CASS COUNTY ENERGY INTERPRETIVE CENTER

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CASS COUNTY ENERGY INTERPRETIVE CENTER

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of North Dakota State University

By

SHANAKA RAJAPAKSE

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for the Degree of
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5/8/2013

Primary Thesis Advior

May 7th, 2013

Thesis Committee Chair

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Name: SHANAKA R RAJAPAKSE Date: 05/06/2013

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This thesis examines the feasibility of conducting an alternative energy educational center parallel to the Cass county electric cooperative and its operations. Promoting renewable energies and educating the Community with new technologically advanced methods in deriving energy can have a large impact on the environment and become a huge facilitator in reducing the global warming catastrophe.

It has become challenging to the human race to find energy and leave a smaller environmental footprint. Striking a balance between extracting energy and renewing resources is crucial for a more sustainable economy.

Using existing facilities cannot only improve a building' s functionality but can be a major source in deriving significant economic benefits. Working in tandem with local energy providers in promoting renewable energy can advantage not only the organization but the community in which it operates.

Key words: Renewable Energy, Educating, Global Warming

How can an energy educational center support the efforts in promoting renewable energy and operate coherently with the community facilitated by a modern architectural structure.

Project typology: Renewable Energy Educational Center

Claim: Build an educational center to educate the youth and adults about the importance of saving energy and the use of renewable energy.

Actor: Architects, Energy service companies, Community

Action: A healthier green environment

Object: Promoting renewable energy through education

Actor relation: Insufficient knowledge of the areas such as renewable energy and methodologies used in such procedures will impact the feasibility of this facility.

Action relation: Educating the community through the learning center will allow the message of renewable energies to spread among individuals who are willing to switch to renewable energies and promote energy technology that is environmental friendly. It will also allow individuals to get to know other people who are interested in renewable energy, thus energizing a community movement toward lowering atmospheric hydrocarbons.

Object relation: Using professional educators will ensure that the knowledge gained through the educational center is accurate and up to date with the current advancements in the field. It will provide a counter balance to biased information that is made available on the internet and printed materials. This facility will provide the necessary requirements for the community to get involved in a database system, which will provide the current clean air standings and upcoming events coordinated by the educational center.

Introduction of educational centers such as Cass County Energy Interpretive Center (CCEIC) will provide a highly visible approach for promoting renewable energy and the reduction of the use of extremely pollutant energy sources such as coal and oil.

CONCLUSION

From 2006 to 2010, there was an increase of 7% in the usage of wind energy in the United States ("U.S Energy Information Administration"). This is an example of the increasing demand for renewable energy sources within United States. Availability of such facilities, such as the Cass County Energy Interpretive Center, throughout the United States will ensure that there is sufficient information available for the public to educate itself about this growing technology. Having a center such as CCEIC in the local community will allow the Cass County population to have access to cleaner and cheaper energy while being sensitized to factors such as global warming and environmental pollution. Being less dependent on fossil fuels will allow the community to make investments in wind turbines and solar energy , thus hastening the transition to a healthier, greener planet.

The quest for natural resources has led humans to excavating the earth' s crust in ways that destroy on degrade human and animan habitats. This has affected the livelyhoods and extinction rates of all forms of life living in these geographical regions.Destroying natural habitats has brought animal species to extinction. Human adjustments have crippled the eco system beyond recognition. Coal has been the most common natural resource used to genarate electricity throughheat combustion. This modest relationship between the two entities created an industry that affects every aspect of human energy consumption. The high demand for electricity has delayed public notice of the environmental consequences and allowed the industry to concentrate on profit making. From an environmental point of view, this commercial commodity makes the biggest impact on our eco system. This has given rise to legislative entities, such as Environmental Protective Agencies (EPA), to seek cleaner and greener ways of producing energy. Renewable energy has become the promise for minimizing annual coal consumption.

Fargo has become the commercial capital of North Dakota, allowing many business ventures to flourish in a demanding business environment. Increasing diversity in the region and the recent boom in oil has funded Fargo' s infrastructure and stabilized it as a center of commercial transactions. Fargo is a growing community in business and population. Years 2000 to 2010 showed a population burst of 16.5%,i.o, 90,599 to 107,349 (United States Census Bureau). Interestingly, this growth of recent years is due in part to the discovery of oil in the state, but this is one reason among many. A booming state economy has brought large business oriented families to Fargo. A growing community means the demand for electricity is high. It is better to adopt cleaner ways of energy consumption when a town is inits early stages of development.

Cass county electric corporative is a large corporation that also provides electricity to many other counties. My research about this corporation allows me to perceive their goals and understand the importance of an energy interpretive center for this community. This concept will help the local community to have a better understanding of a cause that will impact the lives of generations to come and the future of Fargo.

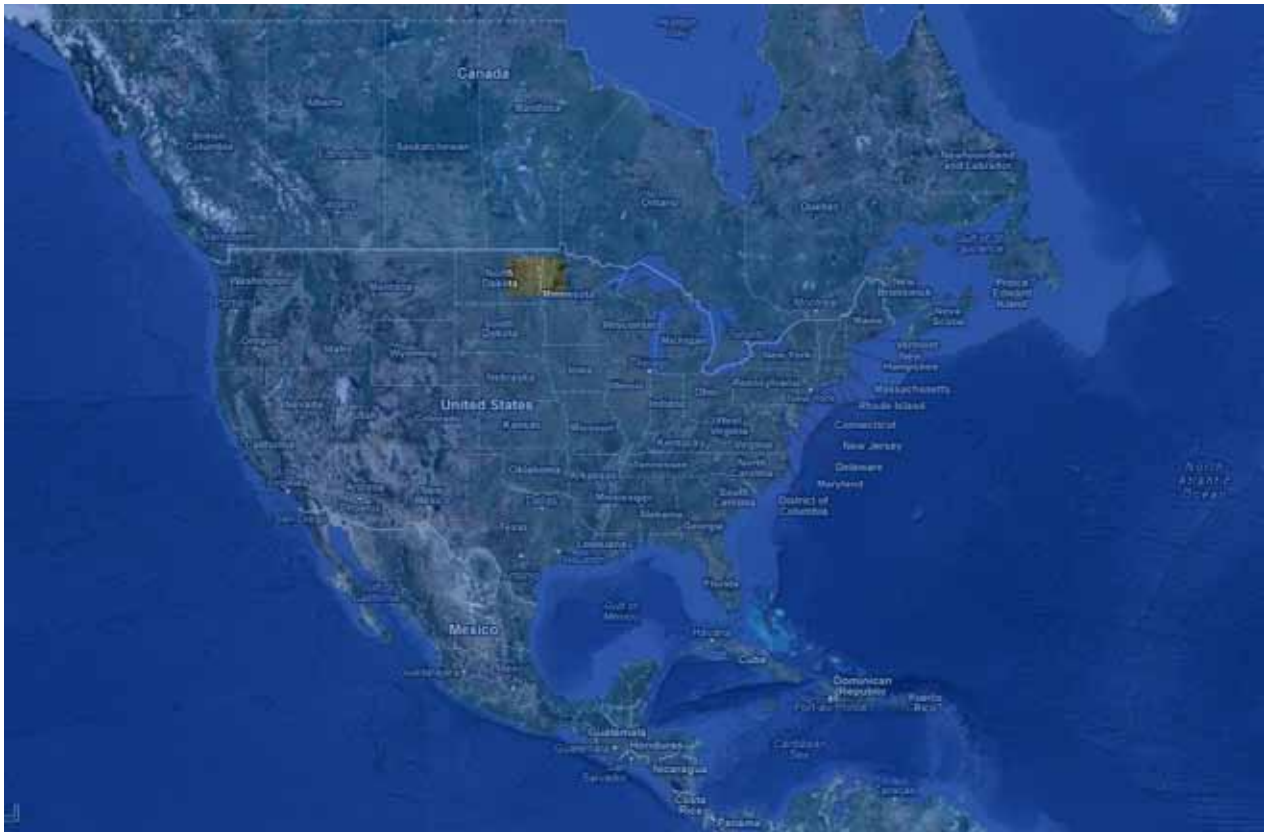
Cass County Electric Cooperative is an electric distribution system located in Fargo, North Dakota. This Cooperative serves over 10 counties in southeastern North Dakota. Cass County Electric' s mission is to provide energy needs with excellent service; consisting of reliable and affordable electricity while upholding core values of integrity, innovation, accountability and commitment to community. "www.kwh.com"

CLIENT

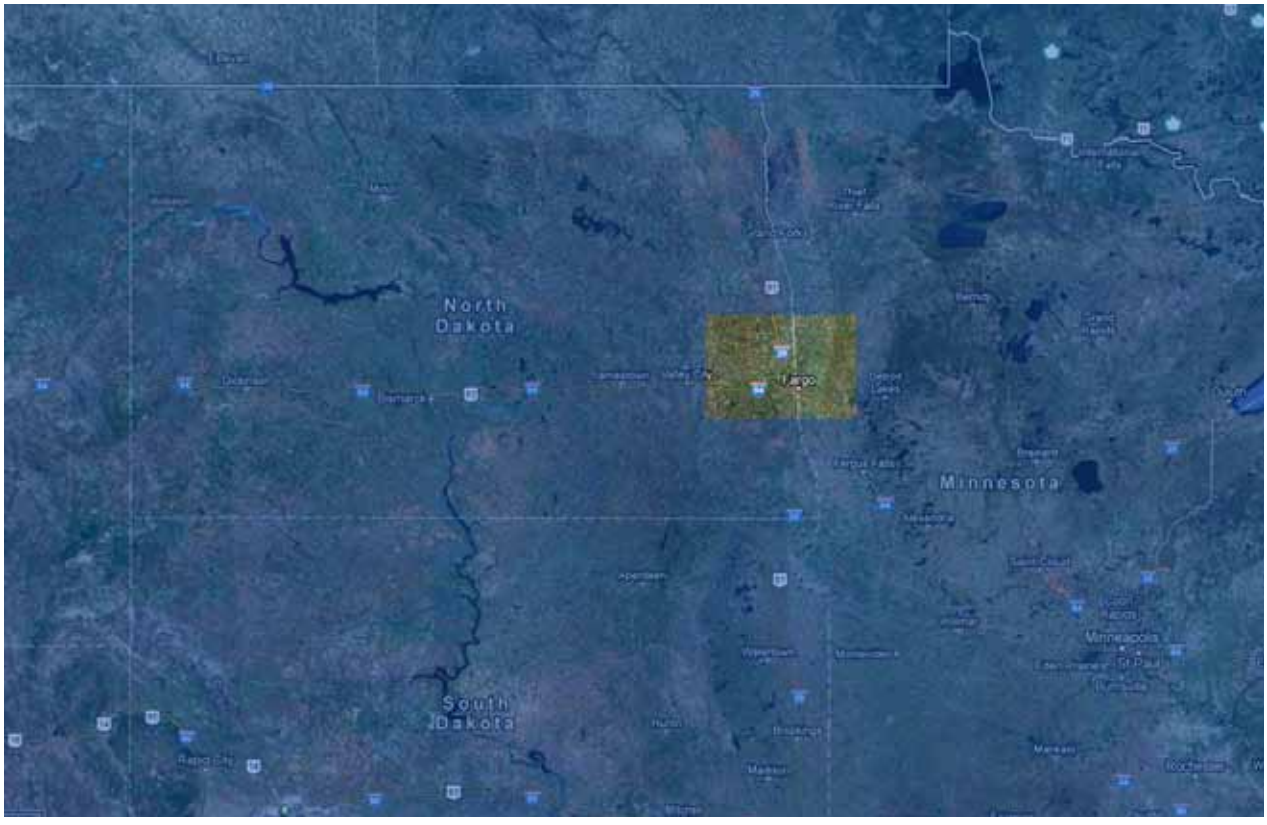
This Center will be open to the general public and all students.

The Main Entrance
Reception
Lobby
Administrative Office
Conference Rooms
Auditorium
Exhibition Area
Infromation Center
Museum
Indoor Green Space
Rest Rooms
Break Room
Mechanical Room
Storage
Outdoor Landscape
Parking

NORTH AMERICA



FARGO NORTH DAKOTA



SITE

4100 32nd Avenue South Fargo, ND 58104

IMAGEA ACCESSED OCTOMBER 09 2012 http://maps.google.com/maps?hl=en&tab=wl

IMAGEA ACCESSED OCTOMBER 09 2012 http://maps.google.com/maps?hl=en&tab=wl

North Dakota is situated in the upper great plains region in the United States with a population of 683,932. Agriculture is the largest industry in North Dakota. With a Population around 105,549, Fargo is the largest City in North Dakota; it is nearly 16% of the population of the State.

SITE VIEWS

4100 32nd Avenue South site is located close to the two interesting major highways of I-29 and I – 94. Along the 32nd Avenue south east part is a developed area with stores malls and educational institutes etc. Along the west side is still a developing area with few neighborhoods and construction sites.

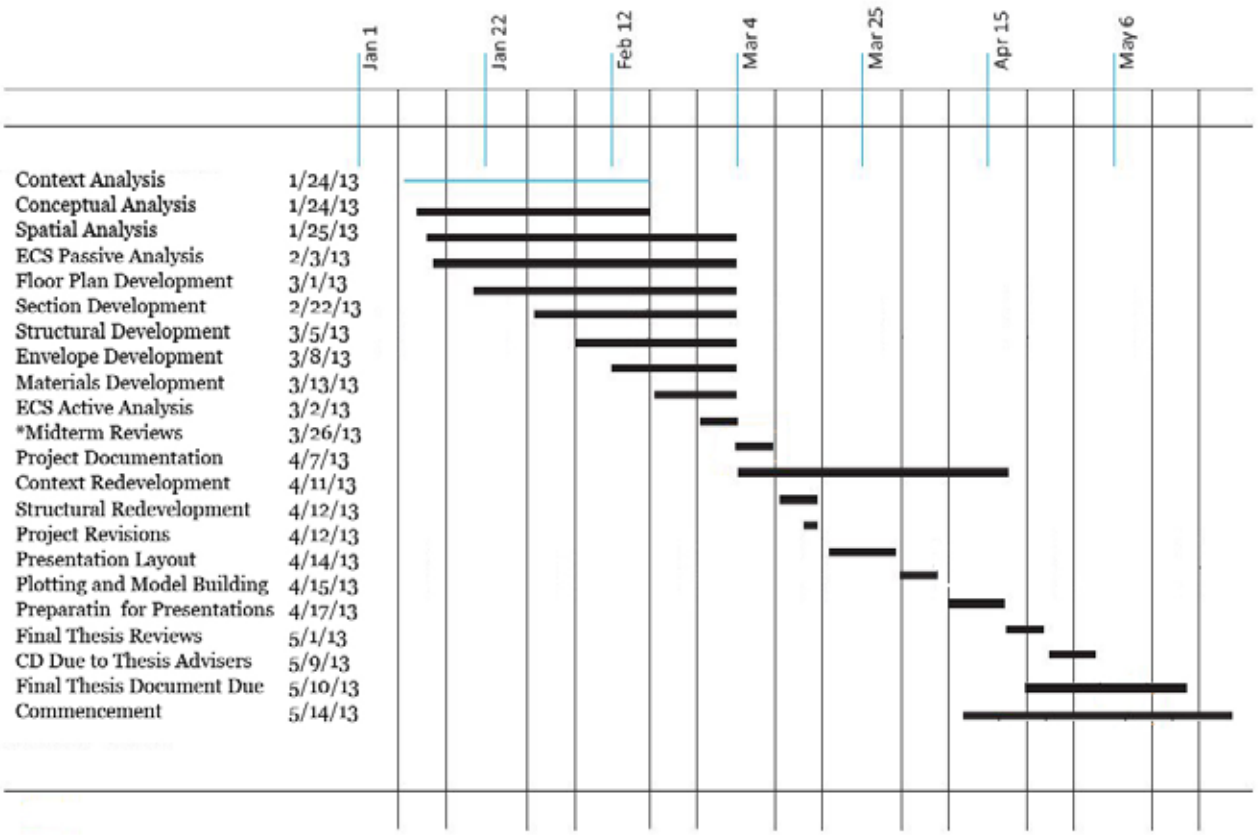
STREETS AND LANDMARKS

Architecturally, the facility will use most of the known green building technologies and renewable energies to provide electricity for the daily activity in the building. Focusing on renewable energy and storing sustainable energy such as wind, solar, geothermal etc; this facility' s main goal is to create a friendly environment for the community in which to learn about renewable energy.

Research Direction: Research will be conducted on the basis of quantitative and qualitative analyses, including graphic representations. All this will be done using digital analyses, hand drawings, and physical modeling. Digital representations will be use to resolve complicated areas of the design.

Design Methodology: Quantitative and qualitative data will be gathered through journal articles, media, web sites, and personal interviews.

Documentation Plan: All the documentation will be save as hard and soft copies throughout the project until the final presentation. Physical models will be photographed and thus saved digitally.


Jan 1
Jan 22
Feb 12
Mar 4
Mar 25
Apr 15
May 6
Context Analysis 1/24/13
Conceptual Analysis 1/24/13
Spatial Analysis 1/25/13
ECS Passive Analysis 2/3/13
Floor Plan Development 3/1/13
Section Development 2/22/13
Structural Development 3/5/13
Envelope Development 3/8/13
Materials Development 3/13/13
ECS Active Analysis 3/2/13
*Midterm Reviews 3/26/13
Project Documentation 4/7/13
Context Redevelopment 4/11/13
Structural Redevelopment 4/12/13
Project Revisions 4/12/13
Presentation Layout 4/14/13
Plotting and Model Building 4/15/13
Preparatin for Presentations 4/17/13
Final Thesis Reviews 5/1/13
CD Due to Thesis Advisers 5/9/13
Final Thesis Document Due 5/10/13
Commencement 5/14/13

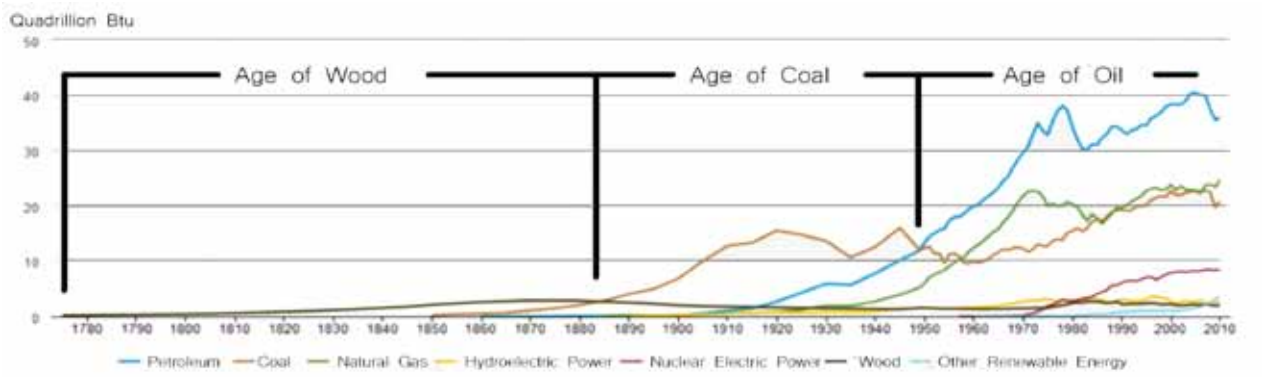
SCHEDULE

Conventional energy now has a very competitive opponent that threatens to steal the heavy weight title from its grasp. This opponent is efficient yet powerful, this opponent is diverse yet needing popularity, and this opponent is relatively environment friendly. This opponent is Renewable energy.

With the global economy expanding at a great pace, the need for energy, or the "energy demand" increases relatively. The use of conventional energy cannot keep up with this overwhelming pace. With its limitations and disadvantages, it is critical that we come up with better ways to provide the energy that is being demanded to meet the requirements of the developing world. Even though measures are taken to come up with efficient methods of producing energy with the use of conventional resources, it is very strenuous on the environment and often comes with hight initial investment. The solution here is simple: a cleaner, environmentally friendly supply of energy. This supply comes in the form of Renewable energy.

Renewable energy is not a new topic. Before the introduction of coal as an energy source, the primary source of energy was always renewable. Wind, biomass, human labor were some of the sources, among many others, that provided humans with useful energy. After coal was introduced, it was the most favored source of energy over sources such as firewood and windmills, since it yielded more energy per mass. During the industrial revolution, coal was mined in large scale all around the world to keep up with the pace of the developing world. Due to its abundance, coal continued to be the primary source of energy till the use of oil and natural gas. To this day, coal still plays a vital role in the supply of global energy. But in between these times, during the late 19th century (1870' s to 1890' s), the world was aware of the limitations of coal and with the end of coal, they assumed the end of modernization of humans. Scientists of the era started investigating and looking for other sources of energies, such as solar power and wind driven turbines. Demonstrations were made by leading scientists who showed electricity can be derived from sunlight in a selenium solar cell. During the same time, electric plants and commercial scale hydroelectric plants were established in the USA and Europe. Idaho and Ohio installed systems that supplied power from windmills and geothermal heat. And with oil starting to surge during this time, renewable energy interests slowly diminished to only an option. Biodiesel and other biomass related power sources didn' t come into effect till the late 1930' s.

According to the U.S. DOE Energy Information Administration the use of renewable energy surfaced during the early 1900' s and showed a surge again only in early 2000' s. The figure below shows the estimated consumption of energy by source from 1775 to 2010. We can see clearly how coal has played,and still plays a vital role alongside oil. But nuclear electric power and other sources of renewable energy was rising its head slowly in the late 1900' s.



US historical energy consumption 1775-2010, Energy Perspectives 1949–2010, U.S. DOE Energy Information Administration.

Coal and renewables will always have their own perks, but it' s important to look at the energy options in light of their impact on the earth. Renewable energy, if implemented properly, will out provide the conventional sources with time; it will bring an end to the energy hype that exists in all our minds. Renewable energy does not need to be extracted by spending millions and millions of dollars; it doesn' t have to distilled or refined. Renewable energy does not leave unpleasant residue that accumulates on this earth and which requires more spending for it' s disposal. Renewable energy, in short, does not require so much chemistry. All it needs is to get started; the rest is free.

To promote renewable energy development at the local level, research has to be done to measure and explore the public beliefs of people local to an area where renewable energy centers can be established. It is important that the authorities start at a very small level and listen to local feedback and involve them in renewable energy schemes. This approach will sustain a positive tide. In recent years, renewable energy development has been led by environmental, economic and sustainable priorities and not so much social concerns. When talking about the economy, it is important to know how renewable energy affects our economy. The money to handle, use and transport coal is much higher that the costs of a renewable source. The economical aspect of a energy interpretive center is localized. The dollars spent on this source stays at home with the locals, creating more jobs and fostering economic growth.

"Renewable energy technologies are labor intensive. Jobs evolve directly from the manufacture, design, installation, servicing, and marketing of renewable energy products. Jobs even arise indirectly from businesses that supply renewable energy companies with raw materials, transportation, equipment, and professional services, such as accounting and clerical services." Solar-estimate.org

According to research done by the University of New Hampshire on the effects of a new biomass electrical generation facility would have on the town and its people, they found out that it will create thousands of domestic jobs as well as create millions in state revenue. Their research article titled "Economic Impact of a New Hampshire Renewable Portfolio Standard," concluded that an adoption of 20 percent renewable energy will create thousands of jobs with wages much higher than the current state average, generate over $1 million in state revenue, and provide a "newfound opportunity for NH residents to start businesses."

The families or groups of people who take charge of powering their houses with renewable sources such as solar or wind will definitely save compared to conventional power consumers. These groups can then distribute this power to the rest of the village or town so that they will be energy independent. But for this to happen, the locals have to be informed and educated on a very large scale. Local economists and businessmen should be given information priority, as they are the ones who will evaluate conditions and come to a decision. If the local citizens are involved, development will be faster and there will not be as many upsets or concerns. Methods have to be implicated to involve the society of a given local area so that they will be better informed and above all, given partial control of the implimentation of renewable sources of energy. If local participation is taken into consideration, approval and consent will increase and with these approvals, initiatives at the local level appear more quickly. Methods include allowing the residential installation of solar cells. The same can be said of windmills and the local distribution of such generated electricity. With such implementations, renewable energy will soon be popular and face a bright future. From research done by Dr. Patrick Devine-Wright BA MSc CPsychol Senior Research Fellow in Environmental Psychology, Institute of Energy and Sustainable Development, De Montfort University on the response to local partnerships, local energy and local profits from renewable energy, figures showed that a very high percentage liked these ideas and that there was an increase in this percentage after being informed about these initiatives. Their study looked at how concepts and ideas change with various sociological aspects such as gender, age, and demographics.

"Analysis according to socio-demographic characteristics indicated some interesting findings. For example, in this case-study, older men were more likely to support local ownership of small renewable energy generating machines than younger generation (although this difference was only observed before the participation process). This result must be seen in the context of the locality in which the research was undertaken. Those male respondents aged over 50 at the time of the research are likely to have worked in, or to be familiar with, another energy industry: coal-mining when it was a major source of local employment in the 1970s and 1980s in South Wales. These individuals may hold political beliefs that favor ownership by workers or local people and may have witnessed industrial decline that led to adoption of negative beliefs about private-sector development from outside the locality. The results suggest that further research on links between respondent' s political ideology, their memories or representations of past development in the locality, levels of trust in public and private sector organizations and their support for future local energy development would be useful" . (Local aspects of UK renewable energy development: Exploring public beliefs and policy implications by Dr. Patrick Devine-Wright BA MSc CPsychol)

Renewable energy in Fargo is relatively new and is gaining attention and popularity among its residents. The renewable energy and the conservation committee which started in 2005 by the city of Fargo, have implemented strategies that will enable the citizens of Fargo to learn and utilize these renewable forms of energy that are abundantly available in North Dakota. The city of Fargo is looking at ways to increase the use of biomass, wind and other forms of renewable supplies to power its city. It is paramount that with the boom in development in the area, Cass county and Fargo look at ways to maintain the beauty and cleanliness of the area while keeping up with the energy needs of the County and the City. According to the information at the city of Fargo website, some suggestions from the renewable energy and the conservation committee have already been implemented in the City. Some of these suggestions implemented are:

-working with architects to strategize ways to save water and energy features of the Metro area transit garage.

-using biodiesel which is extracted from soybean oil to power the entire transportation fleet of the city

-initiating the production of methane generated electricity at the city landfill.

Location : Surry Hills, New South Wales, Australia
Architects : Francis-Jones Morehen Thorp
Opened : 2009
Area : 20,497 Square Metres

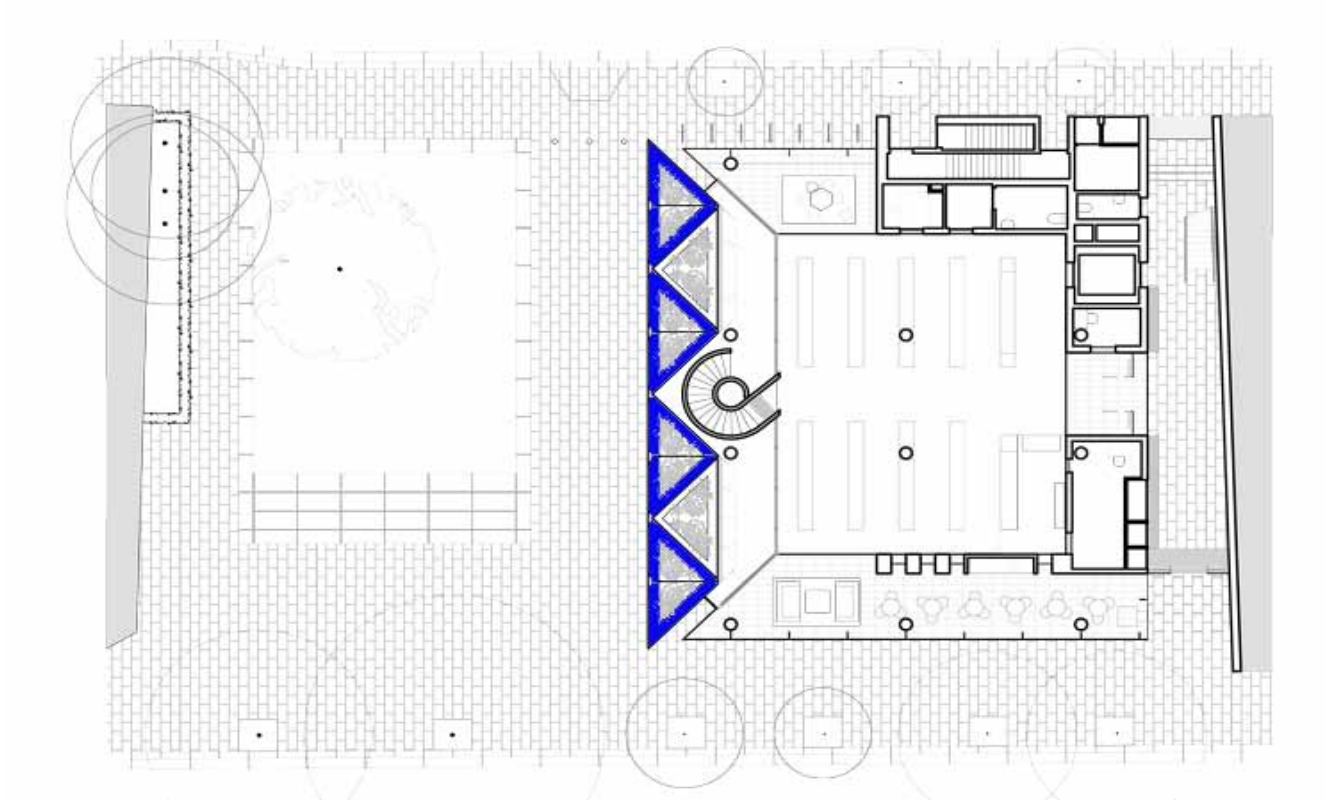
SURRY HILLS LIBRARY AND COMMUNITY CENTER

The first Surry Hills library and community center was a small, modest building built in 1956. The all new library and community center that was built recently is designed to achieve excellence in sustainable energy design and set new benchmarks in environmental performance for multi-purpose public buildings. Designed by Richard Francis Jones, it is an innovative new hybrid building consisting of a library, community center and a childcare facility.

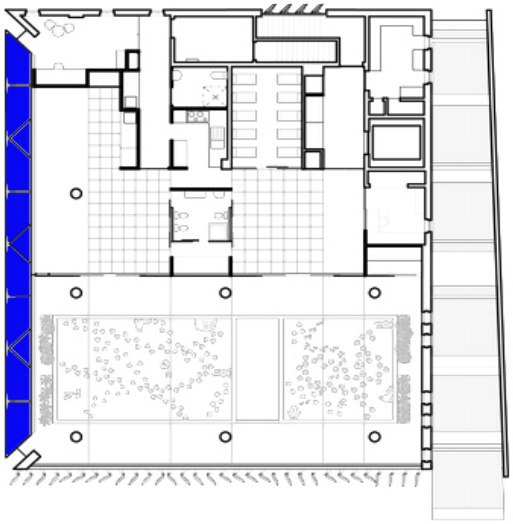
What is mesmerizing about the design of the building is its unique air quality system, which reduces the need for artificial cooling by almost 50%. Air is drawn in from the top of the building' s atrium and passes through special growing plants acting as filters which make up the walls of the building. The air then flows under the building where its temperature is conditioned by a Thermal Labyrinth. The cool and filtered air is then dispensed throughout different levels of the facility.

The building also has an innovative rooftop which has grass on it to reduce the loss of energy and 36 solar roof panels which provide supplemental energy to the building. It is capable of generating clean, renewable energy for up to six hours a day. The facility is also fitted with a computerized building management and control systems (BMS), which automatically monitors and controls the environmental conditions within the building. The system adjusts the ventilation and sunshades throughout the day to control the heat load, light, and shade and also to switching lights on and off as necessary.

The building also has the ability to collect and treat rainwater and then reuse it for flushing toilets and irrigation. It is estimated that this saves over 620,00 liters of water per year. The materials used to build the facility were selected for their durability and sustainability. Many of the materials used for finishing touches are environmentally friendly in many ways.

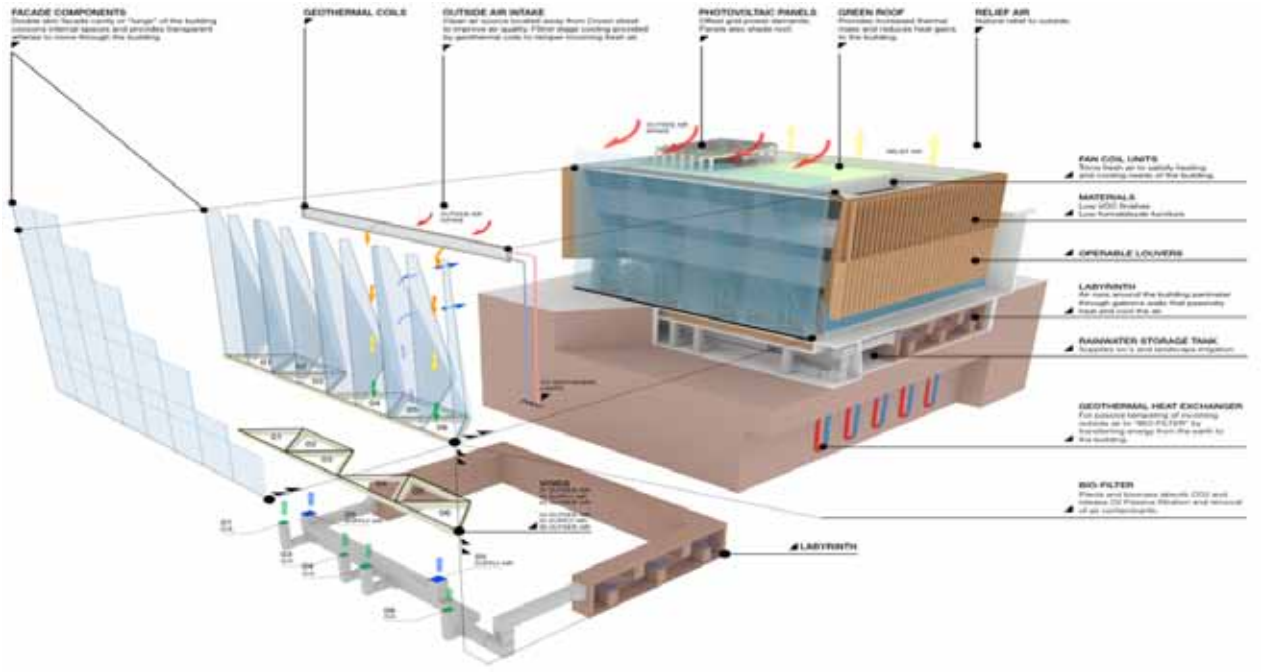


First floor plan



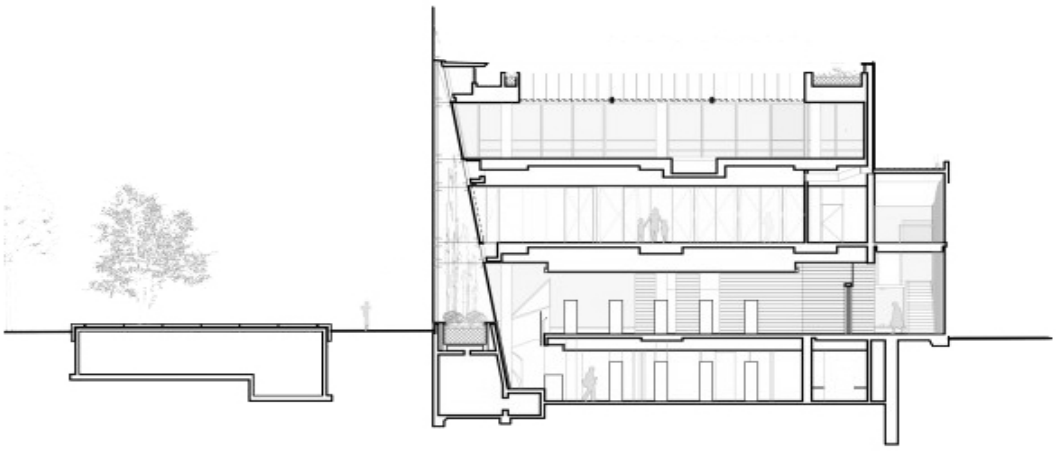
Second floor plan``

Third floor plan



images accessed: Sep 28 2012 http://modernlibrarydesigns.wordpress.com/2012/02/03/surry-hills-library-and-community-centre/, http://www.architecturenewsplus.com/project-images/9859 Images are modified for diagrammatic purposes.

Air circulation



Section

Hierarchy

Mass

Structure

Sun light

Location : Guangdong, China
Architect : Rocco Design Architects
Opend : 2010
Area : 66,980 square metres

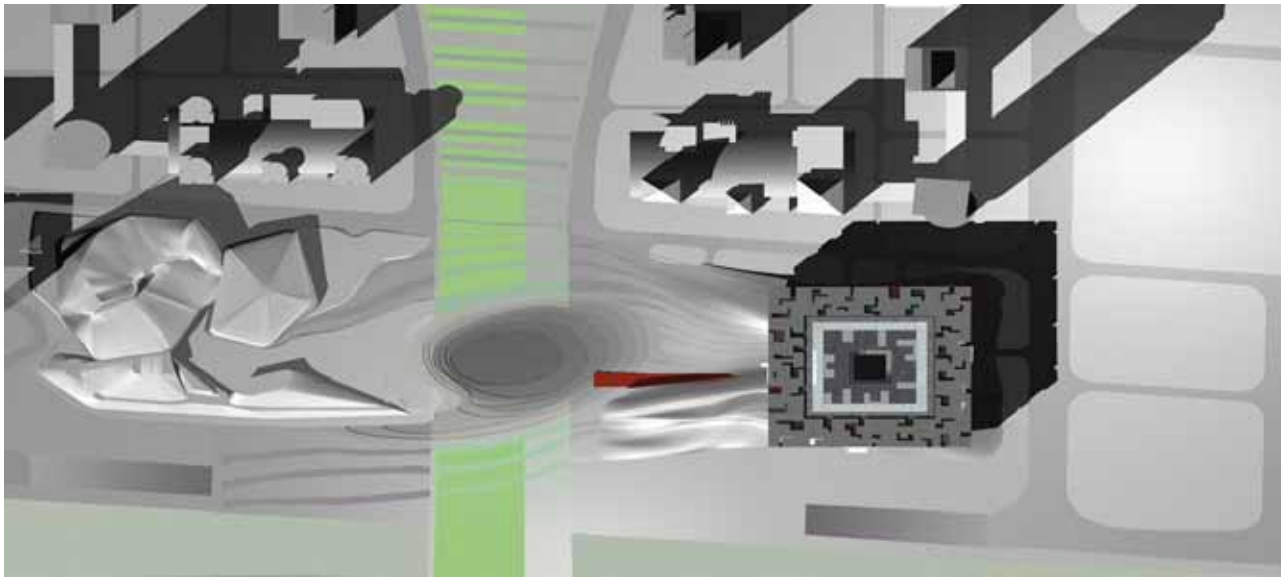
GUANGDONG MUSEUM OF ART

Guangdong Museum is a public museum located in Guangzhou, China. The five story building covers an area of 66,980 square meters. The museum was design by Rocco Design Architects. The museum was conceived as an antique Chinese artifact such as a lacquer box, an ivory ball or a bronze tank, which collects, and reflects treasures of time. Even though the primary objective of the museum is to house and showcase a great variety of fascinating objects of treasure, it is also designed as an object of great fascination that contemplates becoming a cultural icon, boasting of its provincial history and traditional wisdom to the visitors, making sure that they have a memorable experience.

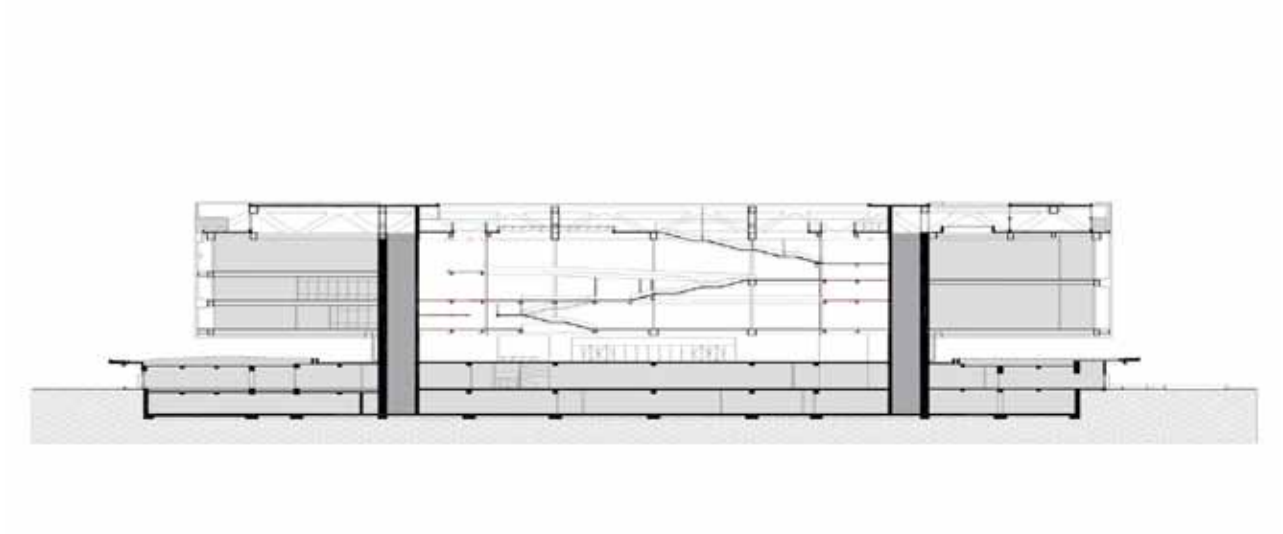
The beauty of the design is in the museum' s spatial arrangement, which draws its inspiration from of concentric ivory balls. Carving slices form interesting spatial patterns throughout the museum due to differing layers with varying degrees of transparency.

This ingenious arrangement not only reinforces the clarity and coherence of a treasure box concept, but allows flexibility when planning the exhibition spaces. In addition to this, all the main exhibition halls have random alcoves on their walls with varying spatial geometry. Not only does this act as visual breakouts to the outside while providing visitors with intimate resting spaces, it also helps fill the museum with natural light, thus reducing the need for artificial lighting within the building. In addition, some of the exhibition pieces are lifted off the ground to allow better circulation of light.

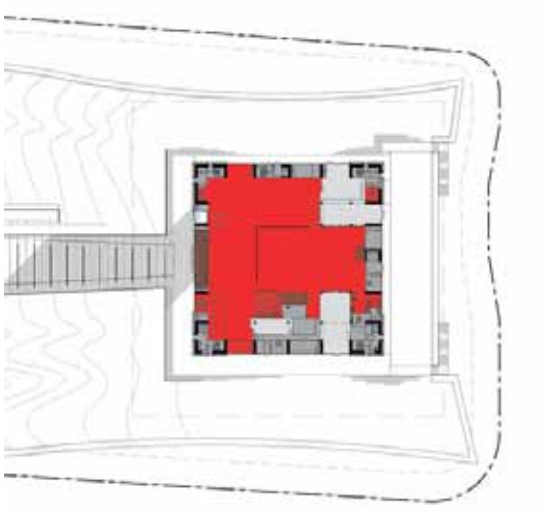
This building is an architecture phenomenon. While its curvy slices all around the building give a pictorial view attracting many visitors to it, its design for letting natural light into the building is remarkable. It helps reduce the use of artificial light, thus saving energy and being environmentally friendly.



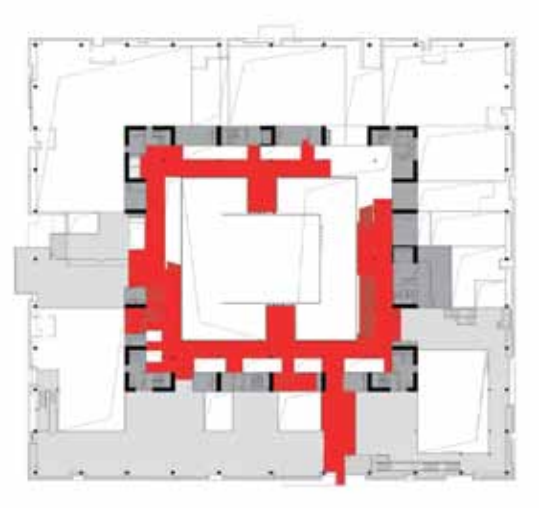
SITE



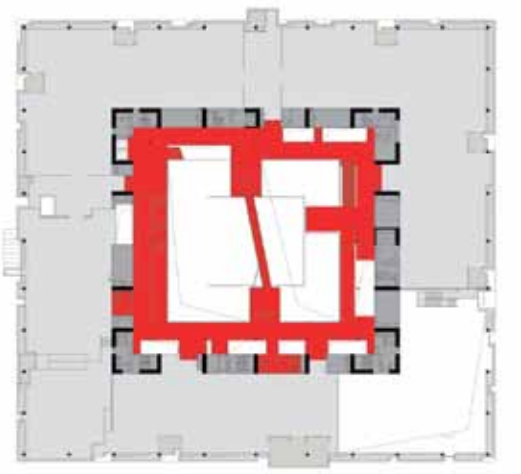
SECTION



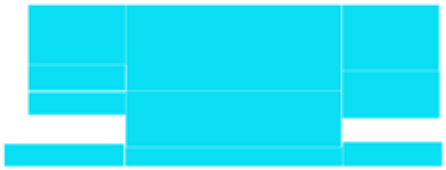
First floor and circulation



Second floor and circulation

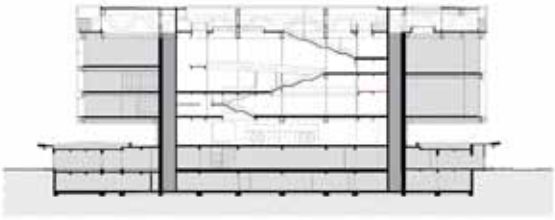


Third floor and circulation

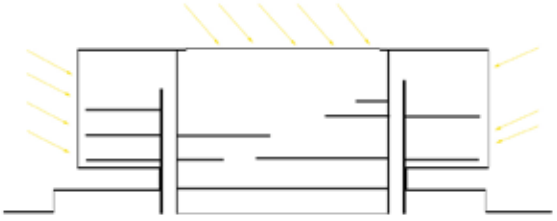


MASS

HIERARCHY



STRUCTURE



SUN LIGHT

Location : San Francisco, California
Architects : Renzo Piano
Opened : 1853- Renovated- 2008
Area : 37,000 Square Meters

CALIFORNIA ACADEMY OF SCIENCE

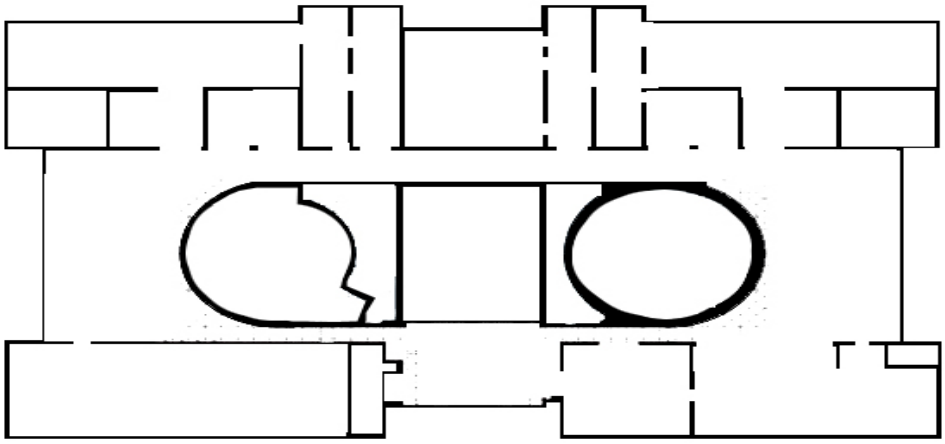
The California Academy of Sciences which began in 1853 as a learned society is among one of the largest natural history museums around the world. Completely rebuilt in 2008, the museum totals 37,000 square meters whose primary function is to explore, experience, and understand nature and to protect the natural world.

The new building designed by the architect Renzo Piano is said to be environmentally friendly in many ways and it has in fact won many prestigious awards for being at the forefront of environmentally friendly design.

The museum supports a green roof covering an area of 2.5 acres. This green roof helps the building to be self sustainable in many ways. It helps with the building insulation excellently by keeping the building warm during winter and cool during hotter seasons. The roof also helps keep the air with in the museum cleaner.

Another feature that make this building an energy efficient building is the use of natural lighting in 90% of the occupied spaces. This was accomplished by the use of voids, which is a remarkable piece of architecture. Also, the museum' s heating and cooling is achieved with 60,000 photovoltaic cells. This in itself is an efficient and an economical system, as it helps save spaces and energy. The building also has a system to recycle rain water for irrigation.

With the use of simple geometry and design the museum has become a leading architectural feat and has become an inspiration and an icon to the city.



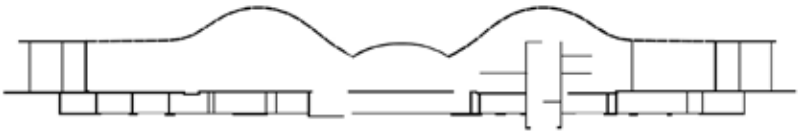
Plan

images accessed: Sep 28 2012 http://www.obayashiusa.com/portofolio/?type=detail&id=84 Images are modified for diagrammatic purposes.

Section

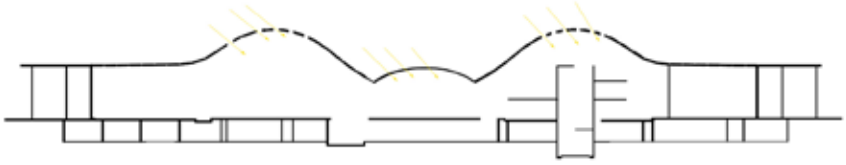
images accessed: Sep 28 2012 http://www.obayashiusa.comportofolio/?type=detail &id=84 Images are modified for diagrammatic purposes.

Mass



Structure

Hierarchy



Sun light

The primary focus of my thesis is renewable energy and how to incorporate and utilize renewable energy in modern buildings, thereby reducing the use of coal and oil. My final goal is to design and build a building which operates more on renewable energy than the building' s of today. I plan to draw inspiration for my project from the numerous environmentally friendly buildings that are being built all around the world.

Three prime examples of such buildings are shown and described above. The California Academy of Science building of San Fransisco is a great example of a building which uses many sources of natural energy to help power itself. It has a green roof covering an enormous area, which help keep the building well insulated during different seasons and also helps clean the air within the museum. The museum also uses a large number of photovoltaic cells, which are used to heat and cool the building. The building also has a system to re-use rain water for its irrigation purposes.

Guangdong museum in China is another such building. It uses natural light to a great effect to light the inner walls of the museum. The walls of the building have many carvings and slices built into the walls to let natural light seep into the building. By doing this, the museum is able to reduce the use of artificial light within the building to a great effect. The carvings and slices also help with the circulation of air within the building.

The library and community center in Surry Hills Australia is a new innovative building, which has slits built in to the outer walls which acts as a filtration system that helps filter the air. The air is then passed through an underground thermal labyrinth which cools the air before releasing it into the different levels of the facility. This system reduces the need to artificial cooling by about 50%.

As you can see, most of the factors talked of above have largely inspired and influenced my decisions to use some of the above methods as my main source of energy. But it is needless to say that I will not be able to use all of these methods in my designs, as there are other factors to be considered, such as the landscape on which the building is built, the environment surrounding the building (such as temperature and humidity throughout the year, etc.). But methods such as the use of photovoltaic cells to control the temperature, solar panels, a green roof, re-using rain water for sanitation purposes are a few ideas that I plan to incorporate into my designs.

This way, after the building is built, people will get a chance to experience the power of renewable energy first hand and know how useful natural energy can be, especially in contrast to the rate at which coal, gas and oil are presently being used.

Historical time line of Renewable Energy
Effects of Coal and Oil

1924
First Federal Law Established to Control Pollution from the Oil Industry

1927
First Commercial Wind Turbines Sold to Generate Electricity on Remote Farms

1935
Hoover Dam, the World's Largest Hydroelectric Power Plant, Is Built

Jan. 28, 1969
Santa Barbara Oil Spill Draws National Attention

1970
Geothermal Steam Act of 1970 Passed to Allow the Leasing of Federal Land for Geothermal Energy Development

1970s
Solar Cells Begin to Lower in Price and Become Cost Effective for Use on Land

1975
Federal Involvement in Wind Energy Development Advances Wind Energy Technology

Aug. 3, 1977
Federal Surface Mining Control Act Signed to Lessen Environmental Impacts of Surface Coal Mining

Aug. 4, 1977
Department of Energy Organization Act Is Signed, Creating the US Department of Energy

1977
Formation of the Solar Energy Research Institute

1978
World's First Solar Powered Village; Tohono o'odham Reservation, Arizona

Dec. 1980
World's First Wind Farm Built in New Hampshire

1981
Solar One: First Large Scale Solar-Thermal Power Plant Begins Operation in Daggett, California

1981
Construction Begins on the World's Largest Wind Farm in California's Altamont Pass; Bird Deaths from Wind Turbines Number in the Thousands

Mar. 24, 1989
Exxon Valdez Disaster in Alaska Becomes the Largest Oil Spill in US Waters

Apr. 1996
Solar Two Plant Demonstrates Low Cost Method of Storing Solar Energy

Nov. 9, 2005
US House Prevents Drilling for Oil in the Arctic National Wildlife Refuge

Nov. 17, 2007
The Intergovernmental Panel on Climate Change (IPCC) Report Concludes Climate Change Is Happening and Is Mostly Human Caused

Oct. 7, 2008
National Bio fuel Action Plan Unveiled

Dec. 22, 2008
Worst Coal Ash Spill in US History in Kingston, Tennessee

Feb. 17, 2009
American Recovery and Reinvestment Act of 2009 Contains Billions of Dollars for Renewable Energy and Energy Efficiency Developments

Apr. 22, 2009
First Framework for Wind Energy Development on the US Outer Continental Shelf Announced

May 27, 2009
US Announces $467 Million in Recovery Act Funding for Solar Energy and Geothermal Energy Development

Oct. 27, 2009
US Invests $3.4 Billion to Modernize Energy Grid

Apr. 20, 2010
BP Oil Rig Explodes & Causes Largest Oil Spill in US History

Sep. 1, 2011
Solar Power Company Solyndra Declares Bankruptcy after Receiving $528 Million in Federal Loan Guarantees

Feb. 9, 2012
US Nuclear Regulatory Commission (NRC) Approves New Nuclear Power Plants for First Time since 1978; Two New Reactors to Be Built in Georgia

Mar. 27, 2012
Environmental Protective Agency (EPA) Announces First Clean Air Act Standard for Carbon Pollution from New Power Plants

Apr. 17, 2012
Environmental Protective Agency (EPA) Issues First Ever Clean Air Rules for Natural Gas

Energy has been a vital factor throughout the industrial revolution time period and even before. The search for a stable supply of an energy resource was a key aspect of growth in the United States and parts of Europe, where the development was taking place at a rapid pace. Supplies like water and steam were compatible enough to power the machinery of the industries that were generating revenue and creating employment. The quest for a reliable source of energy was getting bigger by the day. Discovering coal was a huge break through, and the supply was abundant enough to supply the huge demand created by the industries needing energy resources. This was something that the entrepreneurs were happy about and the demand kept growing, as the supply managed to keep up with the growing demand. Little was known about the downside of this transformation. One of the biggest concerns of using coal was the environment pollution that was tied to it. Combustion of coal created a valuable source of energy but it released a massive amount of pollutants into the land, water, and air atmosphere.

Environmental concerns surfaced when the pollution was big enough to be recognizable in the areas where the industries were at work. Skies were filled with dark and dusty clouds and odorous components of linger around the wide open spaces. Very little was done to rewind these manmade changes. Scientists started looking for alternate ways of rediscovering energy resources to feed the giant energy appetite. This is when the use of crude oil became popular and a huge trend started to develop regarding the use of this commodity. People started looking for a fossil fuel that might reduce the degree of coal pollution. Comparing the two forms of fossil fuel was the first thing on the agenda to impress the environmental authorities. There was a huge difference in the level of emissions to the atmosphere and to the environment. This was a huge plus in recommending the use of oil. Except for a few machinery systems and some industries, the majority of business interests were sold on this newly discovered resource.

The demand for coal still remained, but at a lower level. Locating deposits of this valuable resource and extracting it was the next big step. Drilling is the main method used in bringing the crude oil to the surface. Refining is the next stage. Oil was found in North Dakota as early as 1951 in the Tioga basin of the Williams County. Currently North Dakota is the second largest producer of oil in the United States. The State’ s refining capacity is far below its oil extraction. The extracted oil is being shipped to Louisiana for the refinery stage and production of final products. One could think that the industrial use of oil is preferable than the industial use of coal. Oil might not be as bad as coal but oil has its disadvantages.

The only one good thing about oil is it produces fewer emissions than coal. Are the oil emissions harmful to the environment? Yes, very much. Also the methods of extraction tend to impact the environment. The natural flow of the eco system is altered in many ways to accommodate the extraction and refining of this resource.

Arguably, this has been the main reason why people have started looking into alternative methods of energy consumptions with fewer adverse effects on the environment. To date the best known concept is the use of renewable energy. Another one that could replace the huge demand for energy is the nuclear power generation. Compared to renewable energy, this is a way more expensive method of harnessing energy and probably the most dangerous. Due to the margins of danger, the finished product tends to have a higher cost. Comparing renewable resources with its competition is a much accurate method of analyzing the best process for generating energy. With the ongoing demand for fuel, there is an expiration date on the availability of fossil fuel. On the other hand methods that are been used in renewable energy are more compatible with nature and would have less effects on the environment.

An energy source such as wind, solar, and hydro has no emissions as it is converted in to energy. This is probably the biggest distinguish thus advantage within the energy industry. Large scale operations can cut down the initial cost of a unit significantly and make it available for a large enough number of users. It is important that the process be conducted at a level to harness the economies of scale. The next step would be to analyze the level of emissions created from such operations. Apparently the emissions are zero. That is the best and the biggest advantage that can be achieved within the energy producing industry. But when it comes to the knowledge aspect of this agenda, it is arguably the least widely understood method of energy production. Knowledge of these mechanisms is almost zero within certain parts of society. That is why it would be appropriate to have centers such as the CCEIC in all parts of the country and world.

Centers such as this would be a great method to generate discussion within communities about this topic. Facilities like this would allow the general public to be engaged in activities locally and to develop the necessary skills and knowledge to make decisions on energy consumption methods. When compared to the demography of North Dakota availability of an institute like the CCEIC can be a very challenging task. Due to the smaller population that inhabit the state and the large farming industry that is spread throughout the state, it will certainly be a tough task. That is why it would be a great opportunity to discover the needs of the society and encourage them to be involved in a movement as renewable energy. The current political power makes a perfect stage for displaying such abilities in the world of energy and it would be easier to adopt and implement these opportunities through government sponsored advocates.

GOALS FOR THE PROJECT

The project exists within primarily three different realms of study: academic, professional, and personal, each with goals.

Academic

I want to make this information and the knowledge available for future students to use as a basis for further studies that they may conduct or pursue in this field.

Professional

The outcome of this study will be a community oriented project that broadens professional and the public understanding of renewable energy. Due to the current conservational aspect of many leading countries and organizations, the popularity for such projects has been rising. Choosing a topic and conducting the study along the lines of environmental conservation can increase awareness of the many aspects of energy use. The process will professionally open many opportunities to advance my career in the field of renewable energy as an architect. This can help deliver favorable outcomes from meeting the challenging questions that have been raised during the switch towards a greener planet.

Personal

I have grown up to become an environment enthusiast. It is a very personal aspect that has had lot of influence on my life even at a young age growing up in a beautiful Island in the Indian Ocean. I take this opportunity to distribute my wealth of knowledge to the public through a program dedicated in minimizing environmental pollution. Due to the lack of information and resources about renewable energy, it has become a huge challenge to the general public to understand the basis behind this concept. I believe it is all about taking initiative in such instances and leading the way in creating a better and a brighter world through cleaner air and clear blue skies.

4100 32nd Avenue Fargo ND

The site is located at the intersection of 32nd Avenue South and 42nd Street Southwest in South Fargo, North Dakota. Its located on the same property as Cass County Energy Corporative. It is an interesting piece of land with a rectangular shape. This site is also close to Interstate 29. The location is a non-rushed area with a housing complex and few commercial stores. With already having Cass County Electric Corporative in the site, it is a perfect fit to the new Energy Interpretive Center.

The area near the site divides in to two parts. To the west side is a residential area and agricultural lands beyond that. The east is mostly a commercial area running to the interstate. The east of the interstate is crowded with restaurants, libraries, groceries, apartments, etc. All the buildings that are located around the site are low rise buildings. There are many empty spaces around the site.

Fargo Moorhead

South Fargo

32nd Avenue South

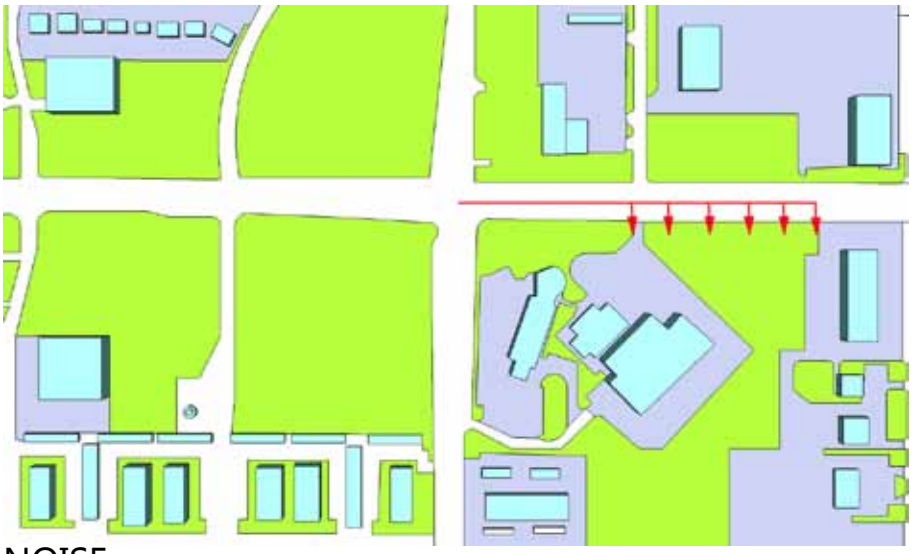
DENSITY

There few buildings around the site as most part of the area is still developing.

EXSISTING BUILDINGS

WIND

The prevailing winds for the area strike from the north west. Becaouse of few buildings and trees, wind flows straight across the site.



NOISE

Due to 32nd Avenue being sometimes congested route along side the site, most of the noise will be coming from the North.

TOPOGRAPHIC

VEHICLE AND PEDESTRIAN ACCESS

SLOPE

With a flat surface in most of the part, northward slope is 1.5 ft per mile and eastward is 2 ft per mile.

GENERAL DISCRIPTION

Urban land with a few industrial parks, warehouses, and office buildings.

SOIL

Clay,Silt

FLOODING

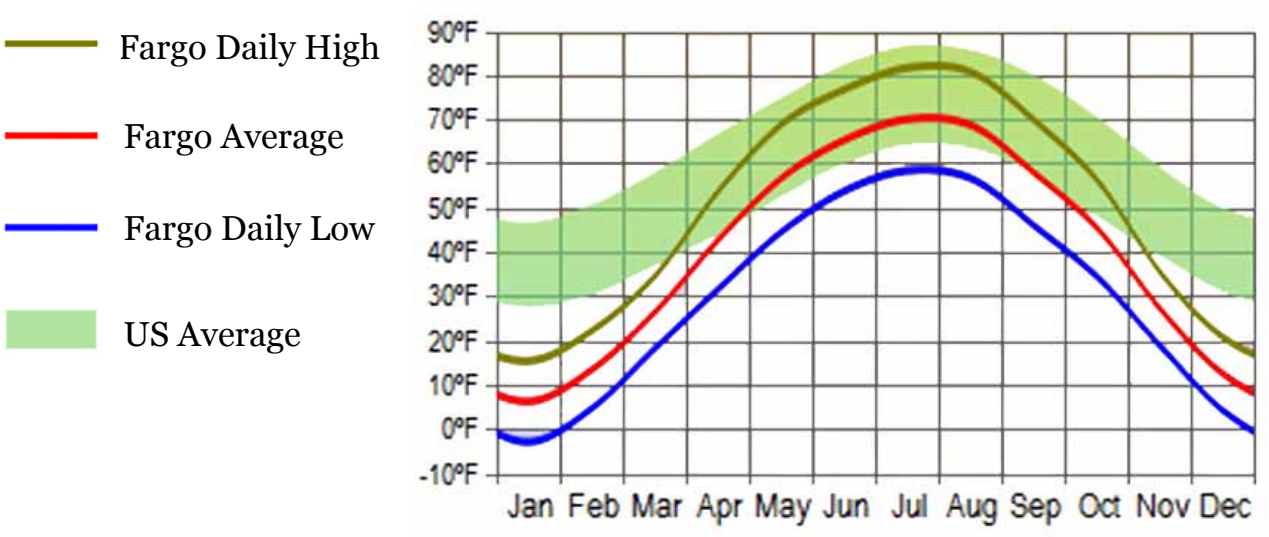
In Cass County seasonal flooding can be occur because of the Red River

Looking North

Looking South

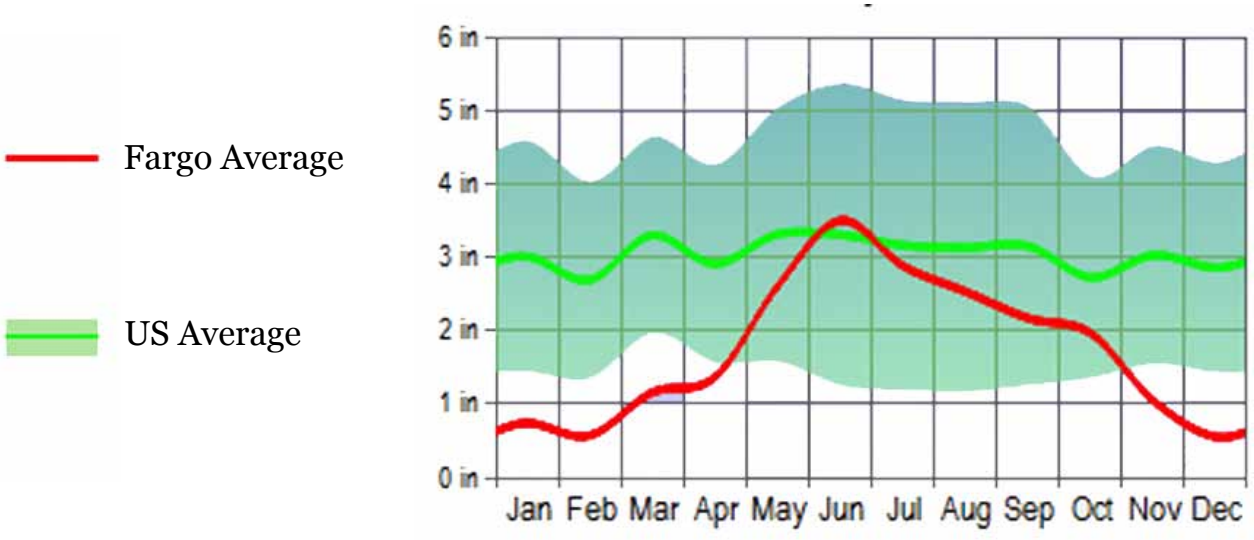
Looking East

Looking West



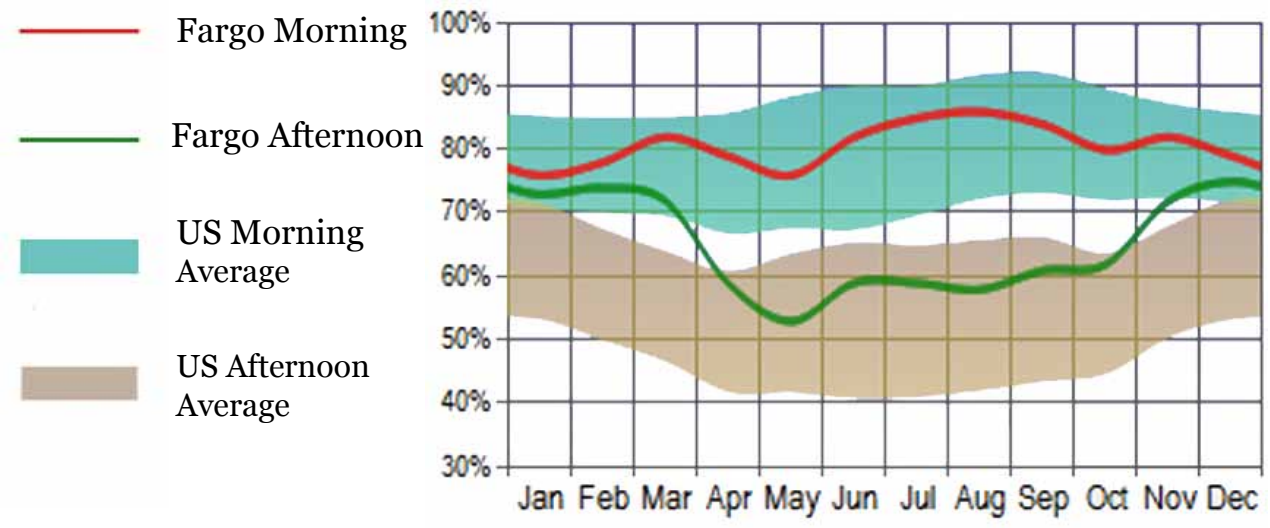
TEMPERATURES

Over the course of a year, the temperature typically varies from -1°F to 83°F and is rarely below -20°F or above 91°F.



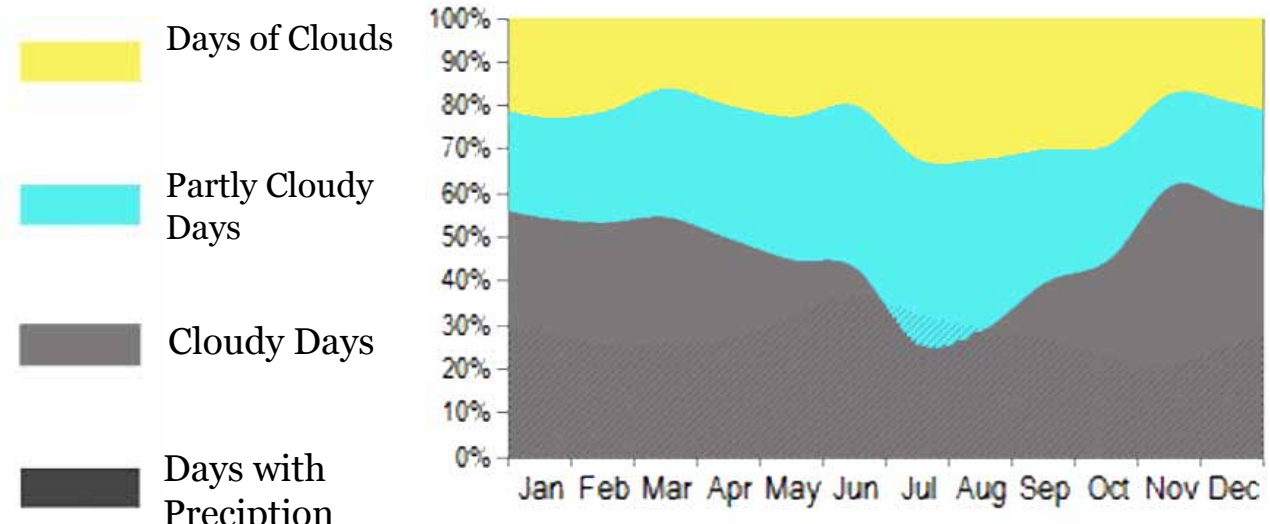
PRECIPTION

Precipitation is most likely around June 14, occurring in 63% of days. Precipitation is least likely around October 8.



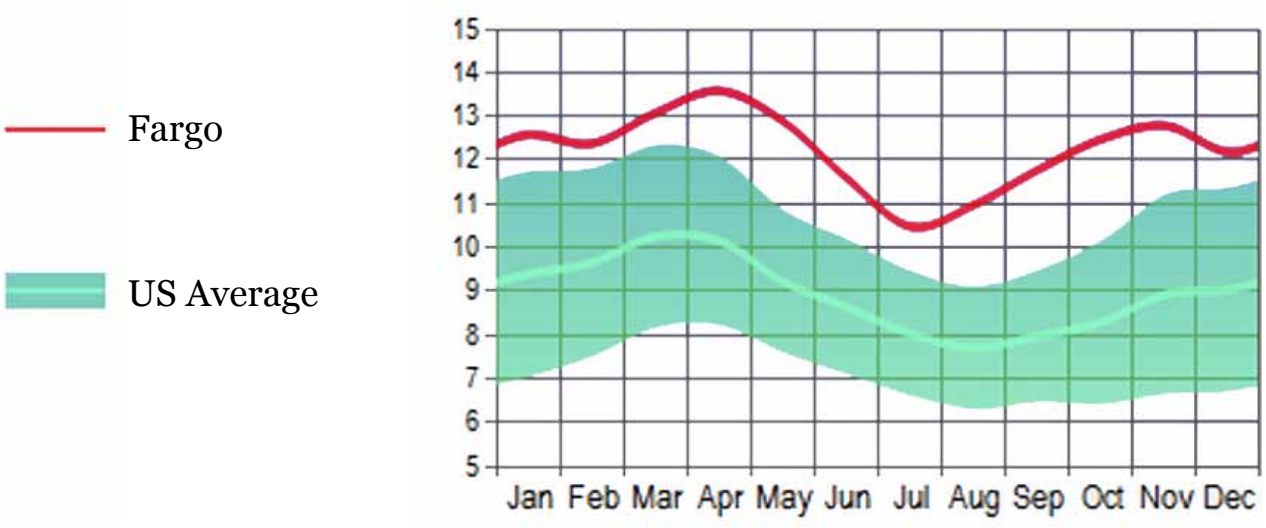
HUMIDITY

The relative humidity usually ranges from 37% to 90% throughout the year, rarely dropping below 19% which is dry and occasionally reaching as high as 99%.



CLOUD DAYS

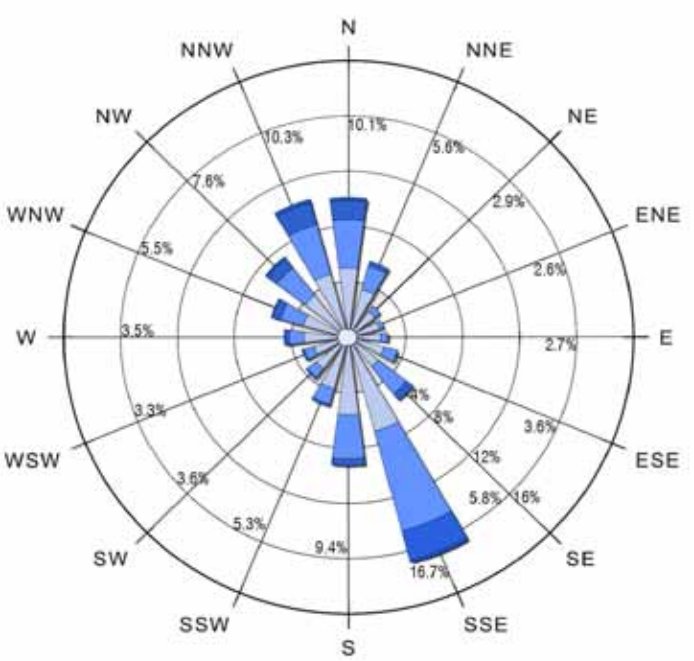
The sky is cloudiest on December 8 and clearest on August 11. The clearer part of the year begins around May 31. The cloudier part of the year begins around October 16.



WIND SPEED

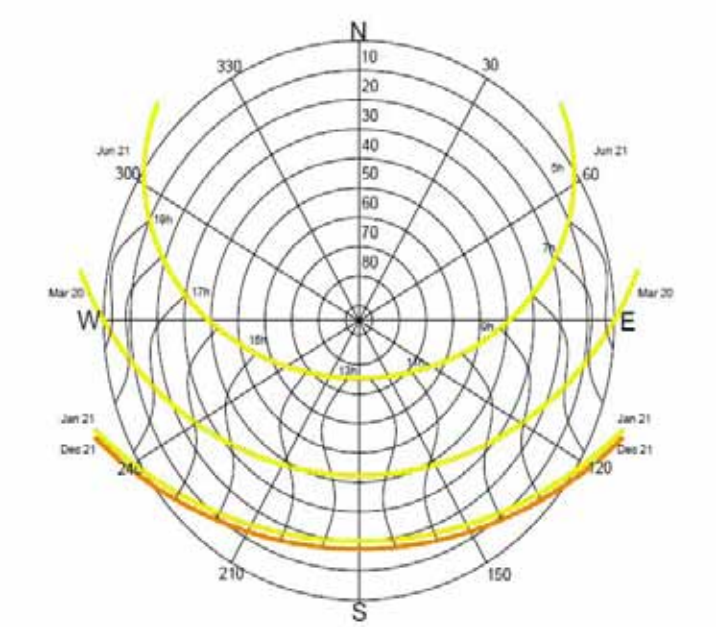
Throughout the year wind speeds vary from 1 mph to 20 mph (light to fresh breeze, rarely exceeding 29 mph, which would be strong wind.)

WIND DIRCTION



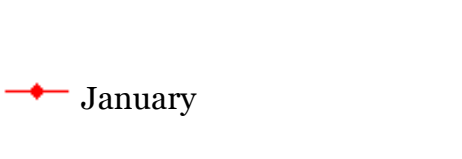
Incoming strong wind from North North-west and returns South and Southeast.

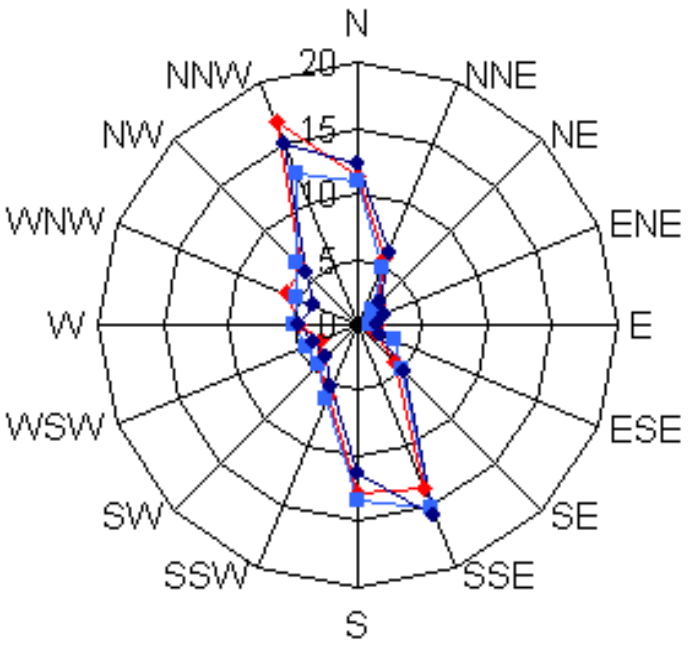
SUNPATH



The shortest day is December 21 and the longest day is June 20th.

WIND


January
February
March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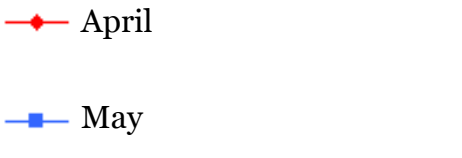
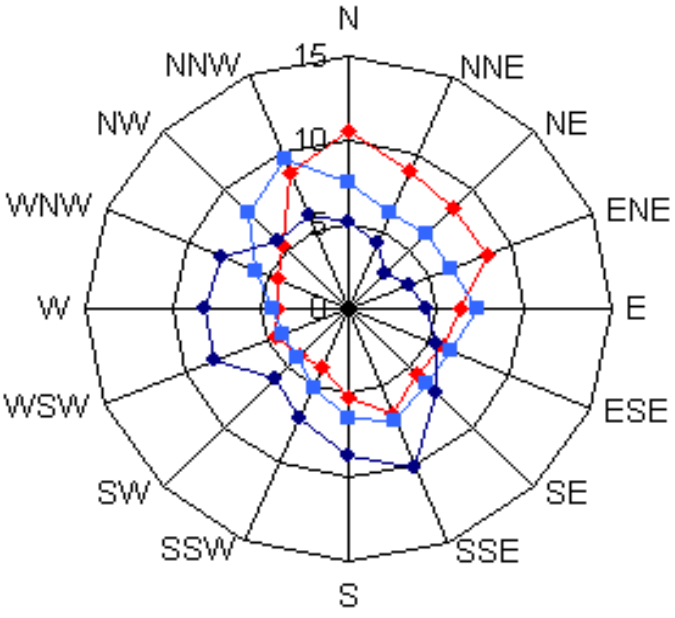

April
May
June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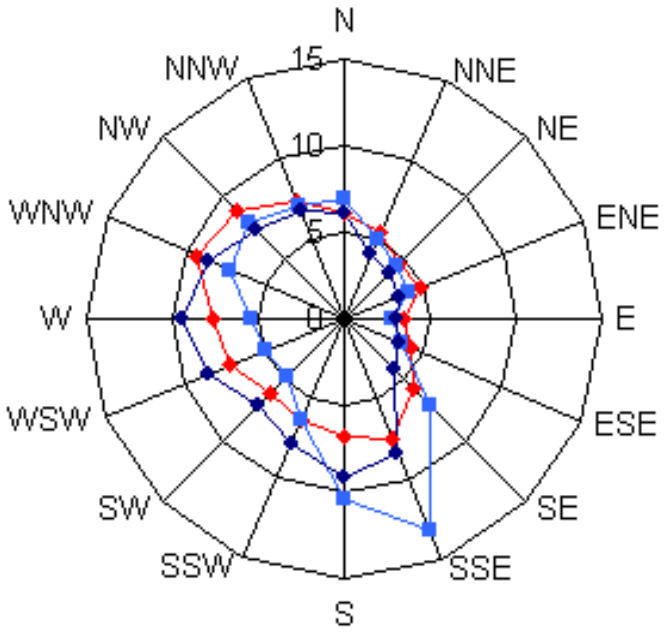
WIND

July

August

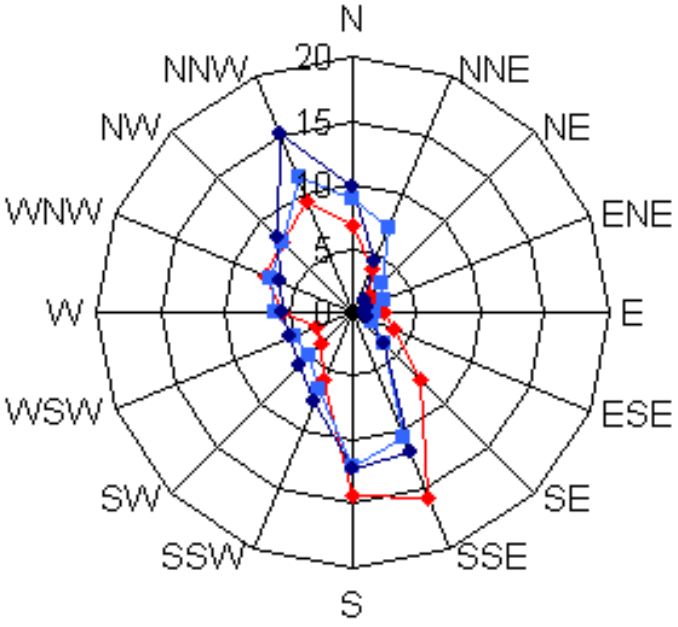
September



October

November

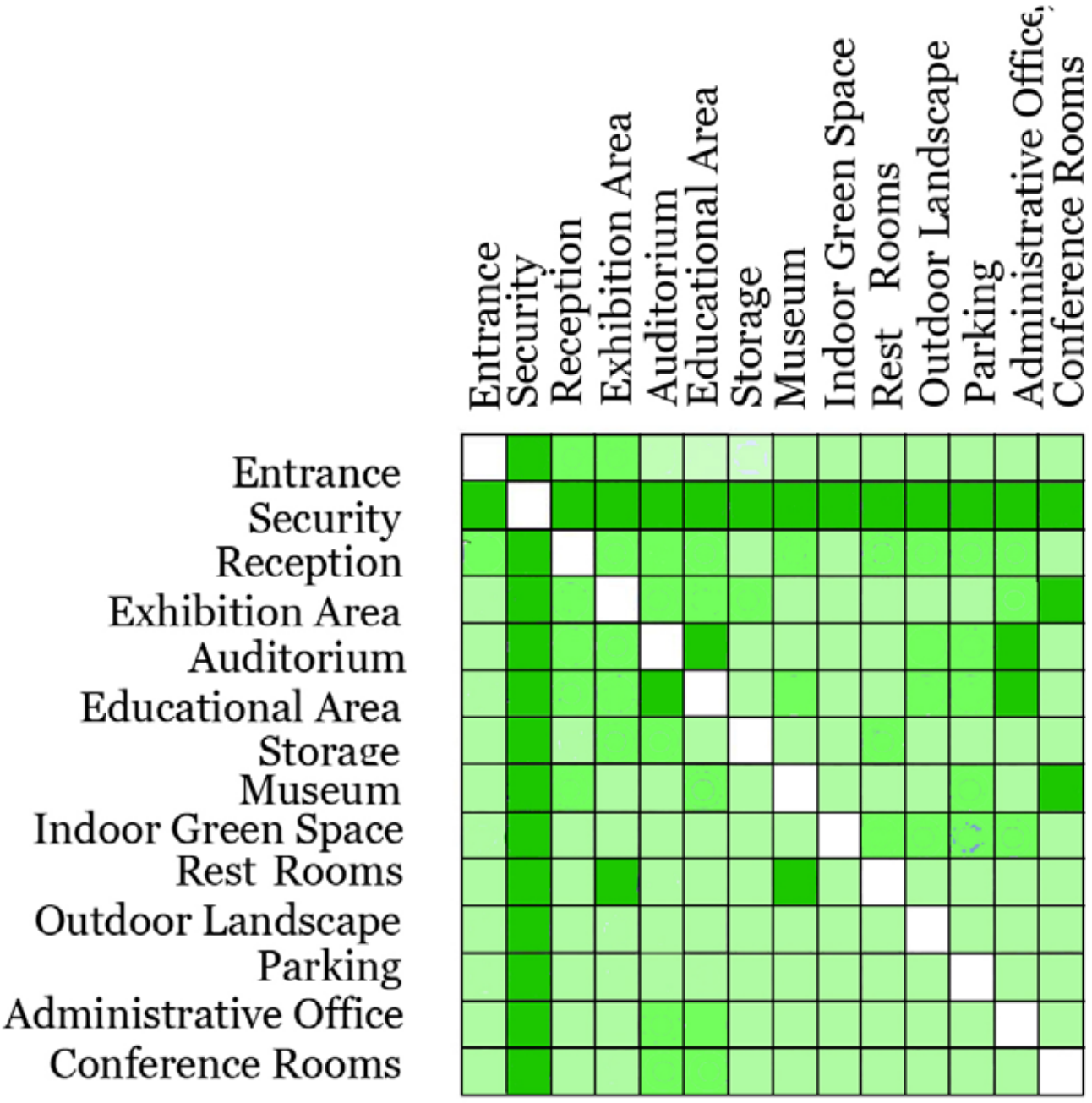
December



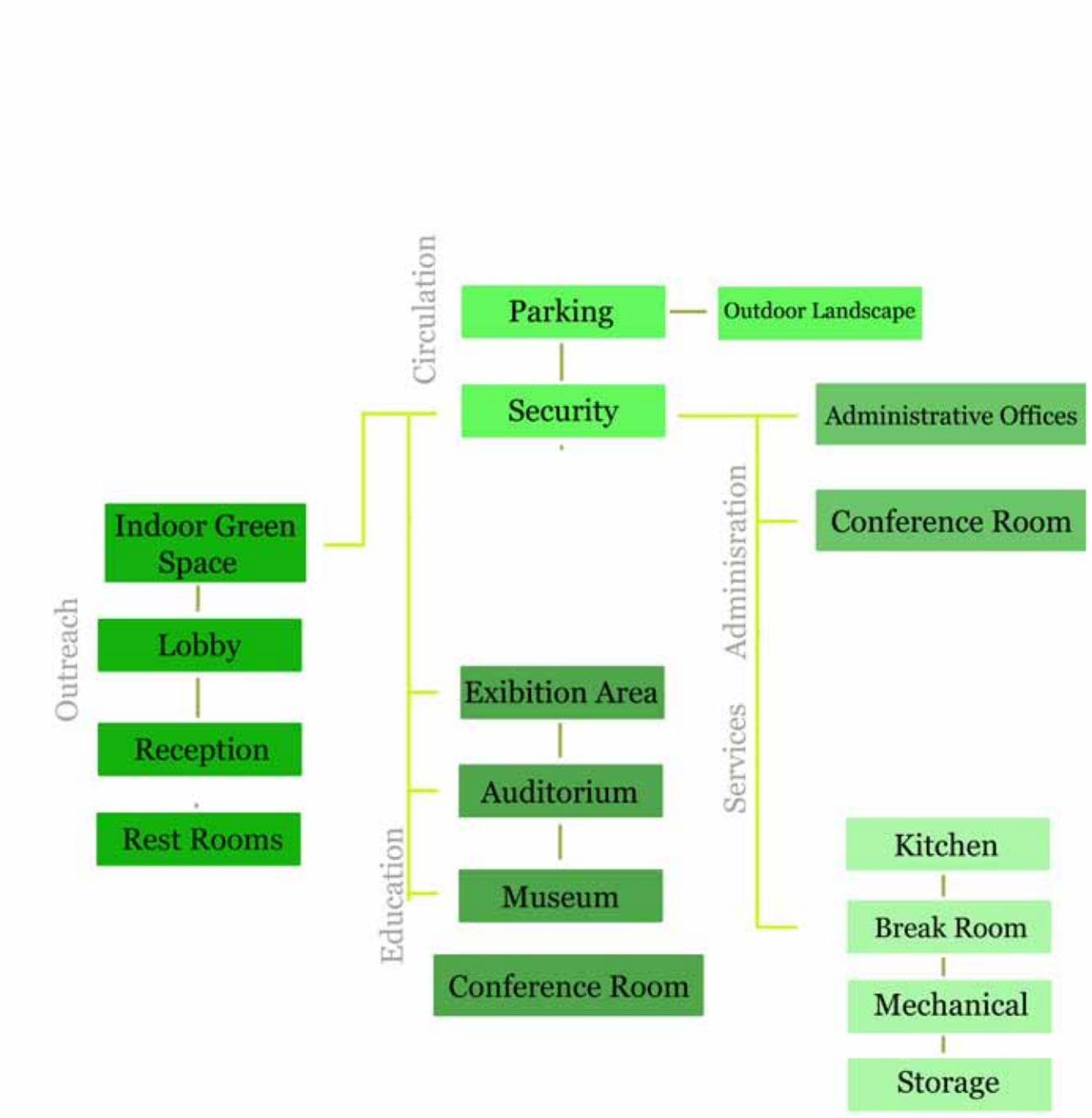
Fargo is a flat, open area. Precipitation is the main climatic characteristic of Fargo Moorhead. Some rain and snow amounts are heavy.

Winter time is cold and of low humidity with the temperature remaining below 0 celcius most of the time. With low humidity summers are comfortable in Fargo with warm days and cool nights

Elevation: 900 feet above sea level



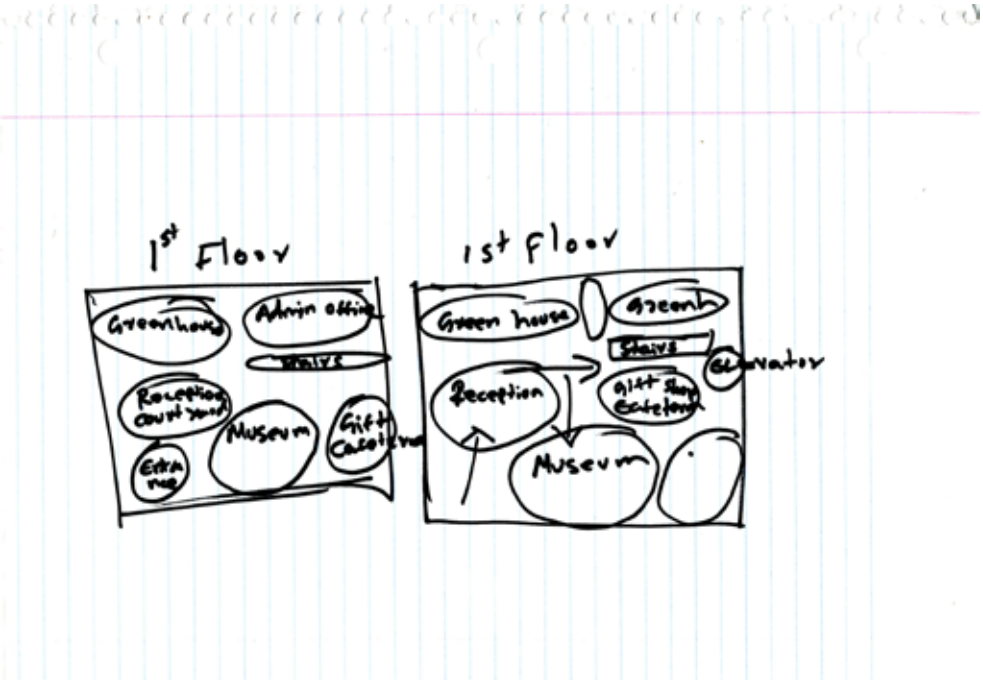
INTERACTION MATRIX

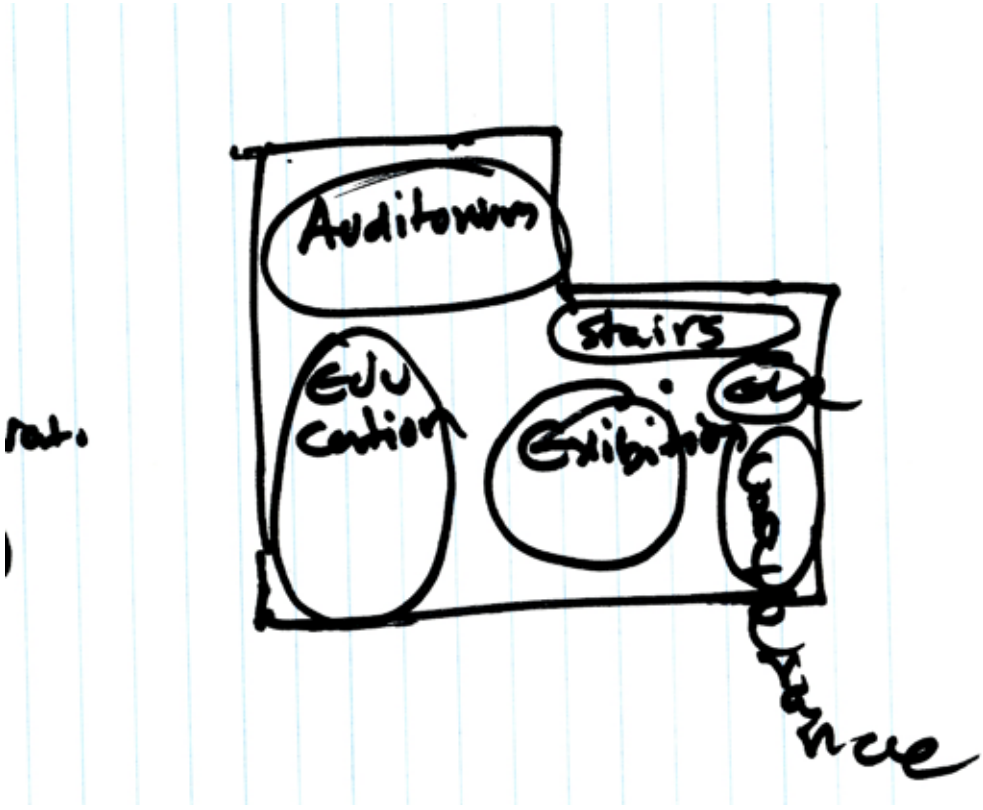


INTERACTION NET

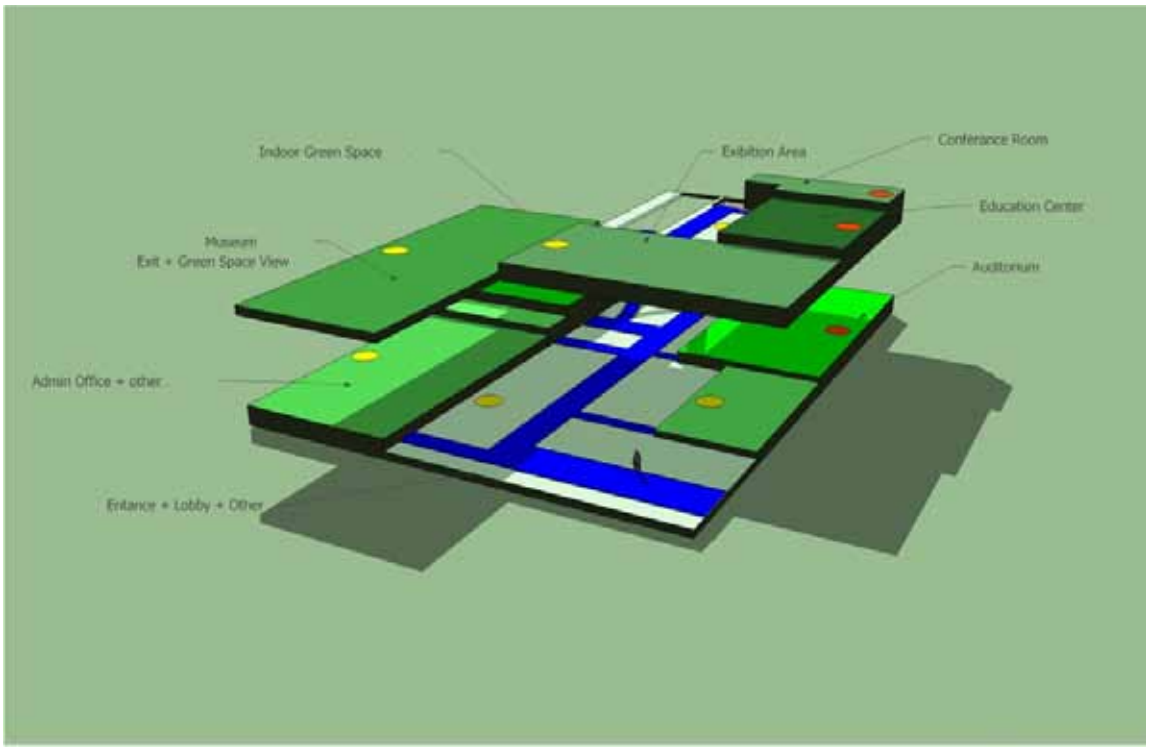
Area	**SF**
The Main Entrance	NA
Lobby	1000
Reception	
Administrative Office	3500
Conference Rooms	1200
Auditorium	1200
Exhibition Area	4000
Information Center	3500
Museum	2500
Indoor Green Space	3000
Rest Rooms	800
Break Room	900
Mechanicaland Storage	2000
Requierd Space Approx	23,600

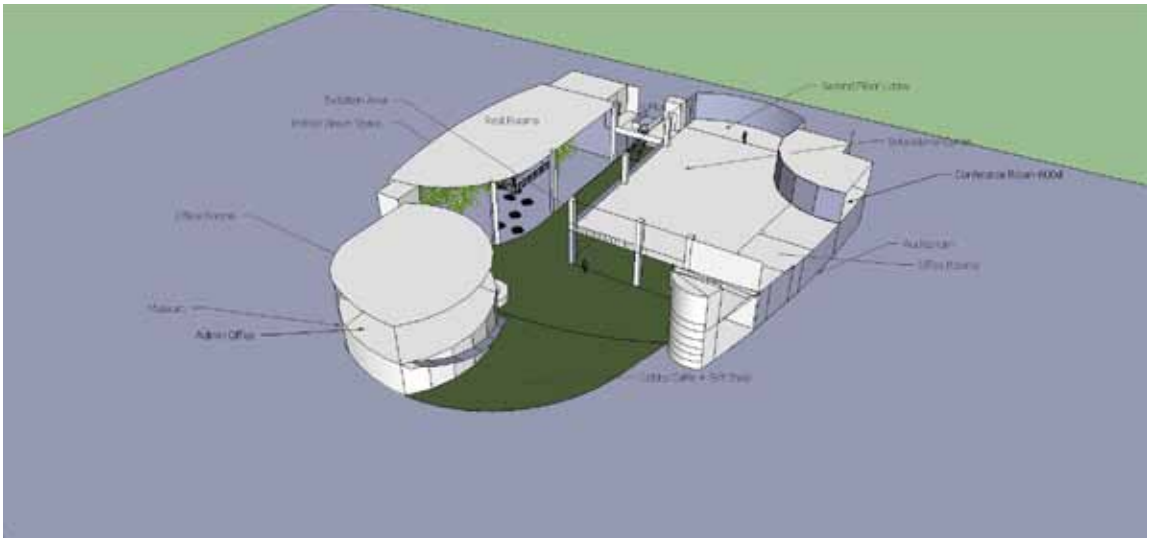
DESIGN





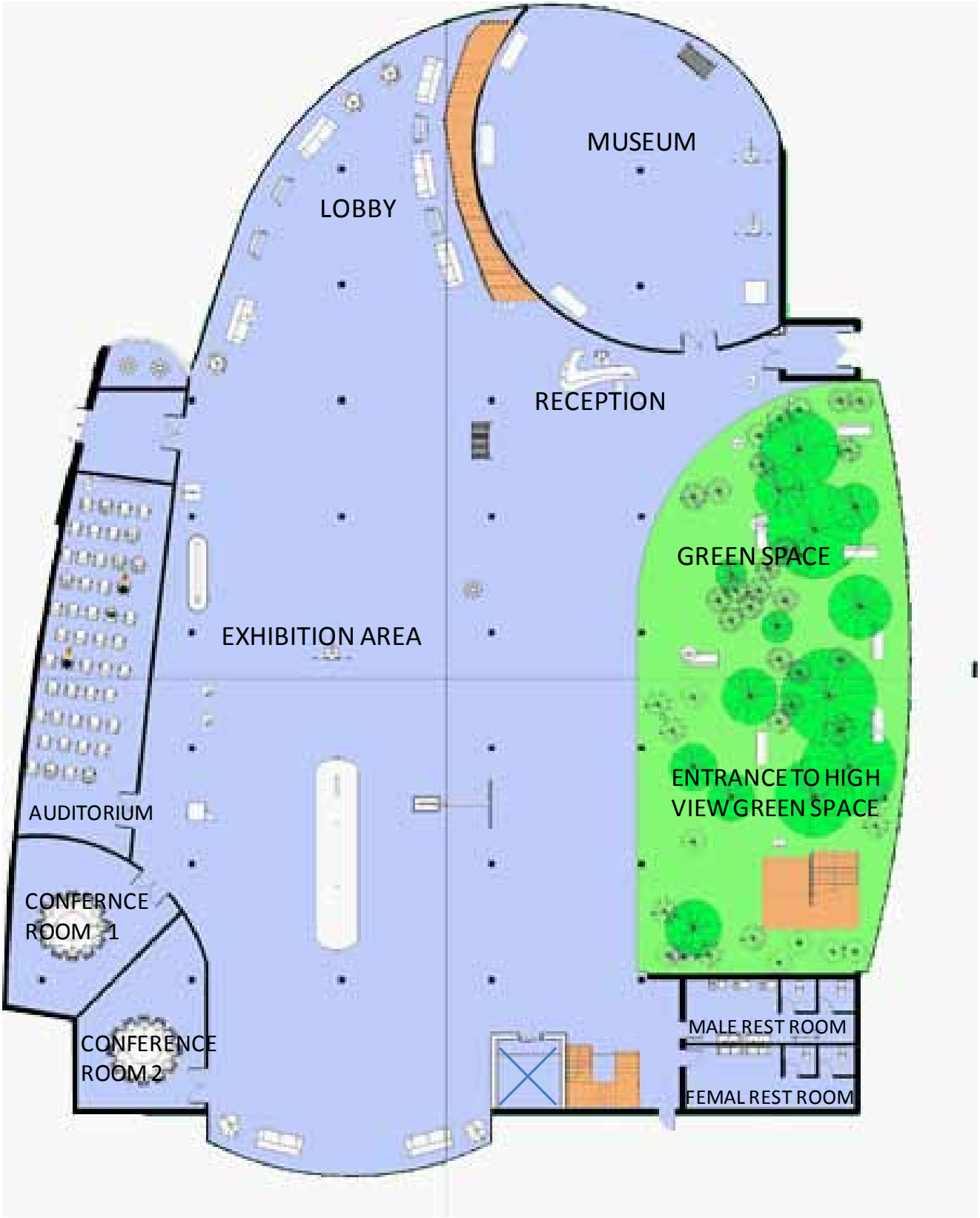
BUBBLE DIAGRAMS



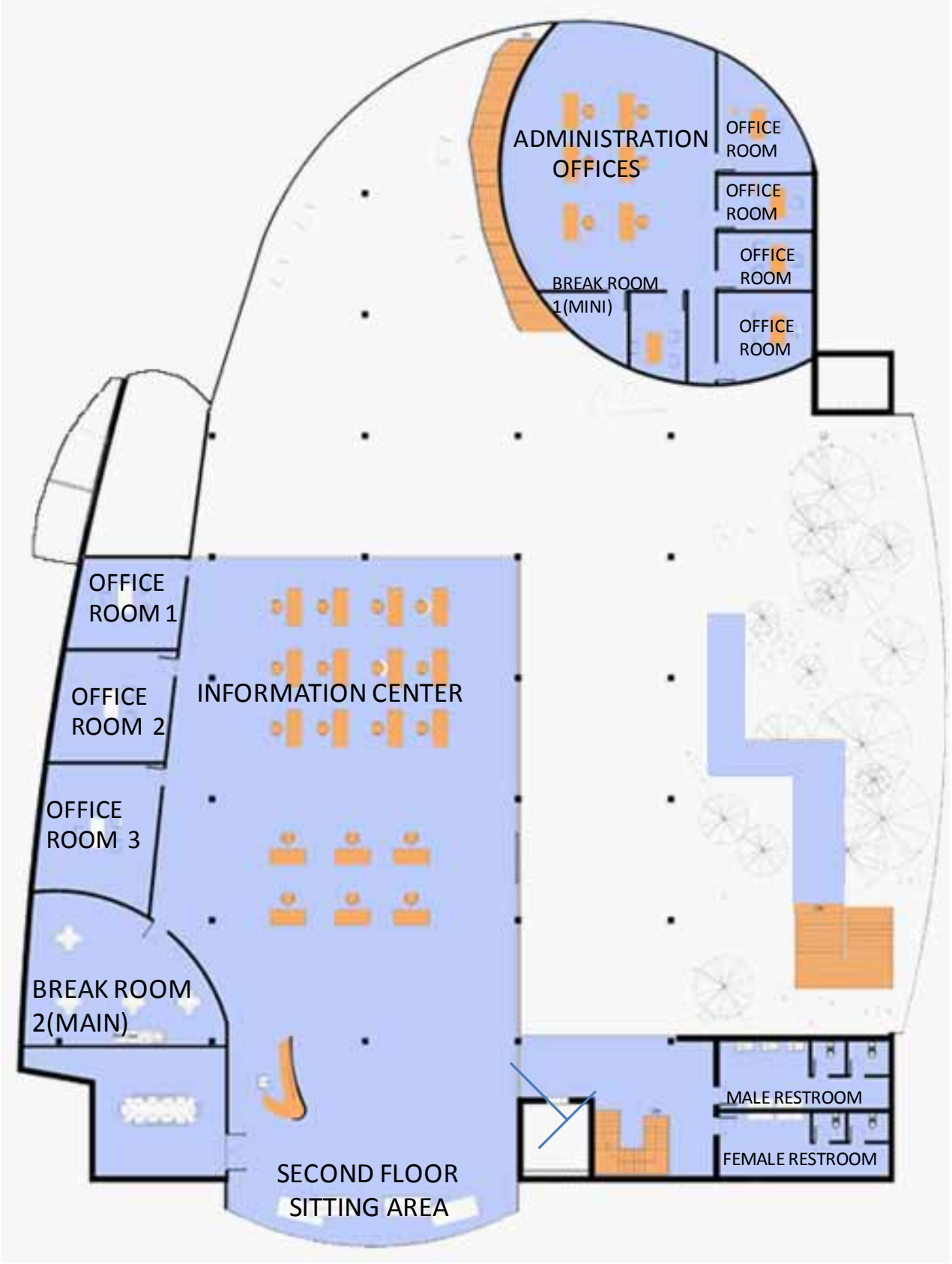


PROGRAM DIAGRAM

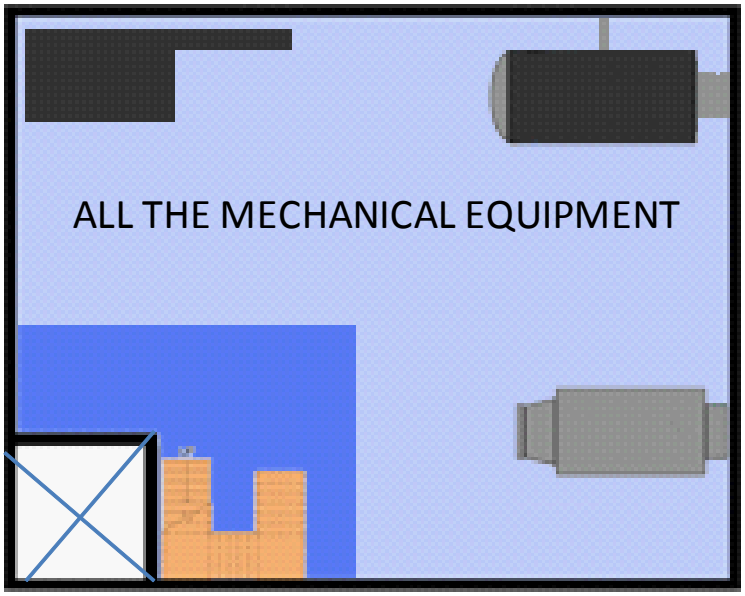
SITE


MUSEUM
LOBBY
RECEPTION
GREEN SPACE
EXHIBITION AREA
ENTRANCE TO HIGH VIEW GREEN SPACE
AUDITORIUM
CONFERNCE ROOM 1
CONFERENCE ROOM 2
MALE REST ROOM
FEMAL REST ROOM

FIRST FLOOR

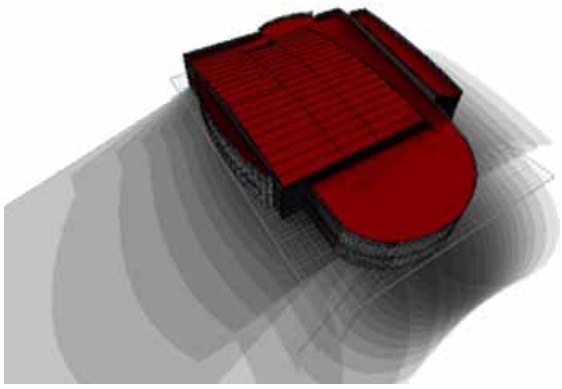


SECOND FLOOR

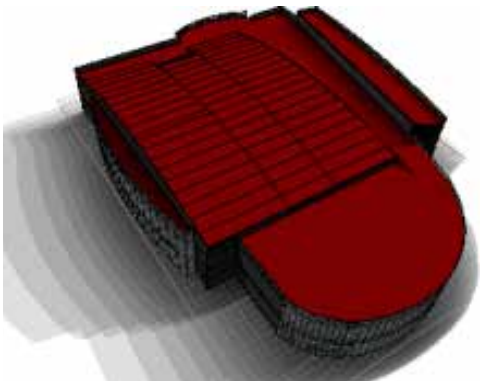


GROUND FLOOR

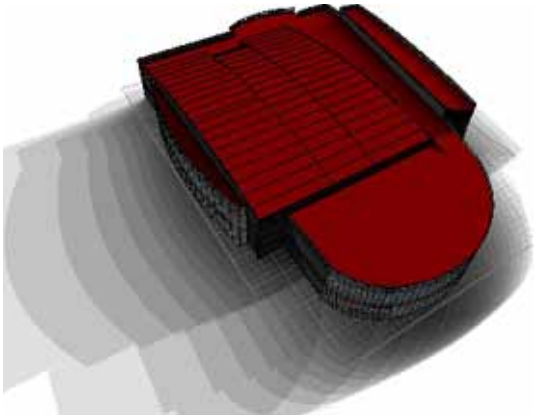
MARCH



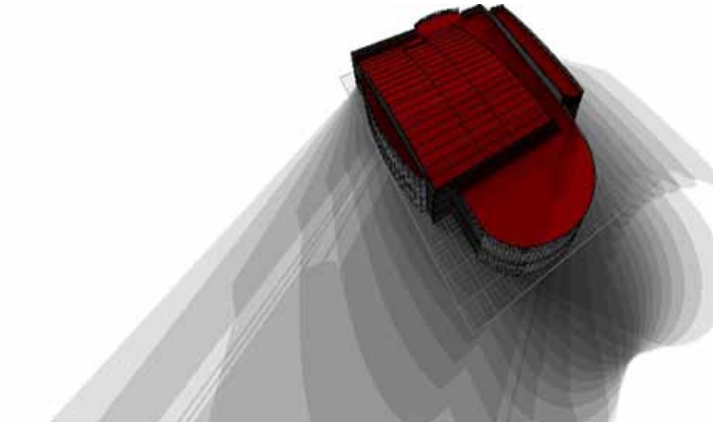
JUNE



SEPTEMBER

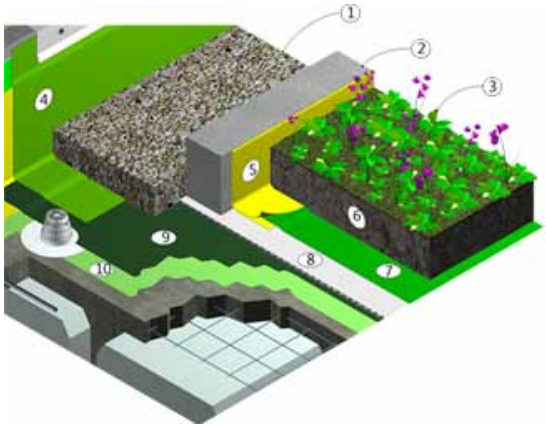


DECEMBER

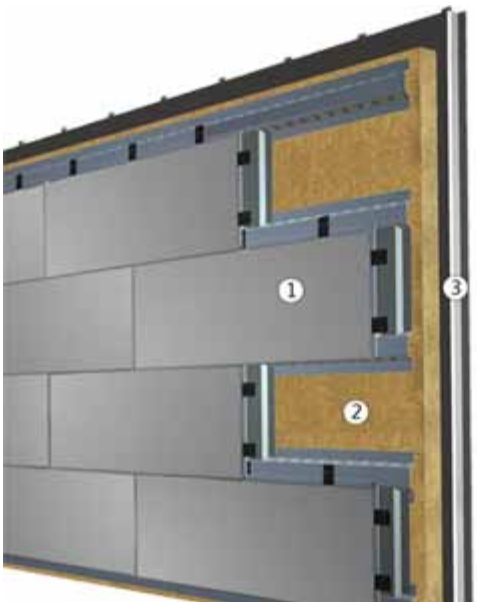


SHADOW RANGE

1 Beam
2 Bolt Connecting Beam
3 Plate

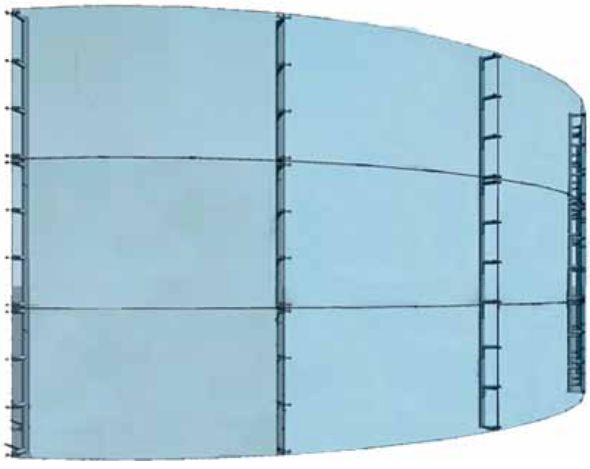


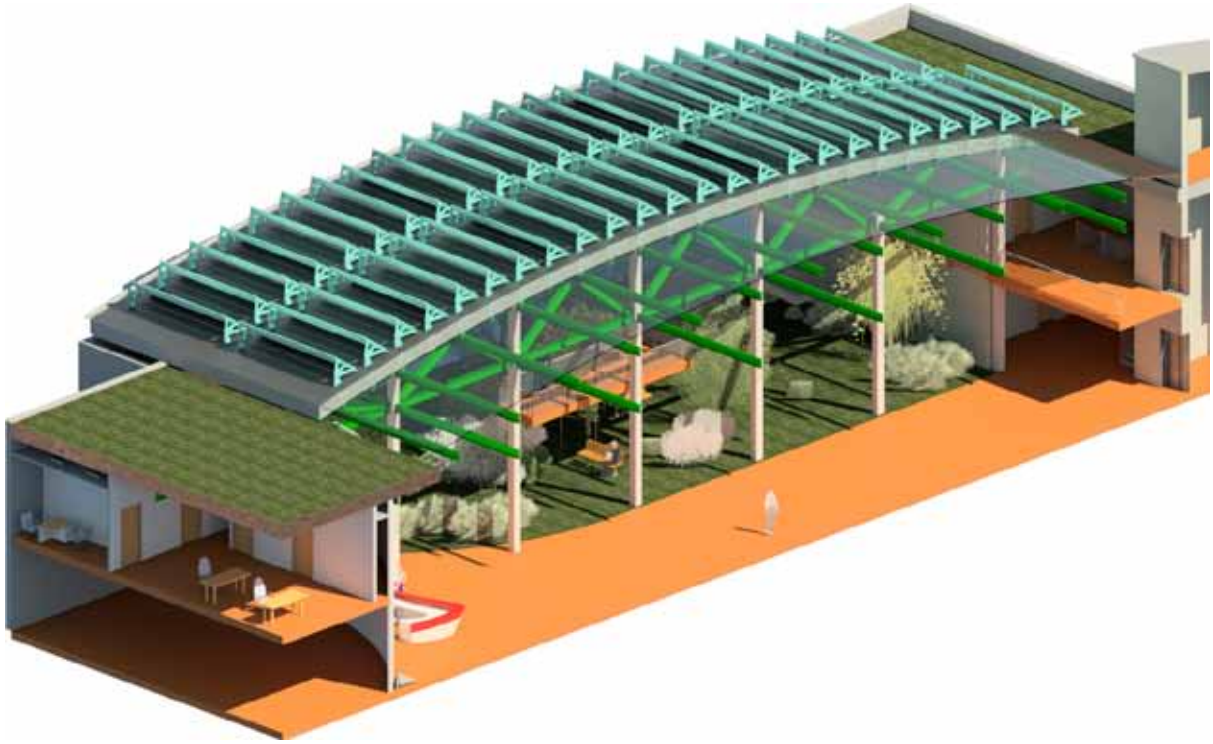
1 Gravel Paver
2 Concrete Curb
3 Vegitiation
4 Cap Sheet Membrane
5 Microfab Double Layer
6 Growing Medium
7 Microfab
8 Sopradrain
9 Cap Sheet Membrane
10 Base Sheet Membrane



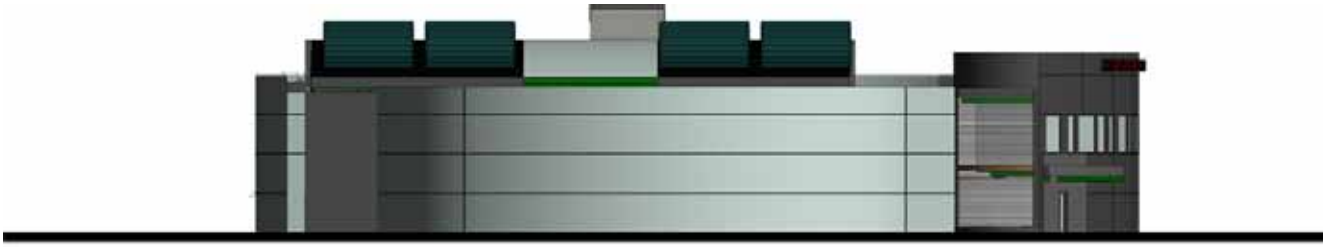
1 Air Barrier Wall
2 Insulation
3 Metal Wall Panels

Laminated Glass
Cirten Wall Framing Members
Extutuion

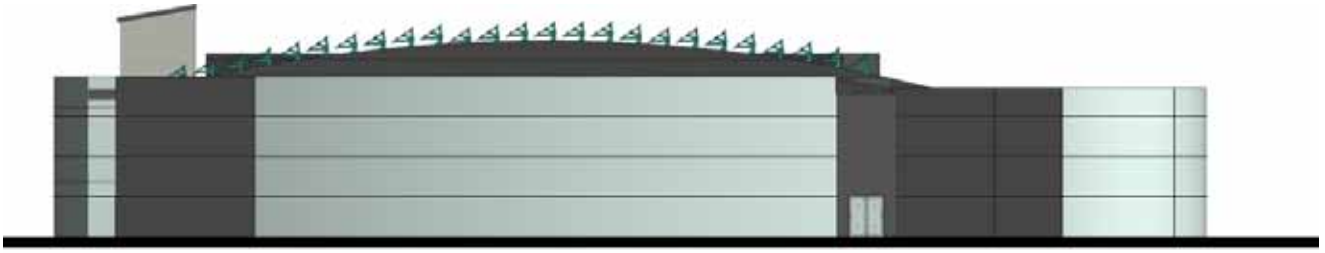




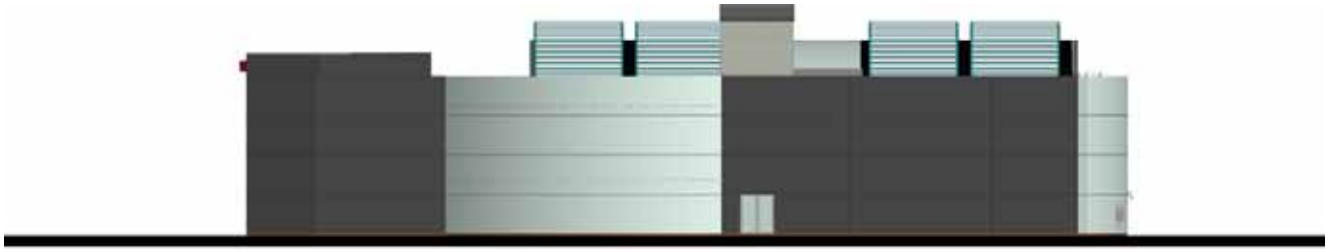
STRUCTURAL SYSTEM AND AIR CIRCULATION



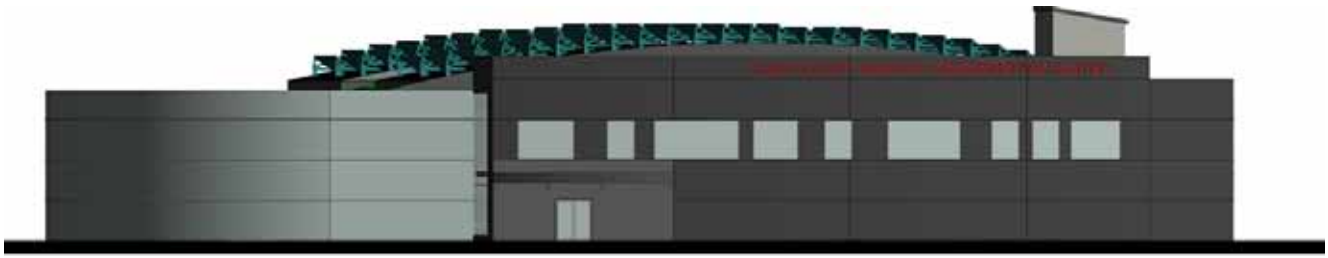
NORTH



EAST

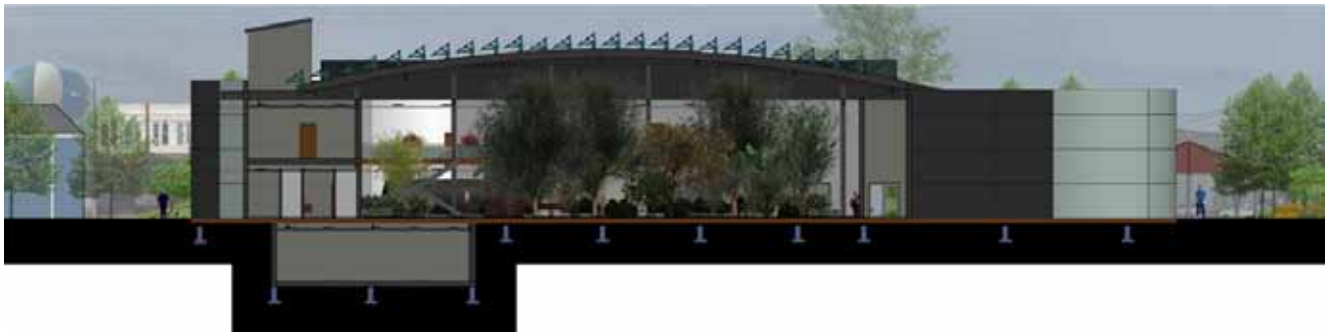


SOUTH



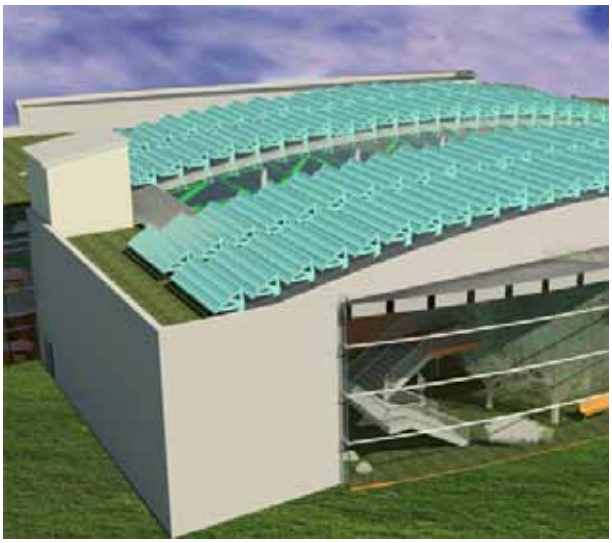
WEST

ELEVATIONS



SECTIONS

Payback From Energy Savings
Energy Efficient System
No Noisy Outdoor Condenser
Safer



No Pollutin
Long Lasting Solar Cells
Low Maintenance
Easy Installation

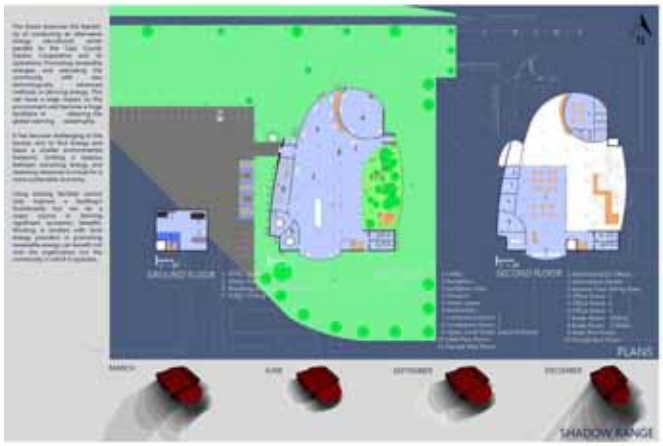
Low Wind Speed Operation
Direct Drive Generator
Silent Operation
Less Operation and Maintenance

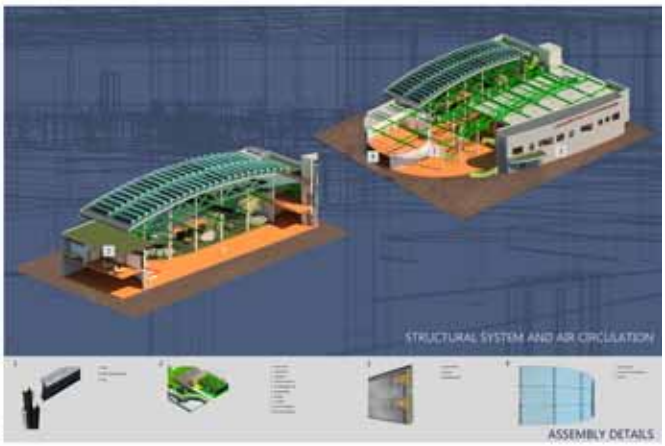
INTERIOR

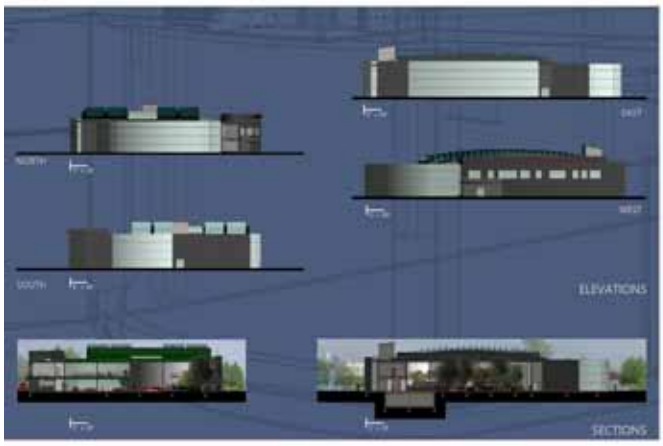

CASS COUNTY ENERGY INTERPRETIVE CENTER
CASS COUNTY ENERGY INTERPRETIVE CENTER

EXTERIOR


A BETTER FUTURE WITH CLEAN ENERGY
CASS COUNTY ENERGY INTERPRETIVE CENTER
4101 32ND AVE SOUTH FARGO NORTH DAKOTA 58103 USA


PLANS
SHADOW RANGE


STRUCTURAL SYSTEM AND AIR CIRCULATION
ASSEMBLY DETAILS


ELEVATIONS
SECTIONS


GEOTHERMAL HEATING
SOLAR PANEL SYSTEM
VERTICAL AXIS WIND TURBINE

EXHIBIT

Fall 2009

Arch 271 Stephen Wischer
Tea house - Moorhead, Minnesota
Boat house - Minneapolis, Minnesota

Spring 2010

Arch 272 Philip Stahl
Free hand drawing
Metaphor chair
Montessori - Fargo, North Dakota
Hemmah Dwelling – Fargo, North Dakota

Fall 2010

Arch 371 Mike Christenson
Re Modeling a House – California

Spring 2011

Arch 372 Paul Gleye
Recreation center – Fargo, North Dakota
Fire station-Fargo, North Dakota

Fall 2011

Arch 471 Don Faulkner
High-rise-San Franciso, California
KKE Design Competition

Spring 2012

Arch 472 Ron Ramsay
A House belongs to the 19th century,
Agincourt,Iowa

Fall 2012

Arch 771 Regin Schwaen
Additon to North Dakota Museum of Art

CASS COUNTY ELECTRICS http://www.kwh.com/

GOOGLE MAPS http://maps.google.com/maps?hl=en&tab=wl
http://www.archdaily.com/57339/surry-hills-library-and-community-centre-fjmt/

Local aspects of UK renewable energy development: Exploring public beliefs and policy implications by Dr. Patrick Devine-Wright BA MSc CPsychol

US historical energy consumption 1775-2010, Energy Perspectives 1949–2010, U.S. DOE Energy Information Administration.

City of Fargo http://www.cityoffargo.com

http://www.world-architects.com/projects/30843_the_guangdong_museum

http://www.obayashiusa.com/portofolio/?type=detail&id=84

http://www.city-data.com/city/Fargo-North-Dakota.html

http://climate.umn.edu/wind/kfar.htm

https://maps.google.com/maps?hl=en&sugexp=les%3Bcpsugrpq2&gs_rn=0&gs_ri=serp&gs_mss=california+academy+of+sciences+ac&tok=v8UTslnFOQZB9Xmn2otewA&pq=california+academy+of+sciences+achitect&cp=13&gs_id=2k&xhr=t&q=cass%20county%20electric&bav=on.2,or.r_gc.r_pw.r_qf.&bpcl=39314241&biw=1920&bih=936&um=1&ie=UTF-8&sa=N&tab=il

http://www.gaisma.com/en/location/fargo-north-dakota.html

http://www.city-data.com/us-cities/The-Midwest/Fargo-Geography-and-Climate.html

http://www.obayashiusa.com/portofolio/?type=detail&id=84 Images are modified for diagrammatic purposes.

http://modernlibrarydesigns.wordpress.com/2012/02/03/surry-hills-library-and-community-centre/, http://www.architecturenewsplus.com/project-images/9859 Images are modified for diagrammatic purposes.

http://weatherspark.com/averages/30234/Fargo-North-Dakota-United-States

http://www.casscountynd.gov/county/depts/planning/Comprehensive%20Plan/Chp1.pdf

http://alternativeenergy.procon.org/view.resource.php?resourceID=002475

North Dakota State Univeristy made me understand how much more there is left to learn in my acadamic career

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