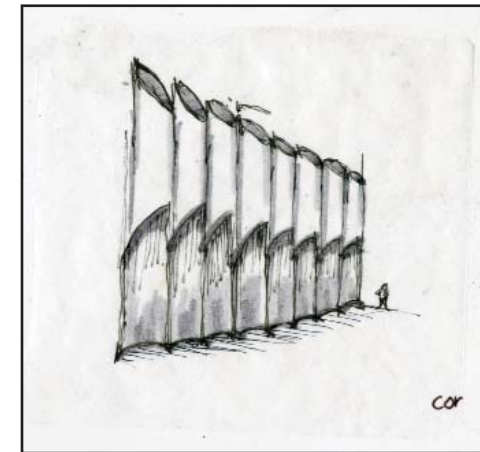


Figure 118 - Light Sketch Study 4

Design Solution Process - Study of Light Drawing the Mass

From this drawing exercise, I found that the exposing of the entirety of the structure was of value to the manipulation of this structure. As I was drawing I also found that there was a natural tendency to create a transition of scale, from street to human to mass. Creating ground level openings that allows people on the ground level to understand the verticality as an entry condition. As I placed voids in the mid of the silos, I wanted to understand more about how these would affect the filtration of light within and out of the structure. At the beginning of this investigation most of the manipulations remained curved and rounded edged, this was in response to the existing geometry of the structure. Light and shadow become an important design principal that would require further investigation.

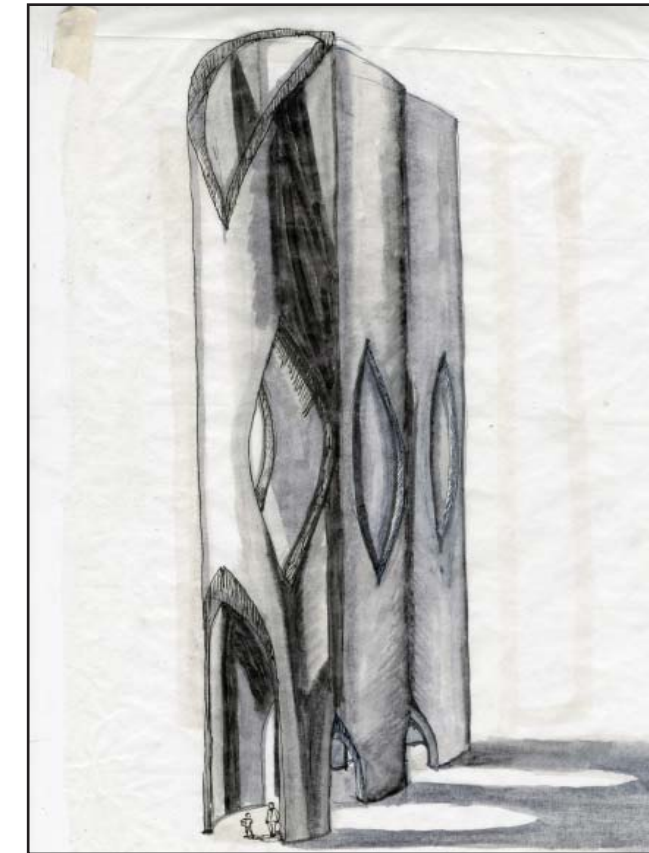
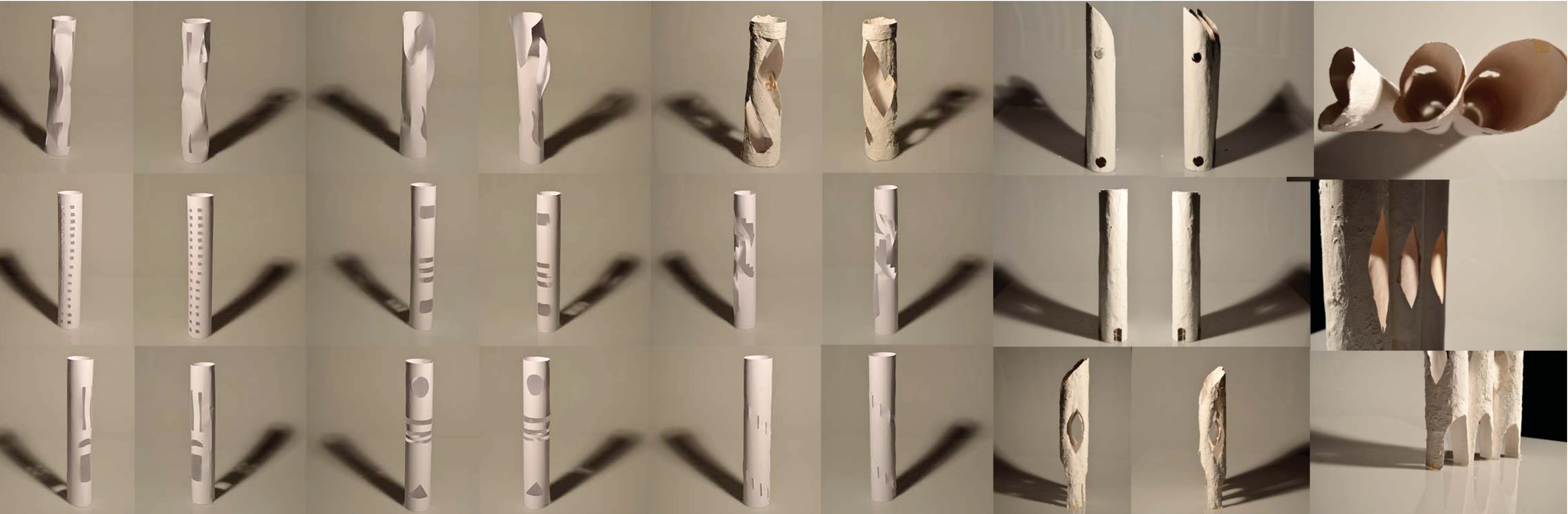


Figure 119 - Light Sketch Study 5



Figure 120 - Light Sketch Study 6

Design Solution Process - Study of Light Paper / Plaster Models



This study was in response the conclusion of the drawing investigation, where I found the significance of light and shadow from the manipulation of voids and the placement within the existing structure. I started this investigation with the material of paper, since it is easily manipulation and could be produced at a fast rate. There were no rules at this point for the sizing of cuts or where they should be made, the manipulation of the paper silos was arbitrary at this state of the investigation.

After cutting into these silos, I was interested in the cast shadows that the voids would make, and how it would affect the reflection of light within and out of the structure. I investigated this question by conducting a light study that would use a direct light source that would represent the sun during the morning and afternoon, and photograph the cast shadows. What I found was that the light was only diffused by the paper, making the cast shadows dim. I also discovered that there needed to be more a systematic approach to cutting voids into these structures to be most effective in allowing light to filter within them. The third significant discovery I found was that the silos, when lighted up, affect how the light interacts with one another, so I need to be studying the structures in groups, instead of as individuals.

The second iteration of this light study include the addition of plaster and a new method for cutting into the silo. The need to use plaster was to create sharper cast shadows for the light study, and to provide texture in understand how the cuts made affect the integrity of the structure of the existing silos. What I also took into consideration was where the voids were being made, I learned that the voids had to be adjacent to one another to allow light to filter in throughout the entirety of the day.

This light study was effective in helping me understand the quality of light that the voids in the silos created for both the exterior and interior spaces. It also helped me understand how the cuts would affect the structure of the existing silos as well as the historic and visual integrity, addressing the user's ability to understand what these structures original function.

Figure 121 - Silo Sculpture Study Collage

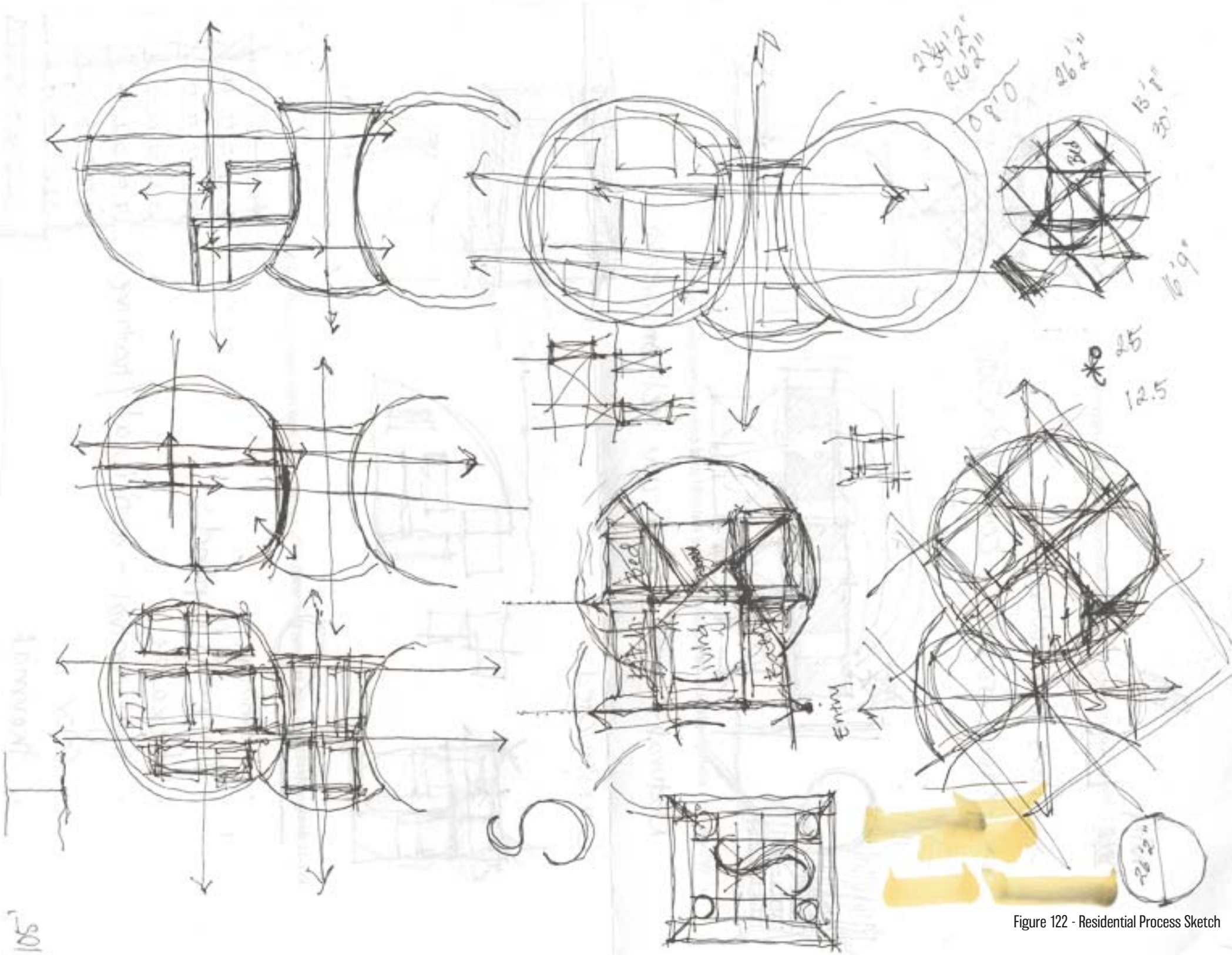


Figure 122 - Residential Process Sketch

Design Solution Process - Residential Space Spatial Arrangement

The design of the residential units was inspired by the idea of experience of the silo, through materiality, ceiling height, and light quality, thus keeping an open floor plan was necessary to achieve these three design elements. These images are iterations of how I wanted to achieve these design goals of the residential units. I started with the types of spaces and how one might through these spaces. I found that were only a necessity for walls for the bathing area, other while space would be implied through the architecture. The residential mechanic would run vertically within the bathroom space, and the walls would be thickened by 6" adding both insulation and concrete to allow the structure to be stabilized and to perform better within winter conditions.

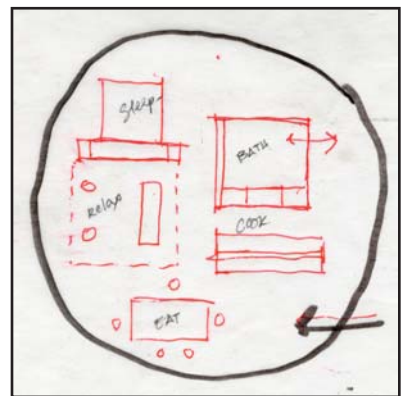
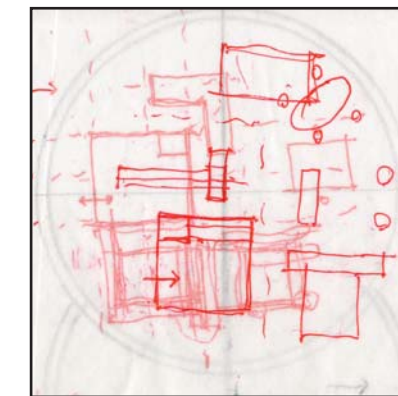
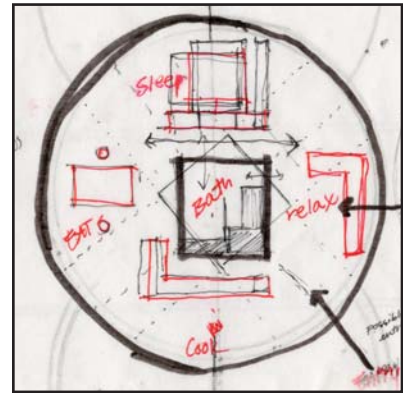
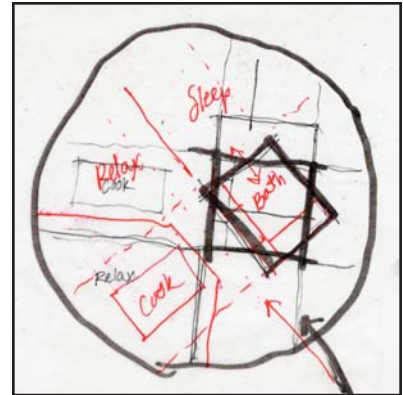


Figure 123 - Residential Unit Sketch Collage

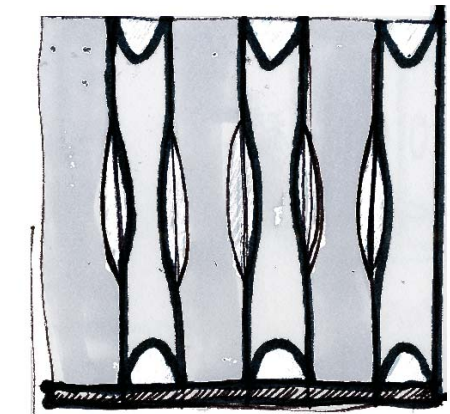
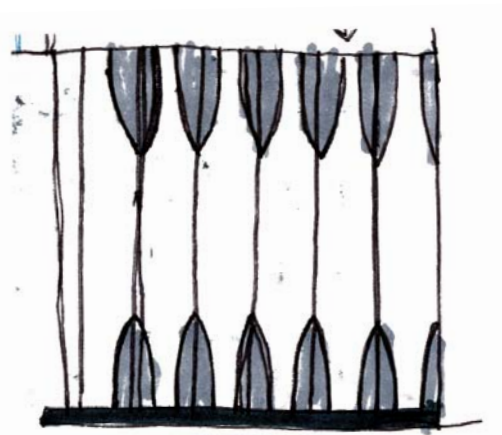
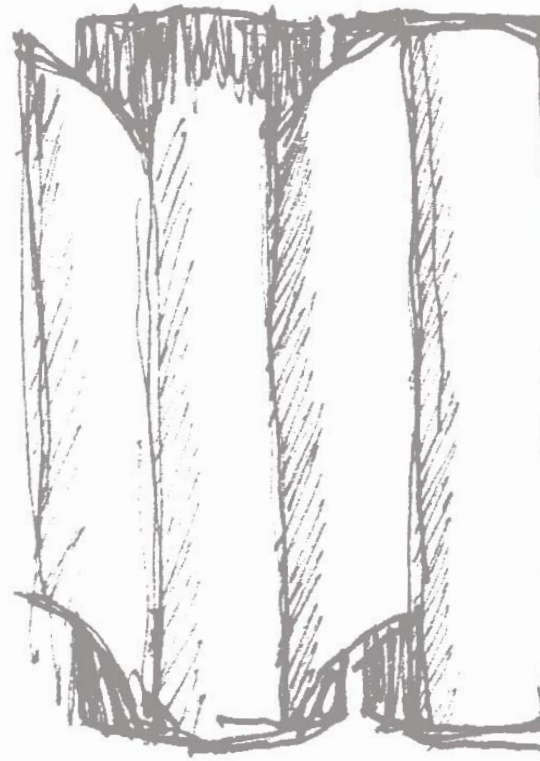


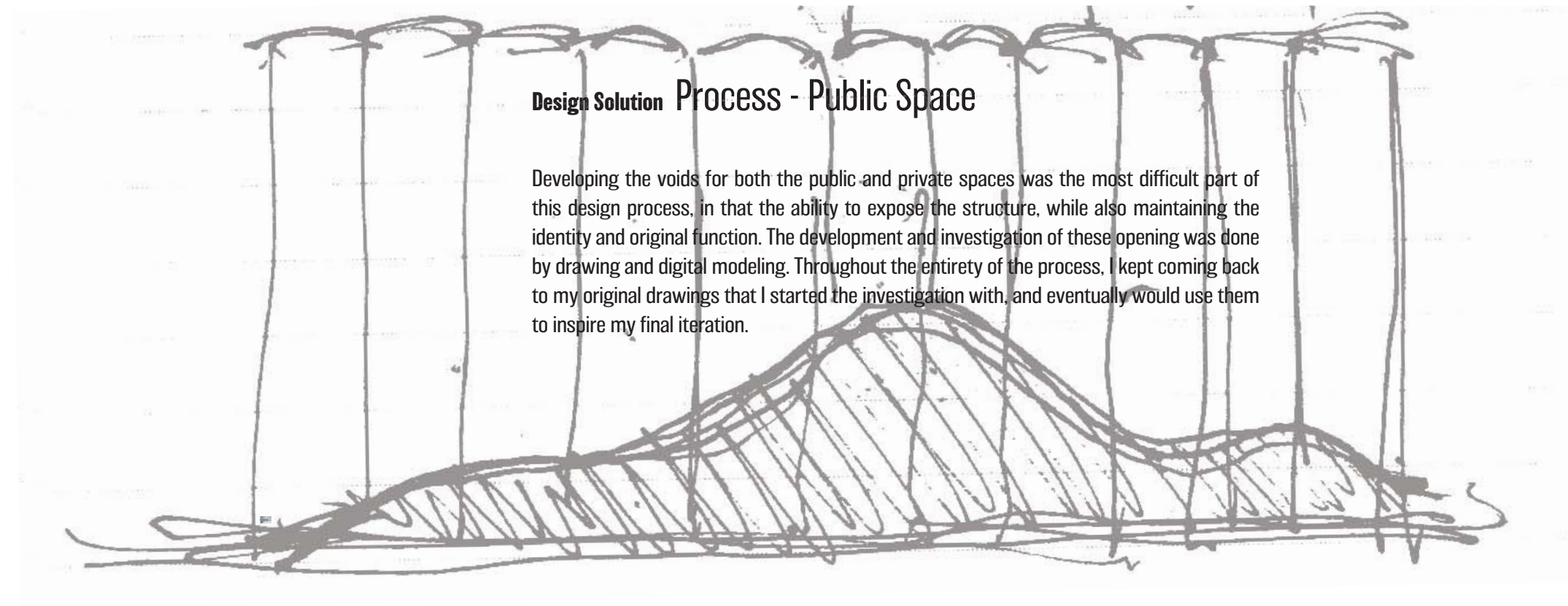
Figure 125 - Hand Sketching



West Elevation



Figure 124 - Digital Modeling



Design Solution Process - Public Space

Developing the voids for both the public and private spaces was the most difficult part of this design process, in that the ability to expose the structure, while also maintaining the identity and original function. The development and investigation of these opening was done by drawing and digital modeling. Throughout the entirety of the process, I kept coming back to my original drawings that I started the investigation with, and eventually would use them to inspire my final iteration.

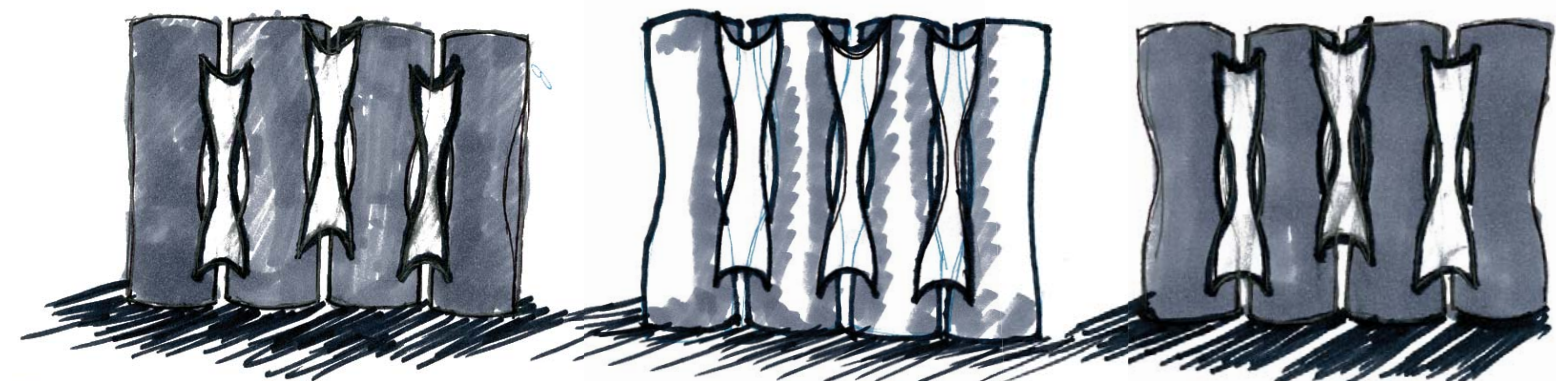


Figure 126 - Hand Sketching 2

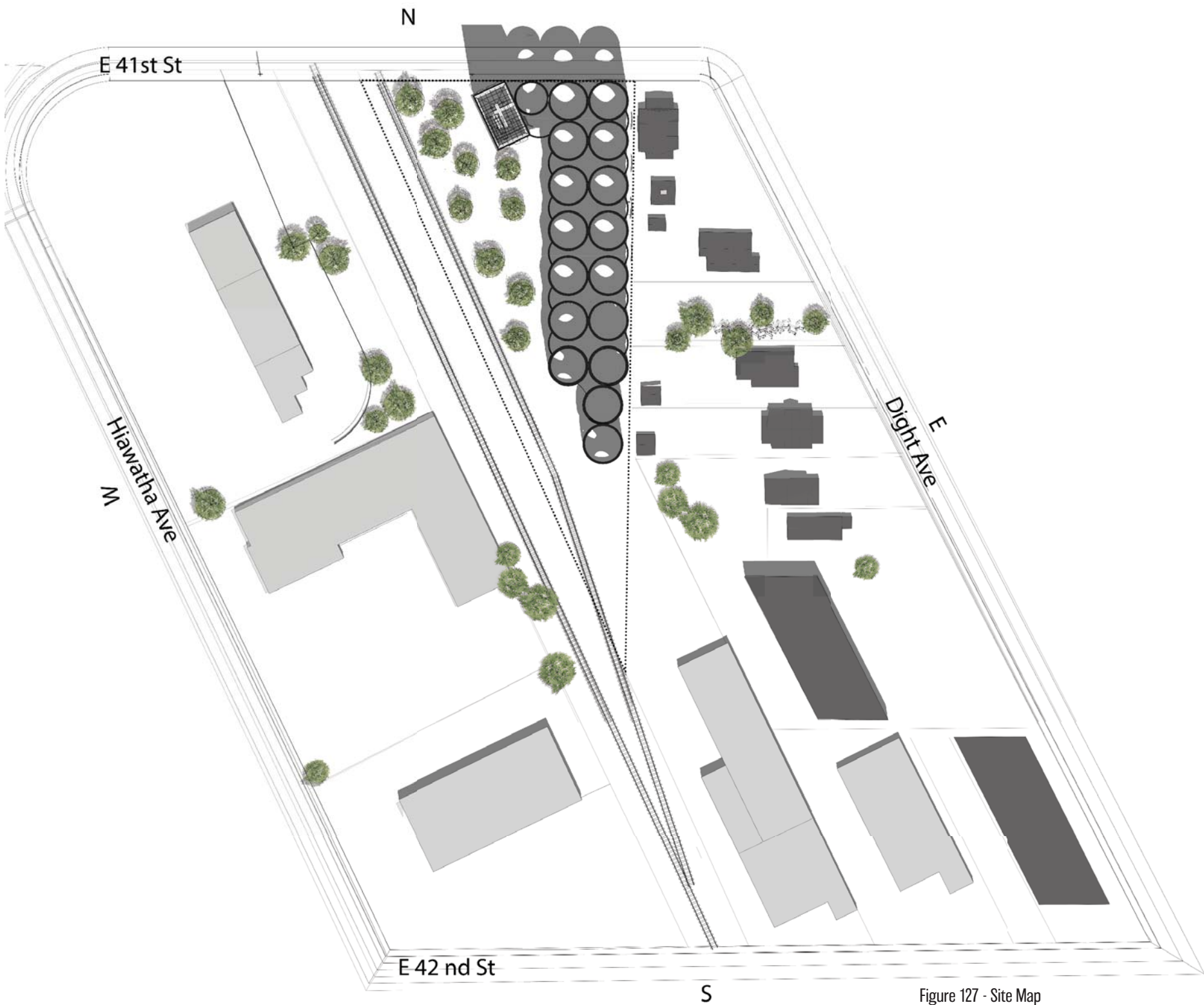


Figure 127 - Site Map



Figure 128 - North East Perspective

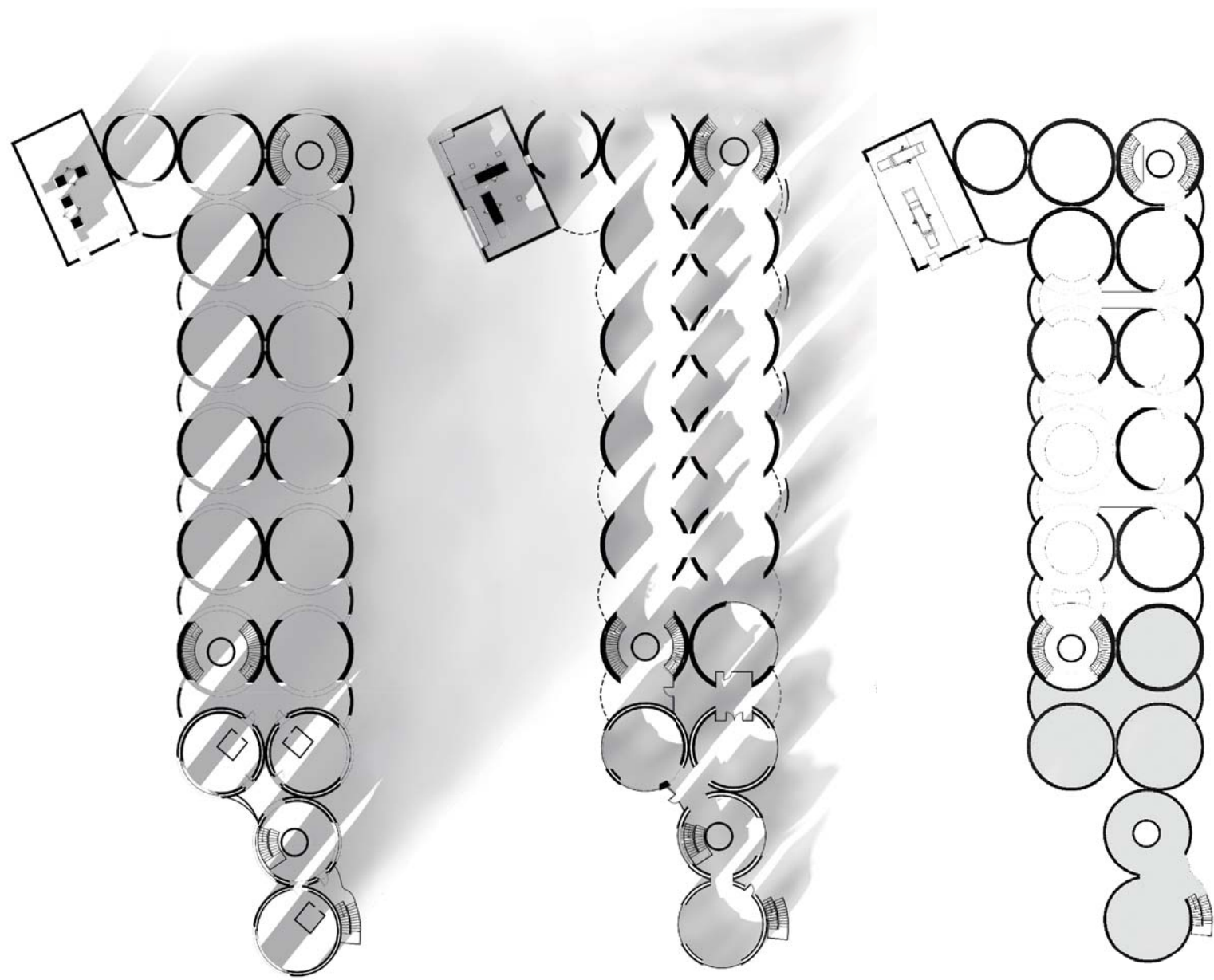


Figure 129 - Floor Plans

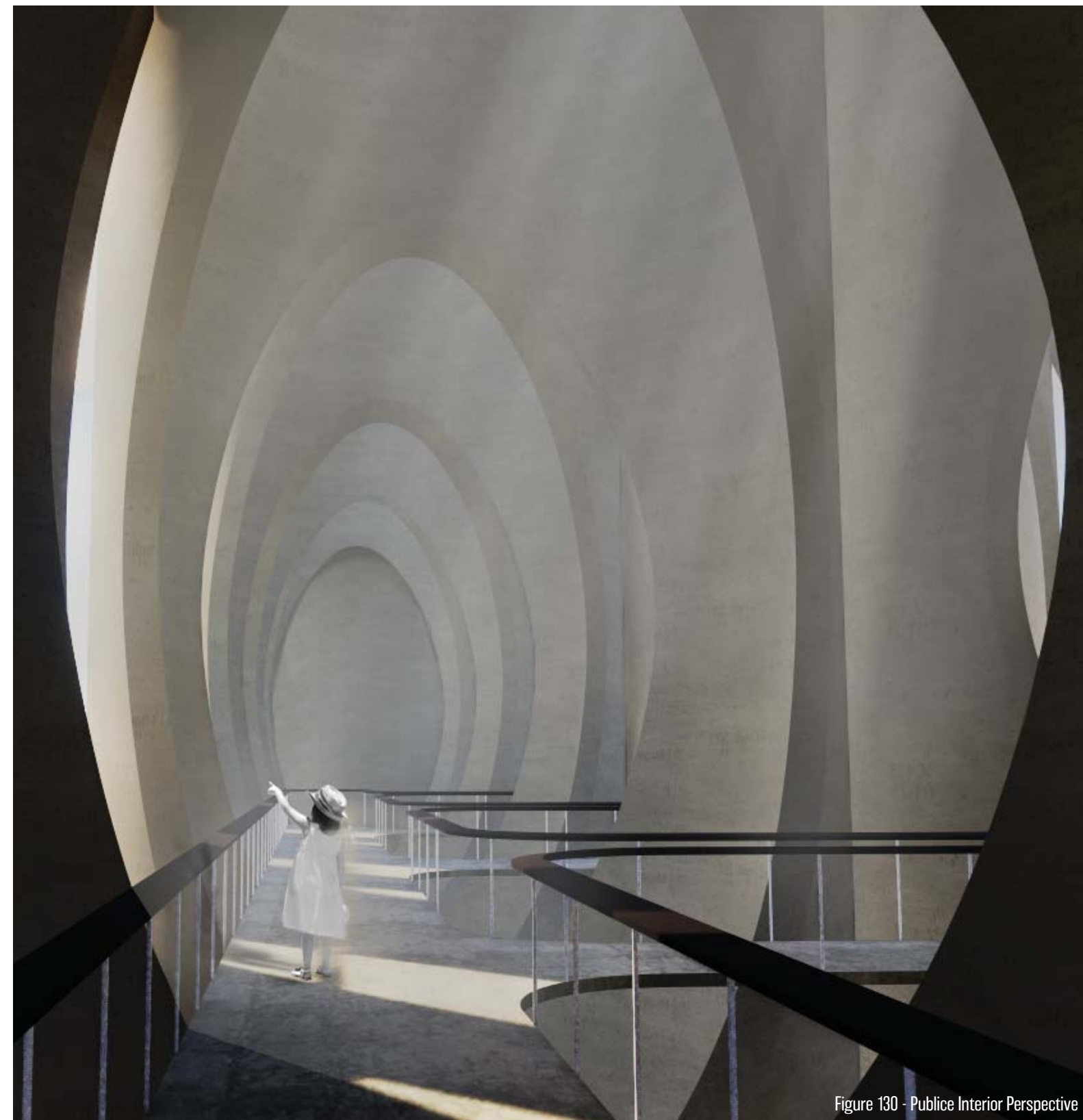


Figure 130 - Public Interior Perspective



Figure 131 - Public North Entry



Figure 133 - Contemplative Silo Space

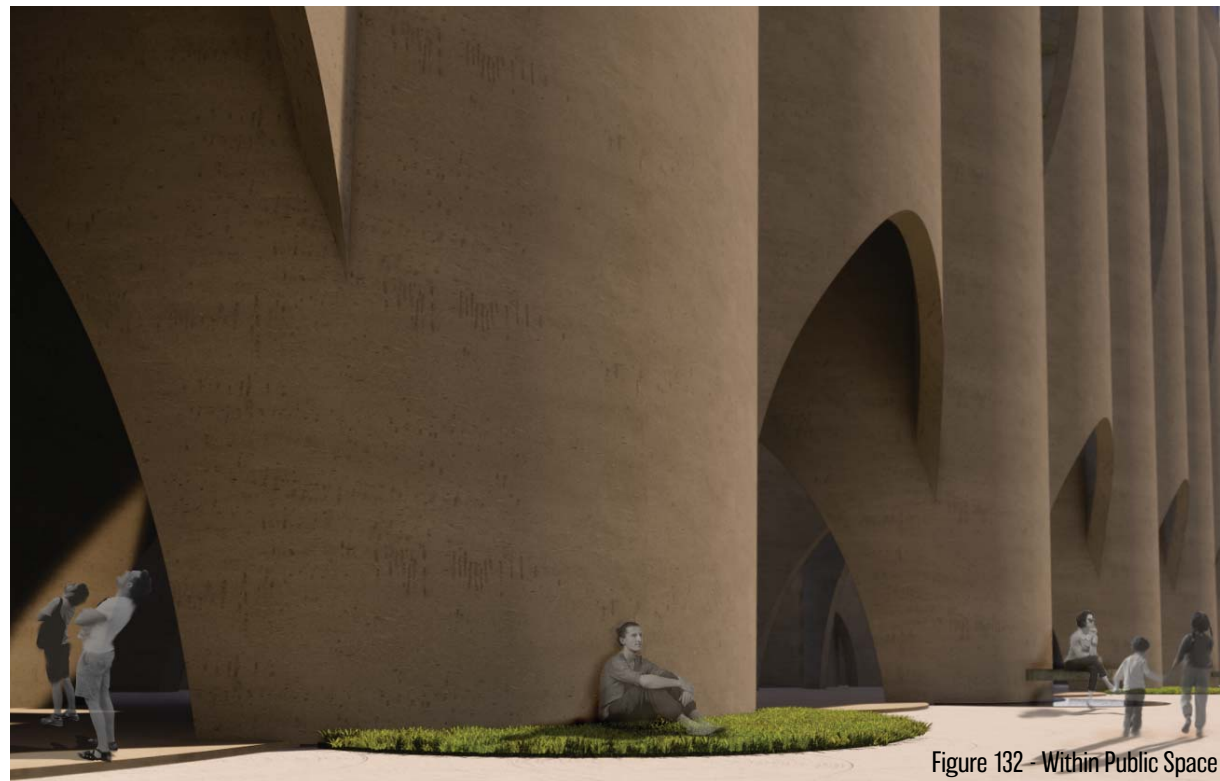


Figure 132 - Within Public Space



Figure 134 - Looking up Within Silos

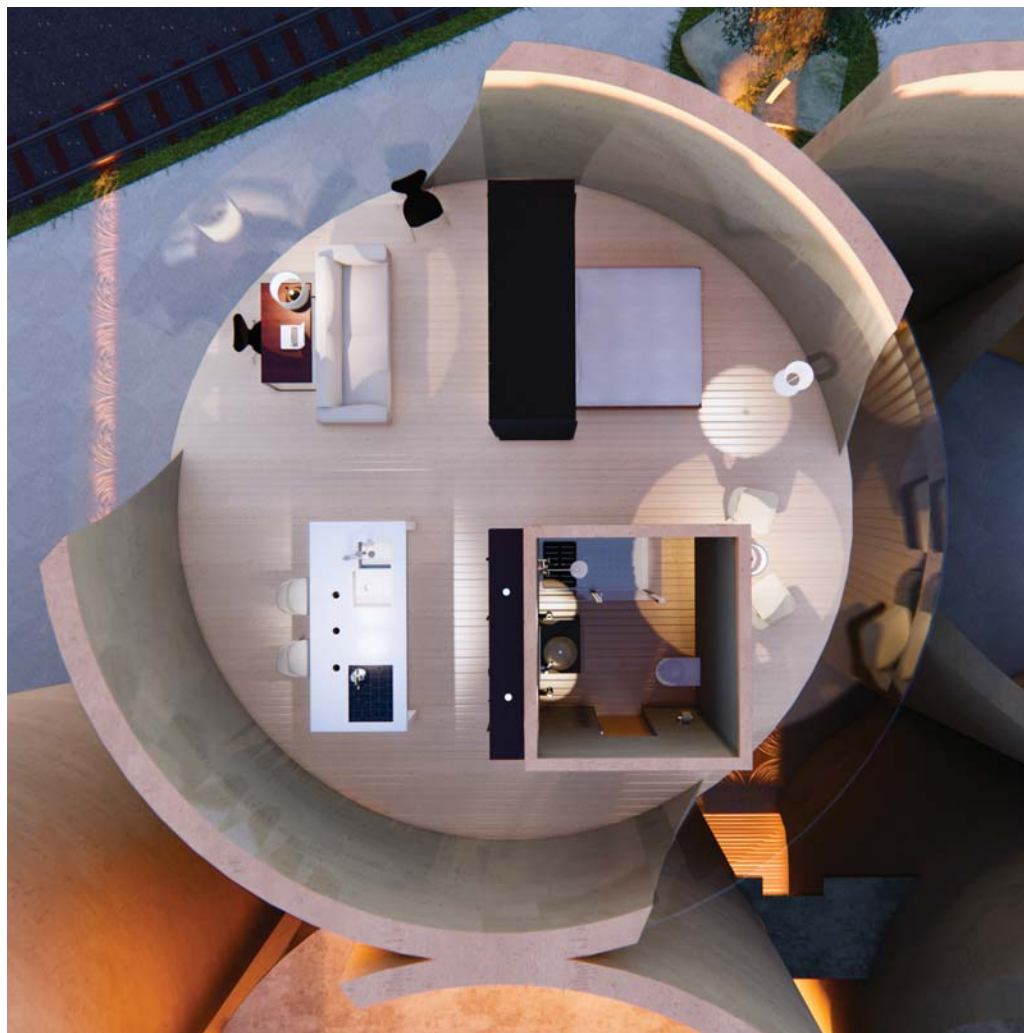


Figure 135 - Residential Floor Plan

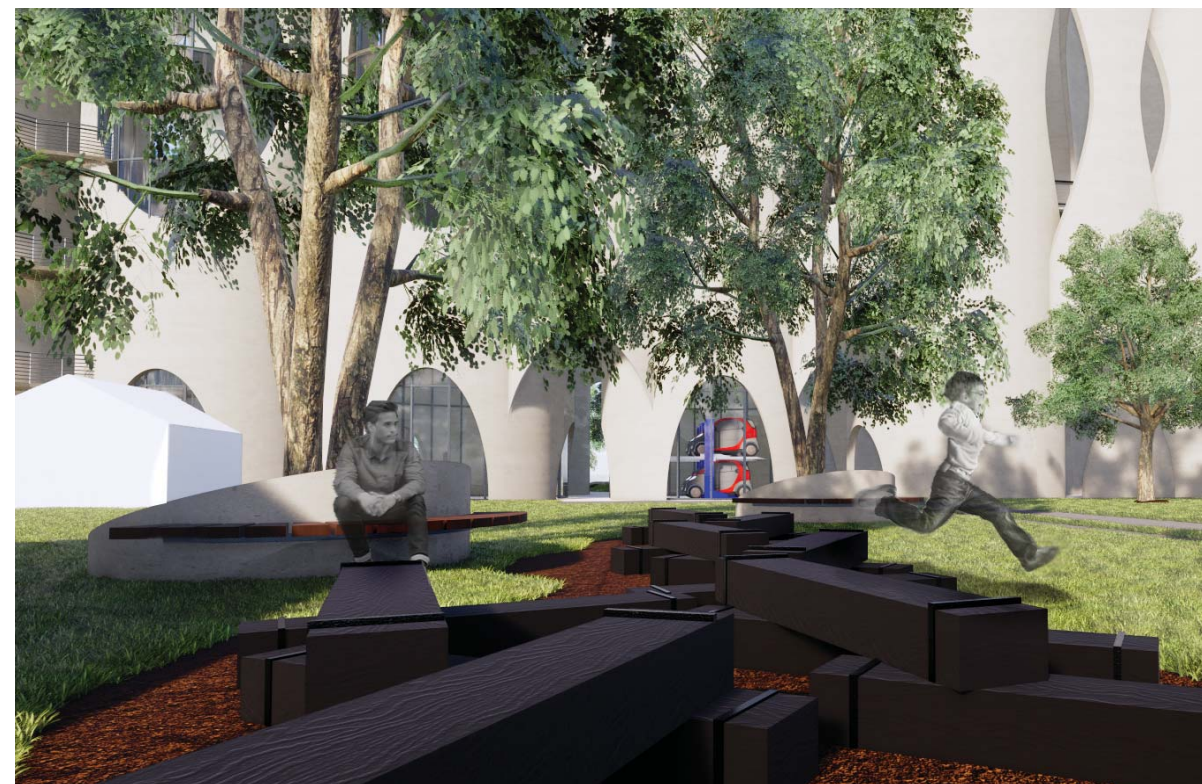


Figure 135 - Residential Floor Plan



Figure 136 - Residential Entry Perspective

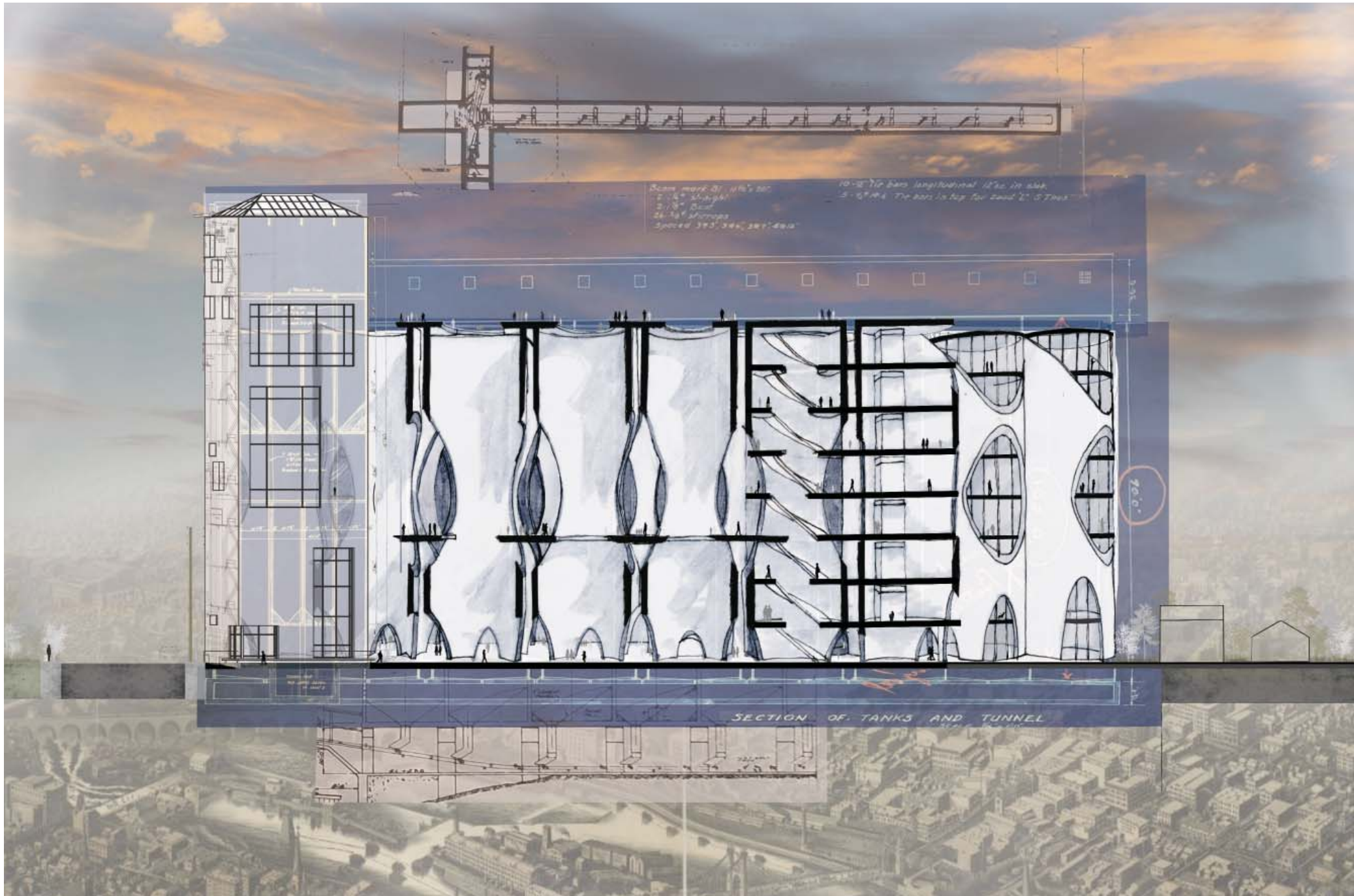
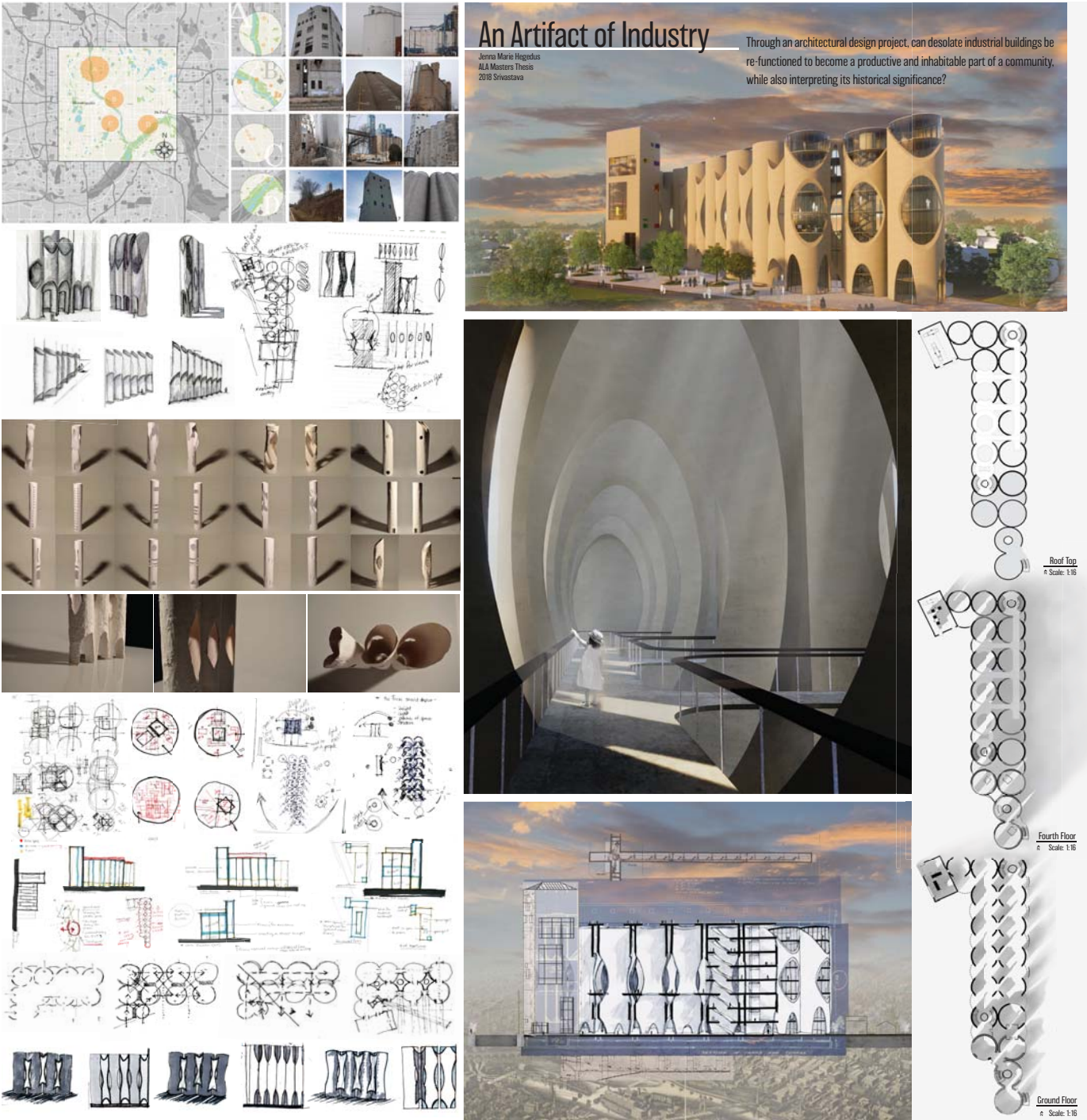


Figure 138 - Past and Present Collage Section

Performance Analysis Site, Typology Project Emphasis

The final architectural iteration to this thesis question responds to the issue and needs of the surround community. It does so by providing a public space that is representative of the heritage and history of both the concrete grain elevators and silos and the Hiawatha corridor community. The medium density residential was developed in response to the implementation of the Metro Transit Blue line along the west side of Hiawatha Avenue as well as the lack of density within the designated R4/ R5 zoning code. The manipulation of the structure and exposure of the machinery was in direct response to refunctioning of the structure that would positively affect the surrounding community, not only in celebration of their heritage but also in celebration in the establishment of Minneapolis, Minnesota

Digital Boards



Physical Display



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Previous Design Studio Experience

Second Year

Arch 271 - Fall 2014
Projects: Tea House, Boat House

Joan Vorderbruggen



Third Year

Arch 272 - Spring 2015
Projects: Montessori, Bird House, Dwelling

Booker Darryl



Arch 371 - Fall 2015
Projects: Fire House/ Wellness Center, Dinosaur Research Lab

Steve Martens



Arch 372 - Spring 2016
Projects: Office Building, High-End Hotel

David Crutchfield



Fourth Year

Arch 471 - Fall 2016
Projects: High Rise

Don Faulkner



Arch 472 - Spring 2017
Projects: Urban Redevelopment

Paul Gleye



Fifth Year

Arch 771 - Fall 2017
Projects: Ulen Wetlands Research Facility

Mark Barnhouse



Personal Identification

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This project was in response to my interest in historic preservation and rehabilitation projects. The topic of concrete grain elevators and silos came to me when I was visiting a friend by the University of Minnesota's campus. I noticed these massive structures, and how their history, heritage, and material, were just being wasted and forgotten. I knew that this was a topic that would challenge me and that I would be passionate in learning about. I hope to continue my career with drive and passion, and interest in historic structures and the ability to rehabilitated them to better serve and celebrate their surrounding communities.

Thank you