"Stream of Heritage"

Minnesota River Valley Research and Interpretive Center

Michael Keim
2006 Architecture Thesis

Department of Architecture and Landscape Architecture
North Dakota State University

MINNESOTA RIVER VALLEY RESEARCH AND INTERPRETIVE CENTER

A DESIGN THESIS SUBMITTED TO THE
DEPARTMENT OF ARCHITECTURE AND LANDSCAPE ARCHITECTURE
OF NORTH DAKOTA STATE UNIVERSITY

By

Michael Keim

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF BACHELOR OF ARCHITECTURE

Steve Martens, Primary Critic
Associate Professor of Architecture

Don Faulkner,Thesis Committee Chair
Associate Professor of Architecture

May 2006
Fargo, North Dakota

Minnesota River Valley Research and Interpretive Center

The project typology is a building which will consist of educational gatherings and displays, and areas devoted to research and development. The thesis will examine how natural forces and imported historical architectural ideas work with one another to guide architectural design. The project location will be within the Minnesota River Valley, near the city of New Ulm, Minnesota.

Contents

Background

The Minnesota River Valley is saturated with history, natural landscapes, and a strong heritage. The area is unique in the fact that most of these attributes can only be found within the Minnesota River Valley region. The river travels over three hundred miles through southern Minnesota. All along the river valley, stories can be told revealing history of the area that has lead to the creation of the present day communities and river.

The region was formed about 11,000 years ago by a glacial river, which was as large as five miles wide, by up to as deep as two hundred feet. The glacial river was a major factor in draining the glacial Lake Agassiz, which once covered as much as 123,000 square miles of North America.

The valley was first occupied by Native Americans, who had complete run of the land for a great length of time. The movement of European settlers moving from the east coast to the west brought new settlers to the river valley region. The settlers had followed and used the river as a means of transportation of people and goods into the region. The river was an important asset to the transporting and trading of goods for the region.

The white settlers slowly started taking control of the land from the Native Indians, while it was agreed they would be paid for the land they gave up to the white settlers. The Native Indians were not compensated for the land as it was agreed upon, which eventually led to conflict and battles between the white settlers and the Native Indians. The conflicts are still remembered today throughout the region, and are an important aspect of the valley's history.

The white settlers brought with them their native heritage and culture into the region. These influences include the settlers' native ways of life, architecture, and culture. Much of the valley today is based on and reflects the influences and impacts the early settlers had on the region.

Another aspect of the present day Minnesota River Valley, is that the Minnesota River is one of the most polluted rivers in the nation. Numerous factors such as erosion, waste, and agricultural fertilizers have been causing the river to become polluted. This polluting of the river has been occurring over a long period of time.

The region deserves a project devoted in explaining the meaning and purpose of the river valley. A building where visitors can come and experience the Minnesota River Valley of present day, as well as from years past. The river also deserves a building to provide the opportunity for professional research, study and development of the Minnesota River environment. Together the features of the project will bring an awareness of the importance and the rich quality found within the Minnesota River Valley.

Statement of Intent

Statement of Intent

Project Typology

The project is a research center consisting of educational displays, museum, offices, and research laboratories. The building will be sited along the Minnesota River.

Theoretical Premise

The thesis will examine how natural forces and imported historical architectural ideas work with one another to guide architectural design. Design metaphors, analogies, and or tectonics will be developed from the examination.

Justification

The Minnesota River Valley is now considered a scenic byway, stretching 335 miles through southern Minnesota. The river valley communities contain abundant historical sites, hiking trails and other recreation opportunities, and many natural and wildlife management and refuge areas. Visitors come to the river valley region to enjoy the history of the area, as well as to enjoy the natural wildlife along the river. The purpose of the research center buildings would be to create an opportunity to educate visitors about the rich history of the river valley, as well as to inform them of other places of interest along the scenic byway. The facility will also provide scientists the opportunity to research and analyze the Minnesota River. The new facilities will encourage more visitors and tourists to visit the region.

Proposal

Proposal

The Minnesota River Valley is rich in historical heritage, architecture and natural environments. The communities located in the Minnesota River Valley were created and shaped by the early historical events that occurred with in the river valley and surrounding areas. The River brought European settlers to the region, bringing with them European influences of architectural design, and ways of developing the land. There is also a history of social and cultural conflict to the area between different groups of people on the region.

The river has been a great asset to the development of the southern Minnesota region, particularly the river valley region. The river valley seems to have lost some of its value and prestige it once held. The importance of eliminating the Minnesota River of pollutants and debris is an aspect that the research and educational center will bring to the region.
The Minnesota River Valley offers a variety of natural landscapes and wildlife. The scenic byway of the Minnesota River stretches 335 miles through southern Minnesota. The river valley communities contain abundant historical sites, hiking trails and other recreation opportunities, as well as many wildlife management and refuge areas. Visitors come to the river valley region to enjoy the history of the area, as well as to enjoy the natural beauty found with in the river valley.

Creating a sense of place is an important aspect of the design project. To make the building seem as if it belongs and is part of the history and landscape of the surrounding region. Using local materials found and created in the river valley region will be used to enhance the feeling and sense of belonging to the river valley.

The purpose of the research and education center will be to create an opportunity to educate visitors about the rich history of the whole river valley region, as well as inform visitors about places of possible interest along the scenic byway. The center will also provide a facility for researchers to study and analyze the river. The new facility will encourage more visitors and tourists to visit the region's communities, and enjoy the attractions they have to offer.

User/Client Description

The Minnesota Historical Society, along with the county historical societies within the Minnesota River Valley will be important to the contribution of historical collection and materials to the historical center division of the project.

The study of geological and historical progression of the river valley, along with hydrology issues concerning the river today.

User Groups:

- Researchers and scientists
- Residents of the area
- Visitors to the Minnesota River Valley
- Administrative staff

Proposal

Major Project Elements

The major elements of the project include:

- Museum – for displays explaining the history of the river, and other artifacts
- Lecture Hall/Auditorium – for educational lectures and presentations
- Observation to the river – allow visitors to view the river
- Research Labs – space for researchers to study
- Offices – for administration and researchers
- Library – archives of research documents
- Paths and trails to the river – allow visitors to experience the river and surrounding landscape
- Information center – information for visitors about places to visit in the region

Site

The site will be located within the Minnesota River Valley, in southern Minnesota. The site and its location are important to the project because the site corresponds with the importance of the river, the river valley landscapes, and the historical aspects of the river valley.

Criteria for choosing a site:

- overlooking or has a view of the river
- site has not been influenced by urban development
- contain natural landscapes, wooded areas
- have access from a major highway
- have a sense of interaction with the river

Possible site locations:

- Along highway 169, two miles north of St. Peter
- Near the intersection of Highway 14 and Highway 15, east of New Ulm
- Along highway 169, five miles north of Mankato

The proposed site north of St. Peter is along highway 169, which runs between the site and the river. The site has a higher elevation than the highway, which allows for a view of the river. Currently the site is an open grass field, with a few wooded areas surrounding the location. Compared with the other two proposed sites, this site does not contain as much wooded landscape.

The proposed site north of Mankato along highway 169 is almost at the same elevation as what the highway. The site does contain clear views to the river, and is embedded inside a natural wooded area. Restrictions to the site include hills bordering the north and south sides of the site.

The proposed site east of New Ulm is a bluff overlooking the river. The site has a clear view to the river, and is located within a natural wooded landscape. The site contains an opportunity for building on an open grass clearing, or the opportunity for building into the wooded landscape. The site has a view overlooking the city of New Ulm. Highways 14 and 15 are traveled less when compared with highway 169.

Proposal

Project Emphasis

The project will emphasize how natural forces and historic architectural ideas will work together to guide architectural design. The project will examine the historic architecture throughout the Minnesota River Valley, as well as the nature of the river and surrounding landscapes. The examination of imported historic architecture will be priority of the examination of natural forces. The utilization of the combined knowledge of the two examinations will influence and guide the design.

Plan for Proceeding

The research and analysis will be derived using the concurrent transformative strategy, which is a mixed method, quantitative/qualitative approach of research. The research will be guided by the examination of historic architectural ideas and natural forces. Both quantitative and qualitative data will be gathered at the same time. The integration of the data will occur at several stages in the process of the research. Analyzing, interpreting and reporting results will also occur throughout the research process.

The quantitative data will include statistical data, which will be gathered and analyzed using searching archival information. Scientific data will also be included in the quantitative research. The scientific data will be gathered through archival records.
The qualitative data of the research will be gathered from direct observation and gathered through archival searches.

Design methodology will be explored by using graphic analysis. The graphic analysis will include the use of an interaction net and venn diagram. The design methodology will also be examined based on language. Philosophical logic will be used to bring arguments forward as evidence, and to make conclusions based from a set of premises. Phenomenology will be used for the examination of objects and events as they materialize in experience.

The documentation of the design process will include photographs of models, scanned images of sketches and other hand drawings, and computer aided drawings and models.

Proposal

Schedule of Work:

Week 1	program research, precedents, site inventory
Week 2	finish program research and site analysis.
Week 3	finish writing program
Week 4	Study functional arrangements Start graphic expression of design concepts
Week 5	Space-planning relationships resolved & organizational patterns clarified.
Week 6	Studies of form and massing
Week 7	Relationships in vertical section; structural and systems concepts established. Movement/circulation systems resolved; Interior/exterior character sketches started.
Week 8	Material studies & initial exterior elevation studies; Elevation studies & perspective sections.
Week 9	Wall sections resolved & detailed material studies complete.
Week 10	Thesis mid-term reviews with primary & secondary critics; all key design decisions have been made.
Week 11	Revisit all design issues addressed above, especially site/context; structural/HVAC layouts.
Week 12	Interior space studies & character sketches finalized.
Week 13	Storyboard the layout of final presentation graphics
Week 14	start presentation boards
Week 15	Work and finish presentation boards & models.

Proposal

Previous Studio Experience

Second year:

Fall semester: Nadja Palenzuela
- Abstract examination of spatial relationships

Spring semester: Bakr Aly Ahmed
- Retirement community – group project
- Addition for Trinity Lutheran Church, Edinburg ND
- Hotel Tower, restaurant and shopping complex

Third year:

Fall semester: Shannon McDonald
- Architecture studio based from design found in nature
- Elementary School
- Bus stop

Spring semester: Vince Hatlen
- Adobe house
- Montessori School
- Mixed development complex- residential, retail, office

Fourth year:

Fall semester: Tim Kennedy
- urban design
- figure ground studies
- redevelop a portion of Minneapolis along the Mississippi river

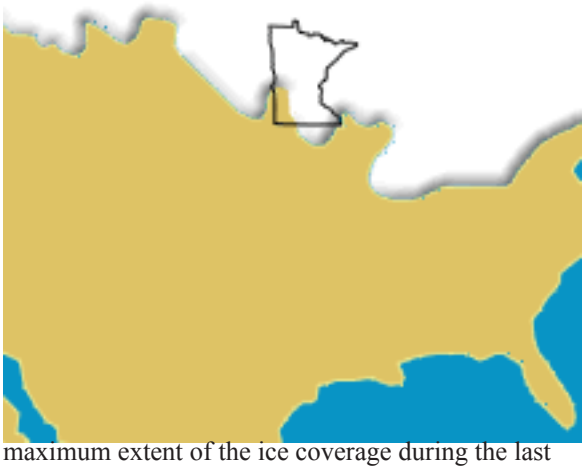
Spring semester: Frank Kratky
- Bioclimatic high rise
- Marvin windows competition – NDSU Downtown building

Fifth year:

Fall semester: Steve Martens
- Fargo City Hall, Civic Center and Winter garden facility

Theoretical Studies

Glacial River Warren



maximum extent of the ice coverage during the last glaciation

total area covered by Lake Agassiz, about 123,500 square miles

scale of River Warren compared to the present day Minnesota River

During the ice age, the climate was colder and glacial ice covered a large portion of North America. There were four major periods of glaciation where glaciers advanced and retreated across the landscape.

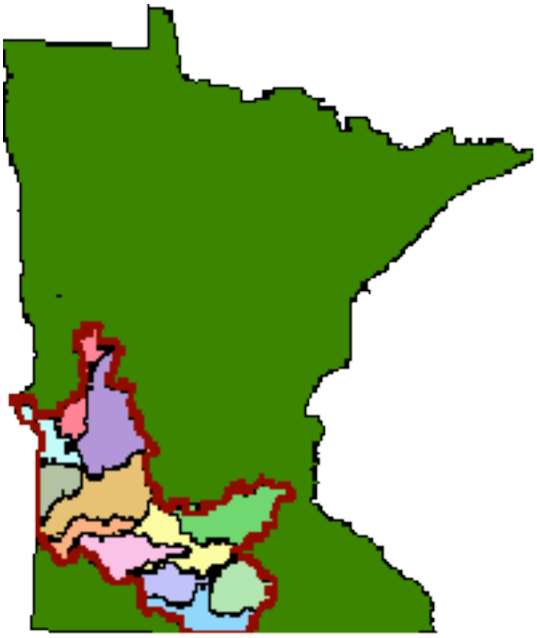
The most recent glacial advance, called the Wisconsin Glaciation, spanned from about 100,000-10,000 years ago. Throughout the Wisconsin Glaciation, lobes of glacial ice pushed in different directions across Minnesota's landscape. The landscape we see today is dramatically shaped by these glaciers.

About 12,000 years ago, the glaciers melted back to the topographic divide (near the North Dakota/South Dakota border). Glacial meltwater was trapped and accumulated, creating Lake Agassiz. To get an idea of the immense size of Lake Agassiz, it was bigger than all of the present day Great Lakes combined.

Lake Agassiz drained in a variety of directions over the years. From 11,500-11,000 and 9,900-9,200 years ago, Lake Agassiz drained through the Minnesota River Valley. Lake Agassiz overtopped a moraine dam (near present day Browns Valley) and an outlet river was created. This outlet, called Glacial River Warren, drained south and carved the Minnesota River Valley. The Valley ranges from one to five miles wide, and from 75 to 200 feet deep.

From time to time these glacial lakes overflowed, and cut huge river channels. At its highest level, Glacial Lake Agassiz crested a moraine at Brown's Valley and spilled over to become the Glacial River Warren. Its bed continues to drain the surrounding uplands, though the water volume of today's Minnesota River is a fraction of the original flow. Consequently, the broad river valley and high stream terraces, remnants from long ago, dwarf today's river.

Minnesota River Basin



area of land draining into the Minnesota River

The Minnesota River drains approximately 17,000 square miles of land in Minnesota, Iowa and South Dakota. In Minnesota it drains about 15,000 square miles, within 37 counties. The Minnesota basin is subdivided into twelve major watersheds covering about 9,570,000 acres. The predominant land use within the river basin is used for agriculture.

Annual precipitation ranges from 22 inches in the northwestern part of the basin, to 32 inches in the southeastern part. Variations in runoff amount occur in different parts of the river basin due primarily because of the patterns in precipitation, land use, slope steepness, soil freezing, and soil recharge in the different areas of the basin. Due to a steeper landscape and wetter climate, soils in the eastern part of the basin are more erodible than in the western part of the basin.

The Minnesota River is ranked as one of the top twenty rivers in America which is seriously threatened by pollution. Pollutants of concern in the Minnesota River basin include bacteria and other disease causing organisms, suspended sediments, excess nutrients, and decaying organic matter, which is responsible for producing low levels of oxygen. These pollutants come from a variety of sources including runoff and erosion from agricultural fields, stream banks and stream channel scouring, city streets, construction sites, feedlots, and waste matter from wastewater treatment plants and septic systems.

There are about 179 municipal wastewater treatment plants and 103 industries in the Minnesota River basin, which discharge significant quantities of phosphorus. It is estimated that there are also 30,000 septic systems in the basin which illegally discharge bacteria and pathogens directly to tile drains, ditches, and streams.

-Pathogens - (bacteria and viruses) that cause disease

-Sediment - (suspended soil particles) makes rivers look muddy and turbid, restricts the ability of fish to spawn, limits biological diversity, and carries phosphorus into the river.

-Phosphorus - stimulates the growth of algae. As algae die and decompose, oxygen levels in the water are lowered, which may kill fish and other aquatic organisms.

-Nitrogen - affect drinking water. At high enough concentrations, nitrate-nitrogen can cause infants who drink the water to become sick.

Geology of the Valley

Glacial Sediments in the Minnesota River Valley

Kasota Limestone

The Minnesota River Valley is one of the few valleys in the United States with such varied and dramatic geological history. The Valley has broad terraces of rock, sand, and gravel that occur at heights of up to 150 feet above the river.

Gneiss outcrops along the Minnesota River Valley date back 3,600 million years. Gneiss is a metamorphic rock formed when granite and other rocks were subjected to intense heat and pressure within the earth, causing a chemical and structural change.

Early precambrian, about 4,500 - 2,500 million years ago, are Minnesota's oldest rocks. Lower precambrian rocks lie in alternating belts within the Canadian shield, which underlies the northern half of the state and much of the Minnesota River Valley. The belts consist of volcanic and sedimentary rocks. Granitic rock materials usually lie in the areas between the belts. Deep seated volcanic magma came up to the planet's surface and formed the granites which are common in Southern Minnesota around 3.9 billion years ago.

Between Kasota and Mankato, there is a rock terrace one and a half miles wide and more than eight miles long, that contains a fine grained dolomitic limestone that is yellow and yellowish pink in color. Variation in color and finishes does occur from quarry to quarry. Thirty five miles upstream from Mankato lies a quarry of precambrian rock. These rock are red quartzites, sandstones, and conglomerates. Other quarries within the Valley consist of pink granite with medium grained texture, dark igneous rock, and red biotite granite.

Limestone quarries were in operation as early as 1854. Quarzite was first quarried at New Ulm in 1859, and later quarried elsewhere in southwestern Minnesota. The dolomite quarries at Kasota opened in 1868, and have continued large production of a variety of stone.

The dolomitic limestones quarried and fabricated in Southern Minnesota are about five hundred million years old. The stone distinctiveness is its magnesium rich property that produces a stronger, less porous, abrasion resistant limestone.

German Immigration

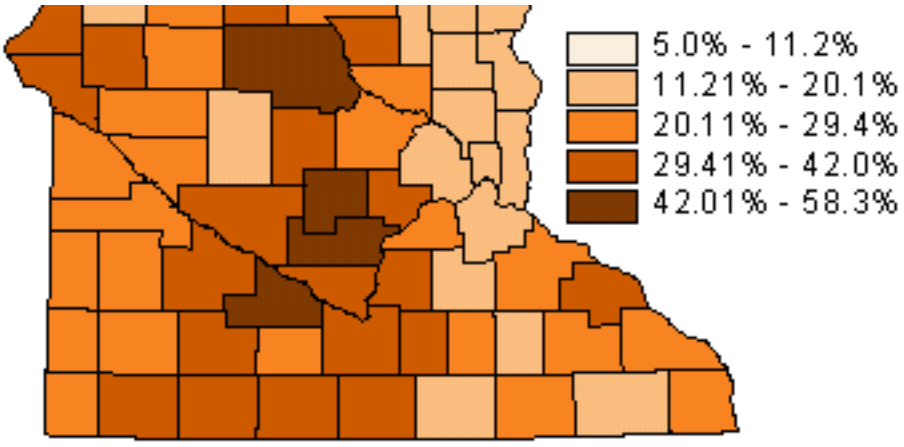
There are many reason why people left their homes in Germany to come to the United States. German immigrants had been leaving Europe and coming to the United States since it was a colony of Great Britain. Many of the early immigrants came to the United States in search of religious freedom, and later as a result of the Napoleonic Wars (1796-1815). Individuals sought freedom from military involvement and political oppression.

German individuals were arriving to the United States and setting as far west as the midwestern states of today. Their reasons for leaving Europe for these new homes in the United States are varied. One reason was the development of the mechanized manufacturing of goods throughout Europe. Increasing industrialization and the use of machines to perform tasks previously done by manual labor threatened cottage industries and drove many individuals to the city in search of employment. The cities quickly became overcrowded and the availability of jobs in the city also declined, forcing many to return to their homes in the rural areas or to migrate to the United States.

Particular states had departments of emigration whose job was to advertise the particular state, and persuade new settlers to come there. Minnesota Territory, for example, established Eugene Burnand as the territory's first Commissioner of Emigration in 1856. Burnand, from an office in New York, advertised Minnesota through pamphlets, immigrant newspapers, and persuasive speeches made to the new immigrants as they arrived at the ship docks. Through his work, Burnand brought many new immigrants to the territory, particularly individuals of German extraction. German migration to Minnesota was at its peak during the decades of the 1860s and 1870s.

German immigrants were determined to retain as much of their homeland as they could by bringing along their language, customs and culture. German immigrants clung to their heritage, which influenced the surrounding American culture to adopt many of the German traditions.

Percentage of Population with German Ancestry



German Architecture

Post Office, 1910

August Schell House

For thousands of years Granite fieldstones and outcrops had been used for the construction of houses in the mountainous areas of southern Germany. When the Geramns found the same kinds of rock in Minnesota, they knew exactly how the material was to be used. The first buildings the Germans constructed in Minnesota were based on local materials found in the area.

Early German immigrants failed to display any distinctive German architectural style. The early buildings and houses that were built by the German immigrants did not contain any distinct features that made them different from what other settlers were constructing. After 1870, new German immigrants brought with them the desire to closely follow the German way of life.

After the Sioux uprising, the Germans started to construct more brick housing inplace of the wooden homes that were burned during the conflict. Brick was a traditional German material, and after the uprising, the new style of constuction was based on the German Gothic tradition.

The greatest of Minnesota's German mansions is the August Schell house, built in 1885. The house design is influenced by the German Gothicism style.

The German Renaissance style post office building, constructed in 1910, is the first instance where a government building took a departure in architecture from the normal architecture of government buildings of that time.

A German Town


Hermann Monument


New Ulm's Glockenspiel


Schell Brewery

New Ulm calls itself 'The City of "Charm and Tradition". The city is proud of its German roots, which date back to the mid 19th century. Each year, thousands of tourists travel to New Ulm to celebrate the German heritage festivals and to experience a part of "Germany". Many of the town's historic buildings are preserved, showing the architecture and buildings as they looked when they were first constructed.

New Ulm has been considered, "The Polka Capital of the Nation." Music has always been a part of life in New Ulm, especially with the arrival of the musically-inclined German Bohemians in the 1870s. However, New Ulm took a major leap to national prominence in the 1920s. Better known today as "Old Time" music, polka and German cultural music is still a big part of New Ulm's culture.

On top a hill, overlooking the city of New Ulm, stands a 102 foot tall monument, known as Hermann the German. The monument is a symbol of the town's overwhelming German heritage. It was designed by architect Julius Berndt, and erected in 1897. Hermann is thought to be a heroic figure in German history. Hermann was a freedom fighter for the Germanic tribes in Europe around the time of Christ. The statue is a smaller replica of another monument to Hermann built near the German city of Detmold, which was built in the mid 19th century.

A unique feature to the town on New Ulm is its freestanding clock tower. New Ulm's Glockenspiel is one of the world's few freestanding carillon clock towers. It stands 45 feet tall and its largest bourdon bell weighs 595 pounds.

Another aspect of German culture in New Ulm is the August Schell Brewing Company. The Schell family has been making beer in New Ulm since 1860. The brewery is located next to an artesian spring, which provides the pure water needed for brewing. Schell's is the second oldest family owned brewery in the United States. Some of the original owners were trained at breweries in Germany. Over time, they brought back many traditional German brewing recipes.

Dakota Conflict

The region of the Minnesota River Valley had been the homeland to the Santee Sioux, also known as the Dakota Indians, for more than two hundred years before Americans tried taking over the land. Before Americans settled in the region, the British had established three trading posts along the Minnesota River. The indian tribes would trade furs for firearms, metal goods, cloth and many other items the British made available. The Santee were economically dependent of the goods and equipment the British traders supplied, but they still had control of the land. Other then when trading, the Indians had very little contact with the white race.

When the Americans moved into the area, they were interested in trading with the Sioux, but their main desire was possession of the land for future settlement. Through a number of treaty agreements, the Sioux agreed to sell large portions of the land to the American government.

Because of the treaty agreements, the Sioux had surrendered a large part of their land to the white settlers. Altogether, the Sioux gave 28 million acres through different treaties to the settlers. Twenty-one million of those acres resulted from the Traverse des Sioux Treaty of 1851. After all of these treaties were agreed upon, the Sioux, were left with two reservations for the population of 7,000 that lived in Minnesota. Each reservation was only twenty miles by seventy miles.

Through the treaty agreements, the Sioux agreed to purchase goods from the white traders, by using money they were to recieve from the government. They would often purchase the goods before the agreed payments would arrive. When the payments finally did arrive, the white traders would get the majority of the money. The Indians were then left with almost nothing, which caused them much frustration.

The Indians were starving in the summer of 1862, and the government was way behind in their annuity payments. Of course, this was occuring at the same time as the Civil War. The Sioux were being taken for fools by the government and they didn't want to take it anymore. The Sioux Indians knew that the majority of the white men of Minnesota were off fighting in the Civil War. So if they did attack they would be fighting a depleted enemy.

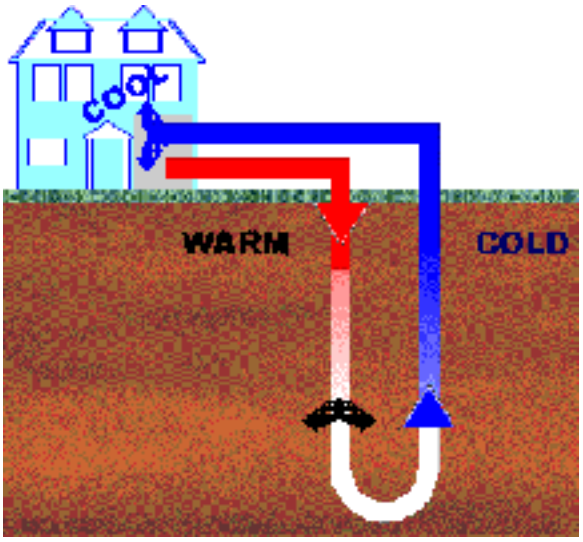
The first attack on New Ulm occurred on August 19th, 1862. Only 42 men had been sufficiently well armed to be assigned to defend the city. Other men, armed only with pitchforks and other crude weapons were to be used in the event that the Indians broke through the first line of defense. Men from nearby towns arrived in New Ulm, forcing the Sioux Indians to give up the on the first attack.

The city was evacuated and a train of 153 wagons carrying women, children and the wounded headed to the city of Mankato. Relief companies were immediately organized and sent to New Ulm. On the 20th of August, the companies arrived in New Ulm and began to heavily fortify the city. Three days later, the Dakota attacked a second time. Although most of the town was burned, the settlers managed to hold them off.

Demoralized, the Dakota fled, but they had done plenty of damage. Many settlers were dead or wounded and the town of New Ulm had been reduced to rubble. The only area of the town still standing at the end of the battle was the two block area the settlers had fortified.

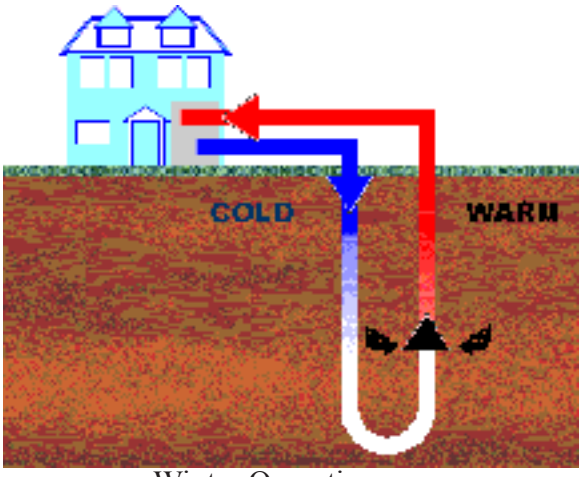
Geothermal

Building temp: 68
Outside Air temp: 95
Ground temp: 55



Summer Operation

Building temp: 73
Outside Air temp: 20
Ground temp: 55



Winter Operation

Geothermal Heating and Cooling Systems provide space conditioning heating, cooling, and humidity control. Geothermal Heating and Cooling Systems work by moving heat, rather than by converting chemical energy to heat like in a furnace. Every Geothermal Heating and Cooling System has three major subsystems, a geothermal heat pump to move heat between the building and the fluid in the earth connection, an earth connection for transferring heat between its fluid and the earth, and a distribution subsystem for delivering heating or cooling to the building.

For heating, heat is extracted from the fluid in the earth connection by the geothermal heat pump and distributed to the building Cooler air from the building is returned to the geothermal heat pump, where it cools the fluid flowing to the earth connection. The fluid is then re-warmed as it flows through the earth connection. In cooling mode, the process is reversed. The relatively cool fluid from the earth connection absorbs heat from the building and transfers it to the ground.

Geothermal heating and cooling systems for large commercial buildings, such as schools and offices, often use multiple heat pumps, usually one for each classroom or office. The heat pumps are attached to the same earth connection by a loop inside the building, which allows each area of the building to be individually controlled. The heat pumps on the sunny side of the building may provide cooling while those on the shady side are providing heat. This arrangement is very economical, as heat is merely being transferred from one area of the building to another, with the earth connection serving as the heat source or heat sink only for the difference between the building's heating and cooling needs.

Geothermal

Geothermal systems use the earth as a heat source and heat sink. A series of pipes, commonly called a "loop," carry a fluid used to connect the geothermal system's heat pump to the earth.

Horizontal Closed Loop

Horizontal closed loop installations are generally the most cost-effective for small installations. These installations involve burying pipe in trenches dug with back-hoes or chain trenchers. Up to six pipes, usually in parallel connections, are buried in each trench.

Vertical closed loops are used in most large commercial buildings and schools because the land area required for horizontal loops would be too large. Vertical loops also minimize the disturbance to the existing landscape. For vertical closed loop systems, a U-tube is installed in a well drilled 100 to 400 feet deep. Because conditions in the ground may vary greatly, loop lengths can range from 130 to 300 feet per ton of heat exchange. Multiple drill holes are required for most installations, where the pipes are generally joined in parallel or series-parallel configurations.

Vertical Closed Loop

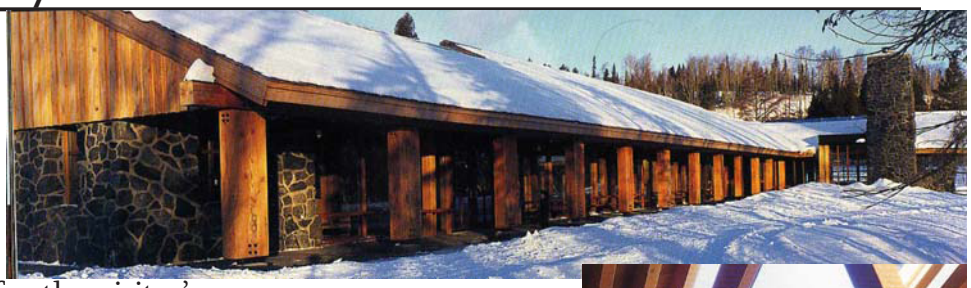
Geothermal heat pumps are much more efficient than air source heat pumps because earth temperatures are much more uniform through the year than air temperatures. They are also environmentally-sensitive, comfortable, and economical. Operating savings often provide considerable payback in less than five years.

The key is that geothermal heat pumps use electricity to move heat, not to generate it by the burning fuel or using electric resistance elements. Indeed, the U.S. EPA has found that no other technology with more favorable operating efficiencies and economics than emerging geothermal heat and cooling systems

Case Studies

Gooseberry Falls State Park Visitors Center

Two Harbors, Minnesota
David Salmela



The major design inspirations for the visitor's center were the elements of nature.

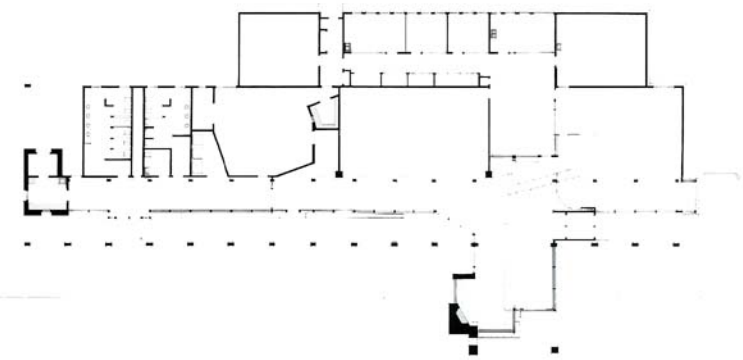
The broad gable roof almost comes to the ground along the back side of the visitor's center, which shields the building from the road and gives it the low hanging feel from the surrounding coniferous trees.

A series of timber columns creates a colonnade that leads you to the main hall, which mimics the tree lines through the adjacent forest.

The columns stand off the ground and bolted to steel plinths, to create the feeling as if the earth has risen to meet the building or the ground around it has eroded.

Black terrazzo floors inside connect to the bluestone paving outside, which is to remind us of the black soil below, the product of centuries of fallen leaves and decaying trees.

The main hall has a timber framed gabled roof with a long steel beam that supports a triangular truss, which allows light to come in where it almost never does, at the roof edge. The sky lit ridge produces an open feeling, helping the occupants feel the outdoors at the center of the room.



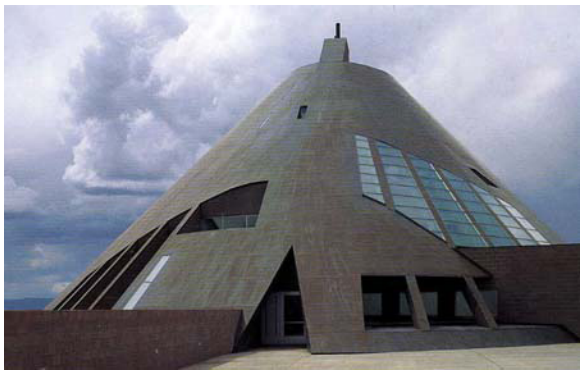
Project Relevance:

The fact of having a design emphasis based on bringing the outside elements into the interior of the building. within the building. By using materials and unique building structural systems, the building is used to portray elements and feelings not normally expressed by building systems. The metaphors created by the design are not of literal design, but requires a deep sense of feeling connected with the structure to get the full meaning of the design implications.

American Heritage Center

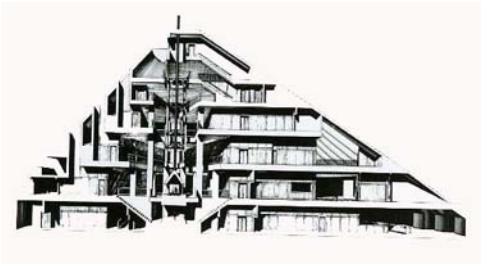
University of Wyoming, Laramie
Antoine Predock

The appearance of this “archival” mountain can be thought of as being a parallel to the slow but certain geologic upheaval of the nearby mountain ranges.



The asymmetry of the building’s stretched side guides visitors to a common ground between the American Heritage center and the University Art Museum, which make up the two halves of the building.

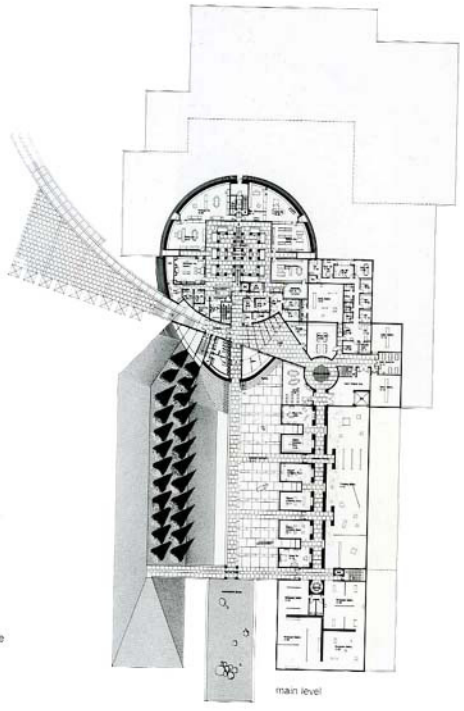
The art museum is to be a reminiscent of a village at the foot of a mountain. If reflects the quality and characteristics that were found in the historic villages that were found in the area.



The link that connects the two halves of the building is called the “rendezvous axis” because it is seen as a meeting place, similar to those of Native Americans, French trappers, and early European settlers. Now it is a place of intellectual and social gatherings.

Project Relevance:

The design of the building is to represent and give a meaning towards the natural landscapes found in the region around the building. The design is based on historical facts of the area, and tries to represent and recreate some of those same influential features in the building. The relevance that the building contains two dissimilar activity sets, but through the design of the building is able to function and work well together.



U.S Naval Academy Visitor Center

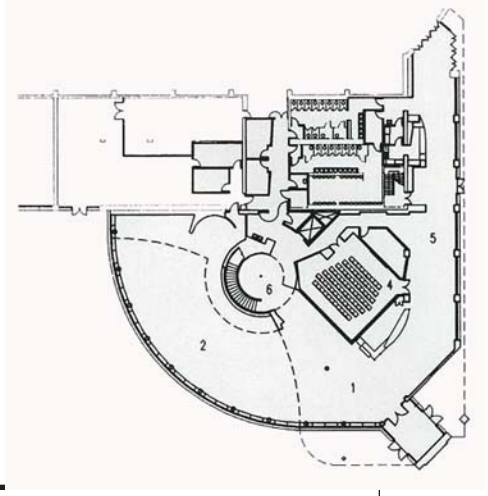
Annapolis, Maryland
Cochran, Stephenson & Donkervoet

The main design ideas of the visitor center are the features found through out that are intended to represent certain characteristics found within a ship out at sea.

The nautical representations are a little more literal than other designs, which is a little different approach than making the occupiers think and interpret what the building is trying to communicate.

On the first floor, a custom designed teak and granite information desk serves as the starting point for tours, and represents a ship coming to port. The retail area continues the nautical theme with its two story trussed wall mimicking a ship's structure while attatched light fixtures represent booms and rigging. Another representation is the wood plank flooring like a boat deck set along sea blue carpet.

Other design elements inside the visitor center include a glinting terrazzo floor in the rotunda that imitates the sweep of a sonar screen. The ceiling above the circular staircase is a stylized version of a compass rose, with lights and recessed sprinkler heads demonstrating cardinal and quarter points. An outdoor balcony off the second level projects over the entrance like the prow of a ship.



Project Relevance:

The project has an emphasis that is based on a reoccurring theme that can be found through out the entire building. The idea of creating a building based on a nautical theme, to make the occupiers of the interior spaces feel as if they are actually out on a boat at sea. The design of the building had specific goals of creating a wanting the visitors of the building to get a certain feeling and communication from the building.

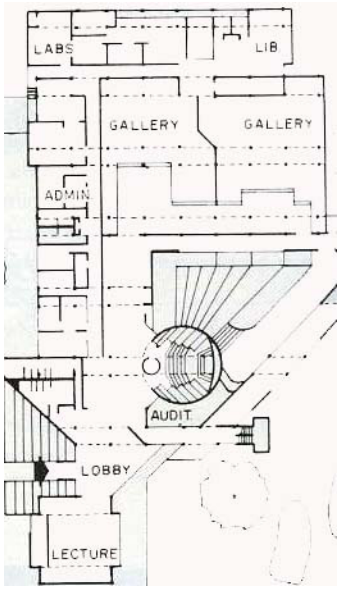
DeSoto Visitor Center

Missouri Valley, Iowa
Neil Astle Associates

The visitor center is designed for a 7,800 acre wildlife refuge, that stretches across the Missouri River between Iowa and Nebraska. The structure is designed to provide education for the public about ecology of the river, and the important archaeological find of the steamboat Bertrand, which sank nearby in 1865.

To help make the structure be harmonious with the site, the design made ample use of wood infill panels and earth beams. The design also divids the building into several parts, which is to reduce its scale. The berms are also important in helping the building retain heat and deflect north winter winds. Large glass areas face south and act as solar collectors during the winter months. In summer, the building is cooled with water from the lake.

Visitors are directed along a carefully planned route through the building. In the lobby, views of the lake are arranged with displays and exhibits about the excavated steamboat. The offices, labratories, and the library are arranged around the exhibition spaces on the north and west sides of the building.



Project Relevance:

The design had a goal to make use of the structure to help communicate the intended purpose of the facility. The design also placed a significant amount of detail in creating the building as one with the site, and surrounding environment. Another important feature is how the building uses key views of the natural environment and landscapes as factors influencing the design of the building. The design took advantage of views in an area to enhance the design of the structure, as well as enhancing the experience of the visitors of the facility.

Tamarac Interpretive Center

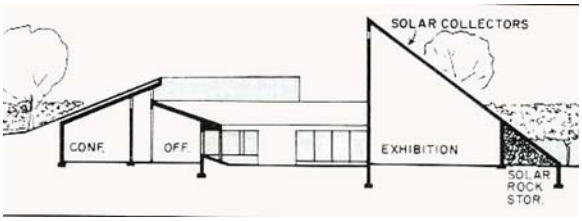
Rochert, Minnesota
Leonard Parker
Associates

The center is designed for the visitors of the Tamarac Wildlife Refuge. The design features natural red cedar siding, and earth berms along the north and east walls. The L - shaped plan has a dominant element at one end, which features a steeply pitched roof over the exhibit space to act as a beacon in the forest.

The building is designed to be extremely energy efficient through the use of earth beams as insulation, and the south facing windows in the office space as solar collectors. Solar panels are also installed on the south facing roof of the exhibition space.

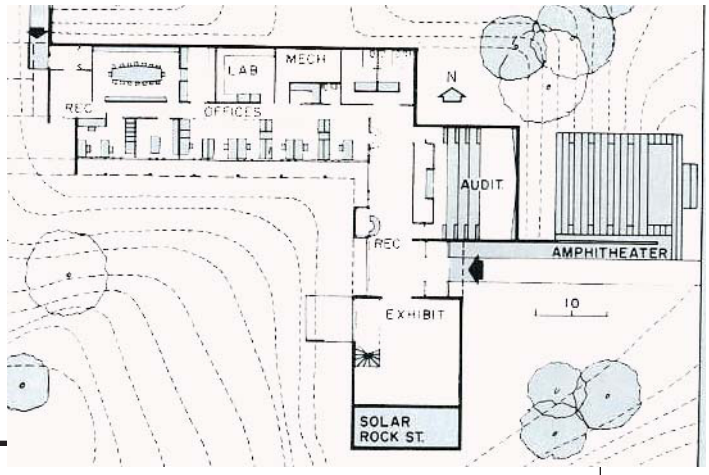
In the summer, the building is cooled by purging daytime heat from the building at night from a rock storage area at the base of the roof. The primary source of heat is a wood burning furnace.

The earth berms shelter the outside of the L shaped plan and are stepped near the entrance to provide an outdoor theater. Glass walls on the inside of the building open over views of the adjacent marshland.



Project Relevance:

The design of the project has a major emphasis on incorporating natural features in the building. The building uses many natural systems for heating, cooling, and for producing power. The design incorporates the building into the site and surrounding context, as if to make it one with the site. The design also alters the surrounding natural environment as little as possible.



The National Center for Atomospheric Research

Boulder, Colorado
I.M Pei

The design of the building is to bring science and architecture together. An important of the design is that the architecture of the facility is to represent the process of scientific discovery. The process of scientific discovery can be described as an accidental process, full of surprise meetings among data, people and ideas.

Chance encounters are stimulated by the design and layout of the structure. The design also encourages random interaction, provides more than one path through the building, and for the building to be very flexible.

A major design criteria is to maximize usable wall space for bookcases and blackboards, which resulted in minimizing the use of windows throughout the building. The design allows the natural environment to penetrate into the interior of the facility. The design does not compete with the natural beauty of the surrounding landscape, but acts as one with the surrounding context.

Project Relevance:

The design of the building is based on ideas that are not from an architectural background. The building's architecture represents the purpose and activities included in the building. The building is isolated by itself, completely free from surrounding built structures and other buildings. The design incorporates the natural environment, and emphasizes the aspect of bringing nature into the interior of the building. Another important factor of the design was to create a building to blend in with the natural beauty of the surrounding context.

Case Study Summary

The case studies show the importance of incorporating the surrounding natural environment into the design of the project. It is important and beneficial to use the natural landscape, and creates many positive design opportunities in a project. The designs emphasize the feelings people get from experiencing natural landscapes, and continues to create those same feelings in the interior of the structures.

Another important factor brought out by the case studies is the aspect of using the environment for natural heating, cooling, and for electricity. Many design solutions can incorporate systems that use the environment in a sustainable and economical way.

The case studies showed how different materials and building systems can be used to represent factors found in nature, or found in other built environments. The representations can be of a more literal fashion in communicating feelings and meanings to the occupiers of the space. The representations can also be more figurative, causing the occupiers to think and feel what the space is trying to communicate to the users.

Site Analysis

Climate

Characterized by warm, humid summers and cold, dry winters

Winter:

	Degrees F
Average Temperature	17
Average Daily Minimum Temperature	8

On average, the sun shines 45 percent of the time

Summer:

Average Temperature	71
Average Maximum Temperature	83

On average, the sun shines 65 percent of the time

Annual Precipitation – 28.6 inches

Thunderstorms occur about 38 days each year

Average Snowfall – 40 inches

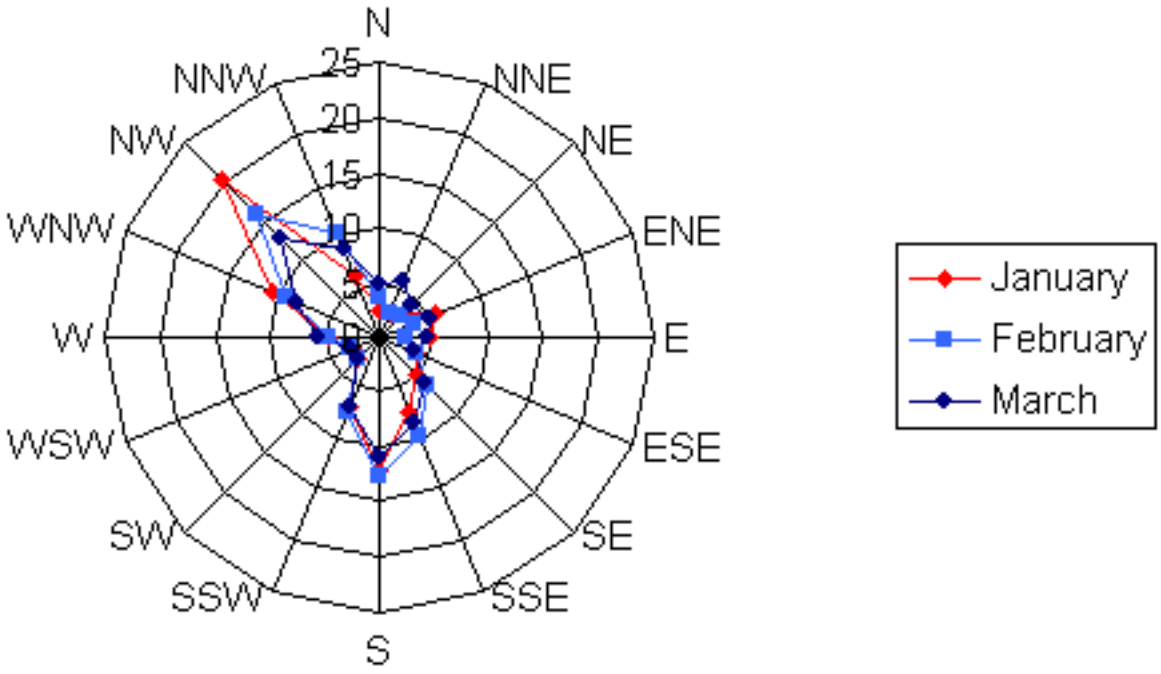
Prevailing winds are from the northwest

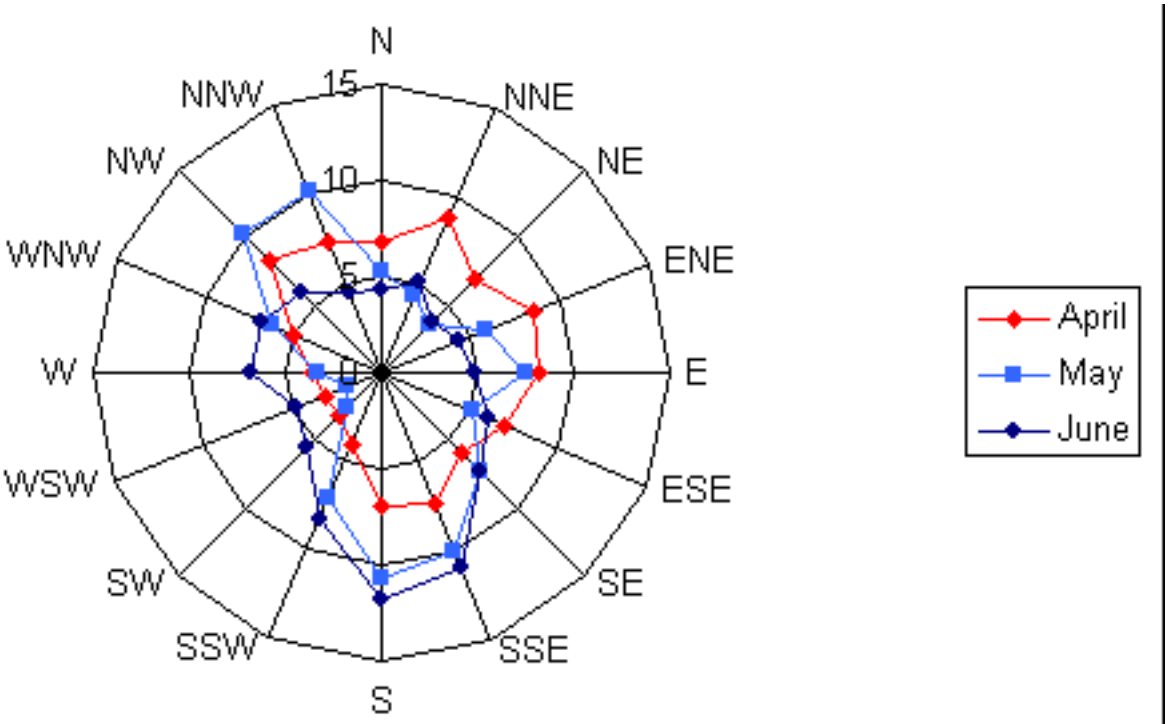
	Temperature						Precipitation			
				2 years in 10 will have--		Average		2 years in 10 will have--		Average
Month	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	number of growing degree days*	Average	Less than--	More than--	number of days with 0.10 inch or more
	°F	°F	°F	°F	°F	Units	In	In	In	
January---	22.6	2.7	12.7	47	-28	0	0.79	0.16	1.25	2
February--	29.4	8.7	19.1	52	-25	0	.86	.35	1.32	3
March-----	41.2	21.4	31.3	73	-10	20	1.68	.69	2.37	4
April-----	58.9	36.1	47.5	88	16	86	2.44	1.36	3.48	6
May-------	72.3	47.6	60.0	93	27	323	3.66	1.86	5.08	7
June------	81.0	56.7	68.9	96	39	567	3.93	2.06	5.22	7
July------	85.3	62.0	73.7	98	47	735	3.79	1.69	5.31	6
August----	82.9	59.7	71.3	96	43	660	4.01	2.10	5.57	7
September-	73.8	50.3	62.1	93	31	363	2.87	1.50	4.20	5
October---	62.1	39.5	50.8	86	19	131	2.15	.76	3.39	5
November--	43.0	25.5	34.3	69	-2	0	1.41	.33	2.26	4
December--	28.3	11.0	19.7	54	-21	0	1.04	.40	1.63	3
Yearly:										
Average--	56.7	35.1	46.0	---	---	---	---	---	---	---
Extreme--	---	---	---	100	-29	---	---	---	---	---
Total----	---	---	---	---	---	2,885	28.63	22.90	34.04	59

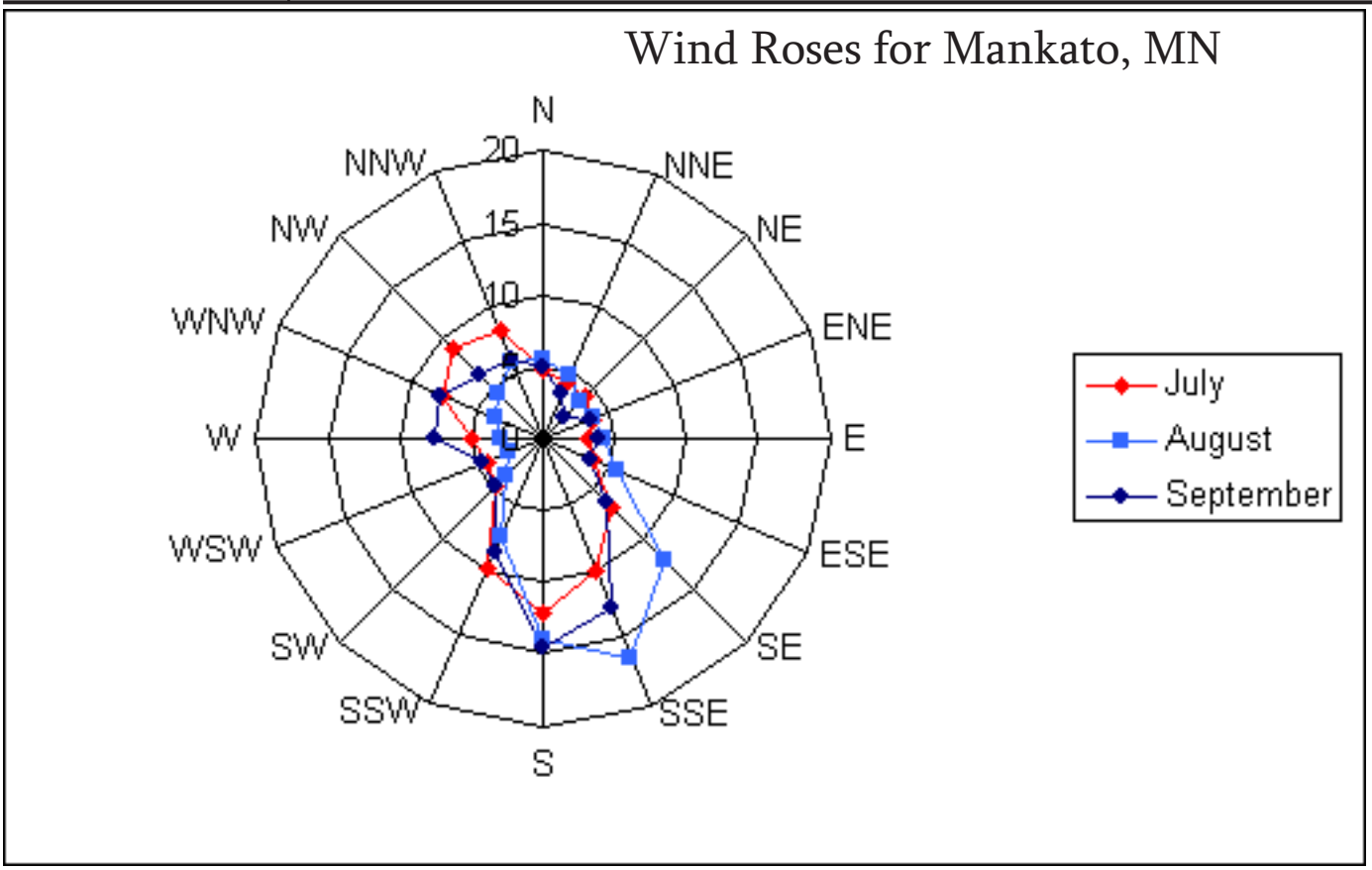
Climate

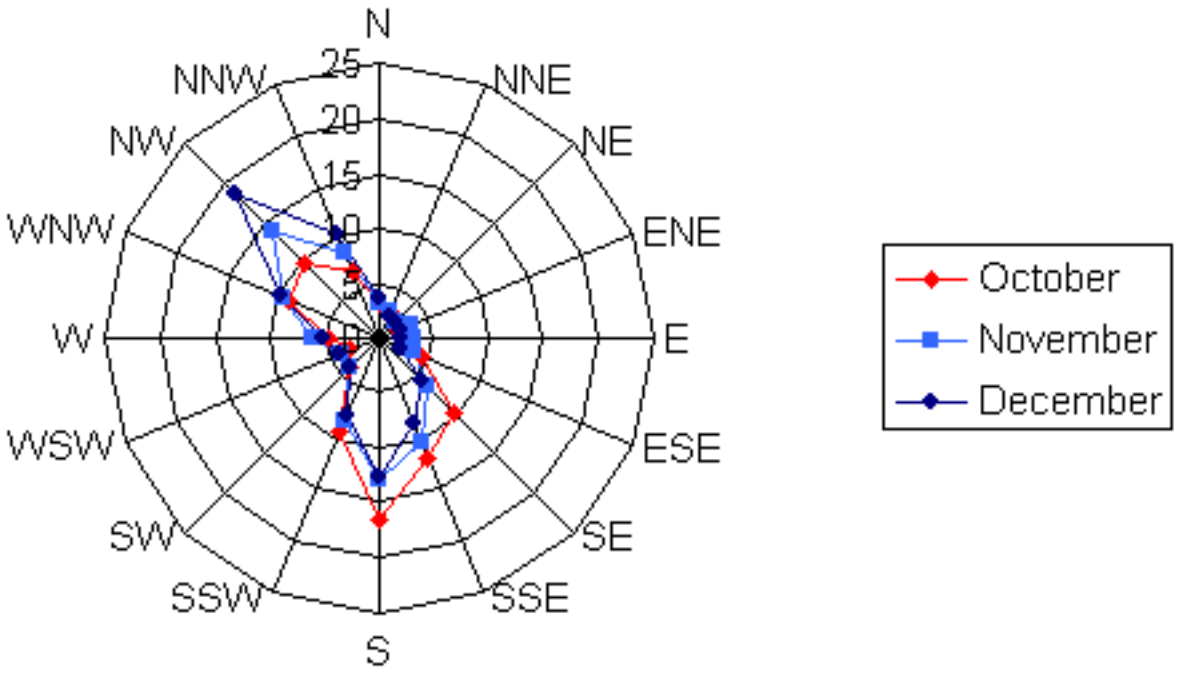
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Wind Speed	10.5	10.4	11.3	12.2	11.1	10.4	9.4	9.2	10.0	10.6	11.0	10.4	10.5
Clear Days	8.0	8.0	7.0	7.0	7.0	7.0	10.0	10.0	10.0	10.0	5.0	6.0	95.0
Partly Cloudy Days	7.0	7.0	7.0	8.0	9.0	10.0	12.0	11.0	8.0	7.0	6.0	6.0	101
Cloudy Days	15.0	14.0	17.0	15.0	15.0	12.0	9.0	10.0	12.0	14.0	18.0	18.0	169
Percent of Possible Sunshine	53.0	59.0	57.0	58.0	61.0	66.0	72.0	69.0	62.0	55.0	39.0	42.0	58.0
Avg. Relative Humidity	57.0	72.0	71.5	68.0	64.0	66.0	68.5	70.0	72.0	71.0	69.5	73.0	75.0
Days with Max Temp of 90 F or Higher	0.0	0.0	0.0	< 0.5	1.0	3.0	6.0	3.0	1.0	0.0	0.0	0.0	13.0
Days with Min Temp Below Freezing	31.0	27.0	25.0	11.0	1.0	0.0	0.0	0.0	0.0	8.0	23.0	30.0	156

Wind Roses for Mankato, MN






Wind Roses for Mankato, MN
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
20
15
10
0
July
August
September


N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
25
20
15
10
5
0
October
November
December

Soils

The site's soil consists mainly of the Lester Loam, 2-6 percent slope category

Typical Profile

0-9 inches- very dark brown, friable loam
9-16 inches- dark brown, firm clay loam
16-40 inches- dark yellowish brown, friable clay loam
40-60 inches- light olive brown, friable, mottled calcareous clay loam

Soil Properties

- Well drained
- Moderate permeability
- High available water capacity
- Moderate organic matter content
- Medium surface runoff
- More than six feet to water table

The site has Fertile soils which supports a variety of vegetation and large wildlife populations.

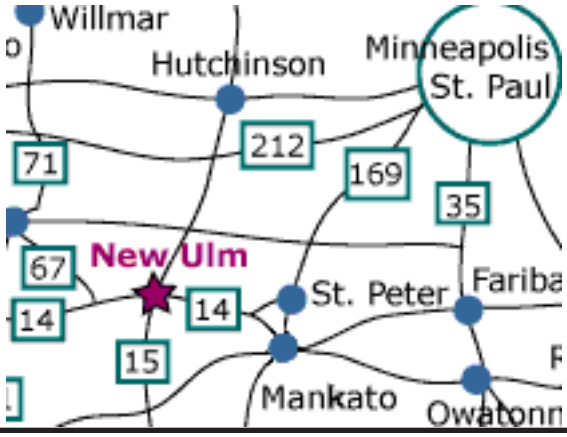
The most popular wildlife in the region for hunting and trapping are pheasants, cottontail rabbits, squirrels, muskrats, raccoons, fox, waterfowl, and whitetail deer.

Proposed Site One

The first possible site is located right outside of New Ulm, on top a bluff overlooking the Minnesota River. The site is located near the intersection of Highway 14, and Highway 15, which are two heavily traveled highways in the New Ulm area.

The site would be accessible directly off of Highway 15. The site would be visible from both major highways. The area of the open field part of the site measures approximately nine acres.

The bluff the site sits on is about one hundred eighty feet higher in elevation than the elevation of the Minnesota River.

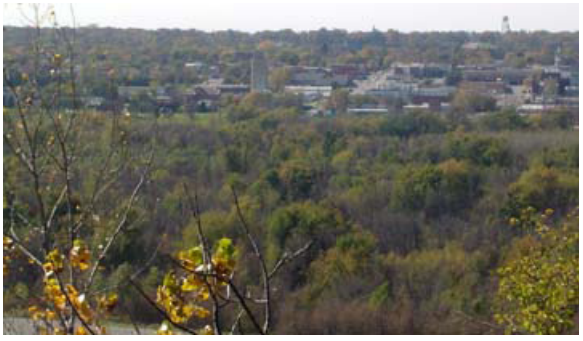


A site near New Ulm is proposed because of the strong historical influences of the Minnesota River Valley contained within the city and surrounding region. The city is a strong tourist attraction in the area, and the proposed project would enhance the region's tourism.

Proposed Site One

view of the site

view of the Minnesota River from the site



distant view of New Ulm from the site

The site offers a view of the Minnesota River, the surrounding natural landscapes, and a distant view overlooking the historic city of New Ulm.

Located on the site is an open grass field that is next to a natural wooded area, which is also part of the proposed site. The site is bordered by Highway 15, a wooded area, a bluff, and a small camping area located right next to the site.

The site used to contain a mobile home village. The site has since been cleared to form the open grass field, and the small camping area.

The small camping area located next to the site will provide an extra opportunity for visitors of the proposed project to continue enjoying the natural landscape of the area and a chance to experience the aspects of the region that will be introduced through the center.

The large wooded area included on the site, equipped with walking and hiking trails, will give the opportunity for visitors to fully experience some of the natural landscape, vegetation and wildlife in the area.

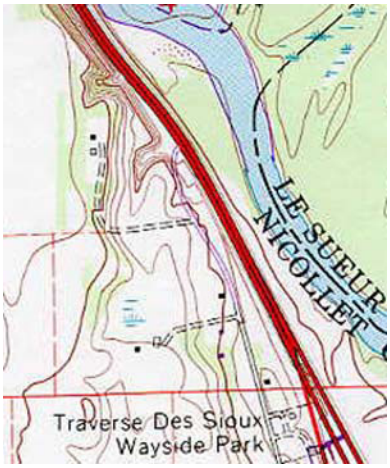
Utilities such as electricity and sewer are accessible to the site. Electrical lines run near the site, and sewer lines were used when the site was used for a mobile home village. The site's large area creates a good opportunity to use the ground for geothermal systems for the building.

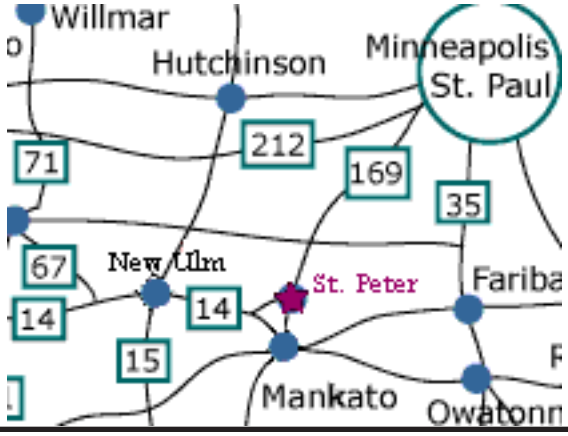
The major design opportunities of the site include the ability to obtain distant views of the river and surrounding region, having a large wooded area along the site full with natural vegetation, wildlife and landscapes, and being able to design with a large open site.

ProposedSite Two

The second proposed site is located just north of the city of St. Peter. The site is located along Highway 169, a major highway between Mankato and the twin cities. The site would be accessible and visible from the highway. The area of the open field site measures approximately three and a half acres.

The site has an elevation that is only about thirty feet higher than the elevation of the river. Overall, the site is fairly flat, with the grade sloping slightly towards the river.

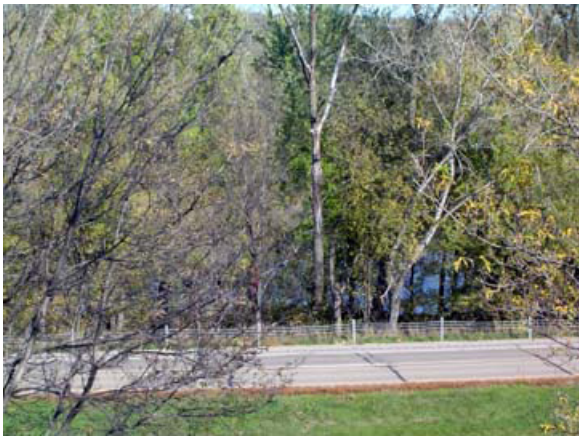




A site near St. Peter is proposed because the natural landscapes of the valley have not been greatly influenced or altered from building or urban expansion currently common in metropolitan areas. The site is also located along a major highway connecting southern Minnesota with the twin cities.

Proposed Site Two

view of the site



view of the river from the site

view of the site

The site is mainly an open grass field, with a small wooded area surrounding one part of the site. The site does offer a view of the Minnesota River, but it is obscured slightly by a tree line between the river and Highway 169. The view of the river will only be hindered by the tree line while on ground level. Being in the building one or two stories off the ground level will allow for clear view over the tree line of the river landscape.

The small wooded areas surrounding the site will provide an opportunity for visitors to see some of the natural vegetation found in the area, but is not large enough to allow for any trails or paths through the wooded area.

The site is located near the Traverse de Sioux History Center, which is classified as a Minnesota State Historic Site. The site was the location of the signing of a treaty between the Sioux Indians and the European settlers. The history center includes walking paths explaining the Indian culture, the 1851 Treaty and its effects on the area.

Being the site is located very close to the city, full utilities will be easily accessible to the site. The utilities, such as electricity and sewer will be tied into the city of St. Peter's utility pipe lines.

The major design opportunities of the site include the site is an open field with the grade sloping towards the river, having a slight view of the river and surrounding landscape, having some natural vegetation and wooded areas along the site, and the fact the site along a major transporation connection to the twin cities metropolitan area.

Programmatic Requirements

Activity Sets

Lobby/Reception
- welcome visitors into the building
- have space available for seating
- reception desk and work area

Theater/Auditorium
- show videos
- have lectures or presentations

Museum/Exhibits
- display artifacts
- explain facts and history

Gift Shop
- souvenirs, memorabilia, other items for sale
- source of revenue

Observation Areas
- view the river and surrounding environment
- indoor and outdoor areas

Administration
- oversee and run the facility
- maintain the facility

Library
- house information pertaining to the Minnesota River Valley
- provide access to research material

Laboratories
- to conduct tests on the river environment
- study issues concerning the river

Research Offices
- conduct research
- maintain the research department
- house staff

Space Allocation

Interpretive Spaces

	Square Feet
Lobby/Reception	650
Theater/Auditorium	2,000
Museum/Exhibits	10,000
Gift Shop	700
Indoor Observation area	500
Outdoor Observation deck	1,000
Total	14,850

Administration

Conference room	400
Lounge/lunchroom	300
Secretary	350
Lobby	100
Storage	200
Offices:	
Director	250
Museum Curator	200
Staff 4@200	800
Maintenance office/storage	400
Total	3,000

Research

Library Collections	2,000
Offices	500
Storage	200
Research rooms	750
Library total	3,450
Science Laboratories	
Labs 3@1000	3,000
Lab Offices (3@300)	900
Storage	300

Space Allocation

Staff Offices		
5@250	1,250	
Lounge	250	
Research Total	9,150	
Unassigned Functions	TBD	
Total		27,000
15% Circulation	4,050	
10% Mechanical	2,700	
Building Total		33,750 sq ft

User Behaviors and Expectations

Behaviors/Expectations

The spaces of the museum, auditorium, and observation areas will be used primarily by public visitors. These spaces will be used as the interpretive features included within the facility. These spaces will be expected to convey the significance and meaning of the Minnesota River Valley region. The users of these spaces can expect to come away with a greater understanding and a greater sense of knowledge about the region and the importance of the historical events were in shaping the area to how it is today.

Most of the occupants of these spaces will be one time users of the facility. If people do return to the facility for a second or third time, they can expect to come away from the visit with new meanings and feeling with each experience to the building.

The design of these spaces will take into account personal comfort levels. The occupants may be using some of these spaces for extended periods of time, and can expect to have a constant feeling of overall comfort.

The administrative offices will be used by the staff of the facility. They will be regular, everyday users of the spaces. They will expect to have adequate spaces, and comfort levels to be able to conduct the administrative functions of the building.

The spaces located within the research departments of the building will primarily be used by the same occupants on a regular basis. The users of the research section of the building will expect the spaces to convey organization, efficiency, and sophistication. The users will have set tasks they will expect to have the opportunity to achieve, and will have the expectation the facility will fulfill all the spatial requirements needed to complete the goals set out by the researchers.

The library areas particularly need to give the users a comfortable feeling, for the users may be occupying the particular space for an extended amount of time. The users will expect to have a quiet, professional environment in which to search materials and information regarding all aspects of the Minnesota River Valley. Users can also expect to find a wide variety of information pertaining to the river valley.

The science laboratories will be used by researchers to further study the issues concerning the Minnesota River and its environment. The users of these spaces can expect to have the ability to conduct their research in an organized, clean, and efficient working environment.

Materials, Systems, and Building Design Criteria

Characteristics of Public Buildings

- Occupants in a library often stay in the space longer, and remove outer clothing, such as jackets.
- Many people who visit museums will not remove their outer clothing. The conditions should not vary in temperature or relative humidity.
- Libraries and museums usually have windows, which contribute to heat gain through the sun.
- Care must be taken to minimize the effects of the sun
- In winter, must consider the effects on objects located close to outer walls, such as possible condensation of moisture on the objects and the surface of outside walls must be evaluated.
- Main reading rooms, large entrance halls, and large galleries often have high ceilings that may allow the air temperature to strafity.
- All air systems are preffered in library and museum areas where steam or water may destroy books and exhibits.
- In museums, patron traffic may follow a planned or random pattern. The pattern may affect the type of air conditioning system required.
- People loads will vary.
- Individually controlled zones are required to maintain optimal environmental conditions.
- The temperature and humidity ranges that are best for books and musuem exhibits do not usually fall within the human comfort range. Compensations must be made to balance the value of preserving contents along with providing human comfort, as well as the initial and operating costs of the mechanical systems.
- In an average library or museum, less stringent design criteria are provided than for archival libraries.
- Relative humidity is held below 55 percent, and room temperatures are held between 68 and 72 degrees farenheit.
- Mechanical equipment should be treated with sound and vibration isolation to ensure quiet comfort for visitors and staff.
- Acoustical isolation is necessary to avoid transmitting resonant vibration within exhibits. Sound levels should be low, but not too low as to produce an environment where normal sounds will become irritable.

- In large assembly spaces, the occupants usually generate the major room cooling and ventilation loads.
- Typical minimum ventilation rates range from 15 to 60 cfm per person.
- The desired noise criteria will vary with the type and quality of the facility.
- Transmission of vibration and noise can be decreased by mounting pipes, ducts, and equipment on a separate structure that is independent of the assembly hall.

Materials

The materials that will be used for the project will be based on local materials found within the vicinity of the Minnesota River Valley. A popular material located within the Minnesota River Valley, is the limestone produced from quarries near the town of Kasota. The limestone, also known as Kasota Stone, has been used for buildings and structures for over a hundred years. The feature of Kasota limestone will be a major design element, and used within the design of the project.

The other materials being used in the project will also reflect aspects of the Minnesota River Valley region. The idea to have the feeling that the natural landscape and features found throughout the surrounding context will be continued to be felt inside the building.

Materials and other design features will be used to represent natural landscape characteristics and experiences inside of the building. The materials that will be used to achieve this goal will primarily be of wood, and other "nature like" materials to represent the natural landscapes and qualities found within the Minnesota River Valley.

The materials used in the research and science laboratories will be based on different principals than that of the materials used for the interpretive part of the building. The design of the materials pertaining to the exterior of the building as a whole will be similar, but the interior spaces will be of different materials and necessities.

The research aspect of the project requires materials that will represent a clean and sophisticated interior environment. The science laboratories will require surfaces and materials that will represent quality and durability for the work being conducted.

Systems

The systems used in the project will also be different based on the requirements of each unique space. Providing personal comfort levels within each of the different types of spaces will be a major in the systems development.

A major aspect to consider while designing the interior spaces of the project is the different heating and cooling needs each of the spaces will require. Each space will have different occupancy loads and activity sets. The length of time occupants will spend in the different spaces in the building will vary from day to day, and in some instances, be different from hour to hour.

The overall design will be based on bringing natural daylight into the interior spaces. The bringing in of sunlight and natural daylight will have the tendency to result in the building having higher solar heat gains. The design will have take into account the factor of these heat gains, and counteract the factors these gains will have on the interior spaces.

The design will have to be concerned with minimizing direct sunlight in the museum and exhibition areas due to the sensitivity level of items being displayed. The same concern will have to be addressed within the library. Some materials found within the library may be affected when exposed to direct sunlight.

The design of the auditorium should maximize acoustic quality within the space. The design should also keep outside noise from penetrating the space, while keeping the transference of auditorium noise to the other parts of the building. The transfer of noise will be addressed throughout the entire building, especially between different activity sets.

The idea of using nature for some of the system needs of the building will be incorporated into the design. Using the ground as a source of heating and cooling for the building coincides with the idea of basing the design from elements found within the natural environment of the Minnesota River Valley. It can easily be used to control different heating and cooling needs for the various regions of the building.

The laboratory environments will need to meet certain requirements and criteria in lighting, ventilation, and air quality. All of these factors may be important in the influences they cause on the testing and experiments being conducted in these spaces.

Building Design

The design of the Minnesota River Valley Research and Interpretive Center will be based on a few unifying ideas. One design feature will be the idea of bringing the surrounding natural environment into the interior of the building. The natural landscape of the river valley is an important and beautiful quality to the area, and it is important that the feature continues into the design of the facility.

The history of the river valley is also an important feature to the region. The geological history of how the valley was formed, as well as the social history of how communities and settlements were created along the Minnesota River. Many of the influences from the first settlers of the area are still prominent features in many of the river valley communities. The building design will be based on a few of the key historical influences regarding the Minnesota River Valley.

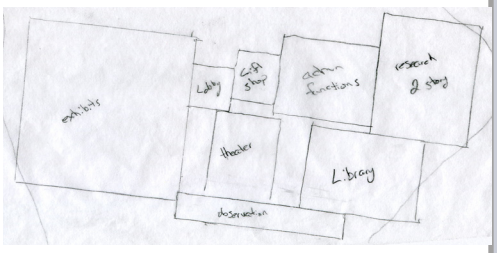
There will be an importance of combining two different activity groups, such as an interpretive center and a research center, and making them emerge together in one facility. The idea will be to keep the activities separate from each other, but to architecturally bring them together in a unifying manner.

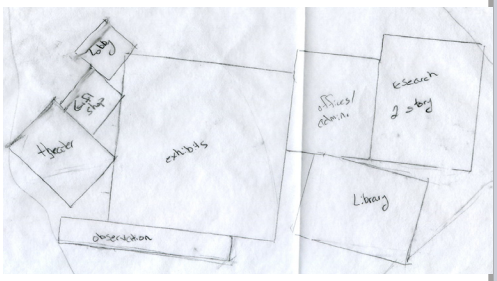
The proposed Minnesota River Valley Research and Interpretive Center will appear as if it belongs to the nature of the Minnesota River Valley. The center will communicate the importance and rich meaning of the region, and will add to the rich value of the area.

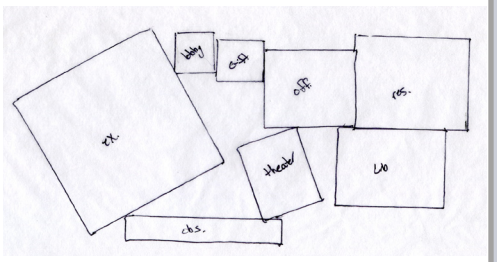
Design Process

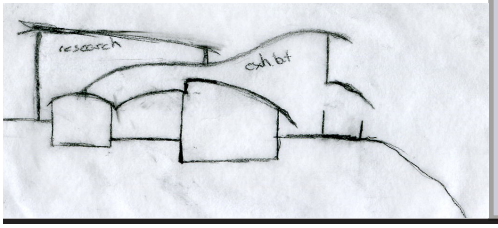
Site Studies

Proposed New Ulm Site





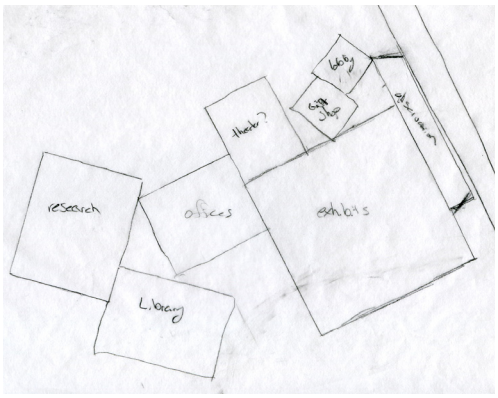


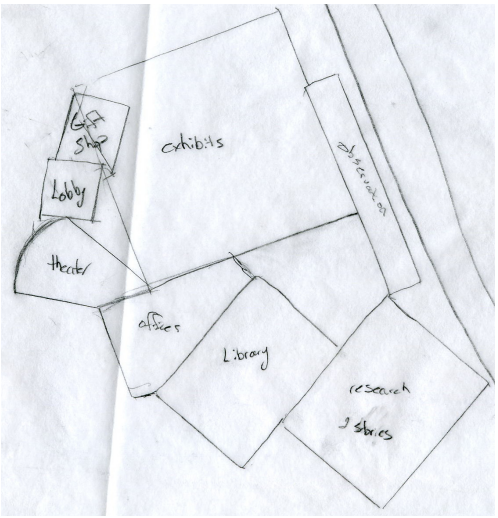


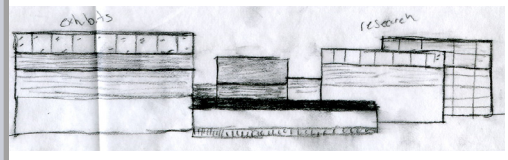
The program called for the study of two possible sites. Studies pertaining to spatial arrangements and site interactions were experimented with on each of the proposed sites.

The analysis of each site conducted in the program was used in examining each proposed site.

Proposed St. Peter Site







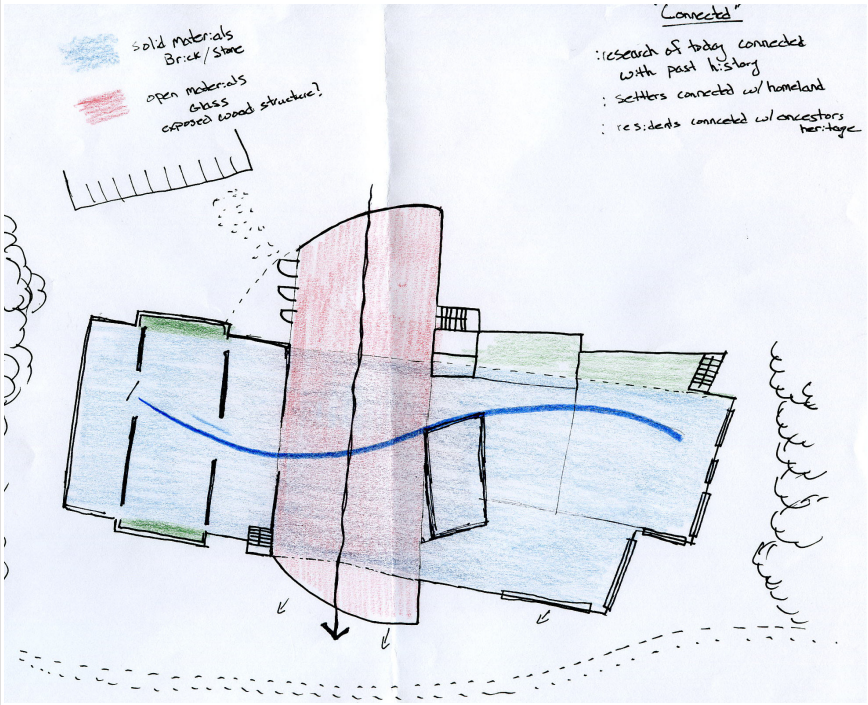
Design Process

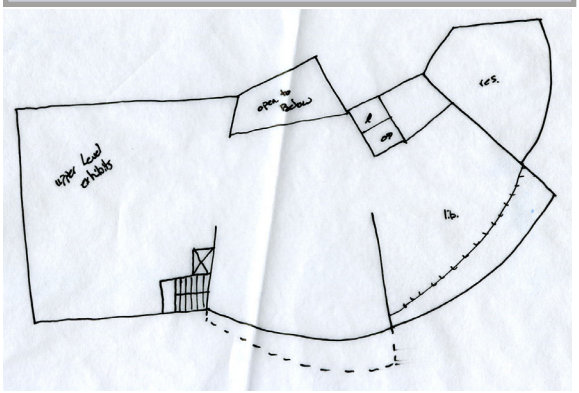
Development

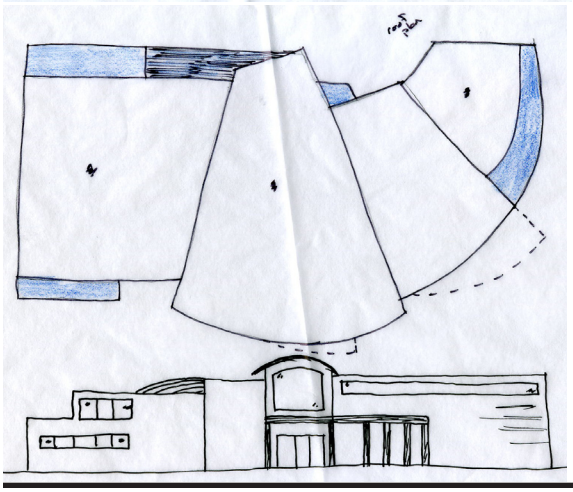
New Ulm site chosen:

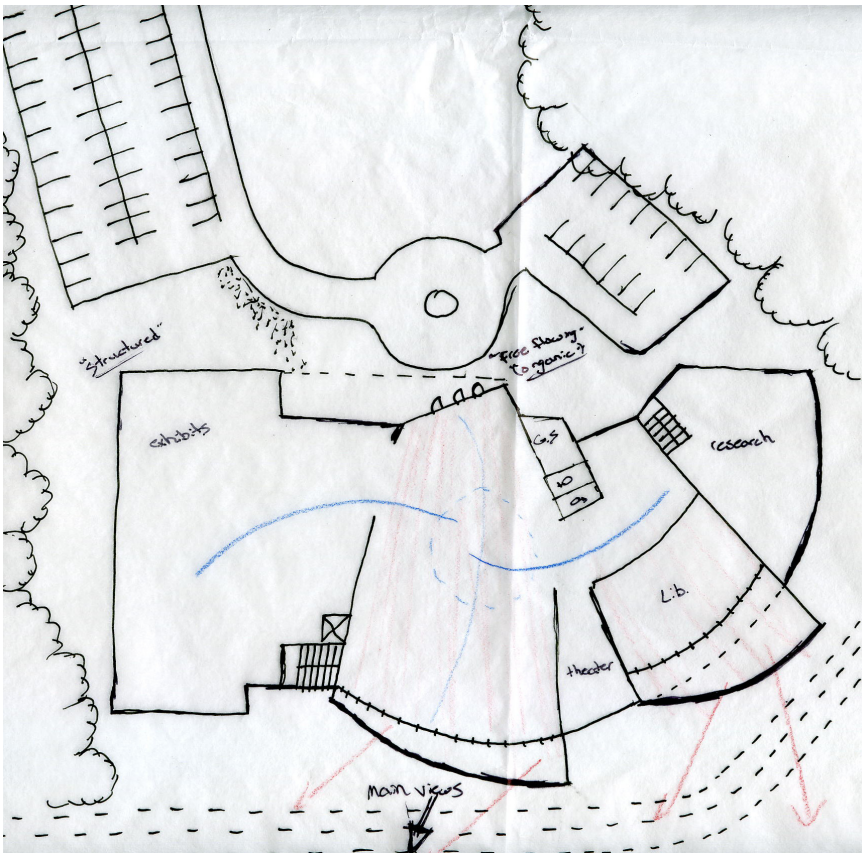
The site was chosen near New Ulm, Minnesota based on the powerful relationship between the river and the valley, and the surrounding natural environment and the landscape. New Ulm also has a strong cultural heritage unifying the history of the region.

The program calls for the integration of these surrounding natural features and the cultural heritage into the design and architecture of the project.





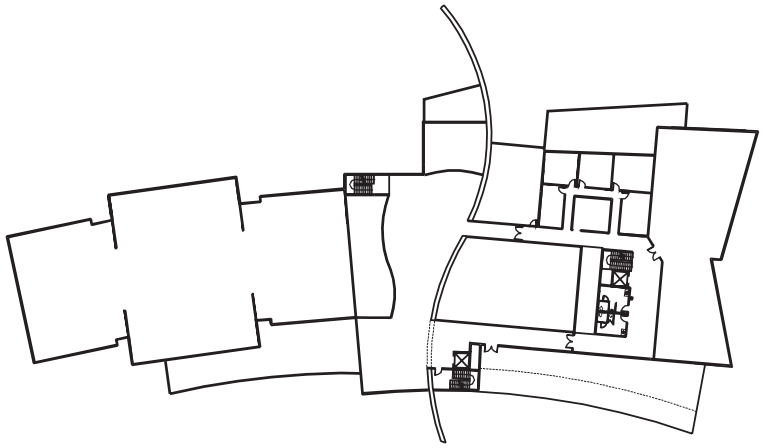


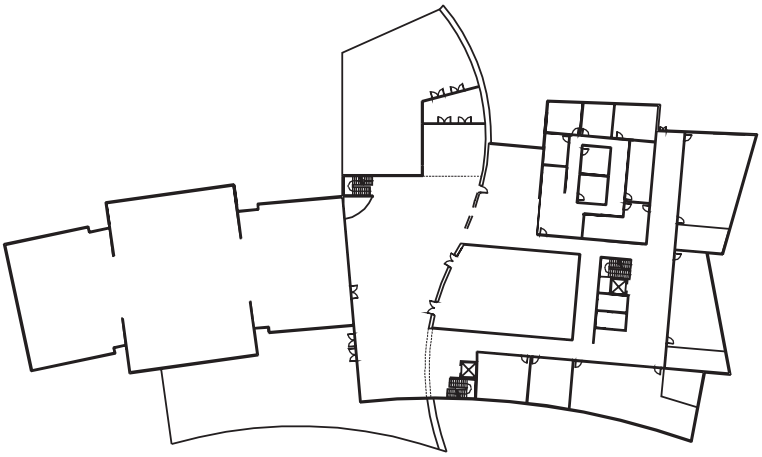


Design Process

Spatial Organization

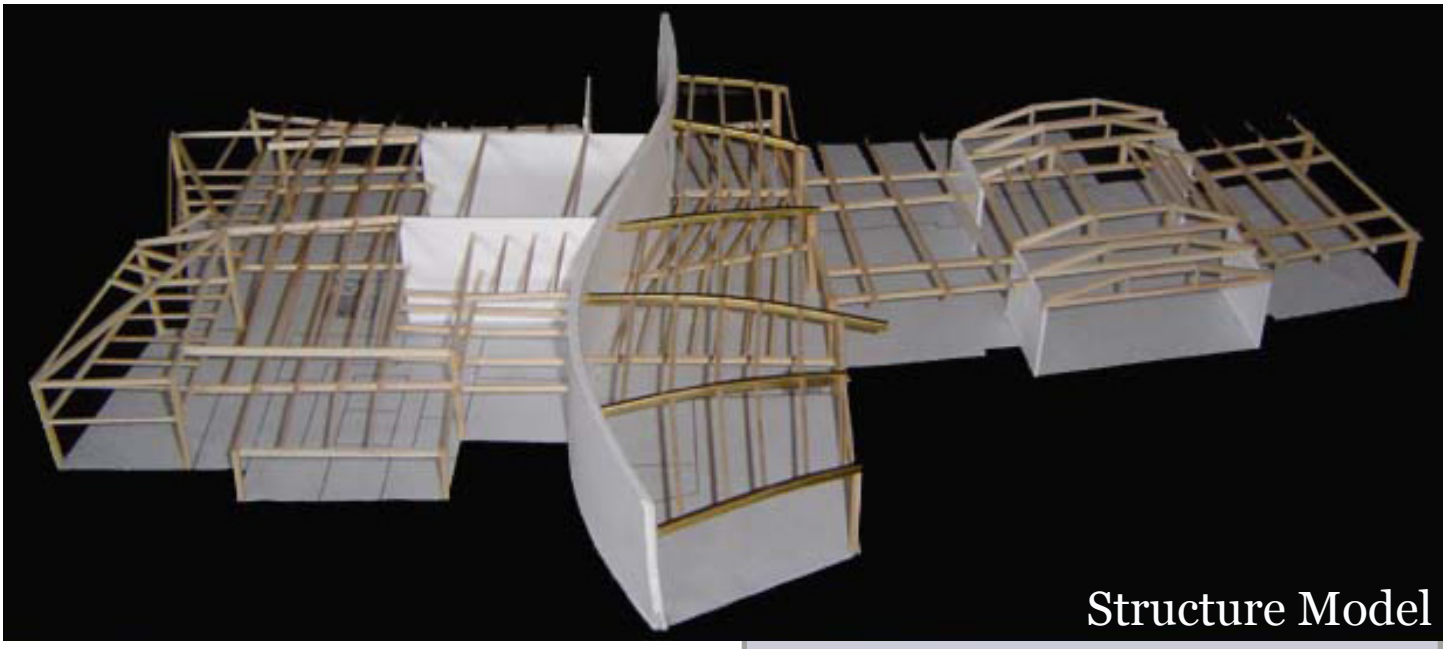
The spatial organization was based on having the interpretive activity sets seperate from the research aspect of the building, while having the main lobby area as the link between the two functions. Forms and arrangements were used to create different levels of energetic feeling throughout the building. The sharp angle and diagonal layouts of the research and library areas were used to create energetic spaces, while the interpretive areas were organized and formed to create a passive and calm feeling. The curve is a representation of the river and valley, forming movement and structure through the building.



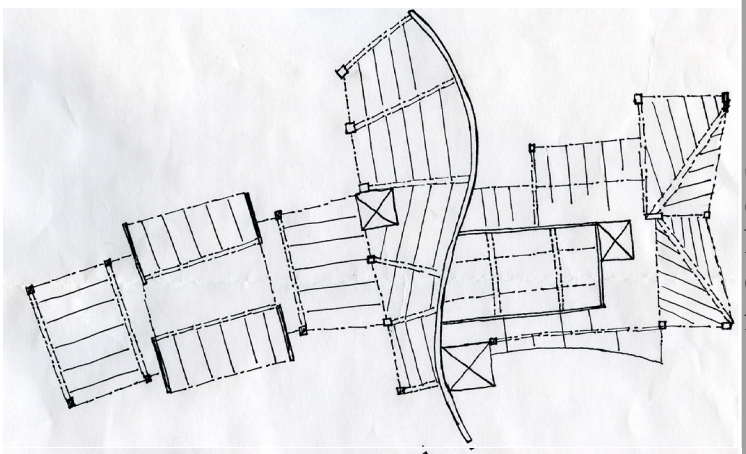


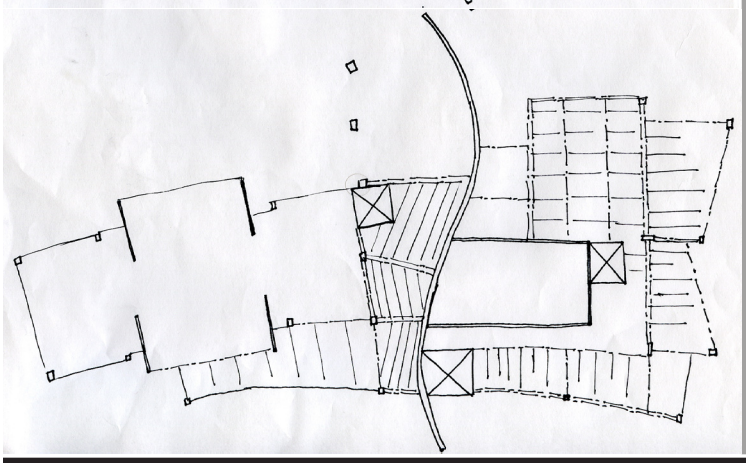
Design Process

Study of Structural Patterns



Structure Model



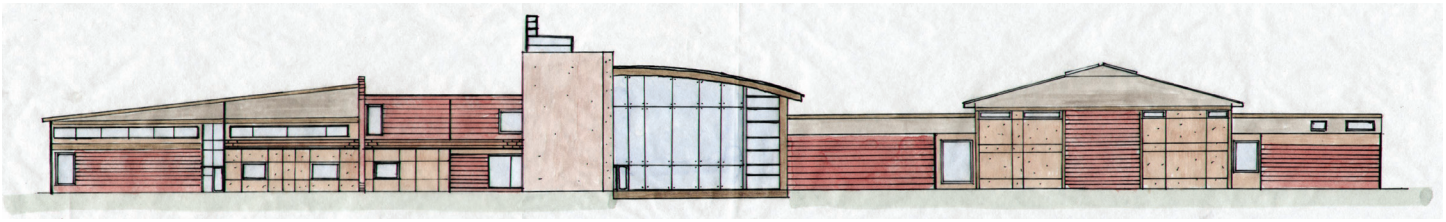


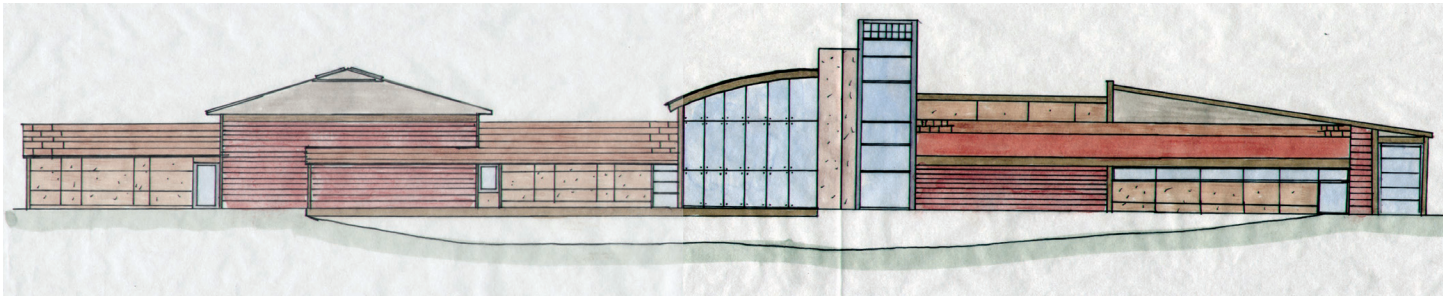
Structural patterns and layouts were studied and examined to create various feelings and energy levels throughout the building. The integrating of different structural heights was used to create feelings of spatial enclosure and openness.

Design Process

Elevation and Material Studies

The elevation studies examine the use of varying masonry materials, combined with the transparent material of glass. The design intent was to express a unity between the various activity sets with the materials used on the exterior of the building. A combination of brick, stone and concrete block was used to form a balance throughout the exterior.

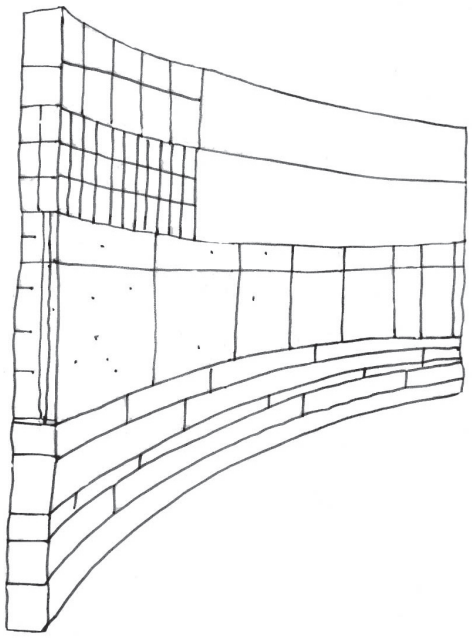


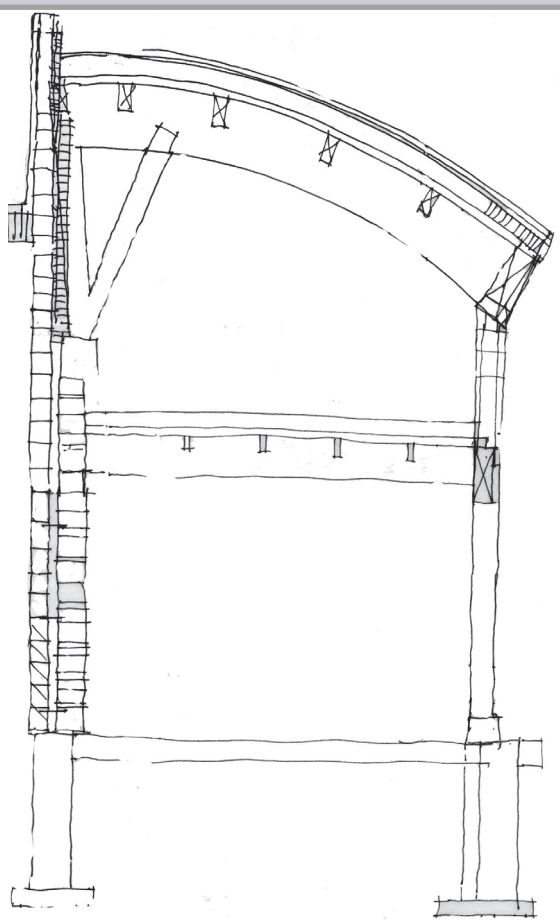


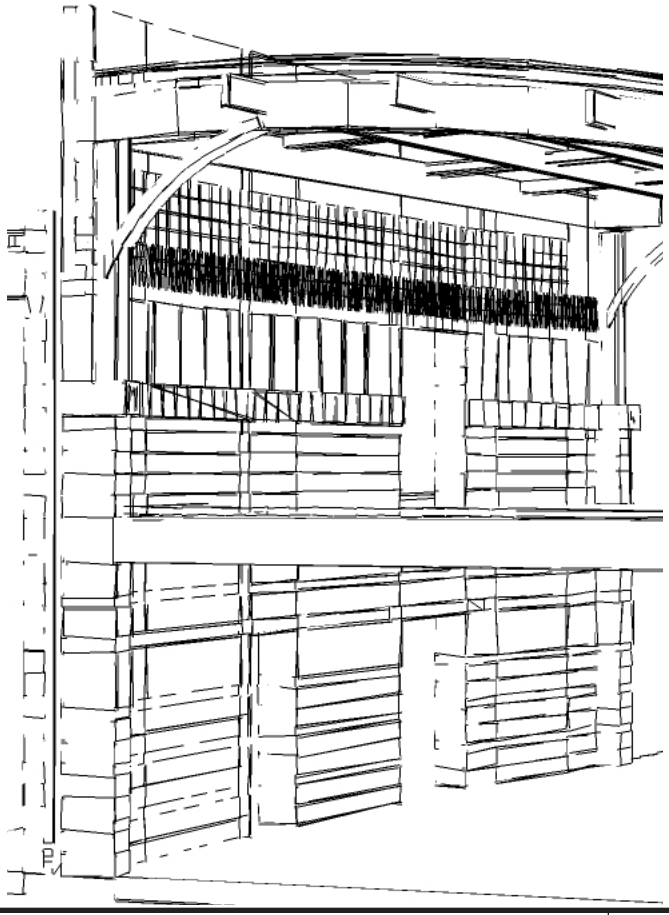
Design Process

Wall Section and Material Study

The wall section sketches show the construction methods and variety of masonry materials used to construct the primary masonry wall, which is orientated through the center of the building. A study of using the variety of masonry materials found locally in the river valley, and the organization of these materials within the wall.







Design Process

Design Influence

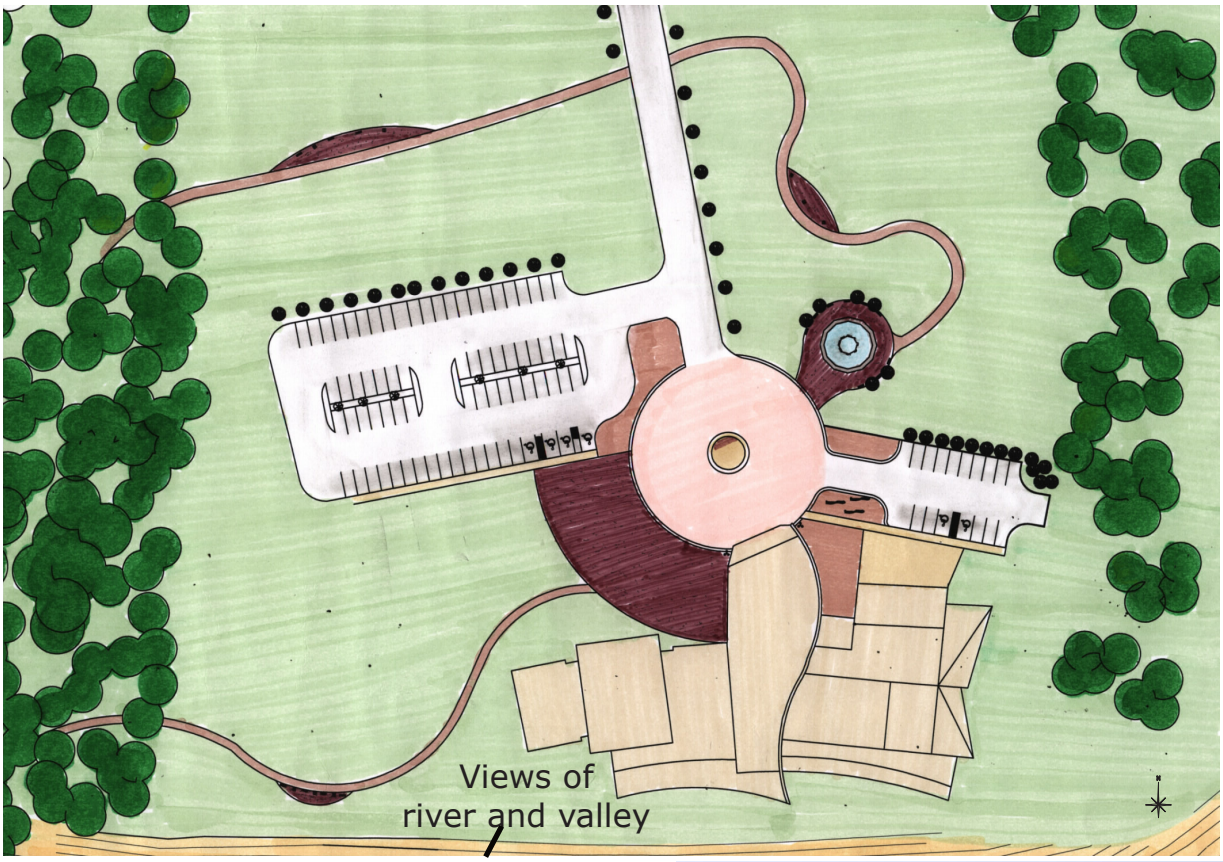
The buiding technique of heavy timber framing using mortise and tenon joints was brought to the area by the European settlers. The early settlers used the building method primarily for barn structures. The construction of the building was a community event, with a big social event when the structure was complete. These building techniques were integrated into the building design, which greatly add to the asthetic and emotional value of the architectural design.

German immigrants to the New Ulm region brought many important European traditions, such as traditional masonry construction, to the area. Based on these imported traditions, immigrants used the geological rock materials found within the region, bringing forth a strong emphasis on detail and ornamentation in masonry design. These same principals and design traditions were incorporated into the design to emphasize the integrity of the building with the surrounding area.

Design Solution

Design Solution

Site Plan



The bluff site allows for views of the valley, the near by city of New Ulm, and the Minnesota River. Walking trails are designed to introduce visitors to natural features found within the valley context. The winding path of the trail is designed to represent the natural, free flowing path of the river.

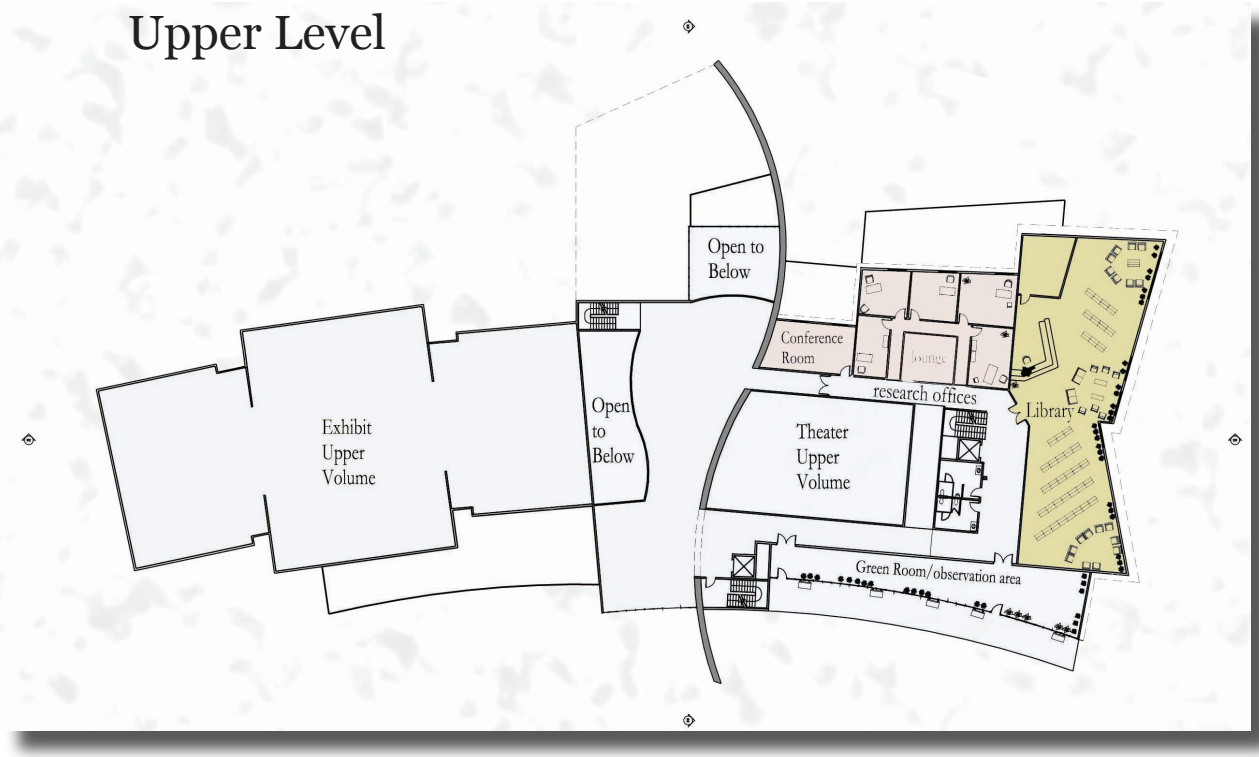
Floor Plans

Private

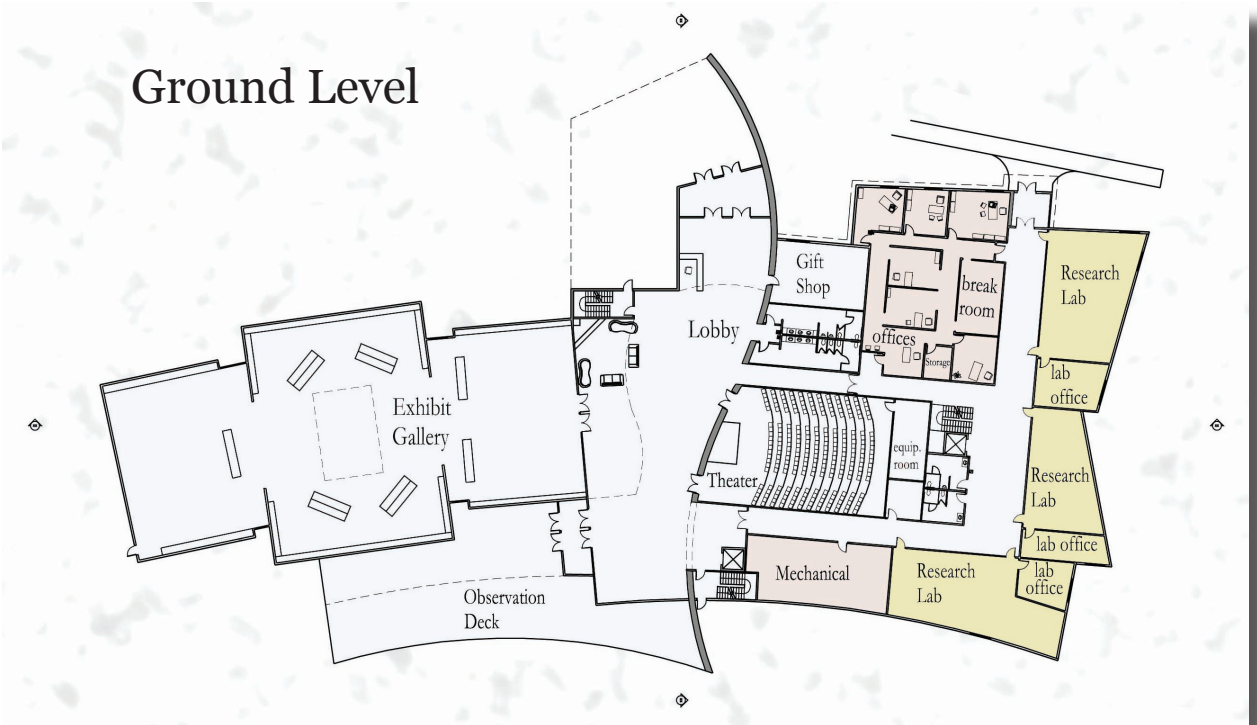
Research

Public

Upper Level



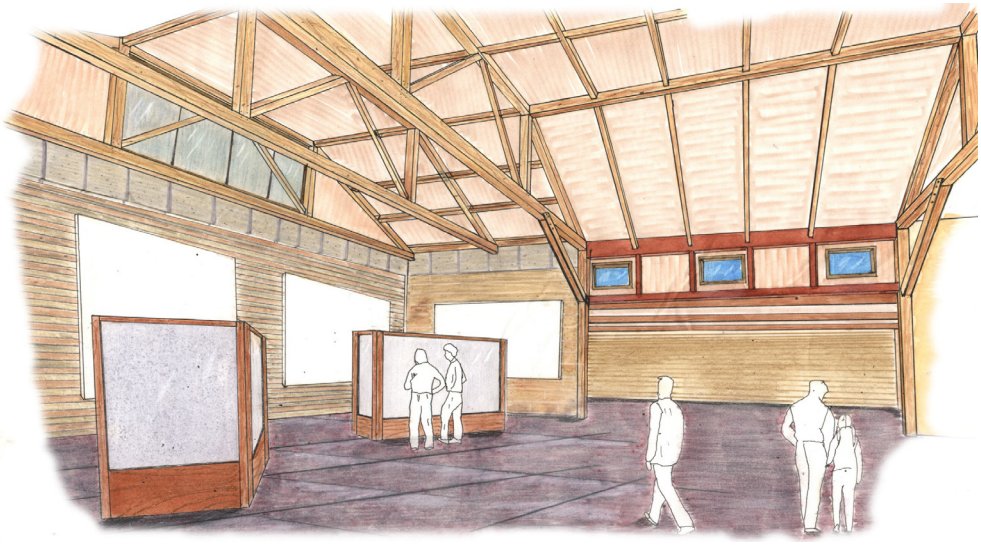
Ground Level



Interior Character

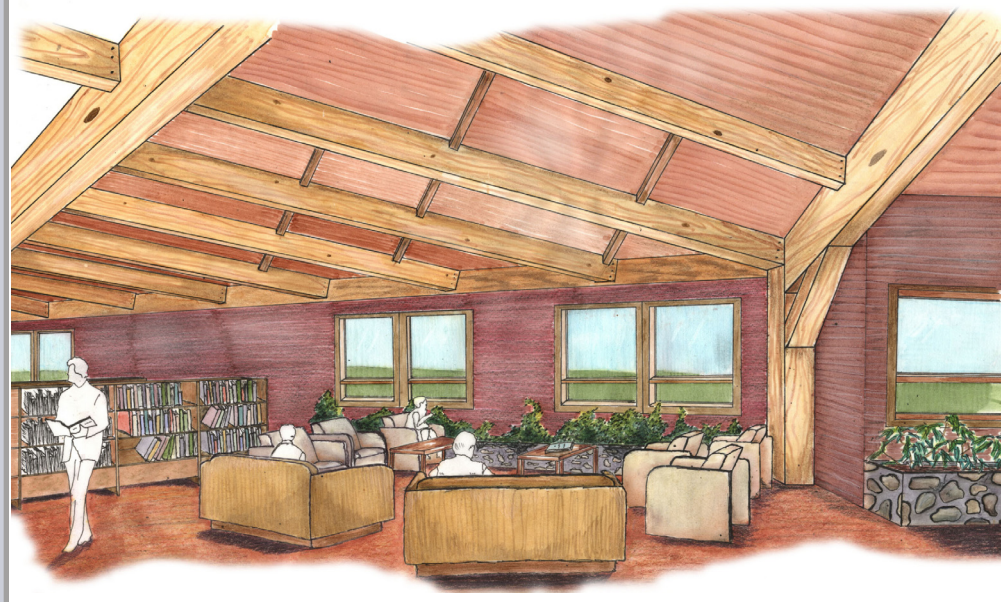
Exhibit

Windows above the galleries allow natural day lighting to enter, and filter through the timber trusses to the exhibit area below. Daylight entering from overhead and the timber frame bring natural elements to the interior spaces. The floor represents the reddish granite that forms the geological floor of the valley. Trusses create a sense of enclosure and transparency while moving through the exhibit area



Library

The Library is characterized by sloping glu lam beams, running diagonally through the space, producing a feeling of energy and integrity. The library is used for obtaining information from written resources. Breakout spaces within the library are designed to allow for gathering and reflection of the material being presented. Views of the river and valley are part of the library experience.



Design Solution

Interior Character

Lobby

The two story volume of space in the lobby links the upper level with the ground floor. Daylight from the clerestory windows is able to penetrate both levels. The fireplace and lounge area is a reminiscence of early ways of living in the area.

Exterior Character

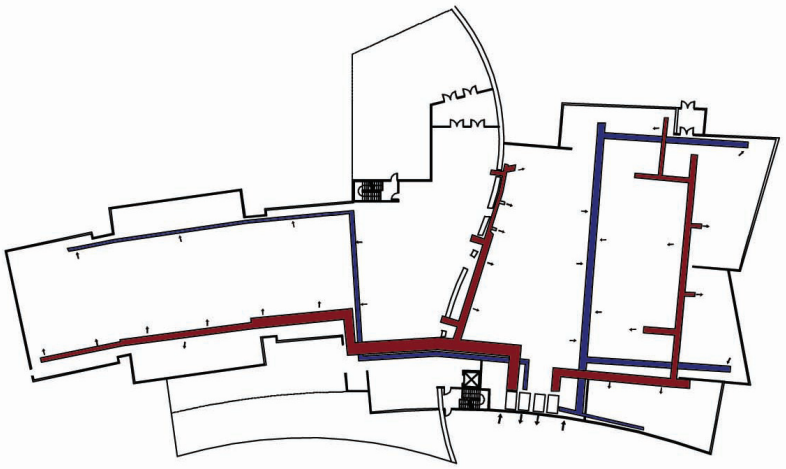
The exterior design maintains an integrity between the building and the natural valley environment. The center precives to belong and be a part of the surrounding river valley context.

Design Solution

HVAC and Structure Layout

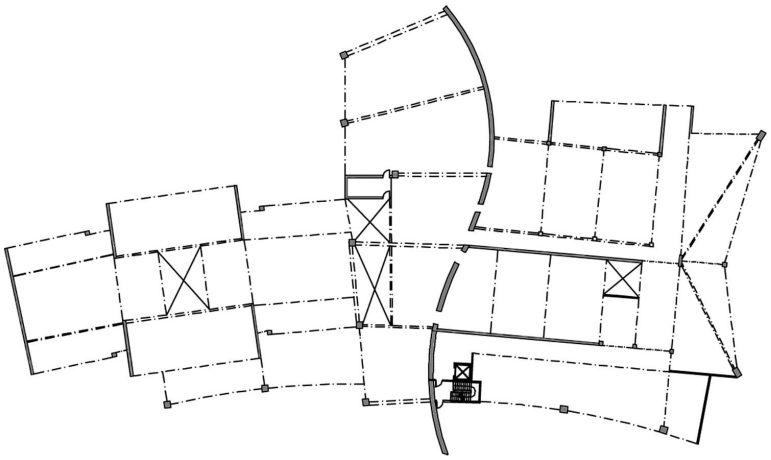
HVAC

The surrounding natural environment is incorporated into heating and cooling the building. Geothermal technology is used to extract natural heat from the Earth for heating, and disperse heat into the ground for cooling of the building.

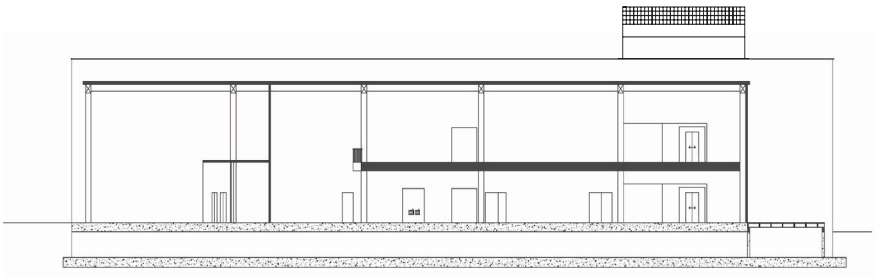


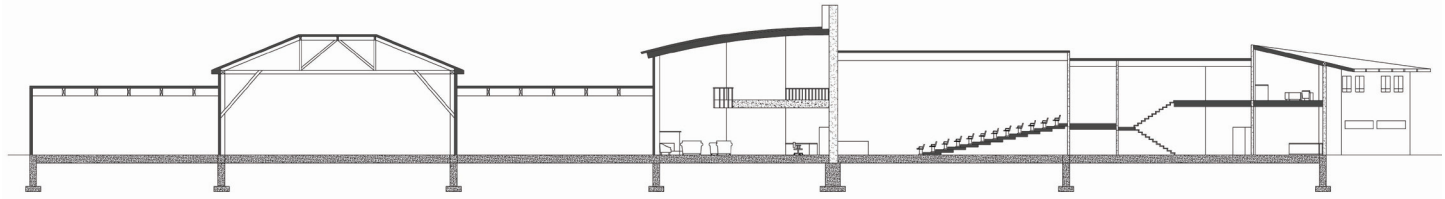
Structure

The structural system combines heavy, load bearing masonry walls with a lightweight skeletal structural system. Structural patterns enhance spatial characteristics and entice a flow of movement throughout the building.



Altering vertical relationships throughout the building enhances the expression and emotion of each of the interior spaces.





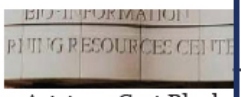
Design Solution

Orientation Wall Detail

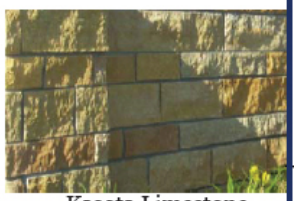
Space is organized by a primary masonry "orientation wall" assembled based on materials and techniques familiar throughout the river valley. Layers of rock materials are easily accessible in the valley due to the scouring forces of the ancient glacial River Warren. Granite blocks at the base of this wall reflect the primary geological foundation of the valley. Limestone is found abundantly throughout the region. Geologically unique Kasota limestone is widely associated with the material identity of the Minnesota River Valley. American Artstone, produced in New Ulm, is a well-established manufacturer of high-quality architectural precast and cast stone building products. The blue stained concrete block represents the river flowing through the valley. Mortise and tenon timber framing is characteristic of many heritage buildings in the New Ulm region of the valley.

Mortise and Tenon Timber Frame

Blue Stained CMU



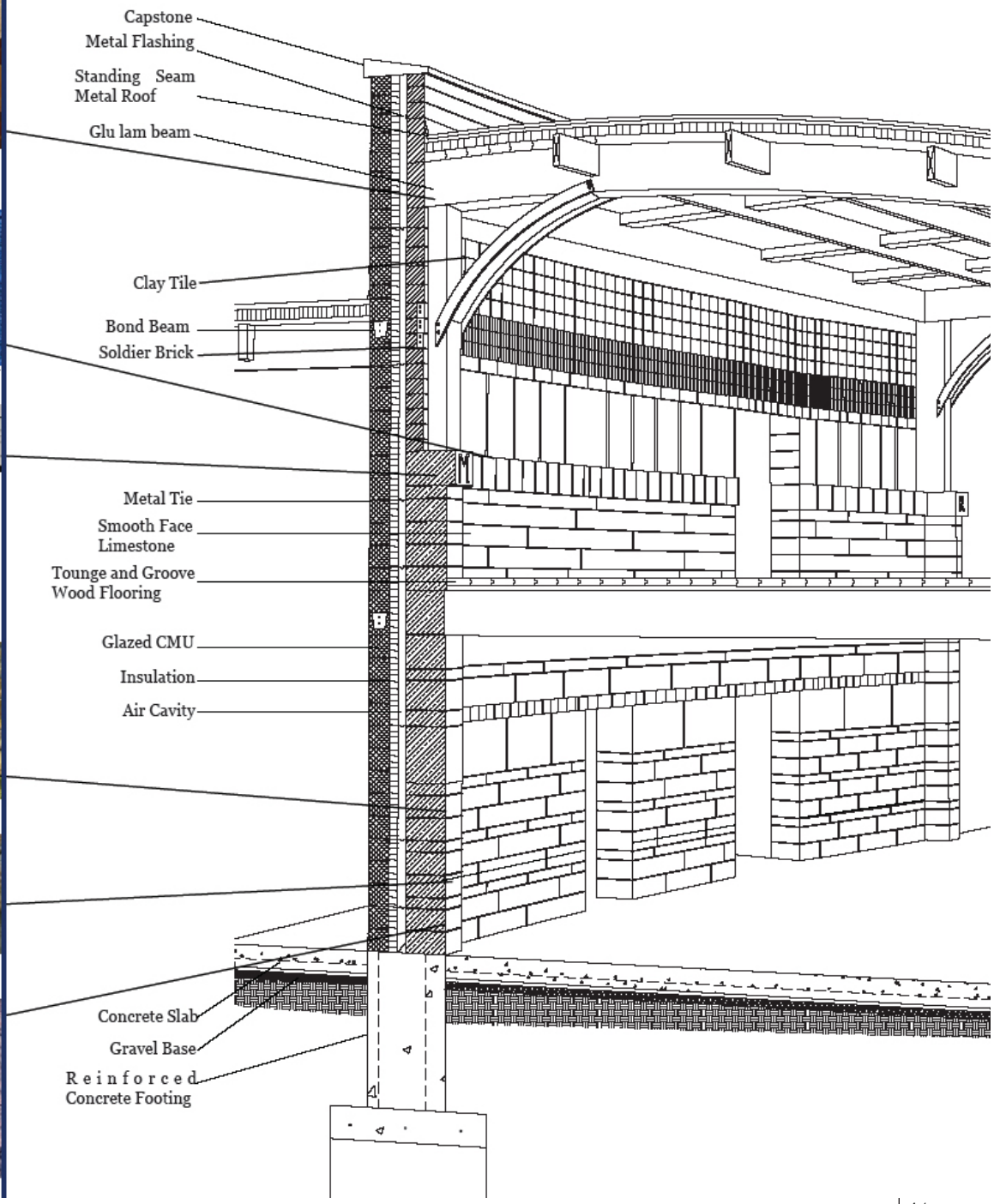
Artstone Cast Block



Kasota Limestone

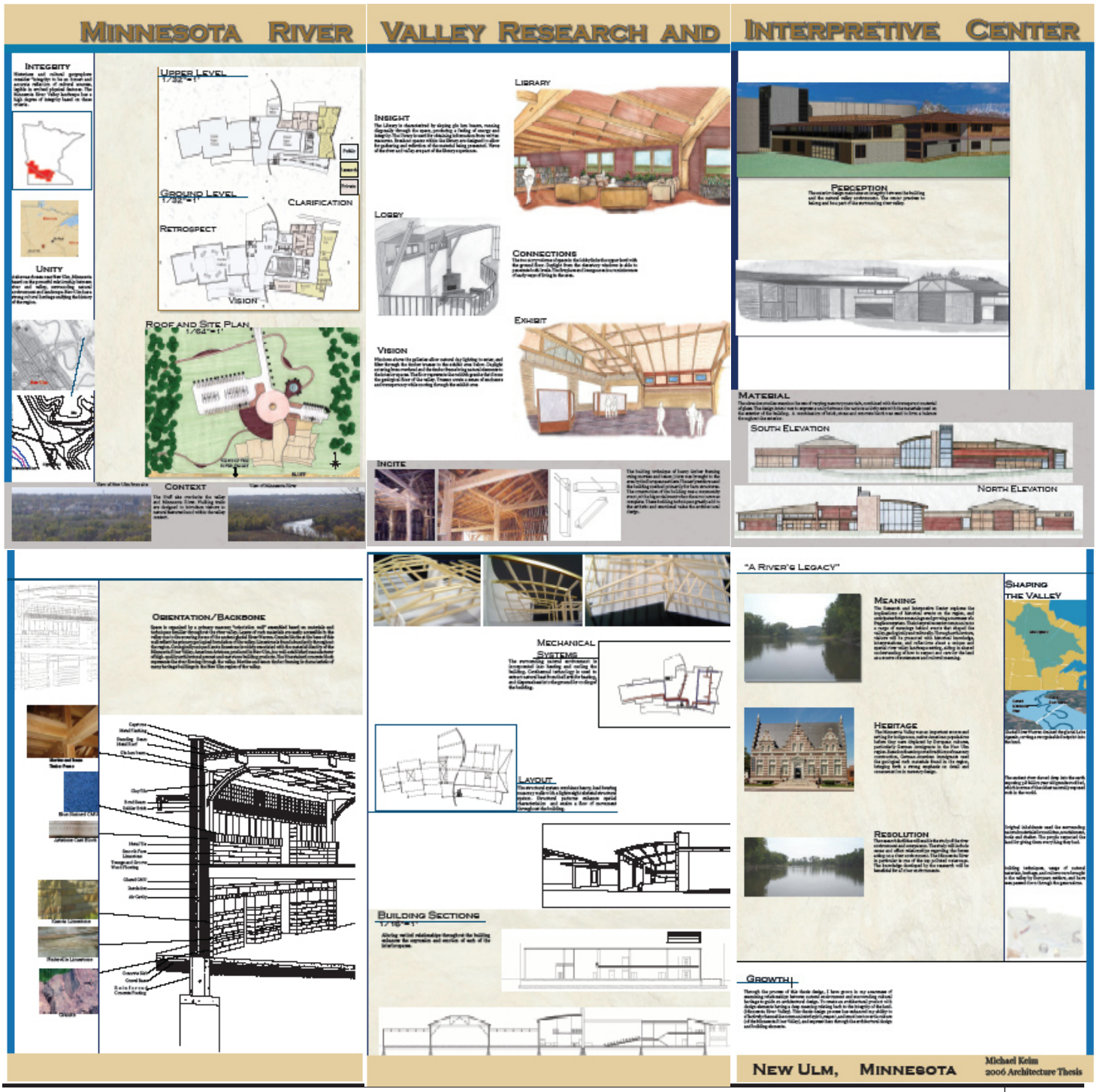
Platteville Limestone

Granite



Design Solution

Presentation Boards



Site Model

The site model was constructed to show the relationships between the building, bluff and the surrounding natural context.

References

Bibliography

http://www.climate.umn.edu/

http://www.climate-zone.com/climate/united-states/minnesota/

http://www.dnr.state.mn.us/snas/naturalhistory.html

http://www.dw-world.de/dw/

http://www.exploreminnesota.com/southern_minnesota.html

http://www.geo.umn.edu/mgs/

http://www.groundloop.com

http://www.mankato-kasota-stone.com/

http://www-map.lib.umn.edu

http://www.mnhs.org

http://www.mnrivervalley.com

http://www.mnsu.edu/emuseum/history/

http://mrbdc.mnsu.edu/

http://www.nuhpc.org/

http://www.nujournal.com/

http://www.riverwarren.com/

http://www.soils.umn.edu/research/mn-river

Bibliography

American Society of Heating, Refrigerating and Air-Conditioning Engineers Applications Handbook, 1995

Beck, Paul N. Soldiers, Settlers, and Sioux: Fort Ridgley and the Minnesota River Valley. Sioux Falls, SD: Center for Western Studies, 2000.

Collins, Brad & Robbins, Juliette. Antoine Predock: Architect. New York, NY: Rizzoli International Publications, 1994.

Fisher, Thomas. Salmela: Architect. Minneapolis, MN: University of Minnesota Press, 2005.

Glasrud, C.A. & Rankin, D.M. (Eds.) A Heritage Deferred: The German-Americans in Minnesota. Moorhead, MN: Concordia College, 1981.

Hoisington, Daniel J. A German Town: A History of New Ulm, Minnesota. Edinborough Press, 2004.

Jones, Evans. The Minnesota; Forgotten River. New York, NY: Holt, Rinehart and Winston, 1962.

Kate, Hensler. (1996, March). "Visitor Center". Interiors, v. 155 p. 56-61

Kennedy, Roger. Minnesota Houses: An Architectural &Historical View. Minneapolis, MN: Dillon Press, 1967.

Koyama, Shin. (1982, May). "Interpretive Center for a Rugged Site". Architectural Record. v. 170 p. 106-107

Newson, Malcolm. Hydrology and the River Environment. New York, NY: Oxford University Press, 1994.

Rubenstein, Sarah P. Minnesota History Along the Highways: A Guide to Historic Markers and Sites. St Paul, MN: Minnesota Historical Society Press, 2003.

Rippley, La Vern J. German-Bohemians: The Quiet Immigrants. Northfield, MN: St. Olaf College Press, 1995.

Soil Survey of Nicollet County, Minnesota. Issued June, 1994.

Stenzel, Bryce O. German Immigration to the Minnesota River Valley Frontier: 1852 1865. Mankato, MN: Minnesota Heritage Publishing, 2002.

Bibliography

Strasser, Joel. (1982, May). “A Visitor Center That Fits Into a Natural Site”. Architectural Record, v. 170 p. 102-105.

Schwartz, George M. & Thiel, George A. Minnesota’s Rocks and Waters. Minneapolis, MN: University of Minnesota, 1963.

Tester, John R. Minnesota’s Natural Heritage: An Ecological Perspective. Minneapolis,MN: University of Minnesota Press, 1995.

United States Geological Survey Maps

Waters, Thomas F. The Streams and Rivers of Minnesota. Minneapolis, MN: University of Minnesota Press, 1977.

Wiseman, Carter. I.M. Pei: A Profile in American Architecture.New York, NY: Harry N. Abrams, Inc. 2001.

Michael Keim

Hometown: