Fig. 1

Ecologically remodeled warehouse:

The use of passive and sustainable systems to repurpose an abandoned car manufacturing plant.

By: Emilee Olstad

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

Cindy Urness

Primary Thesis Advisor

Thesis Committee Chair

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Thesis Abstract:

Sustainable and passive design can be used to remodel an industrial site, while preserving historical context and creating a productive mixed-use space. This thesis project will take an existing abandoned automobile manufacturing plant and create an adaptive reuse space using passive design. The building will be a mixture of spaces and features including both residential and commercial use. The structure will be remodeled using passive and sustainable systems to create a low energy efficient building using; solar, recycled water and daylighting. The passive systems will be researched, cataloged and incorporated into an existing manufacturing plant to make it more energy and cost effective for the building users. The building will include apartments on the upper two floors, shops and restaurants on the lower two floors and offices, meeting rooms and an education center on the middle two floors. Transit and parking will be added below grade and on a vacant lot adjacent to the site. The exterior will incorporate vegetation to provide shading and a garden space for the building users. Case studies will be used to verify, create and catalog the different types of passive systems and sustainable practices and their benefits and shortcomings. A comparative analysis of the passive systems will be used to design a mixed-use space in an existing manufacturing plant.

NARRATIVE OF THEORETICAL ASPECT OF THESIS:

PRESERVING THE PAST: USING PASSIVE DESIGN TO RE–PURPOSE AN ABANDONED CAR MANUFACTURING PLANTS.
How can an abandoned car manufacturing plant be remodeled into a mixed-use space using passive and sustainable design?

The Detroit car manufacturing plants have been abandoned and left to scrappers and spray paint artists. The buildings which once played an important role in shaping the nation and helping the war effort are now fading into history. The buildings and their stories should and can be preserved by remodeling with passive designs. These large spaces can be used for a multitude of things, apartments, shops, offices and education.
These massive structures are deteriorating and crumbling back into nature losing the embodied energy that was used to create these large buildings. In the current state of dilapidation and deterioration, they are not only an eye sore but also a safety hazard. These structures where once grand useful buildings with a purpose and meaning. Life and products flowed in and out of the spaces and gave people and the neighborhood hope.
The people who live near these deteriorating building sites want to improve the neighborhood and their standard of living. The hope, faith and motivation is to renovate these structures to create productive multi-use spaces using passive design. Taking an eyesore, run-down building and creating something that is attractive and brings life and people back into the space while preserving a part of history. Relying on pragmatic thinking and what works best in a real-world situation and first-hand knowledge and other people's experiences I will re-purpose an industrial site. Seeking reason and reality based in facts that can be proven and understood along with faith guide my world-views. St. Augustine in The City of God explains where our faith and relation to God come from, explaining the building, destruction and rebuilding of God's City.

The City of God, by St. Augustine, is about God create man, death and sin from eating the fruit of the tree of knowledge of good and evil, and the creation of the new city for man and his salvation by faith in Jesus Christ. In building and designing buildings our experiences shape our thinking about spaces and what is important to the shape and feel of the space. St. Augustine explains the connection of man and his experiences because "of the knowledge of God...truth itself" (Augustine 346) to seek knowledge and truth. In the beginning Detroit like the Garden of Eden was perfect and the ideal location for the start and boom of the auto industry because of its location. Detroit's location on the Great Lakes and railroad line plus its central location "between the coal fields of Kentucky and the iron ore of Minnesota and Wisconsin" (Kurczewski) made it the ideal place for manufacturing. The Detroit automobile manufacturing plants in the 1920's and 30's where like the creation of man at the beginning, they seemed perfect and glorious. The auto plants boomed and were productive, people had jobs and neighborhoods were full of houses, shops and life.

The manufacturing plants designed and created by Albert Kahn were innovative and exciting with large open floor spaces to work, large exterior windows to allow in daylighting, and new innovative machines for manufacturing. Destruction and wickedness was introduced into Detroit and the car industry as man ate of the Tree of Knowledge of Good and Evil greed and wickedness entered the auto plants of Detroit with the desire for better cars, bigger plants, and more money. Along with worker and racial tensions, and the energy crisis of the 1970's these companies were destroyed by their own success.
The auto plants in Detroit were closed and moved to other cities in Michigan, the Country and the World with larger more modern buildings. Newer manufacturing processes became increasingly more abundant which decreased labor and created more profit for the company owners. These plants leaving the city of Detroit left the neighborhoods in ruin and deterioration, allowing wickedness to enter the city with violence and disparity. "Who can conceive the number and severity of the punishments which afflict the human race...but are a part of the human condition and the common misery" (Augustine 847). The deterioration of Detroit is linked to the relocation of the auto plants, racial segregation, rioting and the energy crisis. The city of Detroit has in recent years has started to clean up these building sites and improving the spaces left vacant from the deserted auto industry plants. Other companies and developers have already started remodeling some of the manufacturing plants into usable spaces, drawing people back into the city and neighborhoods where these giant buildings stand. The city of Detroit can be rebuilt because within each person whom believes, "in the original good, there are two other things, propagation and conformation" (Augustine 850). The propagation of good and the continual rebuilding, re-purposing of these industrial sites in Detroit will lead to the salvation of Detroit. Salvation is defined as, "being saved or protected from harm, being saved or delivered from a dire situation, saving the soul from sin and its consequences" (Wikipedia). Using passive and sustainable systems to create mixed-use spaces in the auto plants of Detroit will lead to the improvement and salvation of the area, neighborhood and city. "It is He, then, who has given to the human soul a mind, in which reason and understanding lie" (Augustine 851). With reason come understanding and then knowledge and hope that rebuilding the auto plants is a continuation of the work begun by the city of Detroit in propagating the enhancement of the city.

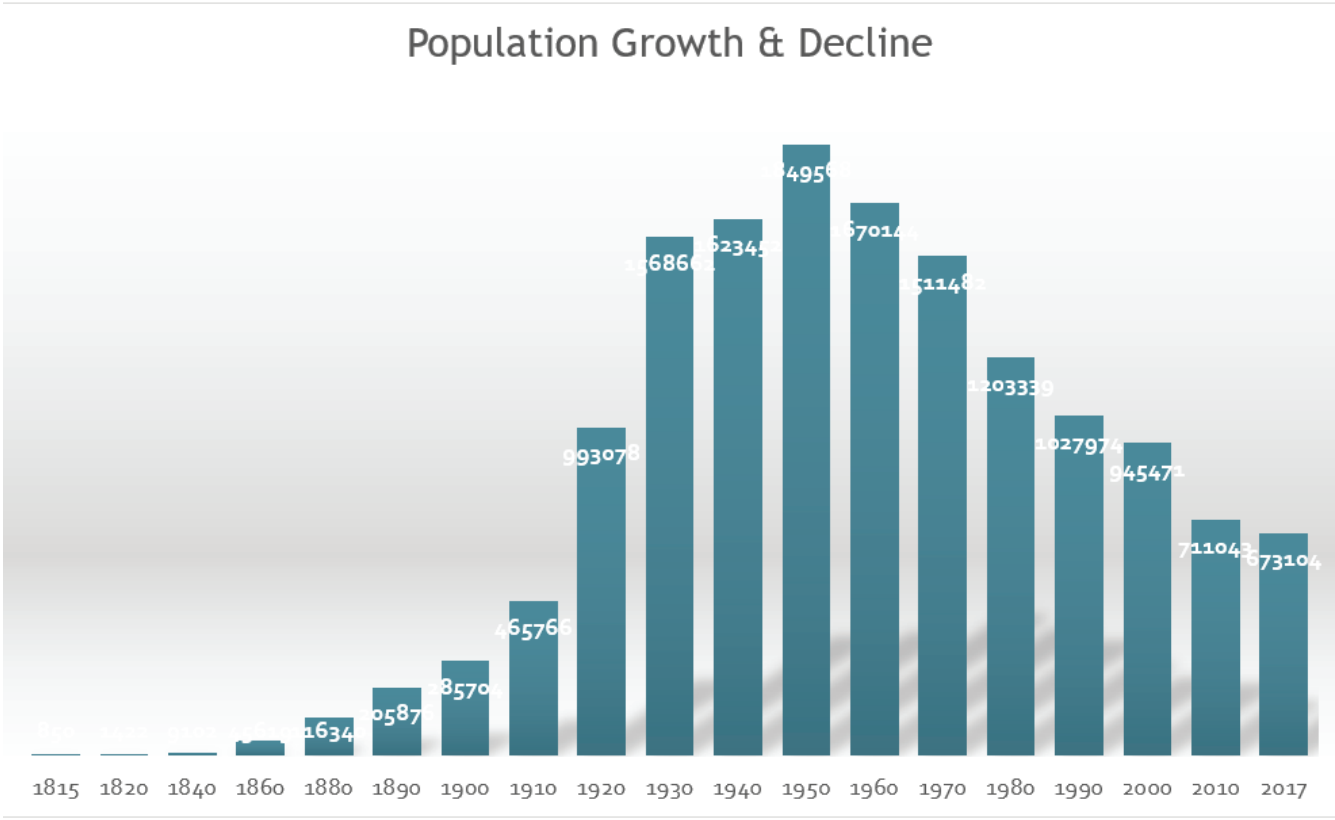
Passive design is an effective way to conserve energy, light and water while using the earths natural elements to warm, cool and light your building. There is a shortage of water and energy parts of the country and passive design will help with these shortages. Thorpe lists the benefits of passive design that include saving energy, comfort in various seasons and climates, adding value to your building, longer life and higher standard of living. These advantages continue through the reuse of materials and embodied energy in the original construction of the building. Using passive systems in an existing site will require creative design to include daylighting, green roofs, and air flow for ventilation. The resurrection of the manufacturing plant can be created by the adaptive reuse of the existing buildings just as St. Augustine says that through knowing God, man can be rebuilt.

The rebuilding of industrial sites into mixed-use spaces will make the neighborhoods known to ourselves and others. Creating an adaptive reuse space using passive systems within the city of Detroit gives life and hope to the buildings and city, just as the existence of Christ created hope and life for man and his soul. “Life eternal is the supreme good, death eternal the supreme evil, and that to obtain the one and escape the other we must live rightly” (Augustine 676). To continue to allow these buildings to deteriorate would be the supreme death and evil of the neighborhood, but the adaptive reuse of these spaces is the supreme good. The beautification of Detroit neighborhoods using passive design to remodel existing industrial plants will create nicer spaces and define the future of the city. Designing multi-use buildings with residential and commercial spaces with passive design is the future, and a better way to design and remodel an existing building. Passive and sustainable systems use the natural elements that God has created to heat, cool and power our buildings and is the future of Detroit’s auto industrial sites. “We do not yet see our good, and must therefore live by faith” (Augustine 676). Passive systems are the way for the New City of Detroit to be glorious again to learn to live rightly.

Remodeling a manufacturing plant using passive design can be done use deductive reasoning, pragmatic views and faith. These will provide an outline for researching the adaptive reuse of an industrial site using passive and sustainable systems while preserving the history of the auto industry. The history of the building, neighborhood and city need to be analyzed and recorded. The existing building and site conditions need to be assessed for cost of remodeling and what contaminates may still be on site. Passive designs will be simulated on a computer program to show the best placement of each system and which ones would be the most beneficial to the overall design and comfort of users and cost. Using conceptual assumptions will help by creating a need to catalog the history, site and building conditions, passive systems and real-world application. A catalog of the various systems will be created and analyzed to determine the effectiveness of each system in a reinforced concrete building and finally used to design a feasible ecologically efficient and sustainable mixed-use space. Adductive reasoning will allow the unknown end results of the study and provide a catalog list of systems that can be used to renovate an industrial site. My life experiences, upbringing, education and faith in God give me my thinking, outlook and skill. Using pragmatic views in a real, fact-based way; will provide an analytical cataloging and quick reference of passive systems to create and renovate existing buildings in Detroit. Making industrial buildings ecologically sound and efficient energy users.

Detroit Population

Year	Population
1815	850
1820	1,422
1840	9,102
1860	45,619
1880	116,340
1890	205,876
1900	285,704
1910	465,766
1920	993,078
1930	1,568,662
1940	1,623,452
1950	1,849,568
1960	1,670,144
1970	1,511,482
1980	1,203,339
1990	1,027,974
2000	945,471
2010	711,043
2017	673,104



The rise and fall of the auto plant is the fuel that lead to the rise and fall of Detroit's population.

Passive design can be used to remodel an industrial site, while preserving historical context and creating a productive mixed-use space. My site is the Fisher Body Plant #21 in Detroit, MI and it was the home of the original bodies by Fisher. The Fisher Brothers created and built the standard undercarriage in all the major cars of the 1920 -1960's and their design is still used by car manufactures to this day. Creating a unifying idea that this building and others like it can be saved using passive and sustainable design. Industrial sites can be given new life as multi-use buildings that includes residential, commercial, entertainment and transit systems while incorporating as many passive and sustainable systems as possible.

Detroit Time-line:

1701 French Settlement begins
1802 Detroit becomes a city, unincorporated in 1806
1815 Detroit Reincorporated as a city

1850 Stroh Brewery Company opens.

1896 Henry Ford drives the 1st car in Detroit.
1898 Detroit Automobile Co. starts
fails 3 years later in 1901
1899 Detroit Automobile Company,
Olds opens 1st car manufacturing plant.

1901 Ford opens Henry Ford Co.
which becomes the Cadillac Motor Co.
1902 Cadillac Automobile Co. starts.
1903 Ford opens Ford Motor Co.
then moves operation to Dearborn in 1910.
1903 Packard Motor Car Co. opens

1908 The 1st Model T was built by Ford.
1908 General Motors in Flint, MI opens
as a holding company for Buick.
1909 Ford builds new revolutionary manufacturing
plant with assembly line production.

1925 Chrysler Corp. starts in Auburn Hill.

1950 Detroit Population was 1.85 million
1950 Detroit is 4th largest city in America with
1.85 million people.
1950 United Auto Workers sign agreement with GM.

1958 Packard Motor Car Co. closes.

1965 Intermittent windshield wiper invented
1967 The 12th Street Riot happens, biggest in US History.

1973-74 Gasoline shortage allowed smaller
foreign cars a better market.

1999 Stroh's Brewery Company is sold and
divided by Pabst and Miller.

2008 GM & Chrysler are given a government bail out.
2009 GM & Chrysler declare bankruptcy.
2013 Detroit files for Bankruptcy with the US Government.

Fisher Body History Time-line:

1904-05	Fisher brothers move to Detroit and work for C.R. Wilson Company making horse-drawn carriage bodies.
1908	Fred & Charles Fisher start Fisher Body Company.
1913	Fisher Body Company was producing 100,000 car bodies per year for Ford, Krit, Chalmers, Cadillac & Studebaker.
1914	Largest auto body manufacturing plant in world
1916	Became the Fisher Body Corporation & produced 370,000 bodies per year.
1919	Fisher Body Plant #21 building built by Albert Kahn.
1919	GM buys 60% of Fisher Body.
1919-25	Fisher Body 21 was building body's for Buick & Cadillac.
1925	Buys Fleetwood Metal Body
1926	Entirely in-house coachbuilding division of GM.
1926	3.7 million sf for floorspace 200x581' =536,000sf.
1928	Fisher Office Building is built.
1929	Fisher Body became engineering facility.
1956	Fisher 21 made Cadillac Limosine bodies.
1974	Fisher Body Plant 21 closed
1984	Fisher Body was dissolved by GM.
1990	The Fisher Body Emblem is no longer used.
1990	Building bought by Carter Color Coat Company
1993	Building abandoned by Carter
2000	Detroit City owns building through default
2004	Michigan Dept. Env. Quality – asbestos, lead waste, ind. equipment, storage tanks, other hazardous mat.,contaminated soils & concrete in & around plant. Severely contaminated.
2008	EPA start removing soil & equipment. Wooden brick in floor & sections of concrete removed.
2010	Remove underground storage tanks.
2018	Still contaminated by EPA, police auto impound lot, Floor sections caved in, cement deteriorated by water & ice, fire on ground floor.
	For sale from city for $300,000.
	Close to midtown & Wayne state univ.

Fig. 3

The Fischer Body Plant #21 was built in 1919 on Piquette Street in Detroit, MI and made car bodies for Cadillac, Ford, Studebaker and Hudson. The new stamping process they created was revolutionary at the time, originally starting as car body designs made from wood frames, this new process used steel frames, for higher efficiency in manufacturing. The building was built and designed by Albert Kahn who created an open building with large windows on the exterior to allow in daylighting and rows of columns running through out the interior. These large windows will allow natural light into the remodeled building and the rows of columns will help create sight lines and walkways. The remodeled design will incorporate Kahn's inspiration into the building. The site is contaminated and research about how to clean up a contaminated site and cost will be conducted. The structural integrity of the building will have to be analyzed since some of the floor sections have caved in.

Transit and neighborhood impact will be considered because the site is close to Midtown and Wayne State University. The research will include historical research and case studies looking at each aspect of passive design. To preserve the historical integrity of the site and building the history of the neighborhood needs to be learned along with how weather and people have been part of its deterioration. Case studies will show how other warehouse and manufacturing plants have been remodeled using passive systems. There will be details from the case studies that will focus my design to create the best overall design. Details include, mixed use residential, commercial, theater, education centers and farmers markets, truly a community space. Computer simulations and a matrix will be used to analyze the passive systems to determine which systems will be the best to implement into the remodeling design of the building.

The main goal is that people and companies can remodel an existing industrial site into a productive mixed-use space that will benefit the neighborhood and city. This research will provide a passive design road map for others, cities and developers to use while remodeling and preserving these buildings to make their communities better and improve the quality of life for the people in their community.

Project Typology:

The typology of the site is inspired by the urban areas of Japan, where each building has a multitude of uses and purpose. The ACROS building in Fukuoka, Japan is a multi-use building. It has offices on the top floors, shops and restaurants on the lower floors including transit connection and conference rooms. Theater and mixed-use rooms on the main & 1st floor. The exterior greenery, green roof, park and garden space are inspired by the ACROS building in Japan, which has a park on the side of the building. Other buildings in Japan have inspired the mixed-use remodel of my site because they are all mixed-use. All the buildings are used for offices, apartments, shops, restaurants and transit. There is a continual use of escalators up and down the buildings to get people to their destinations. My building can be re-purposed into a mixed-use space and create community involvement. These industrial sites will take work to clean up and decontaminate, but the benefits to the neighborhood are worth the cost. People in urban areas need places to work, live and socialize and a mixed-use space will provide those needs.

Other remodeled warehouses around the world include Germany, were sites have been converted into apartments and retail shops. My building is related to many different types of buildings, the residential space is like apartment buildings; shops are what you see in any city. The gardens are like a European Italian home with gardens within the center of the space and the farmer's market is inspired by the Ferry Building Marketplace in San Francisco.

Typological Research/Case Studies:

Fig. 4

Clipper Mill:

Project type: Adaptive reuse industrial mixed-use space, Previous machine manufacturing complex.

Location: Baltimore, Maryland
Architect: Alexander Design Studio; Owner/Builder: Struever Bros. Eccles & Rouse (SBER)

Year: September 2006; Foundry Building 50,000sf stone building built 1870, addition's 1880-1890.

Size: 17.5 acres,

Characteristics: Former cotton mill and iron works company is an 1853 historic site with 5 renovated buildings designed into mixed-use spaces including 61,500sf office, 47,500sf studio, 3,500sf retail spaces with 72 single family, 98 multifamily housing, and 375 parking spaces Office, studio for artists, housing. Sustainable features.

Program: Renovated industrial site, mixed-use space, green space.

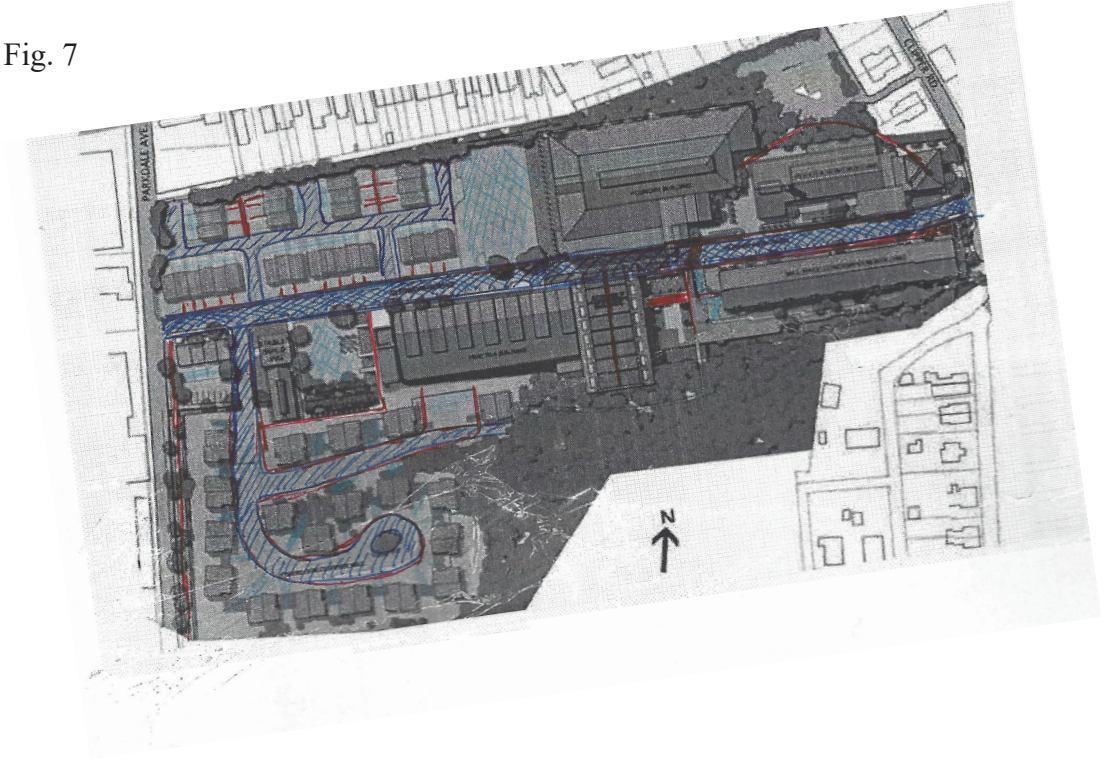
Fig. 5

Fig. 6

HISTORY:

Clipper Mill was a deteriorating space comprised of several buildings, until developers started renovating the site and create a mixed-use space. They are preserving the history of site and honoring the legacy of area craftspeople. The existing residence, draws from other areas, rehabilitate and inspiring the neighborhood. The clipper mill renovation took an existing industrial site that was vacant and designed mixed-use space using sustainable design. The complex has been designed in stages starting in 2006. There was a fire in 1996 that destroyed several of the buildings on the site leaving just the shells of the buildings that were preserved in the remodel. The development of the site was strewn with problems including underground obstructions, structural problems over budget, lawsuit over ownership, and multi-layered financing.

Fig. 7



The Clipper Mill started with the renovation of the Assembly Building and continued with the enlarging the site and complex of the mill area including adding townhouses to the southwest and west of the Assembly Buildings. The diagram shows both the pedestrian and auto traffic on and around the site complex.

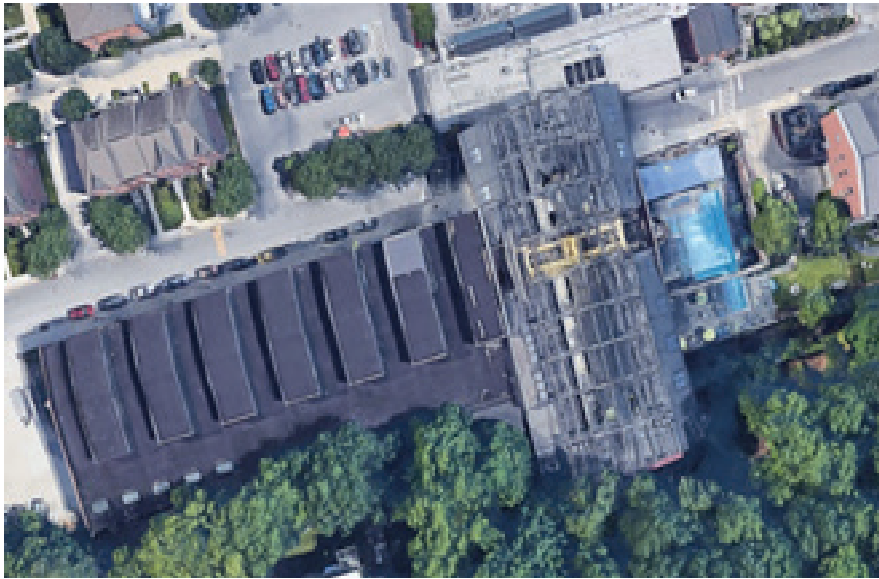
The site also had contaminated soil, asbestos insulation, lead paint and underground oil storage tanks removed that required working with the city of Baltimore.
The design of the buildings included using recycled original parts from the site and buildings including antique steel beams, stones and sprocket wheels from some of the original machines. The Assembly building, shown below, has been remodeled into 1and 2 bedroom apartments, leaving the original shell of the burned building in place, there is a green roof within the open air courtyard and the used porous paving in the parking spaces along with a living wall. The site is also accessible to the surrounding community because of its proximity to light-rail transit and hiking trails.

Fig. 8

ANALYSIS:

Fig. 10

Fig. 9



The vegetation on the site provides ample amount of thermal comfort by providing shade from the southern sun during the summer. It also creates pleasant views of nature, although it does not help with the north and westerly winds during the winter and blocks the southern breezes to provide ventilation in the summer.
An vacant industrial site can be effectively designed to create an adaptive reused space.

Fig. 11

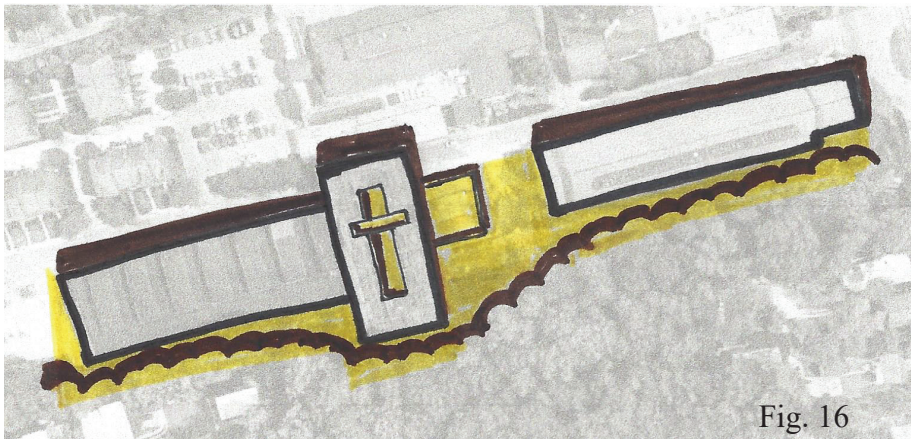


Fig. 16

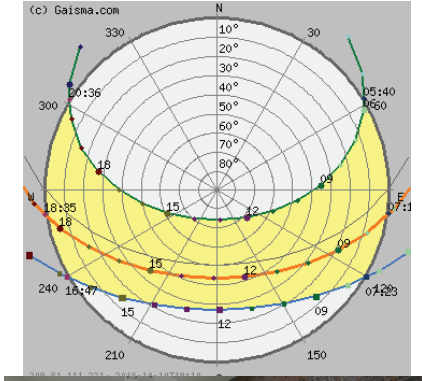


Fig. 12

Fig. 13

The sun path indicates that this building will receive sun on some part of its exterior all day, with the building crooked and facing northwest, the east and south facade will receive the most sun during the day. The building to the west will block the western sun for most of the day causing the building and apartments on that side to be cooler than the warmer east facing apartments. The pool located on the east side will be in the shade for most of the afternoon and evening because of the apartment building blocking the sun.
The large windows allow in ample light, but are uncovered and without exterior shading. This will allow to much sun into the space, overheating the room in warmer months and making the apartment uncomfortable.

Fig. 15

Sun to complex diagrams show the sun hitting the building during the day as seen to the left. The building because of the tilted angle receives sun from sunrise to sunset. The interior courtyard also provides sun and shade, adding to the thermal comfort of the space as shown above.

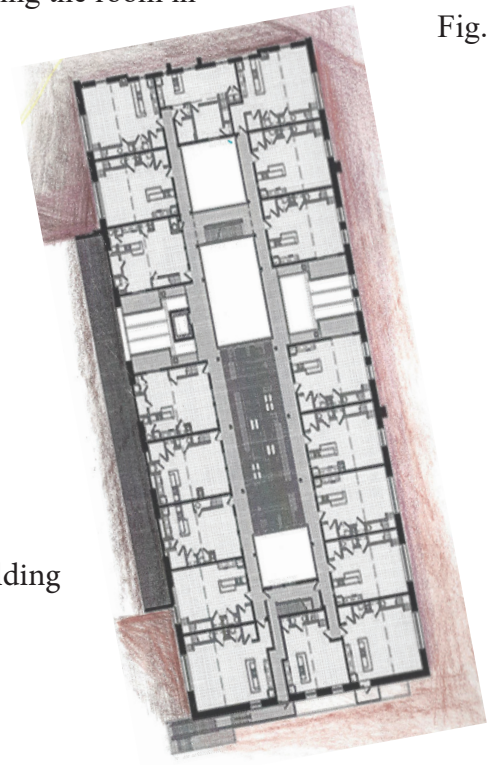


Fig. 14

Shading of the building during the day.

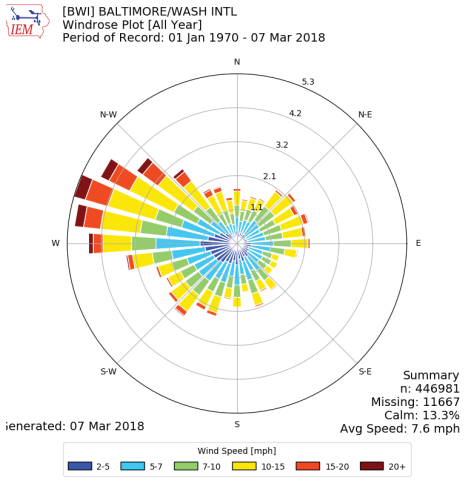


Fig. 17

Wind will also be directed over the building, possibly causing a wind tunnel in the pool or street area. The wind in the winter months is mainly from the Northwest which will cause drifting on the south east side of the building and in the pool area. Summer wind is mostly from the south east, but the vegetation to the south and east of the pool area will block most of the warmer wind.

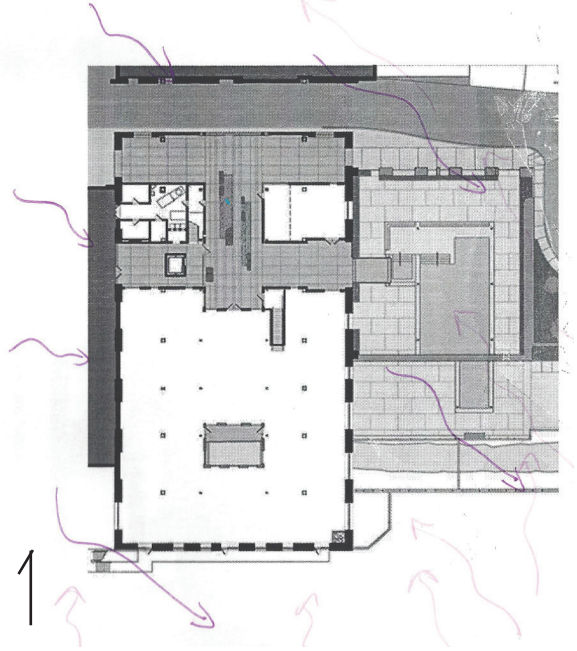


Fig. 18

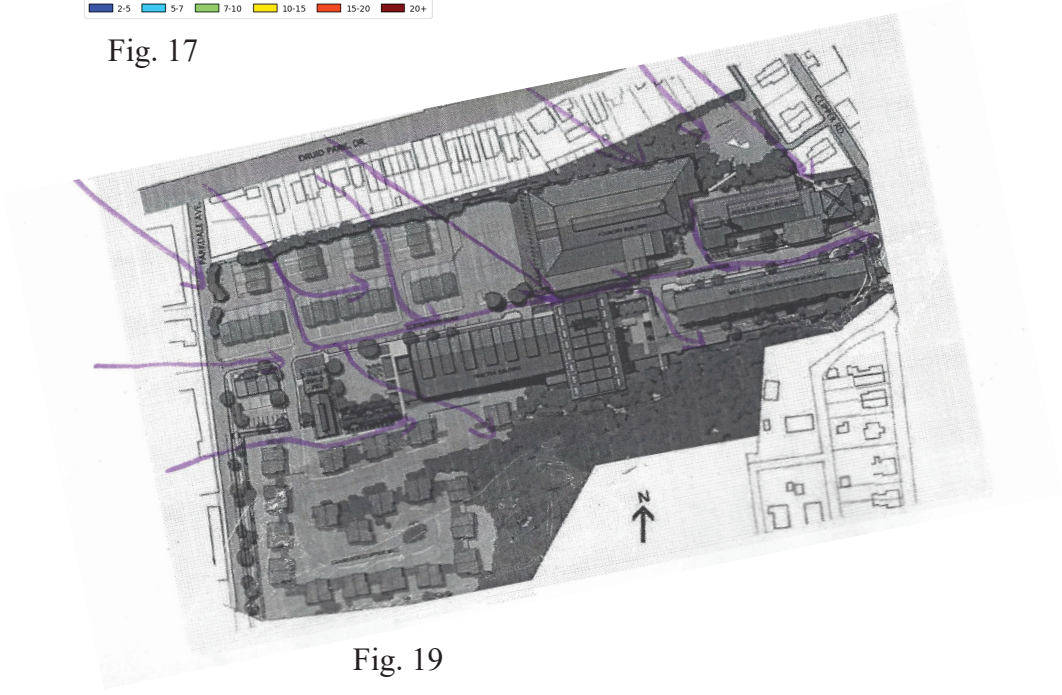


Fig. 19

My premise of being able to create an adaptive reuse space from an existing industrial site is still plausible. The use of the existing structure and using the historical and original parts in the new design show that an industrial site can be re-purposed into a mixed-use space. The lack of shading devices does not create a passive space within the apartment spaces. The use of the open air courtyard will allow natural ventilation in to the apartments cooling them in the summer months.

Fig. 20

Fig. 21

ALTMARKT–GALERIE:

Project type: Mixed-use space, green design

Location: Dresden, Germany

Architect: ECE Projektmanagement GmbH & Co. KG

Year: 2002
Size: 6.5 acres, 281,500sf total area - 2002, expanded 2009-2011; hotel – 57,049sf, office – 78,577sf,

Characteristics: Office buildings created into a mixed-use shopping center located inside the courtyard of six exterior apartment buildings. Attracted different and one of a kind retail shops from high quality retailers with well-known brands,

Program: Mixed-use space, Historic area, Industrial site.

Fig. 22

History:
Mixed-use, shopping center, Close to Altmarkt Square the site links a historic district of Dresden and the cities main shopping street. There is no street access onto the site because of the existing buildings on all four sides in a previously dense residential area. With the city support the interior courtyard of these four apartment buildings was demolished and rebuilt into this shopping center. Built on a protected and archaeological valuable site were about 60 former merchants and tradesman original premises, required the design group to do analysis of the archives for each plot to determine if any spaces were historically significant. There was only one space found to be historically significant and is now used as a wine cellar.

Fig. 23

ANALYSIS:

Entrance into the site is through a series of covered connections through the exterior apartment buildings and these large entrances help to link the historic district and shopping center using pedestrian walkways. With large entrances to through the exterior of the residential buildings holds a unique experience and gives the interior courtyard a new purpose and interesting challenges for construction. The exterior 6story buildings were kept, but the inner courtyard buildings were demolished and new 3-4 story buildings, with retail on the 1-2nd story & basement, office spaces on the upper levels and underground parking for 500 cars.

Fig. 24

There is a large glass rotunda for lighting which is linked with glass covered walkways to the alleys and passageways provides for tighter spaces fitting a European city. Expansion in 2008 linked and gave a better front to the square that faced the historic district. The entrances through existing buildings, linking the site physically and creating a visible link. They added more offices, retail, and a hotel along with improved transit links.

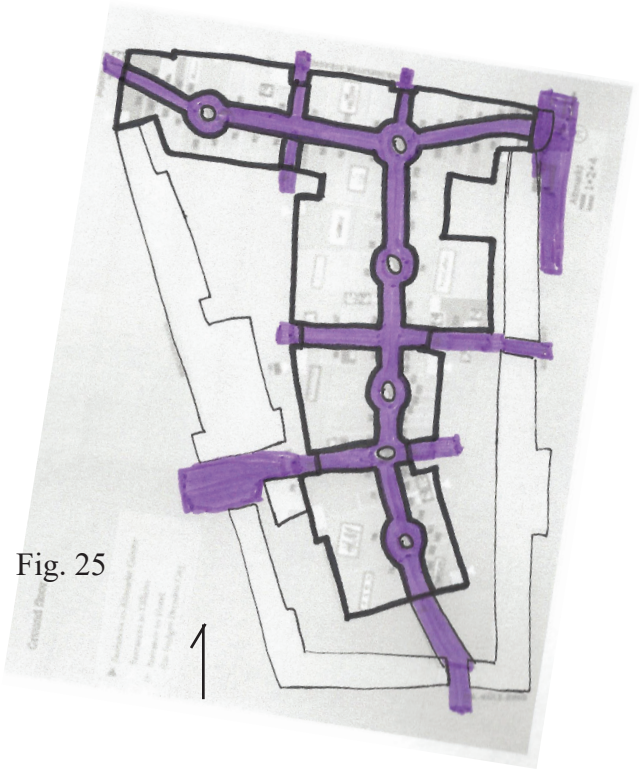


Fig. 25

Roof openings were added for natural ventilation, along with daylight dependent light control, and a watertight concrete wall surrounding the entire structure. The space is in sun most of the day with the only shadows being cast by the surrounding buildings. Each building has a courtyard inside it to allow light and air to enter the building. This also provides cooler interior space and the courtyards are considered green roofs and have light shafts into the interior walkways, daylighting the circulation paths and warming the space. The wind is mostly from the west with occasionally strong winds from the southeast.

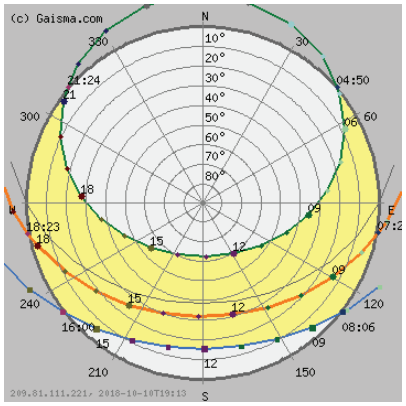


Fig. 26

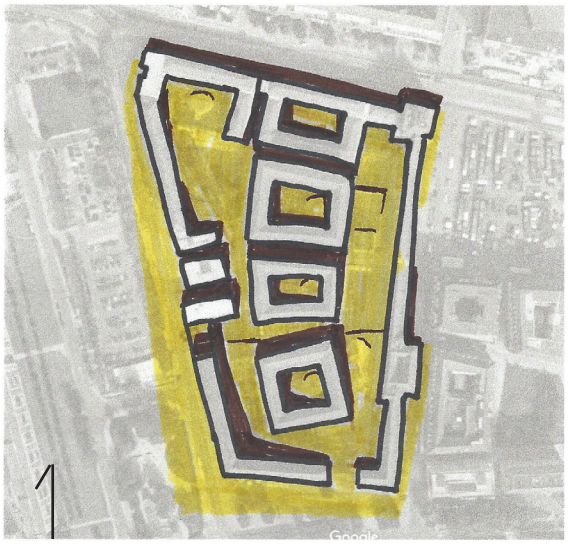


Fig. 27

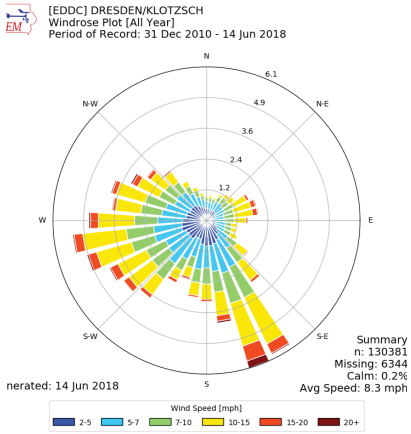
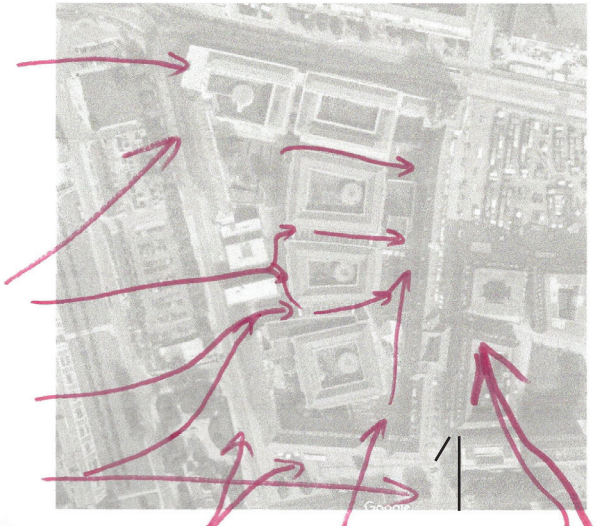


Fig. 29

Fig. 30

This space used an existing space and created a high demand space for people to gather, yet in doing the remodel they destroyed and demolished the existing buildings that were on the site. Instead of saving the buildings in a remodel they chose to use new construction. The building inside of another building complex makes this a unique design challenge and they do use green design.

Fig. 28



ACROS; Fukuoka Prefectural International Hall

Project type: Mixed-use space, green design

Location: Fukuoka, Japan

Architect: Emilio Ambasz', Nihon Sekkei Inc.

Year: 1995

Size: 1,000,000sf

Characteristics: Mixed-use space in the Chuo-ku neighborhood with 15 story tiered garden including 50,000 plants and trees of 120 varieties. The space includes 2000 seat symphony hall museum, exhibition hall. Observation deck, convention hall, municipal passport center, 600,000sf of government and private offices, restaurants, retail space and underground parking and transit connection.

Program: Mixed-use space, Passive design and green space.

Fig. 31

History:
The park and the city wanted to use the same space, the current site. The site was a park that the designer wanted to preserve, so the garden was created on the side of the building to allow the building to be constructed while preserving the lasts undeveloped green space in the city.

Fig. 32

Fig. 33

ANALYSIS:

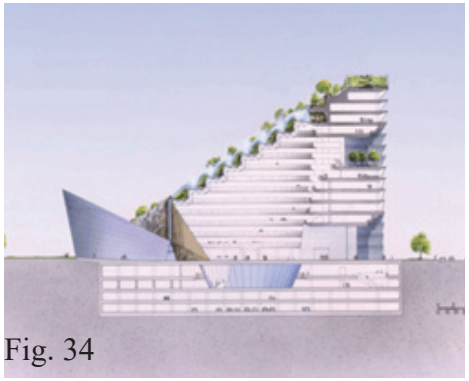


Fig. 34

The ACROS building is called “Asian Crossroads Over the Sea” building; ACROS Fukuoka Prefectural International Hall and houses the Fukuoka Symphony Hall. It is truly a mixed-use space with everything from offices, commercial to business and theater spaces. The building was designed to work with the last green space and adjacent park in the city by creating a tiered garden on the side of the building facing the park. The buildings first floor is 196.85’ and the building includes 15 floors above ground and 4 floors below grade. The green roof tiered is designed to look like a hanging garden on one side makes a 15-degree difference in the building temperature.

Traveling to Japan I visited the ACROS building and walked the path up towards the top of the building amongst the foliage. The trees covered the most of the path and the windows to the building providing shade, but were not taller to block more of the heat from the sun. The difference in temperature from standing on the building in the shaded parts was noticeably cooler than the sunnier parts. The higher we climbed up the building the hotter it was.

As the thermal imaging shows the vegetation on the building does lower the ambient temperature of the interior spaces keeping the side of the building at a consistent level and adds views of plants and the various animals, birds and squirrels that live in the vegetation on the building.

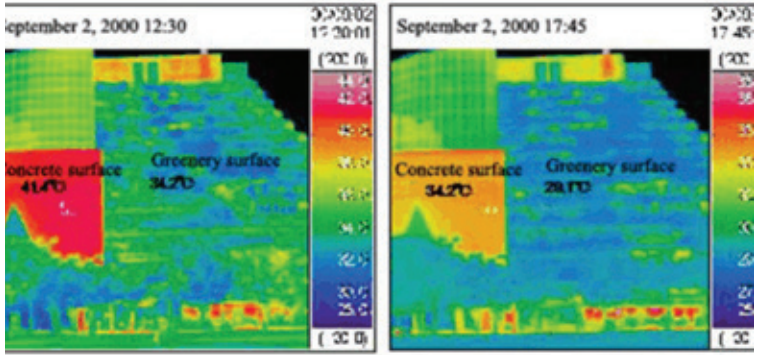


Fig. 35

Fig. 36

The amount of added vegetation combines a green wall with a green roof to create a green building as shown in the diagram above. The thick black line outlines the building where most of the building is covered by foliage. This added foliage lends to the added temperature control and comfort of the interior of the building. The large windows covered with plant material provide filtered daylighting and shade. The platforms, vertical louvers, on the sides of the building provide both additional shading to the interior while providing access to wash the windows. The structure is basic in its rectangular shape with the garden added to the exterior as shown in the diagram to the right.

Fig. 39

Fig. 38

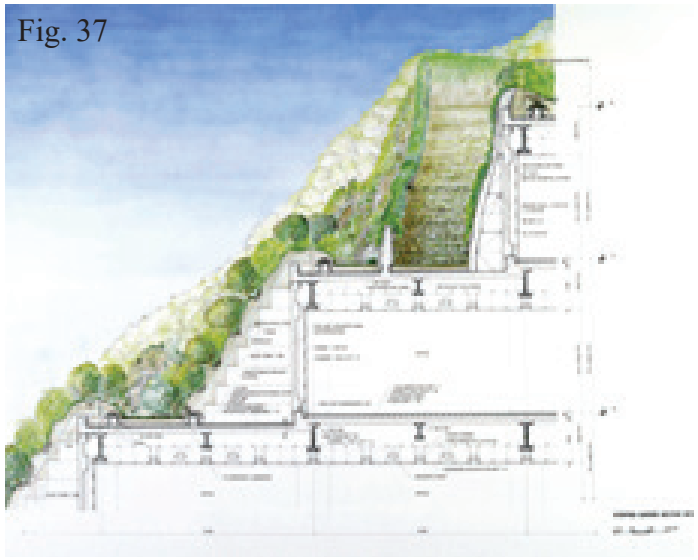


Fig. 37

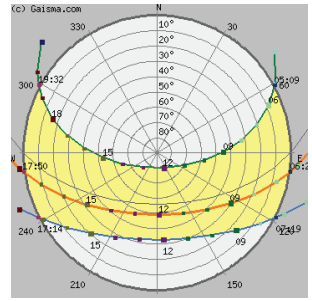


Fig. 40

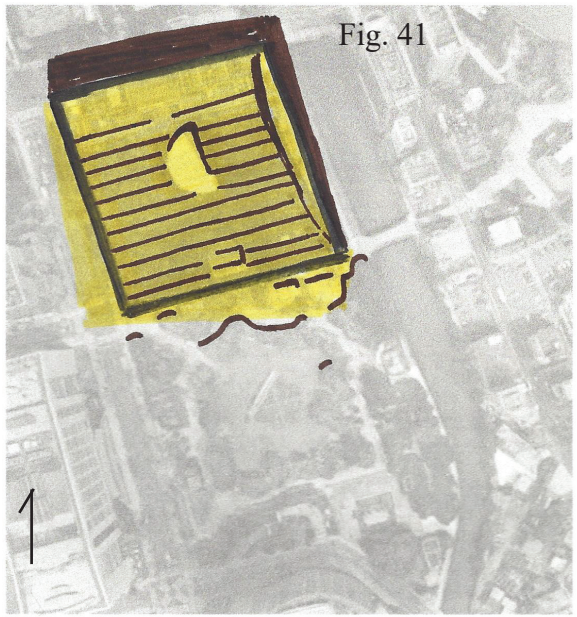


Fig. 41

Exploring the interior of the building included the main level which includes entrances to the Symphony hall, elevators to the upper level offices, and escalators to the lower and upper floors which include retail spaces, conference rooms and transit. The two lower floors, below grade are full of retail shops, restaurants and the lowest level has conference and meeting rooms and access to the train station. These pictures show the interior of the building from the ground floor.
Daylighting of space: The interior lobby is lit during the day from the skylights and numerous windows that face south. The windows are placed in a tiered form with the building shape and covered with vegetation on each of the exterior tiers. This allows only filtered light to enter the lobby and providing soft light and cooler temperatures to the interior spaces. The structure is comprised of steel girding and there is a light tower covered in glass that allows natural light into the interior as shown in the image.

The 1st level above grade houses several gallery spaces, there was a flower show and a pottery exhibition going on. The flower arrangements were beautiful and made out of soap. While visiting the site, I was invited to create my own flower from soap. This is one example of the variety of uses a mixed-use space can provide.

Fig. 42

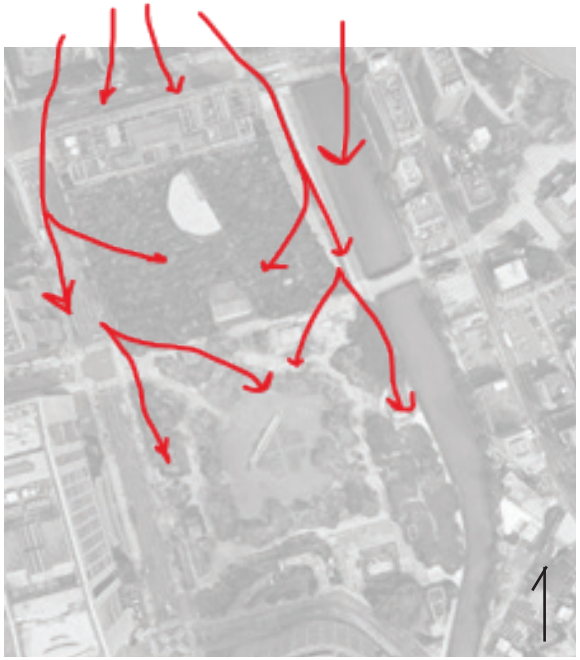


Fig. 43

The predominant wind source is from the southeast, yet the highest volume of wind is from the northwest. The shape of the building is flat on the northwest side creating a wind effect on the side of the building. Buildings to the north block the wind and make the breeze travel around and over the building.

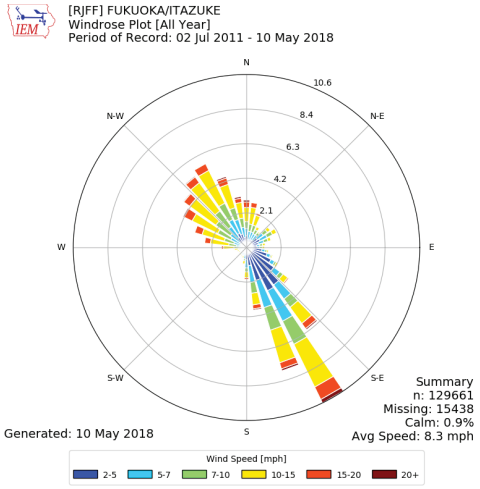


Fig. 44

The ACROS building is fascinating, it not only houses offices on the upper 12 floors, but also houses shops, restaurants and cultural events and areas. The interior is an open space to the top and the vegetation on the south filters light into the space while keeping the heat out. The exterior is a stepped layering system with vegetation of shrubs and trees along the south side and leading into the park at the base.

Fig. 45

Fig. 46

The front of the building looks like every other office building in the city with a basic flat facade and a wall of windows.
My premise is still the same, a large mixed-use space can be created using passive and sustainable design in the use of a garden on the side of a building as in the ACROS building in Japan. This building besides being a new construction building, embodies all of the elements of the thesis project that a building can be designed using passive and sustainable systems into a mixed-use space.

Trinity Groves:

Project type: Mixed-use space, green design

Location: Dallas, Texas

Architect: HD Design Group

Year: 1995

Size: 10.3 acres – phase 1, 100 acres – phase 2 & 3, 100,000sf building

Characteristics: Warehouses and industrial sites and buildings neglected and worn down design into a mixed-use space created with adaptive reuse including retail, restaurants, entertainment, education center and parking with housing included in future development.

Program: Mixed-use space, Neglected Industrial site.

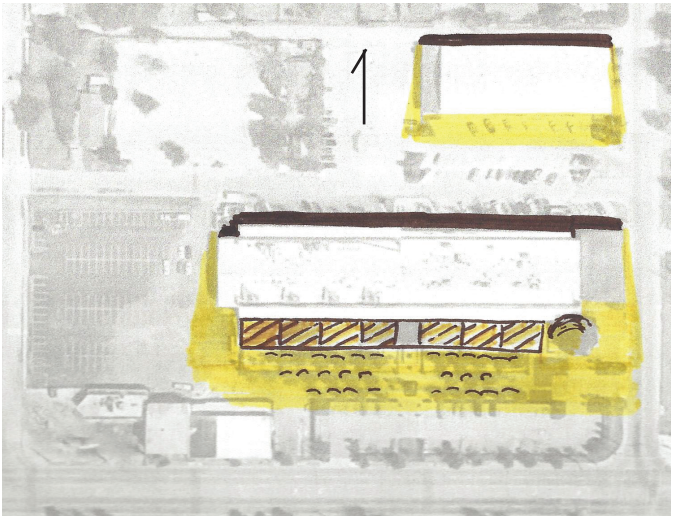
Fig. 47

Fig. 48

History:
Originally an industrial warehouse, three men came together to form HD Design Group and refurbish the space with a unique idea. The site was chosen because of a new bridge that was being constructed and provided easy access to the site. Over a 15 year period the land was bought and designs created as a restaurant incubator. The development of this industrial site helped the surrounding run-down, neglected from drug use community.
The space is a now a mixed-use space with restaurants, retail shops and housing adjacent to the original site with parking for over 1200 cars.
The city gained a developed area and improved infrastructure, while the buildings were reused and not knocked down. This created jobs for people in the area and attracted others to the space. The renovation and adaptive use of four distinct buildings, structure big, open truck terminal buildings with docks on both sides. Corridors expand with seating areas and are separated from street traffic and noise by parking and landscaped paths.
The entire project has been completed in phases with more development to be done.

Fig. 49

Fig. 50



Analysis:

This site is a warehouse, rectangular building in the middle of a parking lot. The reuse of this space is similar to my project because they are both located in open spaces. Yet, the lack of vegetation on the site is disappointing and causes the space to be overheated and vacant. The open parking area seems vacant and underused because it is unwelcoming and hot. The development of the site included using shading devices and vegetation to block the sun during the day and provide a cooler comfortable space to be in. People can sit outside at the cafe and shops and be protected from the summer sun. The passive design only pertains to the south side of the building with awnings and three layers of vegetation. In such a warm climate, planting islands and a green roof would add to the overall cooling of the building and provided added thermal comfort to the customers.

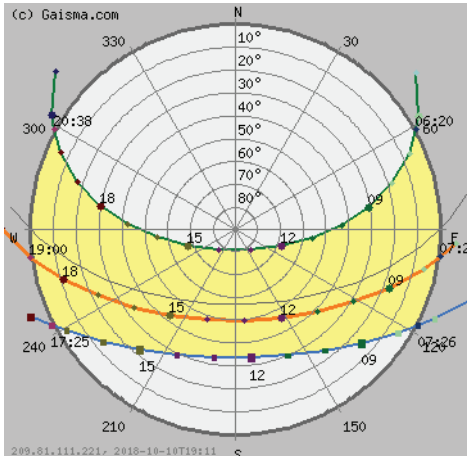


Fig. 51

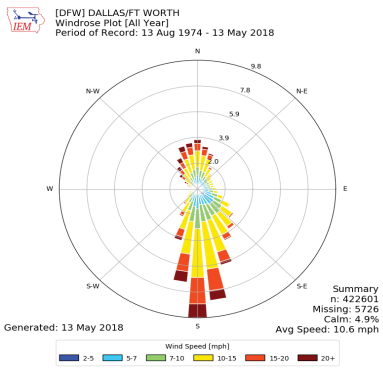


Fig. 53

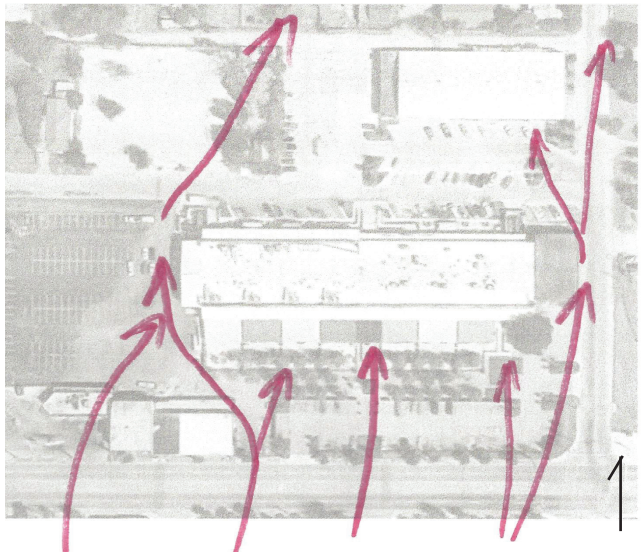


Fig. 54

The wind is predominantly from the south and the three layers of vegetation add more cooling for the space. The plants cool the wind and rays of the sun providing cooler air and filtered daylighting.

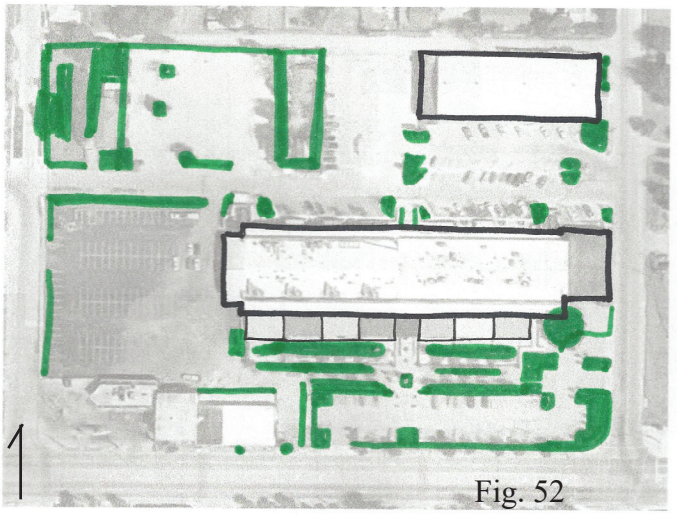


Fig. 52

The vegetation on site is placed on the south side providing shading from the heat of the summer sun. It is placed in multiple layers to provide added spaces for people to lounge and be outside. The awnings also provide shade and additional seating for customers.

Fig. 55

The entire site as shown consists of more than the original building, and has grown from a restaurant space into a mixed-use space while retrofitting existing industrial buildings for a new purpose.

The use of the industrial buildings and the added new development indicates that the thesis project of creating an adaptive reused space from industrial sites is possible. Further development of the Fisher 21 site and adjacent lots is validated in this developed space in Texas.

Fig. 56

Typological Summary:

The case studies are all mixed-use spaces with passive design incorporated in the development of each structure and site. They are a mixture of renovated industrial sites utilizing adaptive reuse along with new construction and demolition of existing buildings, but all use sustainable elements.

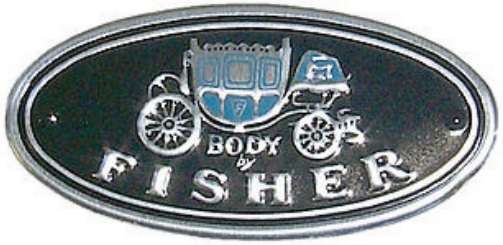


Fig. 58

The Fisher Body 21 building started making quality auto bodies, is now deteriorating getting worse by whether and vandals but with passive design it can be something glorious again.

Fig. 57

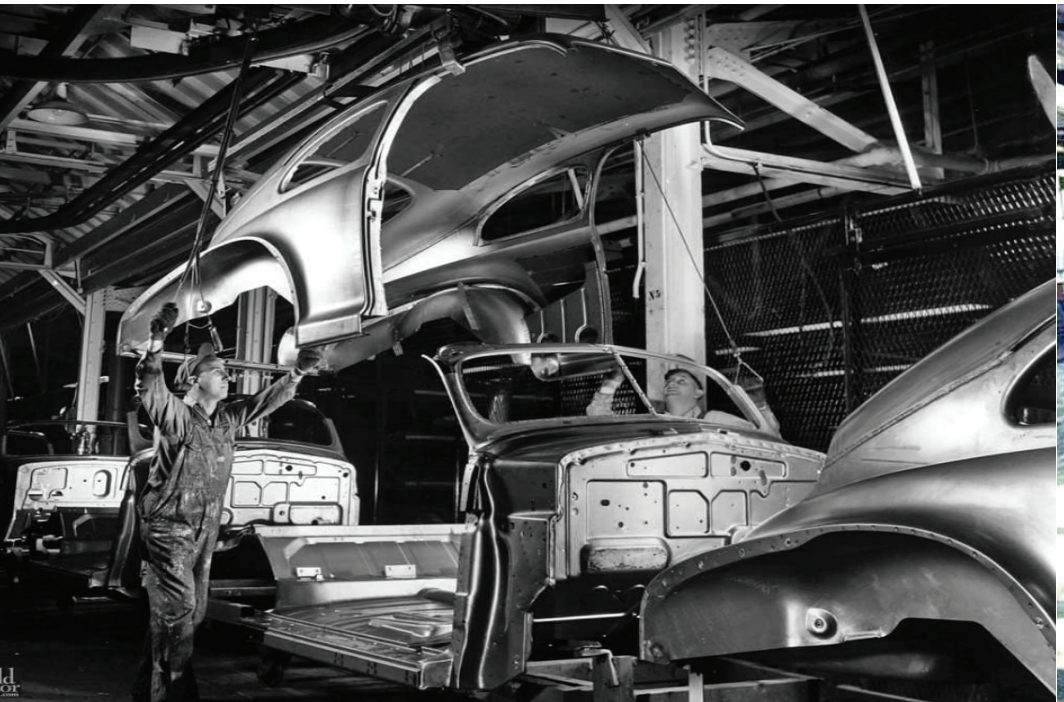


Fig. 59

COMPARISON:

All of these sites contain passive design elements that are part of the unifying idea of creating an adaptive reuse space from an industrial or remodeled site. Using passive and sustainable design to create a mixed-use space that will improve the quality of life in the neighborhood. The premise is to take an industrial building and using passive and sustainable systems create and design a mixed-use space. The preceding case studies contain project element to validate the premise.
The buildings use green spaces in the form of green roofs, courtyards or green walls to provide passive cooling, ventilation, shading, water retention and filtered air and light. The spaces have similar qualities and all have elements that pertain to the original passive design theory and premise, yet after closer analysis there are things that could be improved on each of them. The shopping center in Dresden, Altmarkt, was built by destroying the existing building inside the courtyard but is a unique complex built inside the courtyard of another building complex creating an accessibility challenge and eventually the exterior buildings were included in the overall design project. It uses passive design and it has a green roof with skylights to allow daylighting into the space, similar to the ACROS in Japan. The ACROS has a green garden on the exterior tiered south side of the building with a glass atrium and windows on each wall to allow filtered daylighting into the interior. This concept of filtered daylight continues with the Clipper Mill in Baltimore that left the existing burnt roof with a retrofitted roof inside and the addition of a green roof inside the courtyard of the building. This created a interior space of green design similar to the Altmarkt in Germany. The Clipper Mill is similar to Trinity Groves in Texas that uses adaptive reuse to create a new mixed-use space inside and existing buildings. The Clipper uses an existing deteriorating complex that was burned and left to ruin and created a green space that attracts people to the space. Adding louvers to the south side similar to the awnings at Trinity Grove provides needed shade and added cooling inside the building during the summer months while still allowing the sun to warm the space in the cooler winter months. They all use a variation of vegetation in the site design to provide added cooling, ventilation and air filtration benefits to the buildings and sites.

CONTRAST:

The differences vary in the green design used and how well and how much was implemented to the type of construction that was done for each space. The Altmarkt is unique in it being built inside the courtyard of another building, yet the existing building in the courtyard was demolished to create the new space. The Clipper Mill was a deteriorating complex of buildings that were renovated and the history of the space influenced the design and use of the space. Creating a design unique to the building while honoring the historical integrity of the space contrasts with the other case studies. They also had to deal with contaminated soil similar to my site. Trinity Grove is a retrofit like the Clipper Mill, yet it doesn't have the unique history and is perceived as boring. It appears as a rectangle in the middle of a parking space, although it is unique in the original use of the space. It was conceived as a high end restaurant complex and then added retail later in the design. The ACROS is unique because of the overall design and shape of the building, with a garden on the exterior wall and side of the building. Comparing the mixed-use spaces of each of the spaces, the ACROS has the best implementation of mixed-use of the four studies analyzed. They all are a variation of mixed-use, but the other three just incorporated retail and restaurants in the original design, with the exception of Clipper Mill which included housing.

Fig. 60 Fig. 61

Project Elements:

Mixed use space:

Apartments, low income, student & regular.
- Bedroom, living, dining/kitchen, bath, storage, utility
- Laundry – washer, dryer, folding, hanging space
- Workout space? Utilities- water, heat, air, elect.
- Sun, wind, rain collection

Education spaces: training center & trade skills.
- Classrooms, student work spaces
- Teacher offices, facility offices, work space/break-room.
- Storage, copy room, computer rooms.
- Dining space & prep, eating, student & workers?
- Bathrooms, meeting spaces, breakout space
- Office staff & work space, offices.

Work, offices, meeting spaces, trades, manufacturing.
- Office space, meeting rooms – office.
- Large meeting/convention space.
- Multi-use space, easily movable partitions.
- Re-purpose spaces.
- Learning spaces/classrooms.
- Storage art supplies, tools, etc.
- Utility space
- Other stuff

Shopping retail spaces.
- Large space for retail items.
- Storage space, break room
- Bathroom – public/private?
- Store front, back entrance, loading door/space.

Garden, farmers market, growing space.
- Stands for food, garbage & recycling centers
- Growing space – exterior garden, indoor greenhouse.

Restaurant, cafe, coffee shops.
- Space for customers, food prep & cooking.
- Bathrooms – public?
- Loading space, entrance, break rooms
- Storage space – freezer/fridge & pantry.

Entertainment, theater, music artist spaces and display area.
- Theater space, stage, backstage – prep area
- Seating for audience, entrance space/lobby, bathrooms
- Rehearsal space/rooms,
- Music rooms, sound proof – practice space. Storage
- Display spaces – art, creative spaces, meeting spaces

Transit, car parking, bus & train lines.
- Parking space, cars, trucks & buses.
- Train rail lines, ticket office? Parking ticket office?
- Underground? Driving lanes, entrance & exit space.

USER DESCRIPTION:

The project will be designed for a variety of people and users including, students, renters, gardeners, shop owners, public entertainment, and education center.

Apartments will be used by students enrolled in the training program, rented by shop and restaurant owners in the building and others who work in the building. The others will and can be rented by the public to include 1, 2, 3 bedrooms and have 200 apartments. Peak usage time will be in the morning and evenings when people are returning home for the day. Parking will require that each apartment have 1-2 parking spaces depending on the number of bedrooms.

Restaurants will be used by the owners and public with 50 restaurants with peak usage time during the day and dinner times, mornings around 7-9am, lunch 11am-1pm & supper 5-8pm.

Shopping retail spaces will be used by employees and the public mostly during the day and evenings with peak times being after work or school 4-6pm with 100 shops. Parking will be used by shop owners and the public, 1-2 spaces per shop and spaces for the public.

Education center/school will be used by school employees and students, peak time is during the day when classes are in section. The education floors will have about 150 classrooms and offices each with 18 training/workshop spaces. Parking will be 1 per employee & 3000-3500 students. Office spaces in the building would be used during the day as part of the training program for the school and parking would be included in the school parking.

Farmers market will be used on weekends and after work 4-7pm with parking spaces for each owner and some for the public. The gardens will require green spaces to grow efficiently and watering systems. These 50 spaces can be placed within the building or outside on the adjacent lots near the gardens. The gardens can be located on the roof and possibly in the vacant lots adjacent to the site.

Theater/entertainment will be used mainly on weekends and evenings with parking spaces being used by the public and theater employees using the retail parking. Meeting spaces will be used during the day and will need parking spaces.

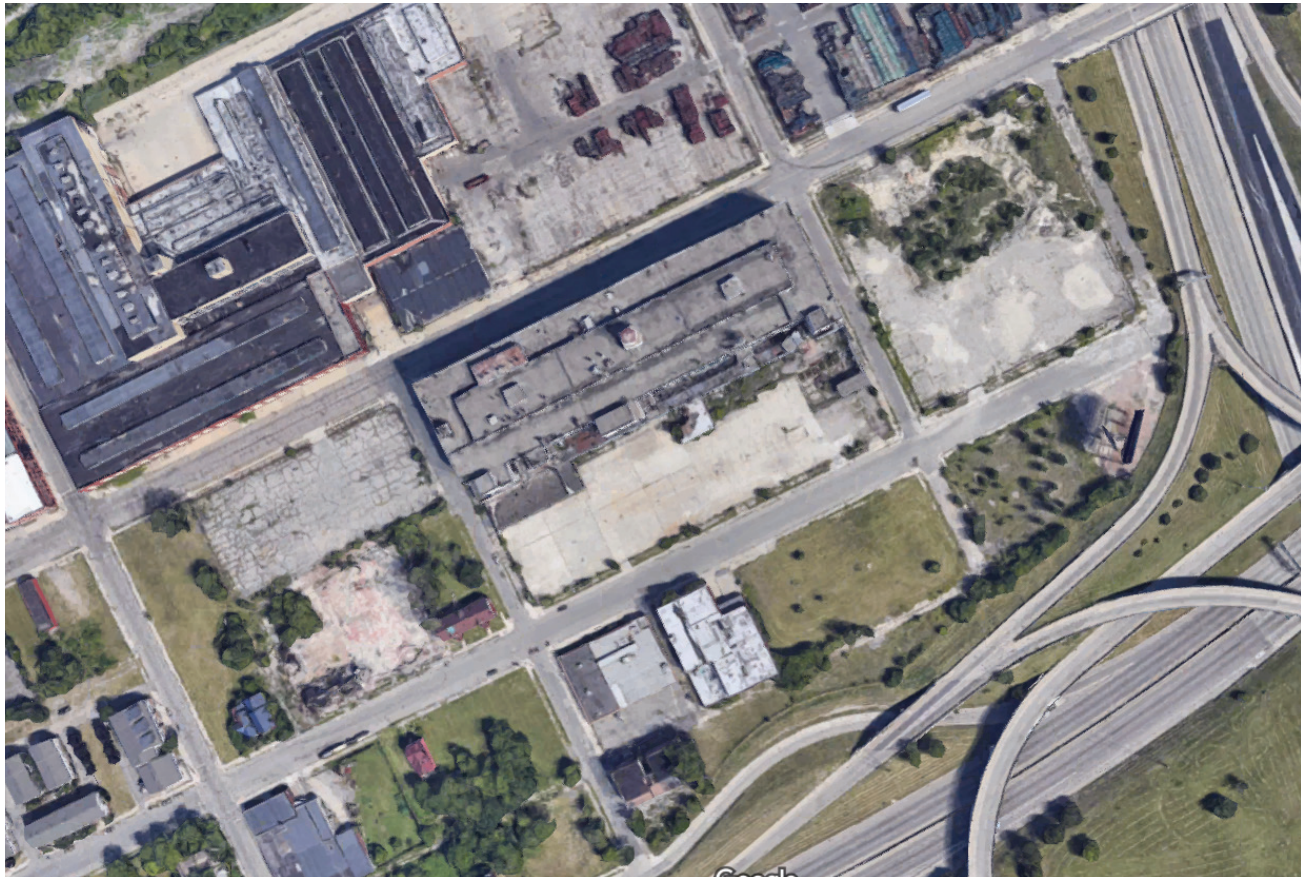
Ownership of the building will be the owners of the commercial spaces in a co-op system. There will be ADA compliant requirements included in the design and remodel of the building. There will be consideration made for families and elderly who want to go to the theater, farmers market and for those who go thru the school for training and education. The population of the area is poor and will need considerations to help them be trained in a new field, find jobs and be productive members of the community.

Site:

Fisher Body Plant #21

This site is home of one of the Fisher Body manufacturing plants that made car frames. The building was designed by Albert Kahn to have large exterior windows and reinforced concrete columns in the interior. This design allowed for a lot of natural light and a large open space in the building to manufacture the Fisher Body. Rail cars were used within the building to transport the car bodies to various parts of the building. The building has large open spaces that would be ideal for remodel and portioning for apartments, retail & entertainment spaces while retaining the use of daylighting in the spaces. There are other manufacturing plants that are similar, but this location has a large space with vacant lots nearby to help provide a garden space and parking. It will also draw people to the space and help to rebuild the neighborhood along with being close to Midtown and the interstate for easy access by the public. There is bus stop one block west of the site with street boundaries of Piquette Ave to the north, Harper Ave to the south, Hastings St on the east and St Antoine St on the west.

The site is important, because it was a part of history. The Fisher Body was revolutionary in its design and was the model for car design for years. The site is in a manufacturing area that is rundown and abandoned. Creating a mixed-use space on this site will preserve a part of car manufacturing history and help to revitalize the neighborhood and help the city of Detroit. The site makes me sad to see a once great space being torn down by neglect, but there is hope for a large space to be turned into a lively and vital space.



Fischer Body Plant 21 and adjacent lots Fig. 62

Project Emphasis:

Passive Design & why it is important:

The main area of interest is passive design which will enable me to create a list of passive design features that can be implemented to remodel an existing industrial site. Data collection of the different passive systems along with case studies will help connect the systems to current use and sites. The cataloging and analyzing of each passive system will provide a list of benefits and disadvantages for the use of each system and which systems would have the best economic impact within the overall design. Passive design features including daylighting, wind flow, water retention and vegetation will be assessed to determine the placement of each element within the existing building. Other sustainable design features will be analyzed and added as needed to the site including solar panels, geothermal, and wind towers.

Another interest to document will be the historical aspect of the site and how the history of the building site can be preserved. This will require an urban analysis of the site and community to see what impact the original building and industry had on the area. This will also provide us with any negative impacts, including the contamination of the site. The site will need to be cleaned up and decontaminated before any design or construction can be proposed. I will research how to clean up a contaminated industrial site and the potential cost inquired.

The design plan of the existing site is to remodel an industrial building into an adaptive re-use space. This space will provide a mixed-use space occupying a large variety of functions and activities. Research using case studies will lead and focus my design to determine which building spaces to include in the building which include residential, commercial, green space and an education center. Comparative analysis of each of these features will be required to accompany them and the required parking spaces. I will use my personal life situations of being a student, home owner, world traveler and working and owning my own company as a basis for creating inviting spaces.

Goals:

Academic:

Studying passive design is important academically to increase students and architects knowledge of passive systems and how to better implement them in existing building design as in the Fisher Body Plant 21. The Detroit car manufacturing plants have been abandoned and left to scrappers and spray paint artists. The buildings which once played an important role in shaping the nation and helping the war effort are now fading into history. The buildings and their stories should be preserved because there is a growing number of abandoned industrial sites in the US. The city of Detroit has an abundance of these abandoned industrial auto plants and is a city in need of revival. Passive design is something that needs to be better understood and better utilized in the remodeling of existing buildings. Passive design is becoming increasingly popular because of the long-term costs and energy use of the systems. People are wanting to save energy while still having the conveniences of today's life style, so passive systems can help people do just that. Using fewer active systems takes the demand off the electric companies and allows the rates and usage to improve. Putting all the passive systems together in one document will make it easier for others students and professionals to know the benefits and problems with each system. The matrix produced will create a base of knowledge for designers to implement, compare and mix the different systems together to find what they need for their specific building design. Through this base of knowledge I will give life to a neighborhood and lower the negative impact of existing industrial plants.

Passive design should be the focus of future design classes because buildings use passive design even when they are poorly designed. This project should encourage designers and drafters to think about the sun path on their site passing through windows and how the wind blows through the space to cool and circulate the air. Using existing buildings is innovative and exciting because of what they can do for the neighborhood that they built in. Using a mixture of Historical documentation, Qualitative Research, Logical Argumentation, Case Studies with Faith will define the analytical thought process.

Fig. 63

Professional:

These structures where once grand useful buildings with a purpose and meaning. Life and products flowed in and out of the spaces and gave people and the neighborhood hope. These massive manufacturing structures are deteriorating and crumbling back into nature losing what embodied energy was used to create these large spaces. The rise of energy shortages in parts of the US are concerning and need to be addressed through the use of passive design being implemented within existing and new buildings. Buildings in cities are the largest draw of energy and by using passive design that draw can be reduced. The initial cost of the implementation of the system is traditionally more than active systems, but the long-term energy use is cheaper. If the building is designed from the beginning using passive systems including building orientation and massing the client can save money in the long run. The economical impacts would include increase thermal comfort for the building occupants along with increase energy saving. Environmentally the impact will be nullified, because passive systems use the earths natural energy to create things like heat, cooling, and air filtration. The lasting results would justify the implementation of these systems because the energy they are using will be free to use and will preserve the natural resources that are quickly being used up or contaminated with in the US. The computer simulations being used to determine the qualities of each passive system will be set to consider all aspects of each passive system. The people living near these deteriorating building sites want to improve the neighborhoods and the standard of living in the area. The hope, faith and motivation is to renovate these structures and create productive multi-use spaces. The impact of renovating these structures will be an improvement to the neighborhood and the quality of life. Taking an eyesore, run-down building and creating something that is attractive and brings life and people back into the space while preserving a part of history. There will also be extensive knowledge gained for cities and developers to enhance an area in their city that is an eyesore.

Cities will use these spaces and abandoned buildings to create mixed-use spaces to create more job opportunities, learning and training centers for the working class, and further community belonging. Another goal is that developers will implement passive design in all their future design plans. These buildings will inspire creativity, belonging and hope. The impact of renovating these structures will be an improvement to the neighborhood and the quality of life. Taking an eyesore, run-down building and creating something that is attractive and brings life and people back into the space.

Fig. 64

Personal:

Researching passive systems will increase my knowledge in sustainable design that can be better utilized in future building designs. My set of skills will be honed to a specific set of skills and knowledge that I can better use to work with future clients to meet their needs while utilizing the earth's free energy to create more energy efficient buildings. Relying on pragmatic thinking and what works best in a real-world situation and using what I have learned from first-hand knowledge and other people's experiences. The tools provided by Christ give me my way of thinking about the world combined with faith that God exists. I enjoy learning about the systems and seeing how they can fit together to better help my design and others designs. Others have done similar projects and influenced parts of my project, but I appear to be the first to combine all the systems together to be used in an existing industrial site to create a mixed-use space. I hope someone else will improve on the work of my project and that there will be more work done to increase the knowledge of others about passive design. To understand and to seek knowledge in building and designing buildings our experiences shape our thinking about spaces and what is important to the shape and feel of the space. The book the City of God, by St. Augustine I connect design and faith "of the knowledge of God, to which no man can attain save through... the man Christ Jesus" (Augustine 346).This connection of faith and design increases my knowledge and guides my thoughts and decisions in building design. If I can complete this project for an abandoned, deteriorating, contaminated industrial site, I should be able to create or remodel a passive building for anyone who wants one. By redesigning this car manufacturing plant, I hope to gain a connection to the cars and time frame in which this building was originally built. Yet, I want to create a new connection to this building and the contribution that it made to the history of car manufacturing, while creating a new sense of community. God speaks not by ears but by 'truth itself' (Augustine 346) This truth guides my research, seeing things in a faith-based way, knowing that God created all things, including my site and gave man the ability to create and destroy structures. My research strategy is a mixture of historical documentation, qualitative research, logical argumentation, case studies with faith inspiring my thought process. I am hopeful and confident that the passive systems will work and there will be a catalog,of passive systems that can be used and applied to any existing structure to create a better neighborhood, community, and city.

Fig. 65

Plan for Proceeding:

Premise: Passive design can be used to remodel an industrial site into a productive mixed-use space while preserving historical context.

Research will be conducted in the following areas; history of the site and neighborhood, site analysis, cataloging passive systems and theoretical redesign of existing industrial building. The history of the neighborhood includes the rise of the auto industry and decline in the city of Detroit. The site analysis includes a visit of the site to determine noise levels, sun path, wind paths, contamination levels, and overall design and measurements of the building and site. The site will also include the possible use of the two adjacent vacant lots for possible future growth of the mixed-use space. Passive systems will be listed and sketches and analysis will be conducted to determine the effectiveness of each system.

Methodology:

My research strategy is to research auto plants and passive design using a mixture of historical documentation, qualitative research, logical argumentation, case studies and faith. Historical documentation of the site will provide a history of the neighborhood and the city of Detroit to show how and why the auto plants left Detroit. The boom of the auto plants during the 1920's-60's will connect the creation of the automobile industry to the creation of man. "That God alone is the Creator of every kind of creature, whatever its nature or form" (Augustine 408). Like the creation of man and the Garden of Eden, so to the creation of the car manufacturing plants in Detroit, MI that came at a time of prosperity, innovation and wealth. They boomed and flourished for many years as ideal places to live and work. Droves of people moved to Detroit to work in the manufacturing plants and the buildings were built large to accommodate the vast number of workers and the demand for the new craze of the automobile. The demand of the auto, starting with the Model T in 1908 started the infatuation of the car and anyone who was anyone built their plant and made their homes and automobiles in Detroit including the big three, Ford, Chrysler and GM. Yet as with any infatuation and quick new thing, the demand and competition of cheaper, faster, and the newest auto led to the eventual destruction of the city of Detroit. The owners of the plants started using more automation, moving the manufacturing plants out of the city and racial tensions led to the deteroration of Detroit. Manufacturing plants were abandoned for bigger, better plants and the existing buildings were left to rot and deteriorate back into the earth. St. Augustine's explains man's body and soul are connected to God "death...of the soul takes place when God forsakes it, as the death of the body when the soul forsakes it" (Augustine 412).

The body and soul are connected, just as the auto plants and the workers are connected, the soul of the auto plant was the people the building the body but the connection was lost. In Detroit when the auto plants left and moved outside the city, there were no cars to build, there were no jobs for the people and the neighborhoods died. Just as Christ brings salvation for man through faith, so to can salvation through passive design save a building, a neighborhood and a city.

Passive systems will be researched, cataloged and analyzed to determine the advantages and disadvantages of each system. The analysis of each system will be compared to the other passive systems to determine which systems can work together to eliminate the negative affects of each system. These passive systems include sun, wind, water, noise and vegetation. Qualitative research using grounded theory will be used with hope and faith to compile and compare passive systems as they are implemented in the adaptive reuse of industrial sites. The information gathered from each passive system will be analyzed to provide a group of design criteria for the remodel of the Fisher Body Plant #21. The completion of the building will attract other people, developers and cities to create other adaptive reused spaces from existing manufacturing buildings using passive design. The existing space is run-down, deteriorating and being destroyed by weather, people and time, yet the remodeling of the space using passive systems through adaptive reuse can be a salvation to the site. Cleaning out the dirt, replacing broken windows, and shoring up the walls and adding a bit of paint and design can change the building into a new space that attracts people, shops and community involvement and change the way people see deteriorating manufacturing plants.

Analyzing the data collected will provide conclusions about which systems will work the best for my specific site. Various experiments and computer simulations will be run to determine which systems work best with different building designs. Logical Argumentation will help me make sense of the data collected and unify the systems into a sustainable passive multi-use building strategy. Case studies will provide the documentation of the passive systems that are currently working in industrial sites and other existing new and remodeled buildings. Using various methods, the research, analysis and implementation of passive systems and sustainable practices can take a deteriorated manufacturing plant or warehouse and create a remodeled multi-use building with residential and commercial spaces just as God uses Jesus to rebuild Man. “For in the Lord their souls are praised... the immortality of the resurrection...should be ours, either in the beginning...or in the end of this world” (Augustine 833). This industrial building can be resurrected and rebuilt into an efficient mixed-use space using passive design. The end results is unknown but with faith, hope and increased knowledge of the benefits of passive systems there will be a catalog that can be applied to any existing structure to be that “he walks by faith, not by sight” (Augustine 692). This redesign will create a better neighborhood, community, and city while helping others help themselves “a man finds three things he has to love – God, himself, and his neighbor...he must endeavor to get his neighbor to love God” (Augustine 692).

To help your neighbor and make their lives better, to provide hope with research and design to the neighborhood of Milwaukee Junction, Piquette Avenue Industrial Historic District, and the City of Detroit. The city of Detroit and these auto manufacturing buildings are currently existing apart from what the city wants for the long-term life of Detroit. The re-purposing of these buildings will resurrect and unite the neighborhoods, people and city to create more mixed-use spaces.

This information will define and link the passive systems to create an economical, remodeled, low energy passive, mixed-use building. The cataloging of the various systems will make a quick reference to create and renovate existing buildings making them ecologically sound and efficient energy users.

The resurrection of the manufacturing plant can be created by the adaptive reuse of the existing buildings. Creating a space using passive systems gives life and hope to the buildings and city, just as the existence of Christ created hope and life for man and his soul. The research of passive systems must be tested correctly to be validated and acknowledged by a knowledgeable journal and worldly experience. There will be a collection of information to peruse through and compare the information gathered. Deductive reasoning will be used to study the different types of passive systems, creating a catalog of benefits and disadvantages for using each passive system.

Results of the Research Project:

The initial research is to study and learn about the history of the city, neighborhood and the Fisher Body Plant #21 in Detroit, MI home of the original bodies by Fisher. The Fisher company created and built the standard undercarriage in all the major cars of the 1920 -1960's and some are still used by car manufactures to this day. The Fischer Body Plant #21 was built in 1919 on Piquette Street and made car bodies for Cadillac, Ford, Studebaker and Hudson. The new stamping process they created was revolutionary at the time, originally starting as designs made from wooden forms, this new stamping process used steel frames, for higher efficiency and consistency in manufacturing. The Fisher building was built and designed by Albert Kahn who created an large open building with floor to ceiling windows to allow in daylighting with rows of large columns running throughout the interior. These large windows will be used to allow natural light into the remodeled building and the rows of columns will help create sight lines and walkways. The remodeled design will incorporate Kahn's inspiration into the building. The site is contaminated and research about how to clean up a contaminated site and cost still needs to be conducted. The structural integrity of the building will have to be analyzed since some of the floor sections have caved in. The building sits on the site which faces northwest and so south facing windows will have daylighting in the morning, during the day and then be in shade during the mid-afternoon and evening. Shading devices will need to be used on the south, east and west sides to provide shading during the hot summer days.

The wind path is primarily from the west with two predominant paths from the west and southwest. These predominant winds will need to be channeled around and over the building using vegetation and harnessed with wind towers and other ventilation designs to provide cooling.
Transit and neighborhood impacts will be considered because the site is close to Midtown and Wayne State University. There is a bus stop 1 block west of the site and is a ten-minute bike ride to Wayne State University. The site is located near the intersection of two major interstates and the main highway connecting downtown Detroit and the suburbs is within minutes of the site. Noise on the site from the interstate will need to be softened with vegetation. The nearby Ford Piquette Museum, home of Model T, is two blocks west of the site to help draw in people. Case Studies have been researched and are being analyzed for their mixed-use spaces, passive systems and industrial adaptability and feasibility to my site. Case studies show that other buildings have used passive design to remodel and create a mixed-use space. Passive systems have been compiled and will be tested in computer simulations and common-sense logic and analysis for feasibility on the site.

CONCLUSIONS:

Researching passive system will help and make a little piece of the world better "as the world itself is renewed to some better thing, it is fitly accommodated to men, themselves renewed in their flesh to some better thing" (Augustine 735). Just as the final judgement of man will renew our bodies and souls to create a better thing so too will the remodeling of this auto plant combined with passive and sustainable systems create a better space. The orientation of the existing windows determines the type of shading devices and the amount of daylighting implemented within the Fisher plant because "light is the prerequisite for architecture" (Schittich 57). The information gathered from each passive system will be analyzed to provide a group of design criteria for the remodeling of the Fisher Body Plant #21. Analyzing the data collected using base line simulations and various experiments and computer simulations will determine which systems work best with different building designs.
This research will be used to create use-able guidelines for others to follow and apply to their own projects and buildings. "The earthly city, which does not live by faith, seeks an earthly peace, and the end it proposes, in the well-ordered concord of civic obedience and rule, is the combination of men's wills to attain the things which are helpful to this life" (Augustine 695). The city of Detroit and these auto manufacturing buildings are like The City of God, the buildings currently existing apart from what the city wishes and hopes for the long-term life of Detroit. The repurposing of industrial sites like the Fisher plant using sustainable design will again unite the hope of the neighborhoods, people and city. Just as Christ is God and he is what God used to bless all nations, so to can the Fisher Body Plant #21 be blessed by creating a mixed-use space using passive systems to be redesigned from an idea of hope.

SCHEDULE:

2018 October

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
01	02	03	04 Finalize work schedule & review proposal draft	05 Finish Case study & review Proposal Draft with Prof.	06	07
08 Proposal done	09 Site Visit Detroit	10 Review Proposal before submittal	11 Proposal Due	12 Put Program parts together Research systems & designs	13	14
15 Research passive systems this week	16 site analysis done	17 Analyse passive systems	18 Finalize passive system list	19 Have Program rough draft done	20	21
22	23 Review Program for submittal	24 Review Program for submittal	25 Thesis Program Draft Due	26 Relax from School	27 Style Show	28
29 Start revising Program	30	31 Halloween Trick or Treat	01	02	03	04

2018 November

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
29	30	31	01 Finalize research	02 Work on Journal	03	04 Daylight saving ends
05 Work on Journal	06	07 Work on Journal	08 Continue research of Passive systems	09 Work on Journal	10	11
12 Abigail Birthday No school	13	14 Check journal submittal requirements for accurancy	15	16 Journal Draft Done Anniversary	17	18
19 Journal draft review	20	21 Studio Assignment #3 Due - Journal Article	22 Thanksgiving	23	24	25
26 Continue to put program together	27 Check to see if have all parts of program started	28	29 Finalize	30	01	02

2018 December

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
26	27	28	29	30	01	02
03	04	05	06	07 Thesis Program done	08	09
10 Review Program for submittal	11	12 Studio Assignment #3 Done & review	13 Thesis Program Due - Final	14 Studio Assignment - Final Due	15	16
17 Relax	18	19	20	21	22	23
24 Christmas Break	25 Christmas	26	27	28	29	30
31	01	Notes:				

2019 January

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
31	01 New Years Day	02	03	04	05	06
07	08	09	10	11	12	13
14	15 Logan Birthday	16	17	18	19	20
21 Work on program requirements	22	23	24	25	26	27
28 Work on program requirements	29	30	31	01	02	03

2019 February

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
28	29	30	31	01	02	03
04 Work on program requirements	05	06	07	08	09	10
11 Work on program requirements	12	13	14 Valentine's Day	15 Finalize mid-term program information	16 Brandon Birthday	17
18 Work on program requirements	19	20 Put Presentation together	21	22	23	24
25 Finalize presentation	26	27 mid-term thesis program done for review	28	01	02	03
04	05	Notes:				

2019 March

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
25	26	27	28	01 Finalize presentation	02	03
04 Mid-term Thesis Review Starts- 4-8th	05	06 Ash Wednesday	07	08 Program final edited copy done	09	10
11 Spring Break	12	13	14	15 Thesis Program final edited copy due	16	17 Fun Fair
18	19	20	21	22	23	24
25	26	27	28	29	30	31

2019 April

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
01	02	03	04	05	06	07
08 Build exibit	09 Build exibit	10 Finalize digital book	11	12 Thesis digital Draft Done	13	14
15 Exibit done	16	17 Bring Exibit to school	18 Review Digital draft	19 Thesis Digital Draft Due Good Friday	20	21 Easter
22 Thesis Exibit Due No school	23	24 presentation review Done	25	26 Finalize presentation review	27	28
29 Thesis Review Starts	30 Drop off Book at Printers	01	02	03	04	05
06	07	Notes:				

2019 May

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
29	30	01 Digital done	02	03 Review Digital	04 Birthday:)	05
06 Thesis Digital Final Due	07	08	09 Pick up Book From Printers	10 Thesis Book Due	11 Graduation	12
13	14	15	16	17	18	19

Theoretical Premise:

Literature Review:

Summary of Solar power:

Christian Schittich (2003) in Detail solar Architecture discusses the energy use of the sun in the design of buildings. That every building has the potential to be a solar house, energy efficient, but, “energy-conserving architecture cannot be limited to the operation of the buildings” (Schittich, 9). Designers and architects need to use the energy from the sun to heat and light their buildings. Society needs to use more renewable and natural resources and the author continues to stress that there needs to be less wastefulness and energy consumption with non-renewable resources.

The buildings energy use is not just based on its structural elements, but also on its orientation to the sun and wind. Its location and placement amongst other structures can create a micro-climate with in the vacant spaces surrounding the building site. These conditions can be both positive such as blocking the wind or negative like creating a wind tunnel. Protecting the building and site from strong winds creates a preferable space and should be highly considered when deciding on a building location. Using vegetation and natural wind barriers to block or channel the wind away from the site should be implemented. These barriers will in effect cause a good micro-climate surrounding the building site. Trees provide the best wind barriers but also cool and filter the air entering the site. Schittich says that evergreens provide wind blocking in every season, but deciduous trees shade in the summer months, yet allow the sun to penetrate the building interior in the winter because of their dropped leaves.

The orientation of the building also affects the wind along with the building insolation level. There are significant heat gains by using higher levels of insulation and orientating the building towards the sun in warmer climates that could have a negative affect on the interior comfort of the building. Schittich suggests that some buildings may have to orientate themselves away from the sun to avoid over heating the interior along with providing high insulation levels within the building. The use of better insulated structures is an effective way to save energy, by saving the heat that is stored within the structure and not allowing it to escape through thermal bridges. Other factors such as surrounding buildings and interior layout will also affect the heating and cooling of the building and should be considered for the orientation of the building.

The interior areas of the buildings will be affected by the sun, insulation and orientation, but the various rooms can be placed to accommodate the different temperature levels. Adequately placing the different rooms and deciding on the type of rooms to provide within the building will shape the layout and orientation of the building. Schittich suggests a new room layout that doesn’t

place the warmer rooms at the core and cooler rooms on the exterior but uses solar zoning by orientating the building to the south. “Core rooms with the greatest heat requirements face in that direction and utilize the solar radiation” (Schittich 19). The other three sides of the building have the rooms with the lower thermal requirements. Yet this is not always possible in design, but linear zoning is possible. The prime rooms with higher heat requirement should face south and the lower heat needing rooms face north with a circulation paths in between the two types of rooms. This system allows for a buffer between the warmer and cooler rooms and thus providing greater energy efficiency.

While the orientation and insulation of the interior rooms need to be considered, each room also provides openings to the exterior in the form of windows and doors. Openings according to Schittich, “offer the greatest opportunities and at the same time, pose the greatest risks” (20). Considerable amount of time should be used when considering the window size, location and glazing to be used in the building and the orientation the window will be facing. The location of the window on the building will determine the size and glazing requirements for each one and should not exceed 45% of the total building surface when standard glazing is used according to Schittich. The frames of the windows are the weakest point and have the highest risk of energy lose even when the window glass is rated at a higher efficiency level. Schittich suggest going without a frame if the structural and ventilation needs of the building can be met. These frameless windows lend themselves to the use of thermal massing within the building to provide heat storage.

Thermal mass is a good and simple way to store heat that is later dispersed throughout the building when temperatures are cooler. Interactive comprehensive systems according to Schittich are the way to efficiently heat and cool buildings. Types include ground ducts that use the constant temperatures of soil; adiabatic cooling which uses water evaporation to humidify and cool the air; free night cooling is the same as window or gap ventilation and is most effective when used with thermal storage mass; and light-directing elements which guide daylight with louvers and light shelves further into the building reducing the need for artificial lights. There are other interactive systems and forms of natural energy collectors including photovoltaics.

The exterior or skin of the building is as useful as the orientation and windows on collecting and using the earths natural energy. Photovoltaics are placed on and within the design of the buildings exterior to collect the sun’s energy throughout the day and either convert it into immediate energy for the building or store it for later use. Traditionally these devices were placed on the roofs of the buildings and were noticeable and distracted from the aesthetics of the building design. Photovoltaics need to be designed and incorporated as part of the building skin to be aesthetically pleasing as well as effective energy collectors. These systems according to Schittich can produce and store more energy than the building needs to use and therefore creating an energy surplus. The collection of the sun’s energy is with solar cells that are either amorphous or crystalline silicon. Even though the crystalline has a higher efficiency rate the two types are being combined to use the benefits of both cell types.

The use of the sun provides not only the heating but also can over heat an interior space and thus shading or light-directing systems should be considered in the building design. Shading consists of movable, fixed and interior devices that can be placed either vertically or horizontally depending on the orientation of the window openings to be shaded. Light directing systems direct the light further into the building using skylights and light towers to name two. Things to consider according to Schittich in either shading or light-directing systems is the flexibility, reduction of radiation transmission and placement of the systems within the building design. Shading provides cooling affects to the building were light-directing provides daylighting. "Architecture that is optimized for daylighting can drastically lower the operating costs… without any notable increase in construction costs" (Schittich 68). This lower cost shows that using passive design is an efficient energy source for building design.

The use of natural energy sources like the sun and soil is an energy efficient way to provide energy to buildings. The opportunity to enhance the energy efficiency of buildings increases the value of the building and the neighborhood it is located within. The improvement of the building design Schittich says, "must go beyond mere façade decoration… the goal must be to achieve the highest possible level of architectural quality in the built environment" (36). This built environment should include not only new construction but existing buildings using the earths natural energy to create efficient buildings with passive design.

St Augustine:

St. Augustine in his book The City of God explains where our faith and the relation to God come from, explaining the building, destruction and rebuilding of God's City. The City of God is about the creating of man by God's will and breath, death by original sin by the eating of the fruit of the tree of knowledge of good and evil, and the creation of the new city for man and his salvation and key to attain heaven upon bodily death by faith in Jesus Christ. St. Augustine explains the connection with Christ and the life of man because "of the knowledge of God, to which no man can attain save through the Mediator between God and men, the man Christ Jesus" (346). Our knowledge of our faith is only by knowing Jesus, the man and God, and understanding what he gives us by our faithfulness. God speaks not by ears but by 'truth itself' (Augustine 346) in the mind that is above and different than the animals.

St. Augustine talks about the creation, destruction and resurrection of God's City, not a physical city of brick and mortar but a spiritual city of hope and love, about the building of man. The original creation of the City is the creation of the earth and heaven, angels, animals and man. In the beginning there was glory and perfection in God's creation, because God is omnipotence, omniscience and omnipresence, meaning that he is all powerful, all knowing and all present. In his creation according to St. Augustine man was created in His, God's, image and likeness and given dominance over all the creatures of the earth.

When man ate of the Tree of Knowledge of Good and Evil this allowed wickedness to enter the spirit and the creation of man.

God so loved man that he gave him the gift of free-will, so that he may choose to follow God and dwell in the City of God or to turn away from God. “Who can conceive the number and severity of the punishments which afflict the human race – pains which are not only the accompaniment of the wickedness of godless men, but are a part of the human condition and the common misery” (Augustine 847). The City of God is being rebuilt by the resurrection and love of God thru his son Jesus Christ. Man’s faith in the Trinity of God, Jesus, and the Holy Spirit create the City of God within each person whom believes in Jesus. According to St. Augustine the propagation of good and the continual rebuilding and salvation of man through Christ is what will rebuild the city. Man/people were given the ability to think, understand, reason and attain knowledge. “It is He, then, who has given to the human soul a mind, in which reason and understanding lie…so as to become of knowledge and of receiving instruction, fit to understand what is true and to love what is good” (Augustine 851-852).

St. Augustine explains that God uses Jesus to rebuild Man. “Man has not been created stooping towards the earth…but his bodily form erect and looking heavenwards, admonishes him to mind the things that are above…. assuredly no part of the body has been created for the sake of utility which does not also contribute something to its beauty” (Augustine 853). Man is to always be searching and trying to attain heaven and to rebuild the City of God through his or her actions, words and thoughts.

Rebuilding a person through Christ is to know God and that they can be rebuilt. “God will be so known to us, and shall be so much before us, that we shall see Him by the spirit in ourselves, in one another, in Himself, in the new heavens and the new earth, in every created thing which shall then exist” (Augustine 864). This knowing of God is within the knowing and existence of Christ who created hope and life for man and his soul.

The good of God through Christ is the goal and so Augustine says, “Life eternal is the supreme good, death eternal the supreme evil, and that to obtain the one and escape the other we must live rightly” (676). The way man thinks are not based only on where they were born and raised, but on what decisions are made to do the right thing and follow Christ with faith. “We do not yet see our good, and must therefore live by faith; neither have we in ourselves power to live rightly, but can do so only if He who has given us faith to believe in His help do help us when we believe and pray” (Augustine 676). Faith is not just believing but it is about living the right way, thinking of others needs before our own to love as God loves us and to do what the commandments tell us to do. The joy that God has created mankind and all the angels, animals and all the things in nature draws man to him and St. Augustine says that the result will be worth it in the creation of man. “That God alone is the Creator of every kind of creature, whatever its nature or form” (Augustine 408). People are made in his image and likeness, we are created by God for his purpose.

St. Augustine explains the connection between man’s body and his soul and their creation by God. “Human soul is truly affirmed to be immortal…death...of the soul takes place when God forsakes it, as the death of the body when the soul forsakes it” (Augustine 412). The body and soul are connected, if the body is good so will be the soul yet if the body is wicked so will be the

soul and vice versa. The connection of the soul to the deeds of the body influences confirms that man is living rightly. Unless God is working in the person, the deeds are no good, only by God's work are the person's deeds good which makes their body and soul good and the salvation of man and the city of God can be attained. In the city of God "True peace shall be there, where no one shall suffer opposition either from himself or any other. God Himself" (Augustine 864).

God uses Jesus to rebuild Man for the Lord is praised and the truth of his resurrection shows that salvation and peace will come to those who believe. St. Augustine continues by saying that the immortality and resurrection will be ours because of Christ rising from the dead. This truth according to Augustine is why man has a pursuit of knowledge but cautions against it leading him down the wrong path unless he has a divine Master such as God and Christ. This master can instruct and direct the pursuit of knowledge to preserve the freedom of his body and yet as man is a stranger to God because of his mortal body. Those who follow Christ discern, "he walks by faith, not by sight" (Augustine 692) and thus has peace in both the body and spirit and continues to follow the laws of God. Through this law is the law of Christ when we walked the earth, "the love of God and the love of our neighbor – and… he has to love – God, himself, and his neighbor" (Augustine 692). These laws create the right living of man and creates "the heavenly city, or rather the part of it which sojourns on earth and lives by faith" (Augustine 695). He continues to say that earthly man must live like a captive in the earthy city and follow the rules of God and they will already receive redemption and the Spirit connecting the heavenly and earthly cities.

The result and true test according to Augustine is that eternal life is the supreme good and the supreme evil is death of the soul and body and living rightly is the only way to reach the heaven and the city of God. The peace and truth of God along with the faith and love of Christ is the way to eternal salvation and to be renewed in the flesh. "There we shall rest and see, see and love, love and praise. This is what shall be in the end without end. For what other end do we propose to ourselves than to attain to the kingdom of which there is no end" (Augustine 867)? St Augustine is talking about the physical destruction of Rome, but his work can be applied to any city and the creation of man.

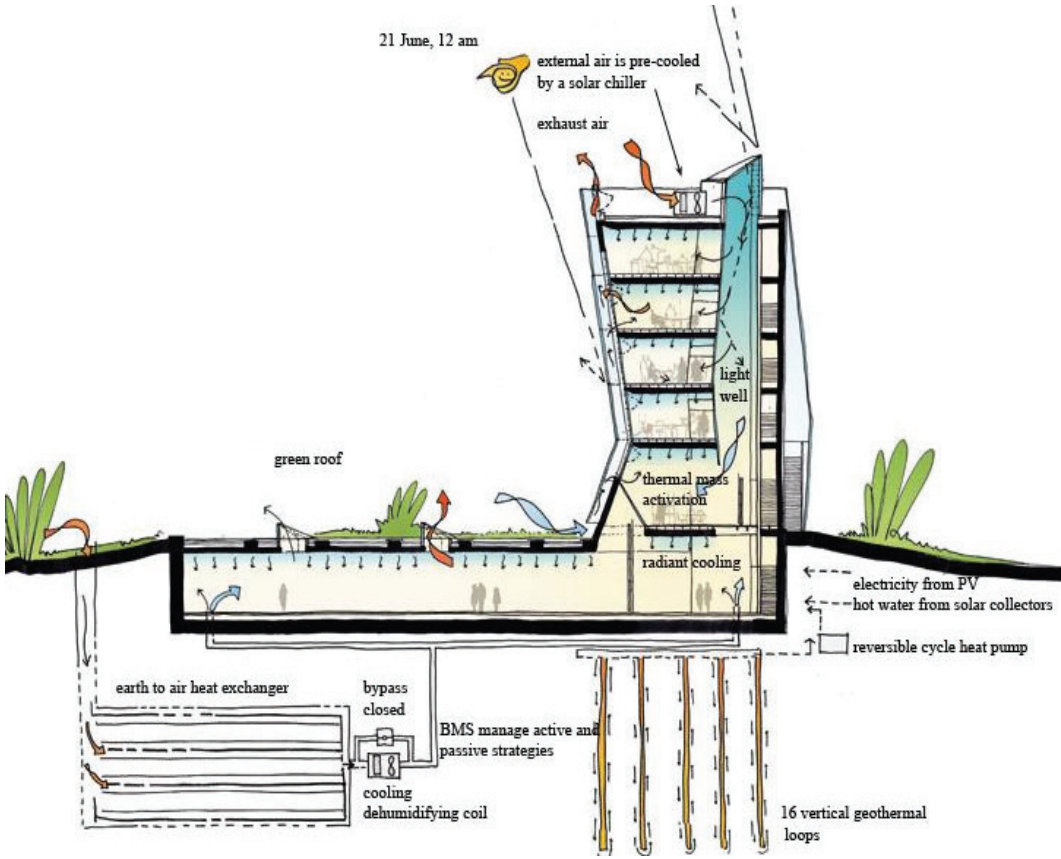
The similarities between the two books are difficult to see when they are first experienced. One book, the Detail Solar Architecture book talks about nature and energy efficiency using the earths natural systems to heat, cool, ventilate, shade and create thermal comfort within a building. The other book talks about how God is the salvation of man and he is creating a city for man to dwell. The connection of the city of God and the energy of a building are connected because God created the earth and the natural elements that are used in a passive building design. The passive building uses the sun to heat and light, the wind to cool and ventilate and the plants to filter and cool the buildings. These are created by God for the pleasure and use of man in the Garden of Eden where everything was perfect. The building that uses effective solar design should create excessive energy and thus be perfect in energy use like the Garden of Eden. The faith and reasoning that is described by St. Augustine is about the physical destruction of Rome and why God allowed the city to be invaded and destroyed. This book continues to explain the lack of faith the people in the city of Rome had in God and so to the design of a poorly designed building will not be protected from over heating and thermal massing. The continued salvation of the earths resources is through solar design just as the faith in God is the salvation of man.

Catalog of Passive Systems:

Passive design is the use of the earths natural elements to heat, cool, provide energy to your building. The five main principles are Sun, Wind, Water, Noise and Plants but also include Thermal Mass and Thermal Comfort. A passive building designs goals are to save money, energy, and water, reduce material cost, minimize construction waste, enhance the site, and community and improve aesthetics of area.

Advantages: Efficient,design is free, interior air temp is constant, better overall health because no dust particles from vent, lower energy bills

Disadvantages: construction cost is higher, better design standard, must have airtight envelope, maintenance and cleaning of systems, well constructed



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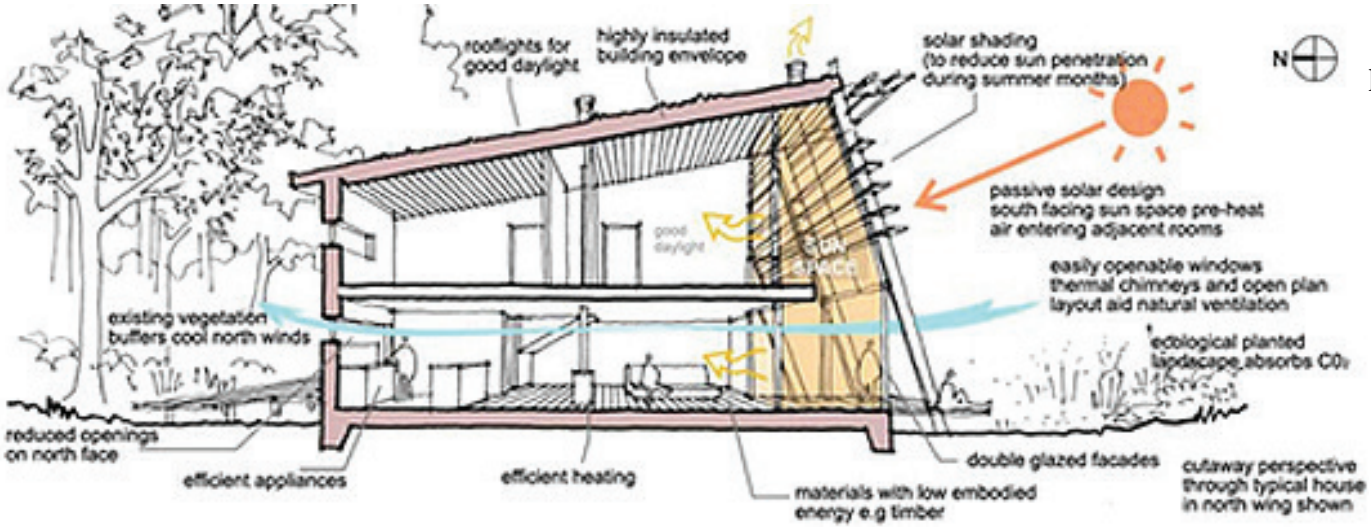

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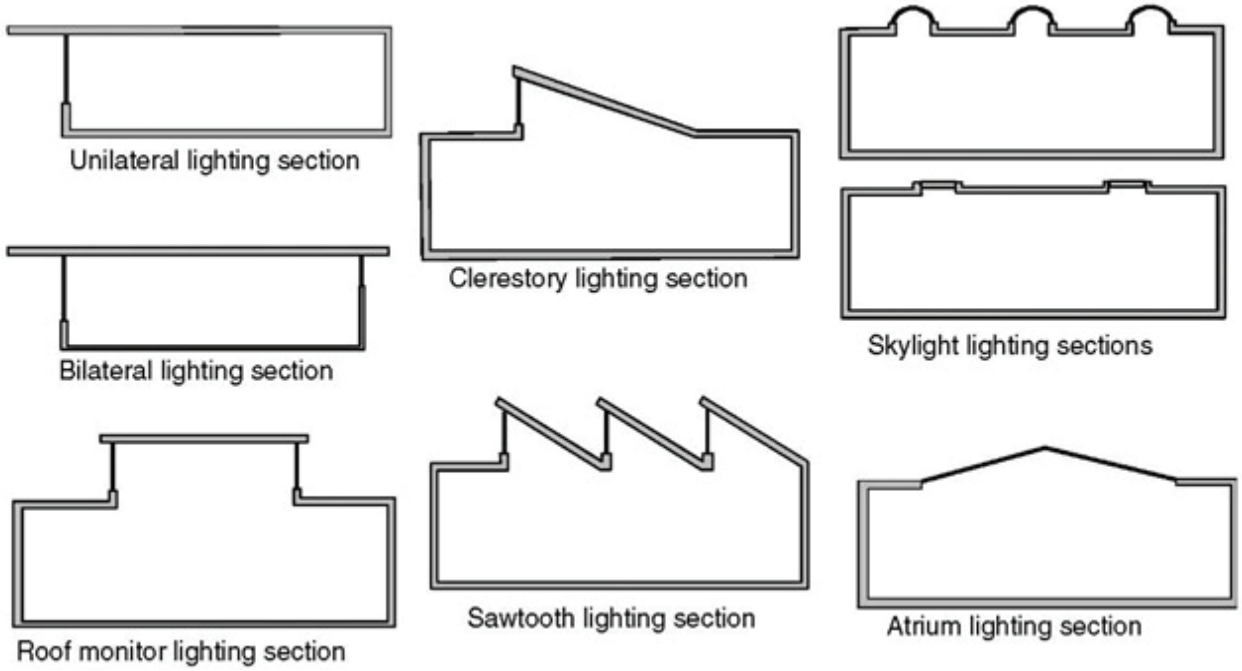
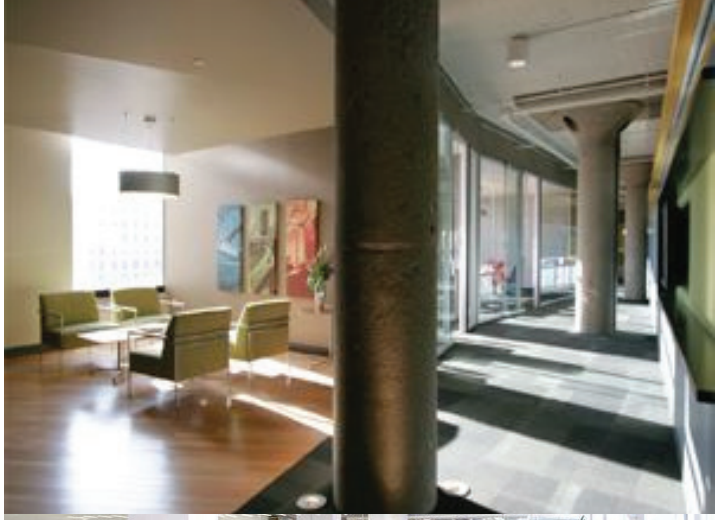
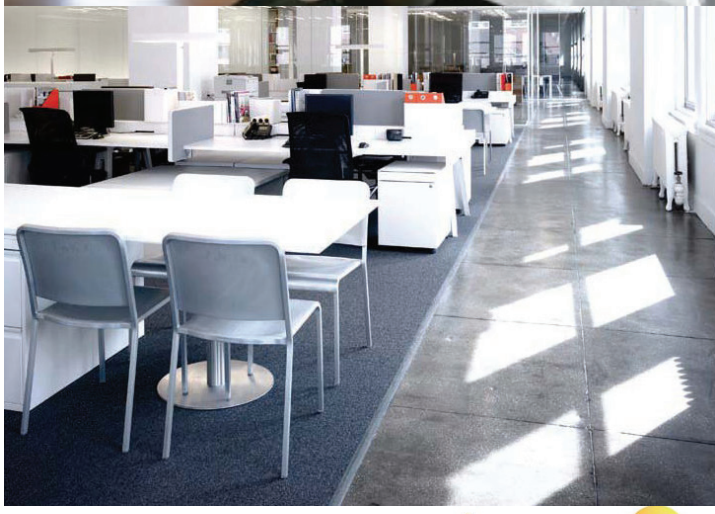


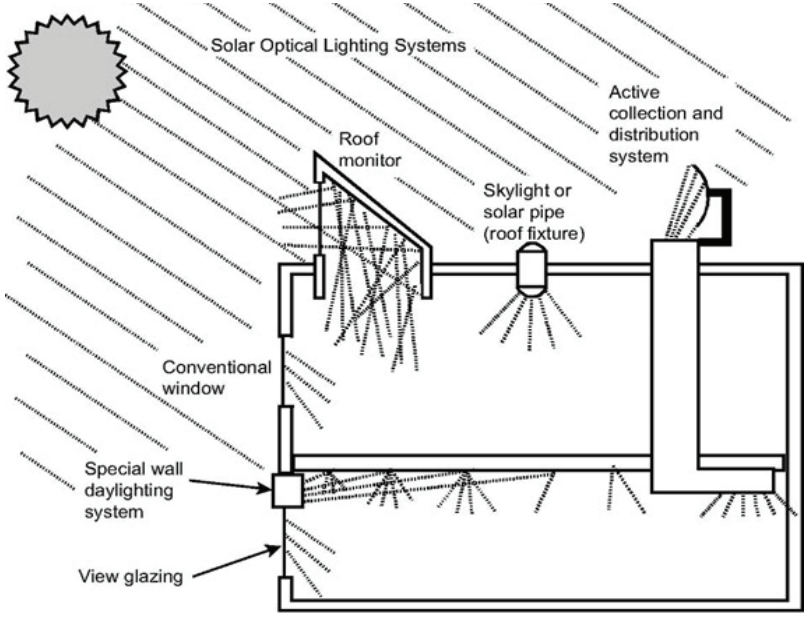




Daylighting uses the sun to light your building using different types of glass openings.

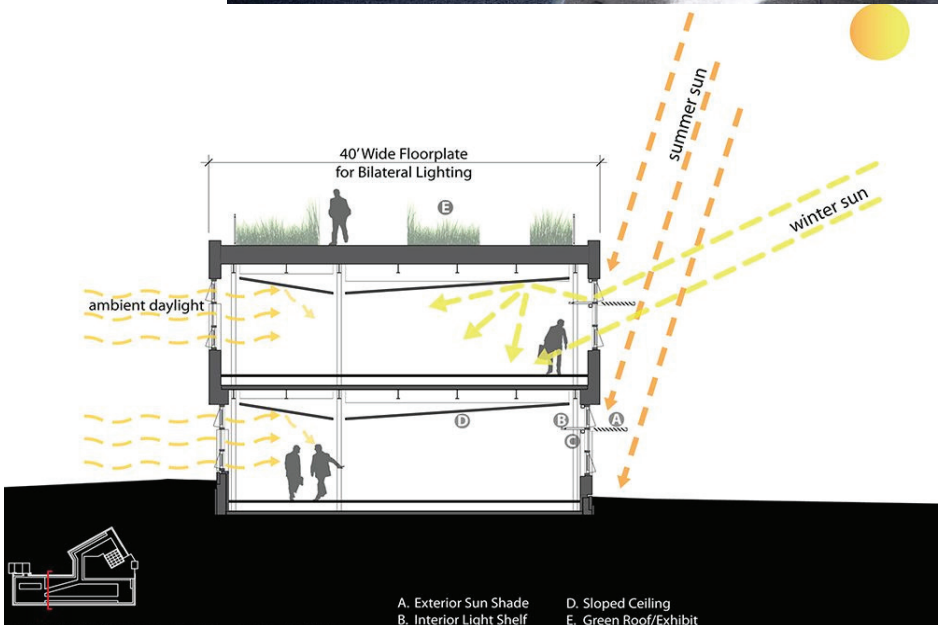
Advantages: Save money on utility bills, clean, efficient, constant sun use is free, improved air quality.

Disadvantages: cloudy days may not provide enough energy, active system needed to supplement energy need, overheating, glare.

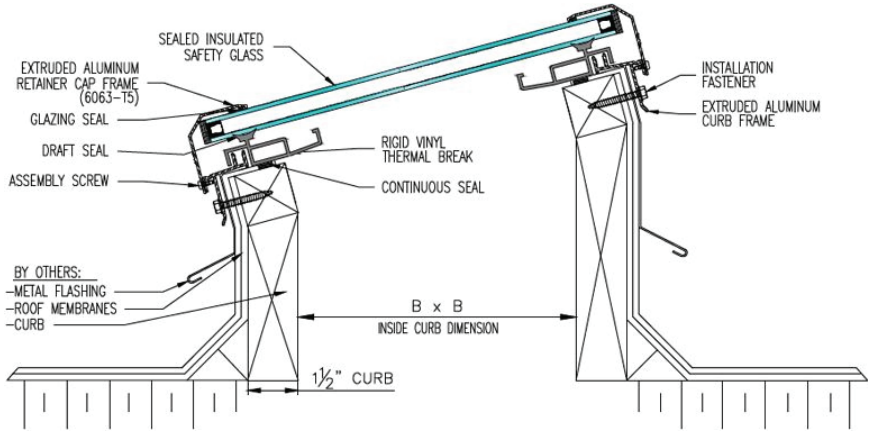


SUN:

Solar Daylighting



Sun:



Luiz Wilson, pinterest

Skylight

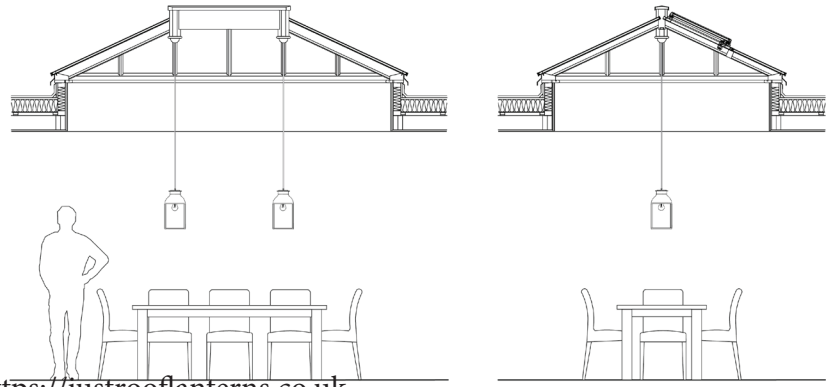
Sky light detail and examples of types. Some are operable and others are not.

Allows light into the space from the ceiling or elevated side of building, A larger or taller building will need to use light tubes to reflect the light farther down into the space

Advantages: natural light, privacy, energy efficient, sun is free, operable ones can be opened to draw heat out of space.

Disadvantages: too much light on sunny days, heat-gain, heat loss in winter, not sealed or insulated, leaking

http://www.inreads.com



https://justrooflanterns.co.uk

Monitors/Roof Lantern

Monitor diagram and photo of monitor on building allowing light into space.

Raised piece of glass and frame on top of building, can be decorative to building. use to bring natural light into space, can use tube to reflect light farther into space for use on a tall or larger building. Can use to create enclosed courtyard.

Advantages: natural light, ventilation, added light in winter months, privacy, energy efficiency.

Disadvantages: heat loss if not insulated correct, leaking possible, too much light on sunny days.

https://en.wikipedia.org/wiki/Roof_lantern

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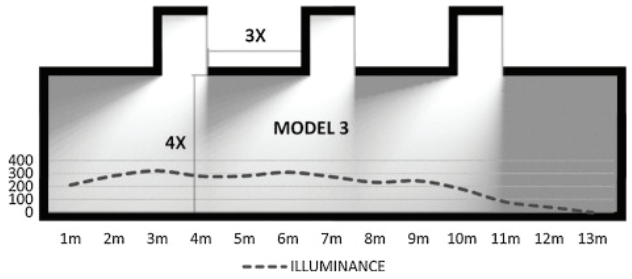


https://inhabitat.com

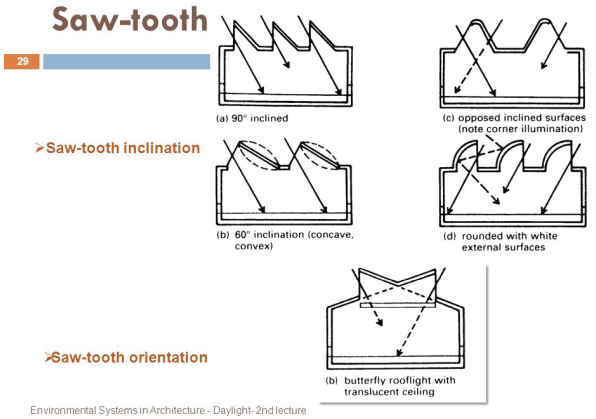
LIGHT SCOOP

Light scoop diagram shows how light enters a building.
It is a series of windows on top of building allowing naturally diffused light into the space. The opening is located facing the direction of the sun to allow the maximum amount of light which then reflects off the surfaces and sends more light into the space.

Advantages: less light in summer and more light in winter because of angel of scoop. privacy, improve mood. provide patches of light for users, good in halls, offices. works good in northern climate.

Disadvantages: heat loss through window area, only has patches of light.

https://inhabitat.com



https://slideplayer.com

SAW TOOTH

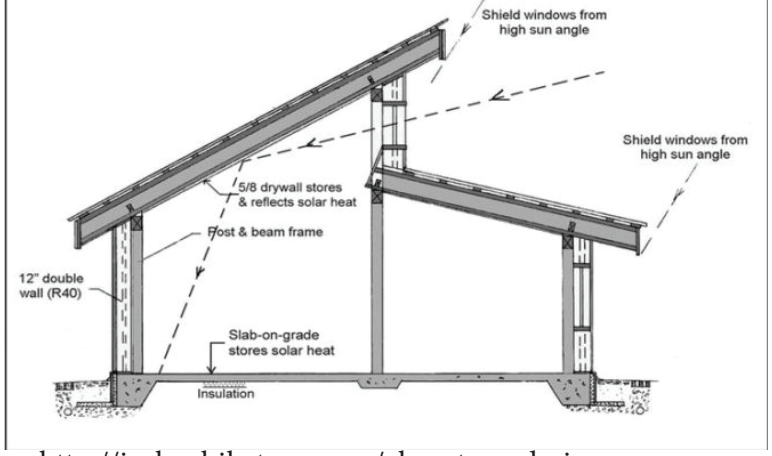
The Saw tooth design incorporates the window design into the roof line by creating an angled vertical part of the roof to allow daylight to enter the building. Usually found in older buildings and orientated to the north for filtered light.

Advantages: reduced glare, more light, less energy use

Disadvantage: overheating, part of building roof.

https://inhabitat.com

Sun:



http://jackochikatana.com/clerestory-design

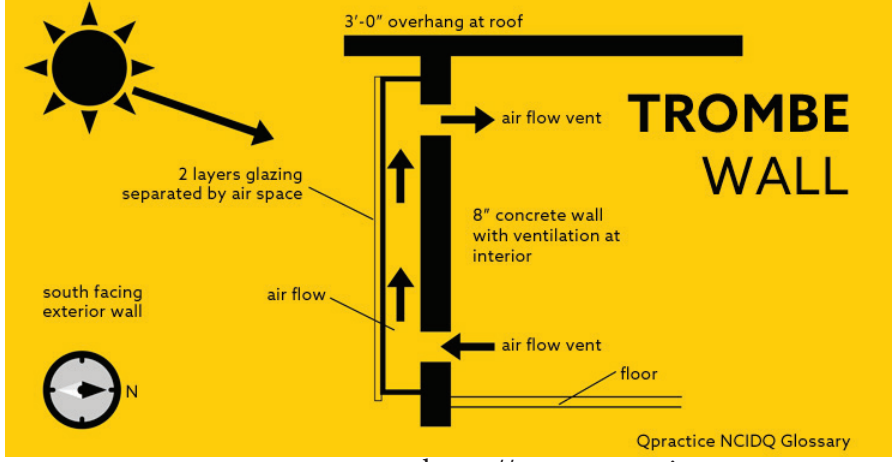
Clerestory

Clerestory diagram showing implementation in a building and providing natural light. Placed near the top of a building to allow natural light into the space. The light reflects off the interior ceiling or wall to be directed into the space. Can be used as a line of windows to add decorative features to building design.

Advantages: Allows a large amount of light into the space, heating and ventilation.

Disadvantages: overheating, heat loss, glare from window, requires overhang to shade from summer sun.

https://johnrobinsonbooks.com



https://www.qpractice.com

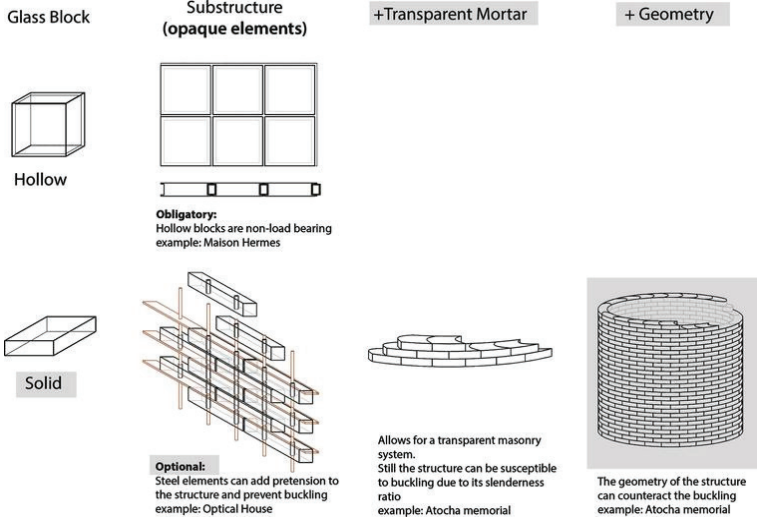
Trombe Wall

Showing how a trombe wall works and the use of a space. sun heats a concrete wall placed behind a glass wall during the day and at night the heat stored in the wall is radiated into the building. Vents are at the bottom allowing air flow in and out of the spaces.

Advantages: free heat of building, esthetically pleasing, natural air flow, used to cool, good in cooler climates, concentrated space used and quieter spaces.

Disadvantages: cost to install, constant monitoring of vents in warmer months. larger foundation to support weight, heat sinks, block views.

https://makewealthhistory.org



https://content.iospress.com

SUN:

TRANSLUCENT SURFACES

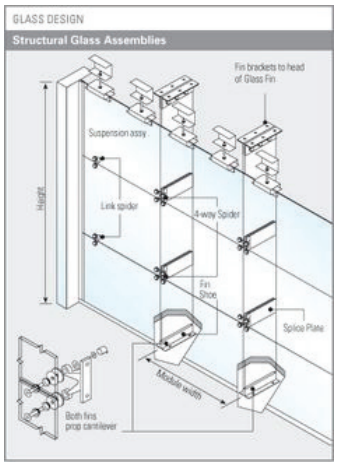
Different types of reflective surfaces including blocks and glass. The use of reflective glass is better used in warmer climates where heat gain from the sun is important. Allows light into the space that is filtered into the space. Glass can allow light but keep sun UV rays out of space. Good for large buildings, hot areas and where privacy is important.

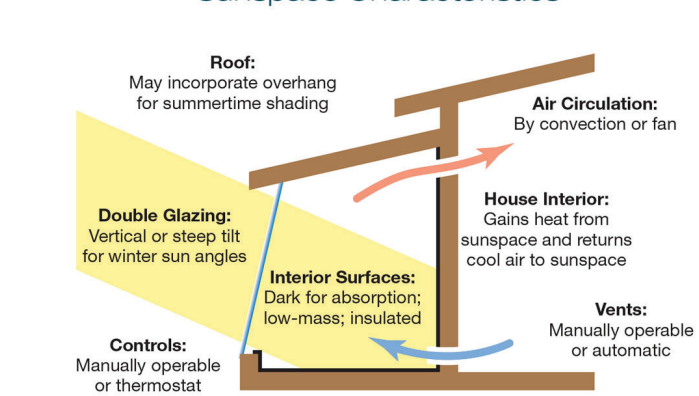
Advantage: privacy, light, reduces heat gain from sun allowing a cooler space, easily cut and installed.

Disadvantage: reflects the heat in winter and less light allowed, not good in cooler climates

https://www.domusweb.it

BYROL YLMZ, pinterest





https://www.homepower.com

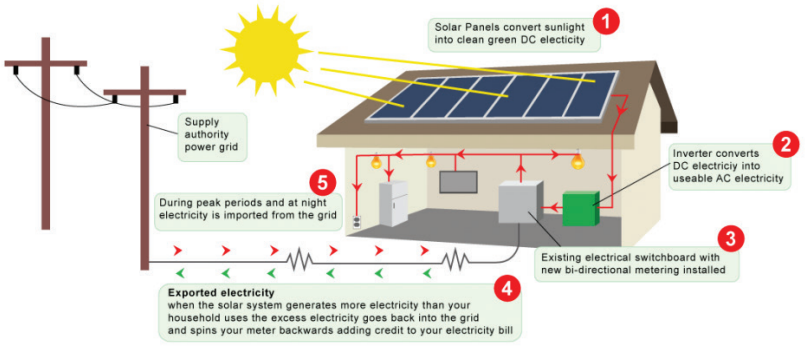
SUN–SPACE

Sun-paces, porch, sun-room, 3-season space, heats during the day by the sun and allows added indirect light into rest of building. Roof provides shading during warmer months, yet will increase humidity. Uses dark surfaces to store heat and than transfers heat into cooler spaces at night. attached to exterior of building.

Advantages: heat for room and adjacent space, reduce heat loss from adjacent rooms, warm air circulation, reduce glare, added living spaces, grow plants year round, provide views and aesthetics to building.

Disadvantages: overheating, sun drenched, too cold at night and winter, fans needed to move air, bad for plants because of inconsistent temps, added installation cost.

https://sunspacesunrooms.com



www.maived.com

PHOTO–VOLTAICS

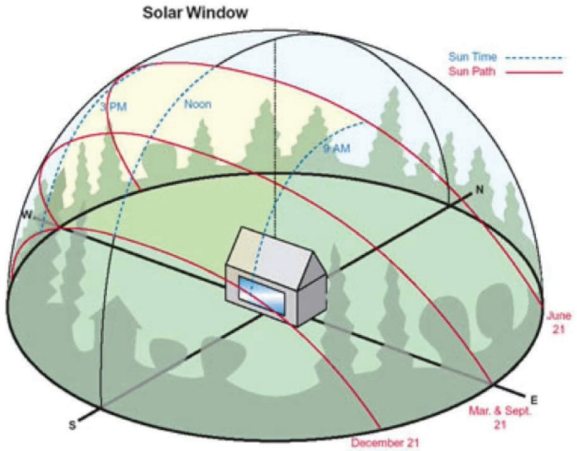
Photo-voltaic panels are used to provide energy to a building. When the sun shines on the panels, they store the heat created and converts that into electricity. This sustainable system supplements the energy, light, heating, cooling and ventilation needs of the building on overcast days were sun exposure is limited.
The sun energy is converted into DC, direct current

Advantages: free sun energy, uses sun light to run, sell extra energy back to power company, can be placed on roof or wall of buildings.

Disadvantage: Initial cost of installation, need inverter to change DC into AC power, can require large amount of land.

/www.shutterstock.com

SUN:



https://www.youtube.com, Equinox Observations:

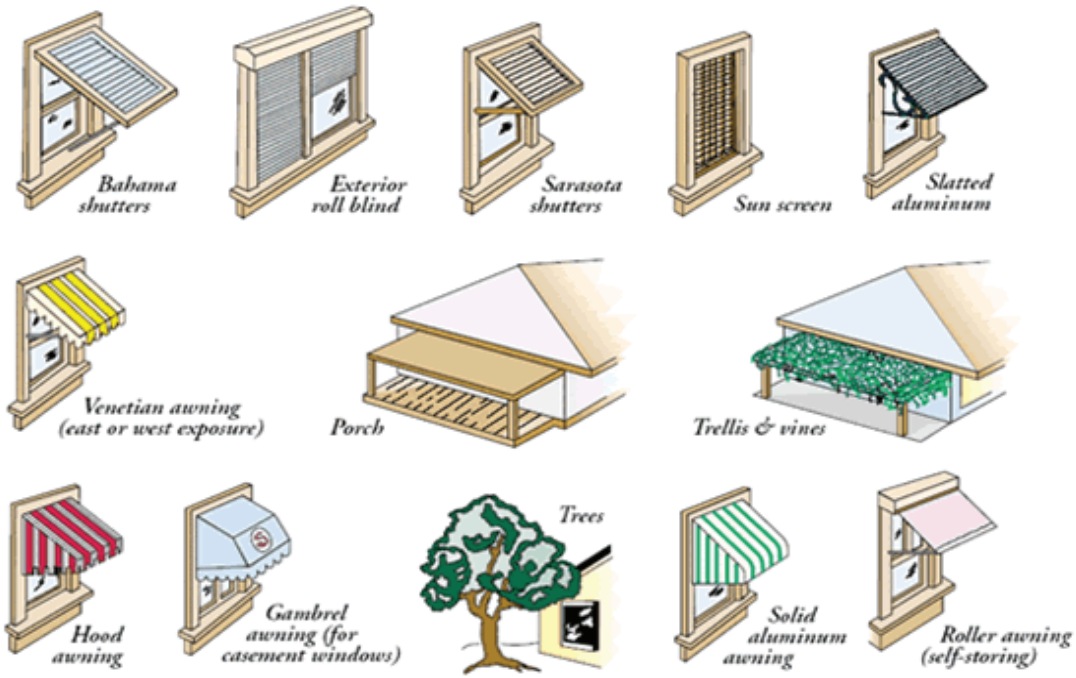
WINDOW ORIENTATION

Showing the sun paths in relation to a building to use windows to allow light and heat in to a space. Different directions and climates lend to using different sizing and locations of windows. The North face uses smaller windows and allows filtered or indirect light into the space. the South face allows the most light and heat gain into the space, uses shading to control amount of light. The east face has direct sun in the morning and the west face has direct sun in the afternoon. these both have heat gain when in the sun and use shading devices to shade building. Locate the building to the advantages of the sun.

Advantages: energy efficient, use to heat and cool building.

Disadvantage: if designed poorly can lead to higher energy use.

http://hezbollahpress.com



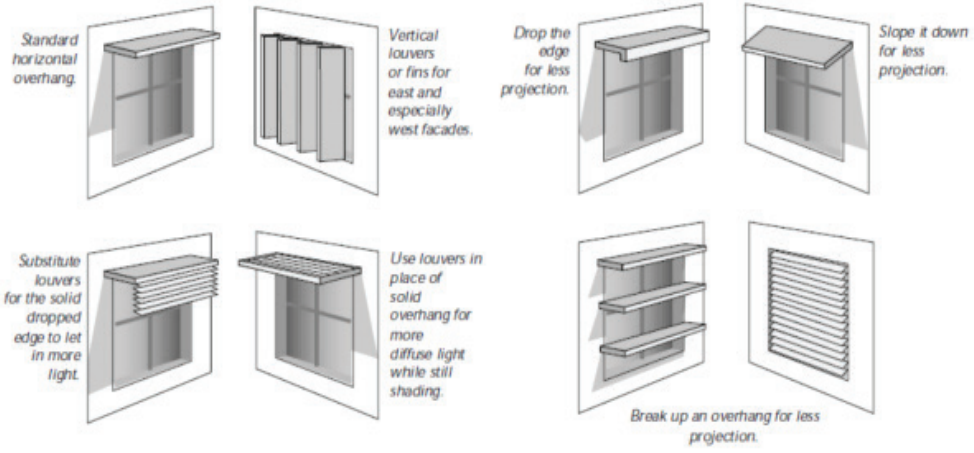
http://www.fsec.ucf.edu

Different types of shading devices including fixed, movable, interior and exterior. The orientation of the building and windows will determine the type of shading used. Exterior louvers, plants and overhead devices on the south face, vertical slats and interior blinds needed for the east and west side of building. north face doesn't require shading devices unless they are needed for privacy.

Advantages: Different types of devices, cooling of building, filtered light, energy saving, added aesthetics,

Disadvantages: Blocks view, need for regular cleaning and repair.

http://autodesk.typepad.com



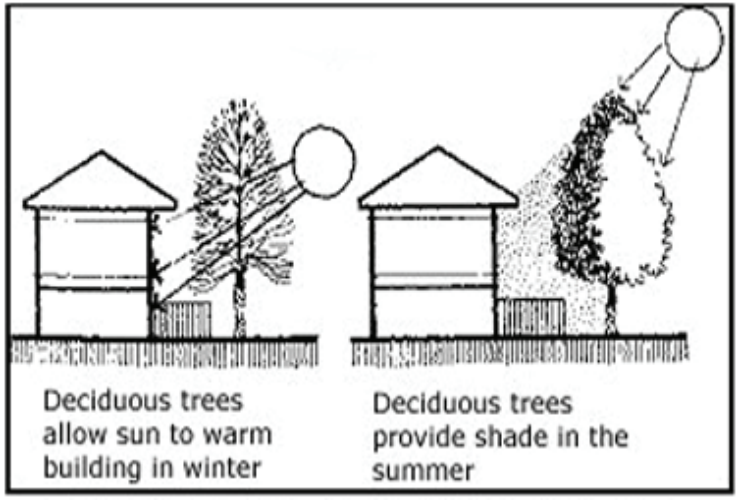
https://www.pagethink.com

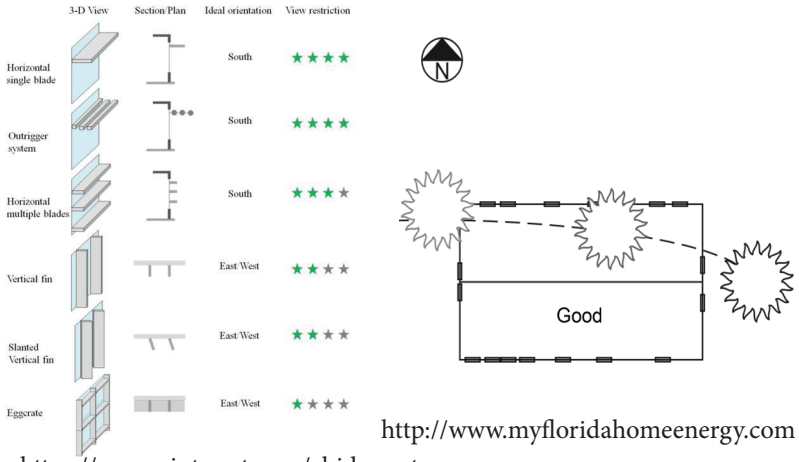
https://www.c-sgroup.co.uk

https://www.wbdg.org

SUN:

Shading



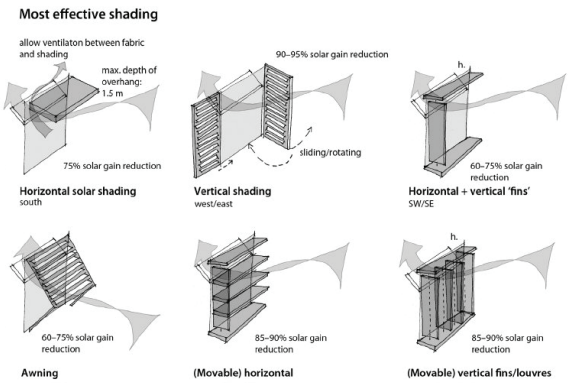


http://www.myfloridahomeenergy.com

https://www.pinterest.com/chidungvtvn

SUN:

SHADING:



https://www.researchgate.net

FIXED DEVICES

Devices used for shading that are not movable and designed as part of the building. On the exterior of the building to block the sun's rays from directly entering the space and adding unnecessary heat. Different orientation will dictate the type of device used. They are not able to be removed from the building.

Advantages: provide shade and cooler spaces, energy savings, provide natural light, avoid overheating.

Disadvantages: can't be moved, permanently part of building design, can block some views, too cool in colder climates. they can not change to move with sun.

https://jpg.group

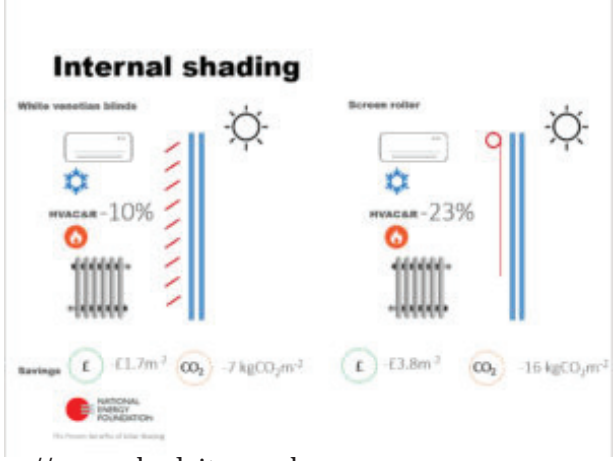
MOVABLE DEVICES

Types of devices used that are movable and able to be removed from the building. they can be designed to react to amount of light being provided by the sun. Movable devices on exterior of building, can move with the sun, either with sensors, or manually.

Advantages: reduces air conditioning need, reduced solar gain

Disadvantages: reduces natural light, higher cost to install and maintain, block views.

http://www.arhitekton.net



https://www.shadeit.org.uk

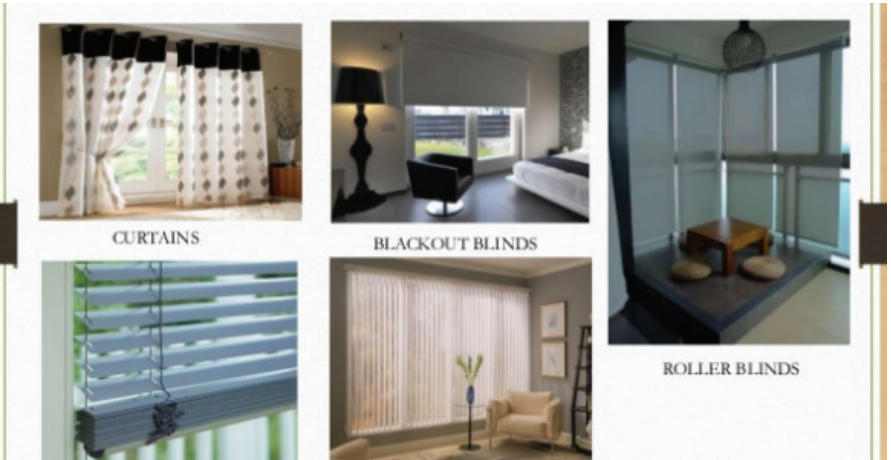
Internal Devices

Internal types including blinds, shades, and curtains. They are influenced by user preference in design, style and shape. Reflect the use and personality of the user in the space. The need to be manually adjusted to allow or block the sun.

Advantages: personal preference, avoid overheating, reduces glare, cheaper, redirect light, privacy.

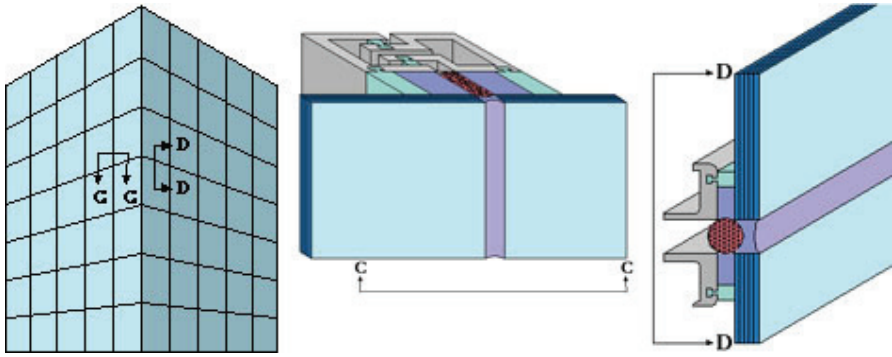
Disadvantages: block views, manually adjust, build up of radiated heat in internal surfaces, heat gain is minimally reduced.

https://www.quora.com



Sun:

Shading:



mastersil.r

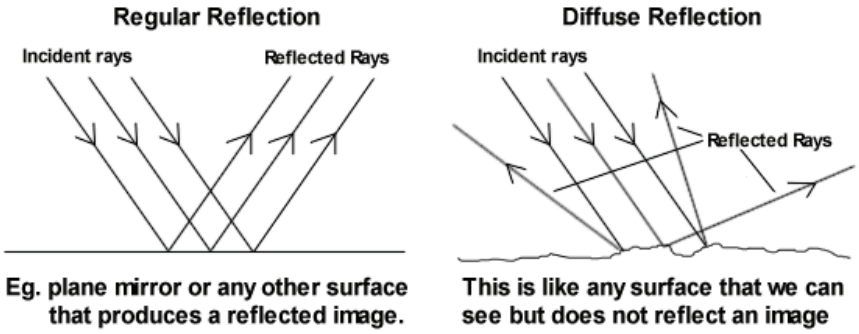
Glazing

Glazing diagram and use an external coating on glass that provides shading and blocks uv rays. Allows light into the spaces while allowing less heat to escape through the glass, double glazing is more efficient than single. The more glazing layers the more insulated and energy efficient the window.

Advantages: reduce energy bills, noise reduction, more difficult to break, reduce interior fading of items, limits condensation making the space feel warmer.

Disadvantages: trap heat, difficult to repair, cost more to install, difficult to use in older buildings.

https://www.wfm.co.in



https://sites.google.com

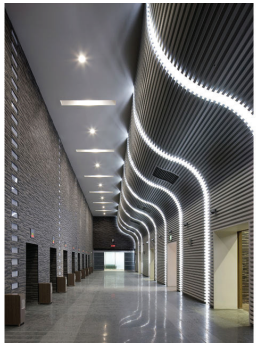
Reflective Surfaces

This uses the surfaces of the exterior and interior of the building to allow light to bounce around the room or reflect the light from being absorbed into the building.

Advantages: energy efficient, low cost to operate, uses the natural sun light to light the space,

Disadvantages: Needs to be designed with the building, regular cleaning of surfaces to ensure efficiency.

https://ssb2013sk.wordpress.com



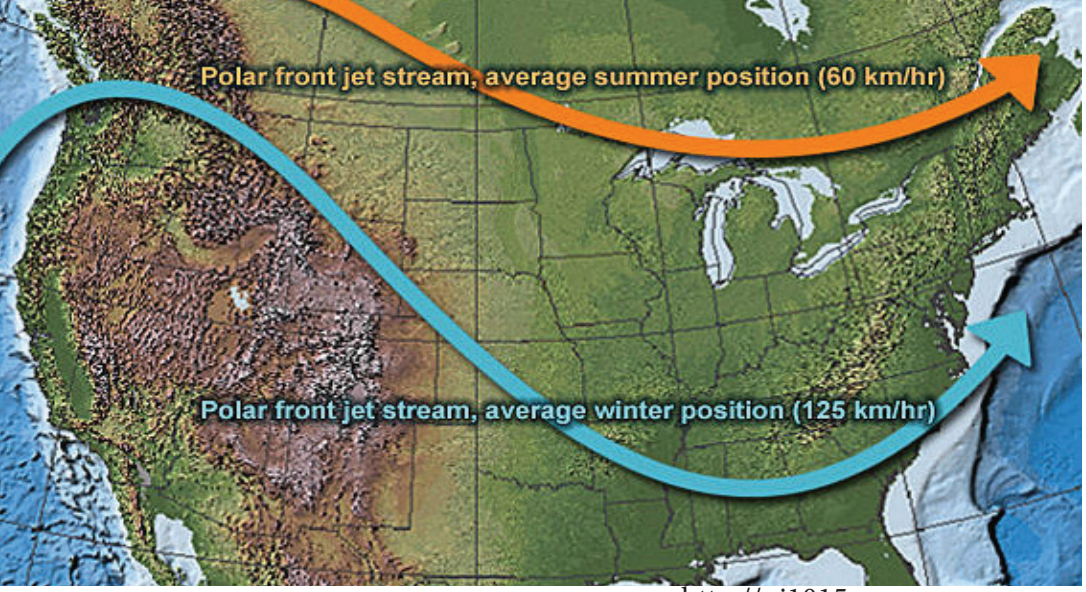
Sun:

Shading:

The sun is used to heat our buildings and light our way, as Schittich says, “light is the prerequisite for architecture, for architecture cannot be perceived without light” (Arch Folio, 57). Light from the sun is efficient and economical and can be used in all buildings. Light can change the mood of the space, transform it from ordinary to divine. To judge light quality is done with natural light fluctuations, and personal experiences. Humans were made to be in the sun light and when they are subject to only internal light they become ill.
When considering the use of natural light in a building, the use of shading devices both man-made and natural must be considered. Shading devices are good in the summer months when the sun exposure is longer and can cause overheating in spaces. When using shading devices in the winter months with less sun exposure, precise measurements and consideration of their placement and type need to be investigated. “Shading from neighboring buildings or trees as well as orientation influence the incidence of daylight into the interior to a considerable degree” (Arch Folio, 61). Shading by plants provides added benefits over other devices because they provide both cooled air and shade in the summer and allow the sun to enter the building space in the winter. Devices placed on the exterior of the building can be stationary or movable and allow the sun protection needed in the summer and still allow sun light during the winter months when the angle of the sun is lower. These can be an aesthetic part of the building if designed correctly.
The use of daylighting can reduce your energy dependency when designed correctly. Every building with windows uses some form of daylighting, but if the building orientation is designed without considering daylighting or sun paths, than the building will either be too cold or too hot.

The wind is not just the leaves blowing on the trees but can be used to cool and heat your home with the help of the sun. A poorly designed building and thermal bridges will lead to heat loss and increased energy use.

The use of plants to shelter the building help protect from strong winds that can cause heat loss that has built up from the sun. “Plants near the building contribute to cooling the immediate surroundings as a result of evaporation and transform carbon dioxide into oxygen” (Arch Folio, pg 16). Wind protection is just as important as the need to allow wind to naturally vent and cool our buildings.



http://nj1015.com

http://www.ecogeneration.com.au

www.architectmagazine.com

WIND:

COOLING

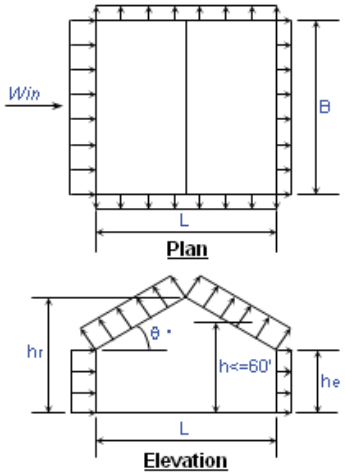
Wind is used in passive design to cool and to bring fresh air into the building. Ventilation of a space allows the natural flow of air into and out of the building providing comfortable temperature. Different types of wind cooling include wind turbines, and cooling towers.

Advantages: clean fuel, no pollution, no emissions causing acid rain & greenhouse gas, local energy source, caused by the heating of the air by the sun & rotation of earth, cost effective (4-6cents/kh), built anywhere space & wind.

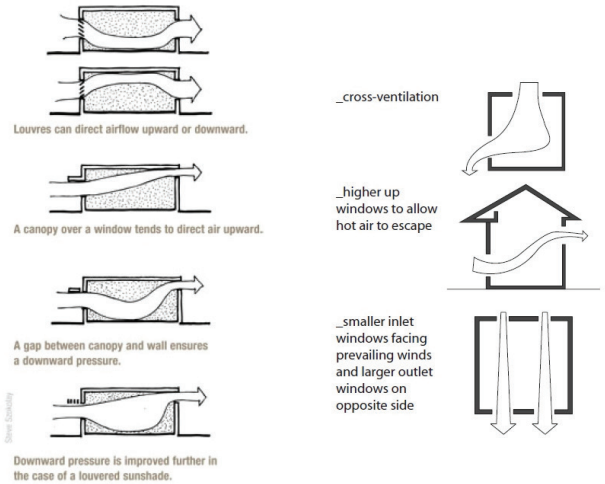
Disadvantages: High initial cost, transmission lines required to move power, not profitable use of land, noise & visual impact, damage to wildlife.

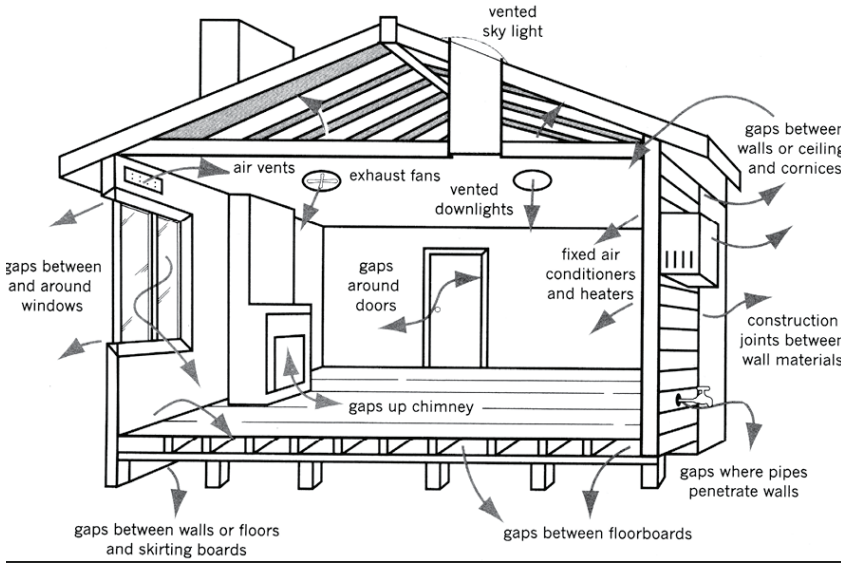
http://www.jdgroup.com.au

https://www.buildingsguide.com

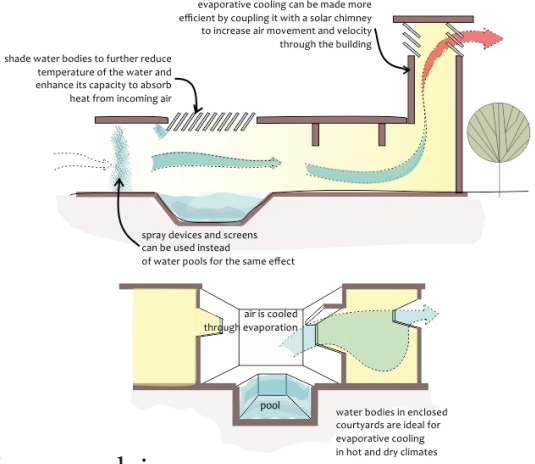


https://swazischool.wordpress.com

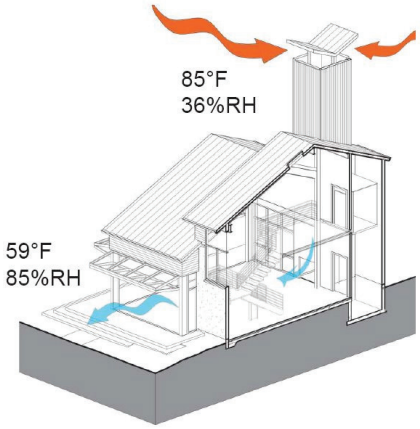




Wind:
Cooling



http://www.nzeb.in



Nishita Mohtā /www.pinterest.co.uk

Evaporative Cooling

Increases the moisture in the air by drawing heat from the air when water evaporates.

Advantages: Energy saving, higher amount of cool and fresh air in building, natural level of humidity, less maintenance.

Disadvantages: works the best in aired dry climates, humid areas would be to muggy and cause uncomfortable spaces, air must flow over the water feature to work, if mechanical devices needed they can increase water consumption.

https://riorenewables.com

Cooling Towers

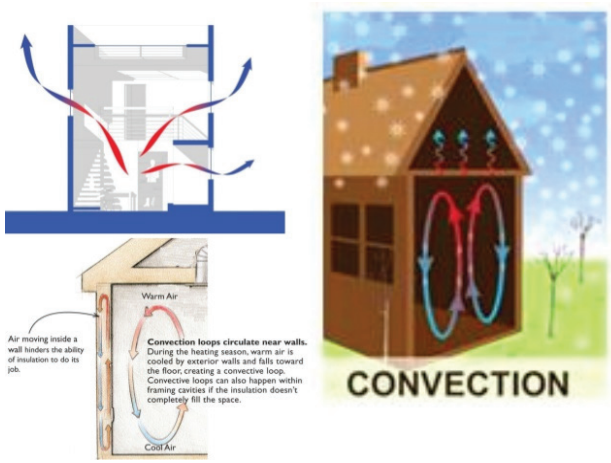
Also known as chimneys draw the hot air up and out of the building by the air flow across the top the tower. The tower is a tall piece on the side of the building with an opening at the top to allow air to pass through the top and are warmed by the sun. Some types use fans to draw the hot air up.

Advantages: no need for fans, lower cost to run, low thermal energy waste, provides air flow through the building, no recirculation.

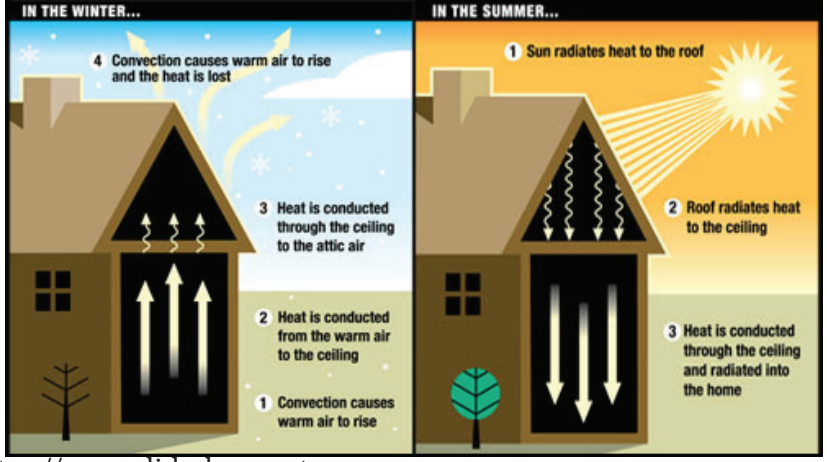
Disadvantages: higher installation cost, large space required, may cause aesthetic problems in some areas.

http://www.2030palette.org

WIND:
COOLING



https://www.slideshare.net



https://www.slideshare.net

CONVECTION

In convection warm air rises and uses that to allow the hotter air to naturally flow upwards and out of the building. This rise in air than draws in cooler air at the lower levels from shaded spaces or cooling ponds.

Advantages: improves cross-ventilation, works without a breeze, warmer air can leave through roof vents.

Disadvantages: may not allow for fast cooling of inhabitants, should be used with other passive systems.

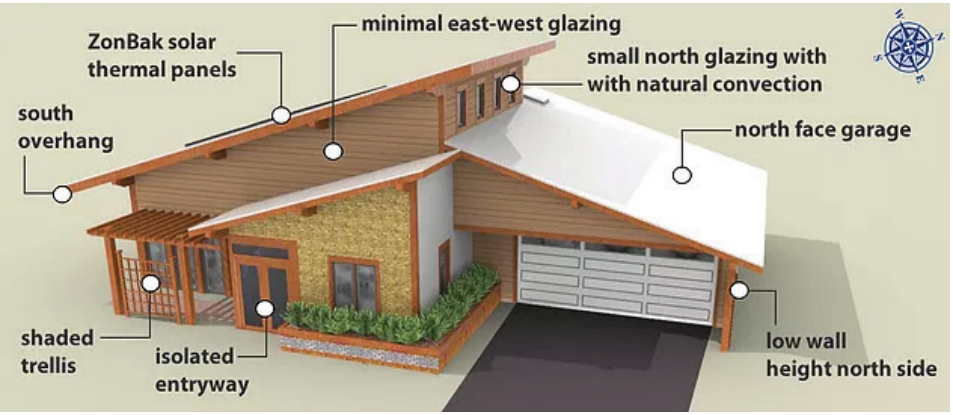
CONDUCTION

Heat flows from an object or space with higher heat into another space of lower temperature. Types of systems include the heat sink and heat pipes which are heated and then the heat is transferred into the cooler space.

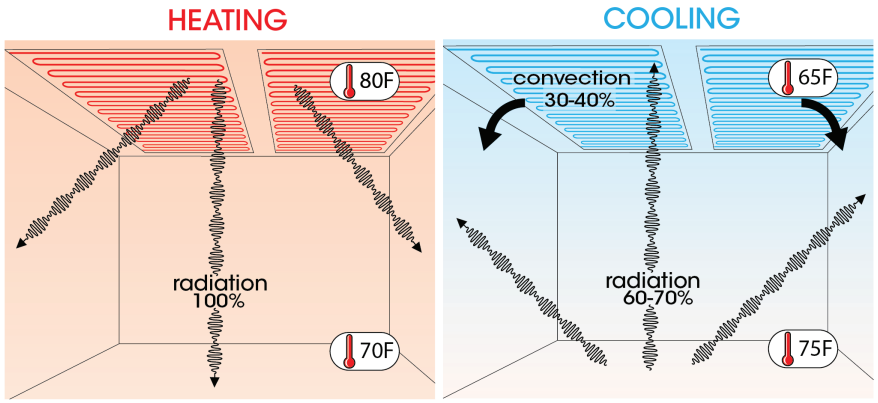
Advantages: lower energy used, keep consistent temperature.

Disadvantages: higher installation cost, difficult to repair. may take time to warm space when first turned on for cooler season. Works best with heating, difficult to use for cooling.

http://mariajosepego.wixsite.com



http://www.wikiwand.com/



https://radiantcooling.com

RADIANT

This uses cooled surfaces to draw heat into the space. Systems used water and air to move the air into the building spaces. Uses heated or cooled floors or ceilings.

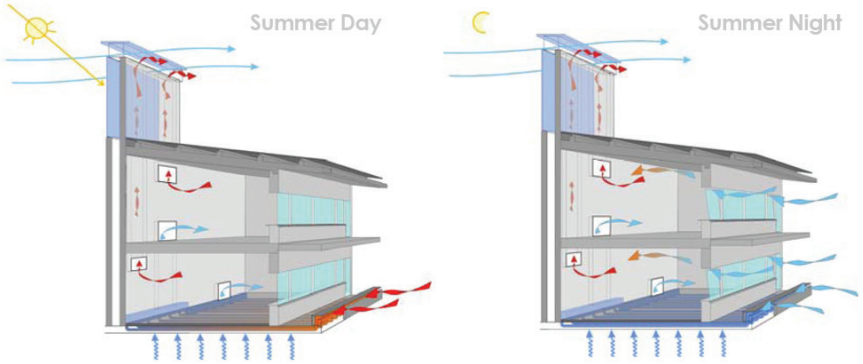
Advantages: Uses natural air movement, lower energy used to cool or heat water pipes,

Disadvantages: Used with pipes and mechanical systems, cooling best in hot climates, water damage can result and cause expensive repairs.

https://radiantcooling.com

WIND:

COOLING



http://www.carboun.com

NIGHT FLUSH

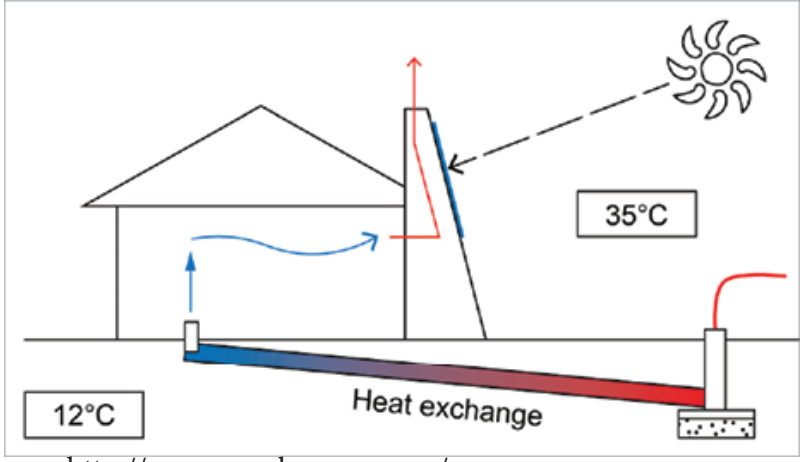
Uses the natural cooler temperatures present at night to pull hot air up and out of the building while pulling cooler air into the lower levels of the building.

Advantages: Uses natural air flow, lower energy cost. lower HVAC load,

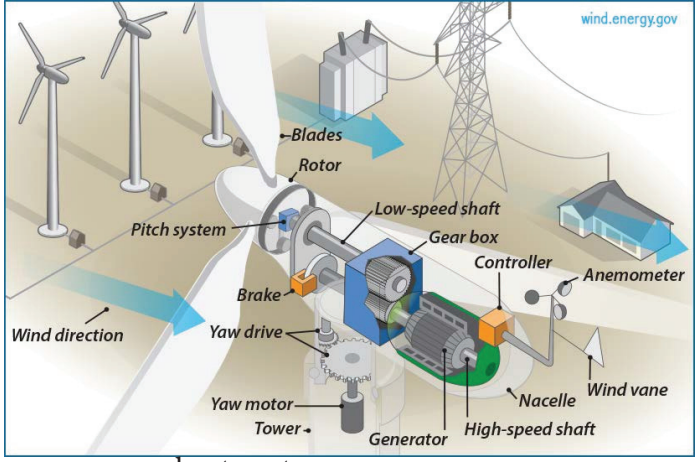
Disadvantages: security from having large openings in lower parts of buildings, needs significant temperature difference between day and night time.

http://www.carboun.com

WIND:
COOLING



http://www.yourhome.gov.au/



www.researchgate.net

GEO–THERMAL

This system also known as earth cooling, uses pipes located in the earth to provide a constant temperature to the building. It uses the earths constant temperature to cool or heat the space. Cool air is pulled up into the building during the warmer months.

Advantages: Consistent temperature, uses earths constant elements to use, lower energy costs, very quiet,

Disadvantages: uses large amount of land to use, high installation cost, difficult repairs to system, needs to have proper shading to lower change of overheating ground

/www.youtube.com

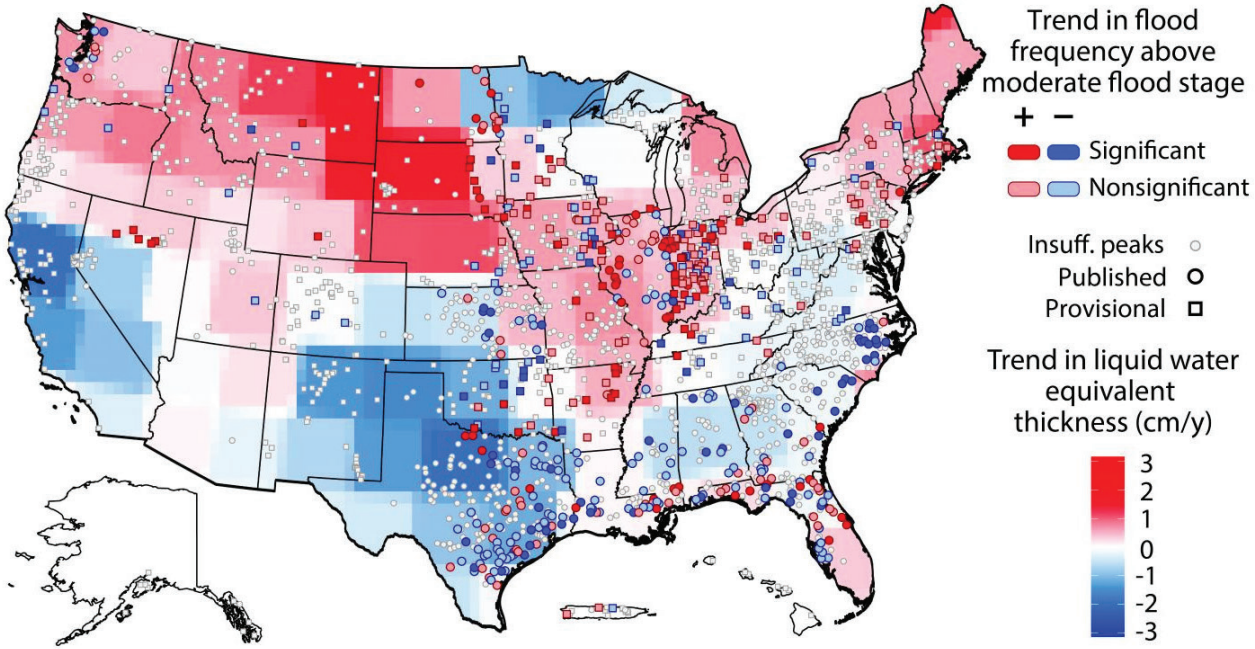
WIND TURBINE

Turbines use blades like a fan that is turned by the wind to convert kinetic energy into electricity. Two types are vertical or horizontal blade orientation and can also have blades or be blade-less.

Advantages: Low operating cost, no greenhouse gas, free energy.

Disadvantages: Initial installation cost, possible damage to birds, possible illnesses in people, can get very large, relies on the wind blowing.

https://xindaenergy.en.made-in-china.com https://wwtonline.co.uk



http://somebodypinch.me

Passive water treatment use natural elements to treat water for recycling which includes the use of wetlands, and bio-reactors to remove metals.

Advantages: good to use at remote locations, no electricity required, natural, aesthetic, support wildlife and plants, cost efficient.

Disadvantages: Required discharge permits, possible lower water quality, can fail from poor design or weather conditions, large area of land use.

http://www.china2west.com

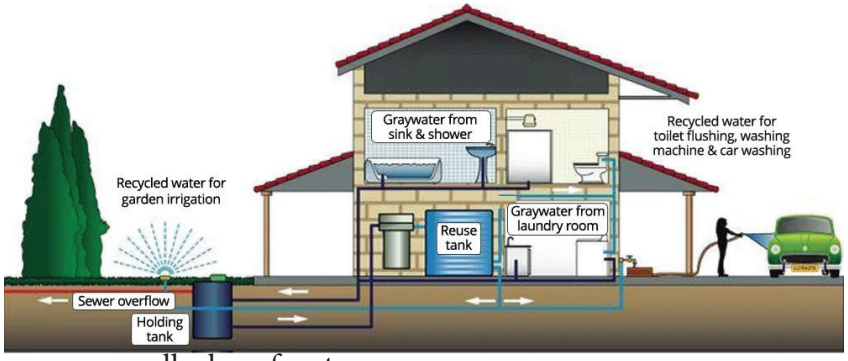
Water:
Reuse

/www.howtogosolar.org

http://hit-interiors.com

/www.re-thinkingthefuture.com

Water:
Reuse



www.alleghenyfront.org

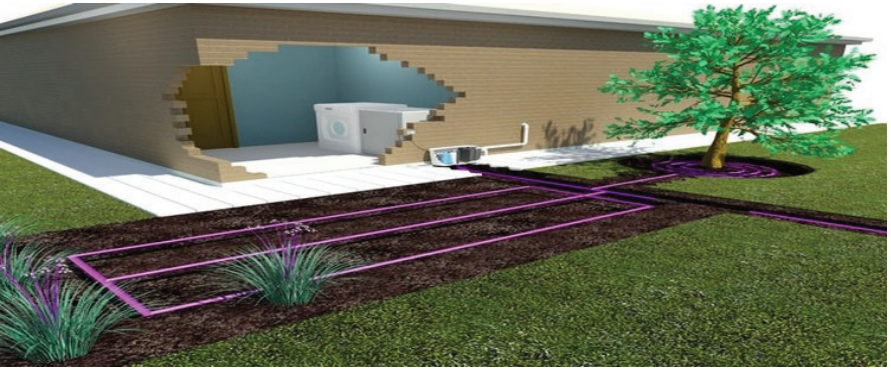
Gray Water

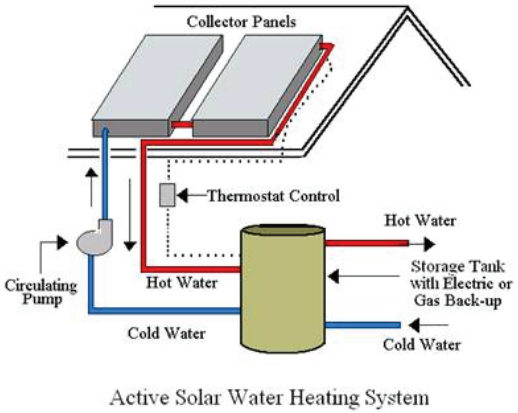
Gray water is the collected used water from showers, sinks, washing machines, and dishwashers that is used to flush toilets, water lawns and flower beds and cool mechanical equipment.

Advantages: high amount of nutrients for plants, recycling water, less water waste.

Disadvantages: water can contain harmful elements if drank, standing water can smell, need storage area or pump system to use water.

www.sandiegocounty.gov





Active Solar Water Heating System

www.energydepot.com

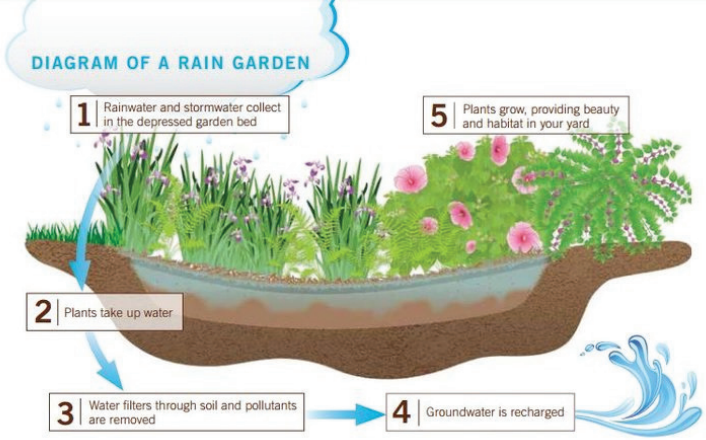
Solar Hot Water

Solar hot water is water that is heated by the sun. The 3 types include passive used in hot climates, active - direct used moderate climate and active - indirect used in cold climates.

Advantages: energy efficient way to heat water, improve environment, type for every climate,

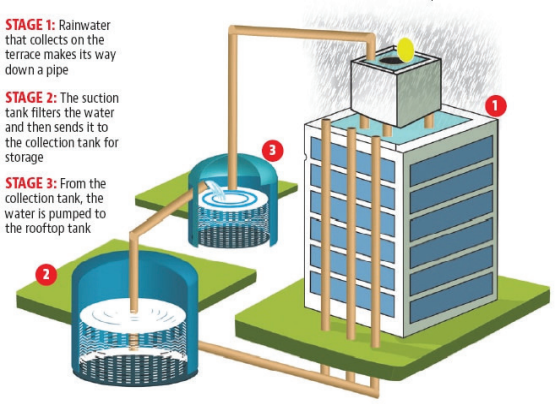
Disadvantages: water is not hot enough, high installation cost of solar panel, leaks, sudden change in water temperature.

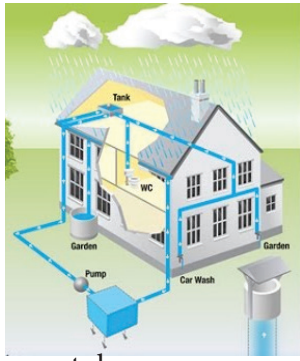
http://www.appropedia.org



/www.arcgis.com

Wind:
Cooling





wheadlines.com www.youtube.com

Bioswale

Bioswales also known as rain gardens are areas that use plants to filter water and cool the area.

Advantages: cost effective filter of water, aesthetics to area, wildlife habitat, treatment of storm-water.

Disadvantages: can use large amounts of land, need plants that can handle the phosphorus and nitrogen,

www.chapelvalley.com

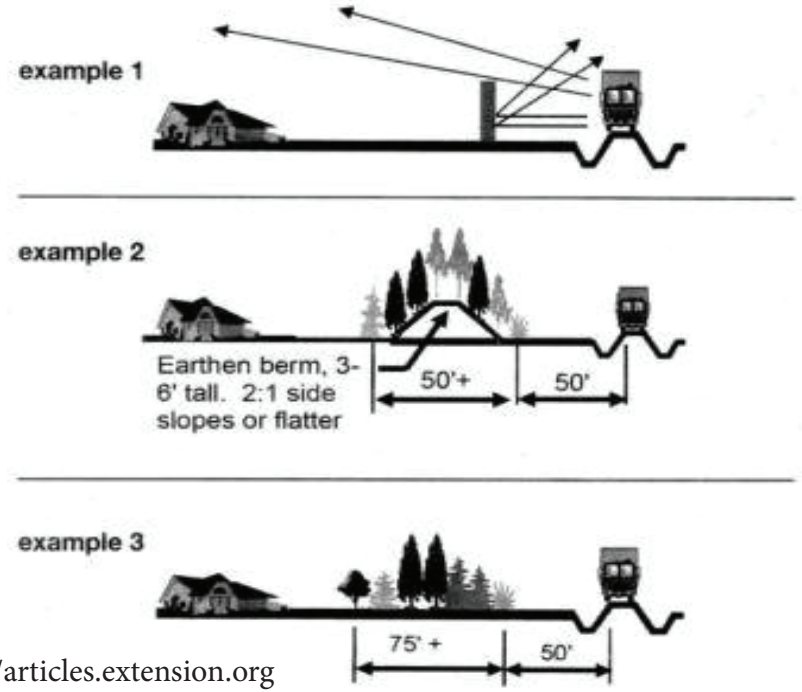
Rain Runoff

Rain runoff is water collected from the rain and can be filtered to use in watering plants, cooling mechanical equipment and flushing toilets. Some filtered water can be used for cooking.

Advantages: free water used for daily use, can be used as drinking water, easy maintenance, reduce water bill, reduce flooding, use for irrigation,

Disadvantages: Rely on rain fall, high installation cost, regular maintenance, some roofs contain pollutants, storage capacity.

www.watercache.com



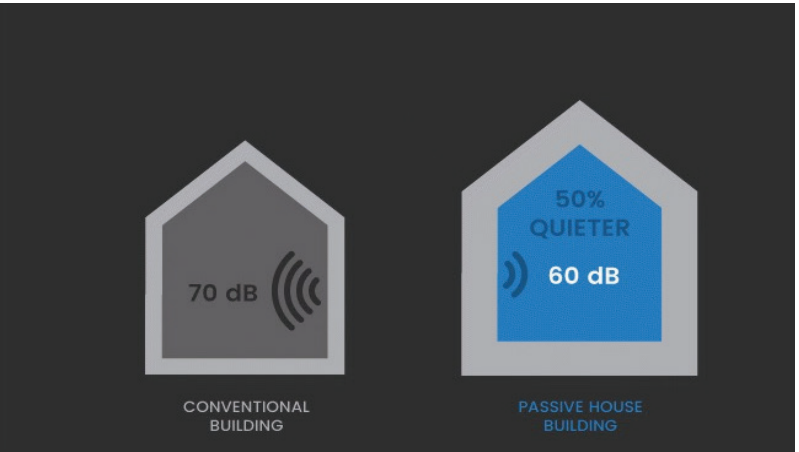
https://articles.extension.org

Noise can cause problems including loss of sleep and illness. The building design should minimize unwanted noise and include both vegetation or man-made forms.

Advantages: create different air flow patterns, shade building and site, buffer against wind, lower air temperature, lower heat island effect, improved air quality, noise barrier.

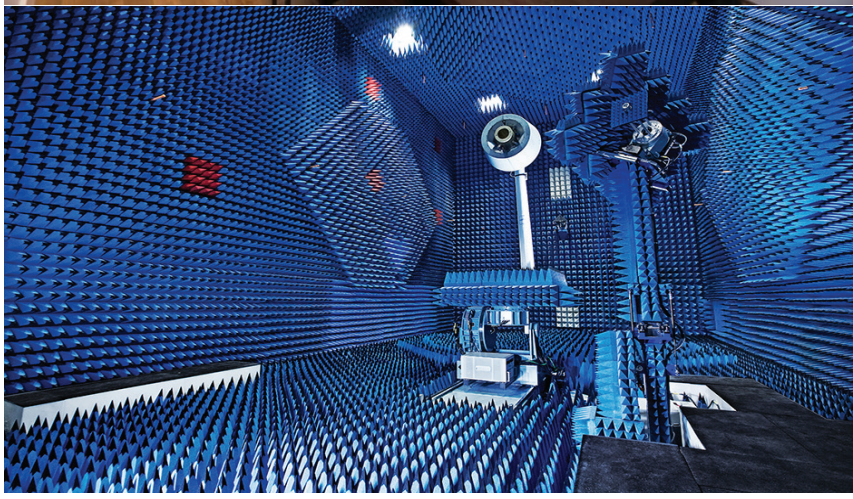
Disadvantages: Cause damage to roof, plant life cycle, maintenance, area used, waster usage, block views

https://www.jigsawplanet.com/

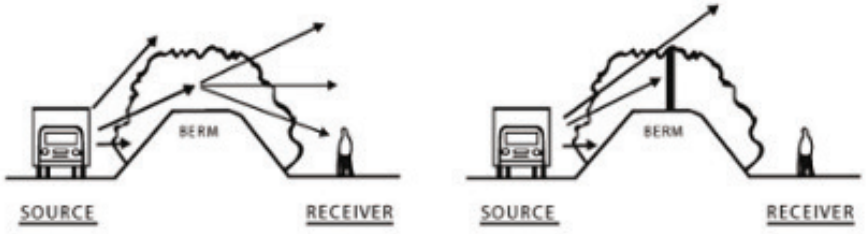


Noise:
Barriers

fr.wikipedia.org



http://www.passivent.com



Noise:
Barriers

http://info.acoustiblok.com/

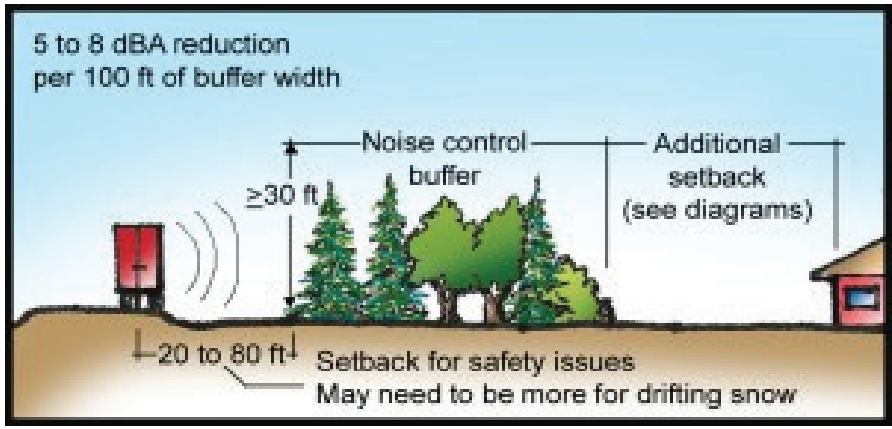
Noise Berms

Barriers constructed using the natural elements to block noise including rock, and dirt.

Advantages: use extra elements on site, easier maintenance, plants can be grown, added visual aesthetics, wildlife.

Disadvantages: takes more space because of slope and width, destruction to existing features, block view, maybe too large for site

https://www.fastcompany.com



https://arbordayblog.org

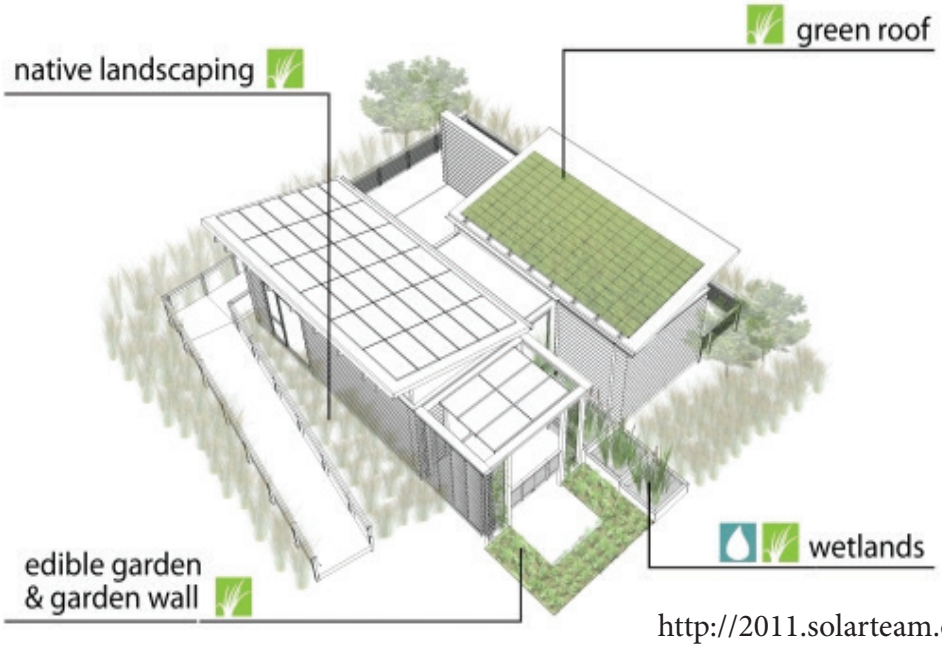
Vegetation

Hedges, evergreens and decidious plants can all be used to reduce the noise on a site. The hedge should be dense with 2-3 rows and are difficult to see over and through.

Advantages: Can be combined with Berm, aesthetics, added wildlife, privacy.

Disadvantages: maintenance of plantings, time to allow plants to grow to full height, limited view, more noise in winter when leaves drop.

http://www.tropicalenvironment.com.sg



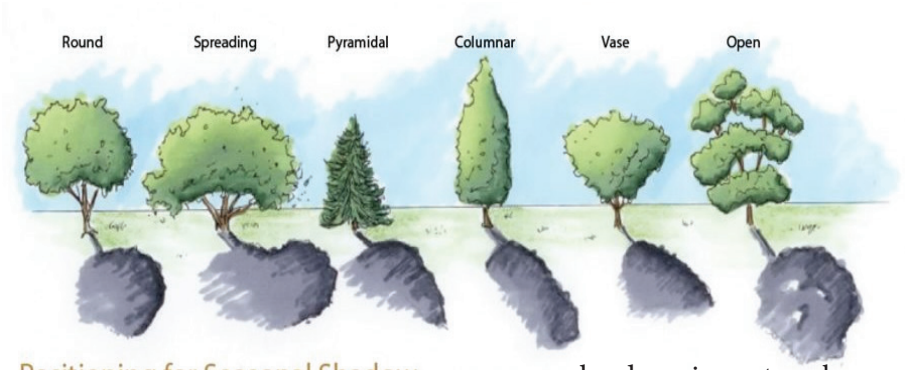
http://2011.solarteam.org

http://www.yourhome.gov.au

Plants are a natural way to control sun glare, provide shade, cool buildings, provide ventilation, clean air and be a buffer to winds and even change the wind direction.

Advantages: shading for building and site, block or change wind direction, privacy and noise reduction, aesthetics, increase in wildlife.

Disadvantages: possible damage to building, maintenance of plants, space needed for plantings, block views.

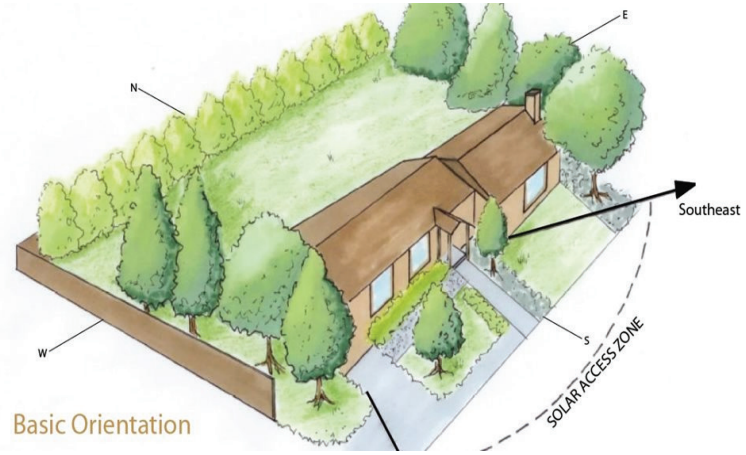


Positioning for Seasonal Shadow

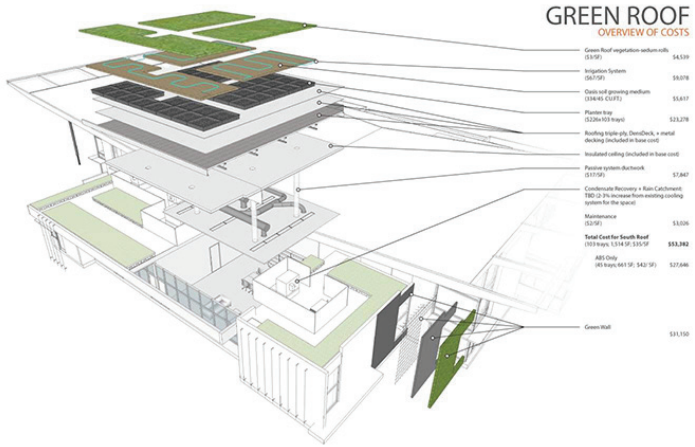
This diagram provides examples of different tree forms, and the shadows they cast. A trees shadow is defined by the canopy shape and depth. Understanding a trees form will help you with positioning for seasonal shading of a wall or window in your home.

www.landscapingnetwork.com

VEGETATION:
PLANTS

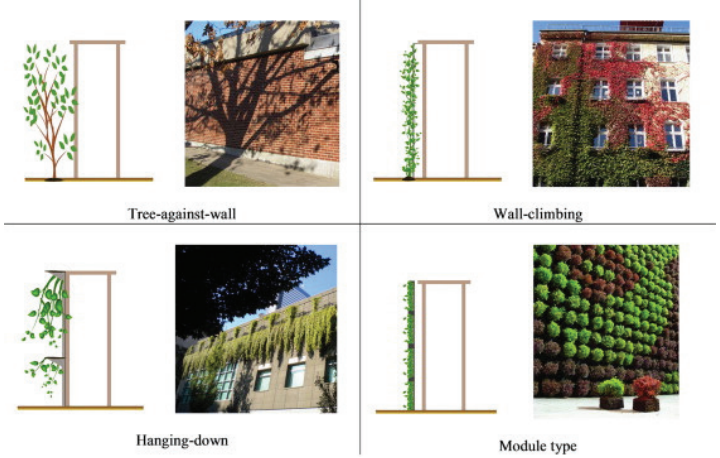


Basic Orientation



www.climatecolab.org

Vegetation:
Plants



Green Roof

Green roofs are an efficient way to use the unused space on the top of buildings to plant grass and other vegetation.

Advantages: added thermal insulation, lower internal temperatures of building, can be used to collect rainwater, shading of building, reduce heat island, reduce noise

Disadvantages: possible building damage, water leaking, maintenance of vegetation, added weight and thickness of roof, higher cost.

https://inhabitat.com

Vertical Greenery

Plants are grown in pockets in and on the wall of a building. They can be grown both on the exterior and interior of the building.

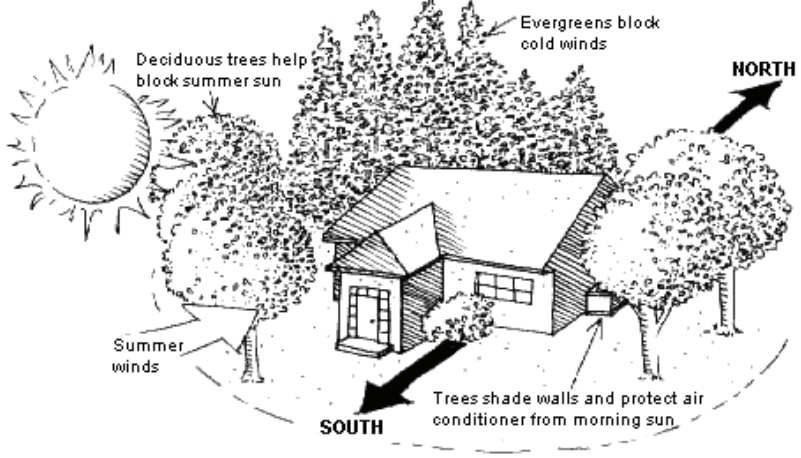
Advantages: Use less water, added interest from people, aesthetics, cools air, provides shade, can be disassembled and assembled easily.

Disadvantages: More maintenance to trim plants, possible leaks, pump room needed, small increase in initial cost.

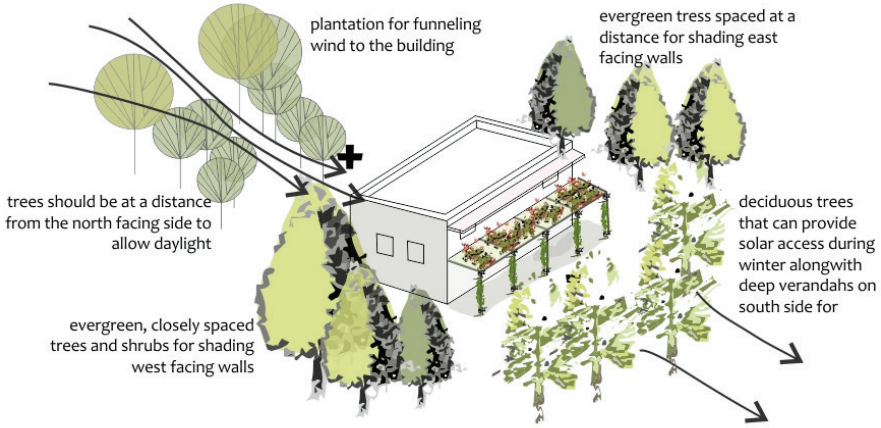
/www.sciencedirect.com

VEGETATION:

PLANTS



www.state.nj.u



http://www.nzeb.in

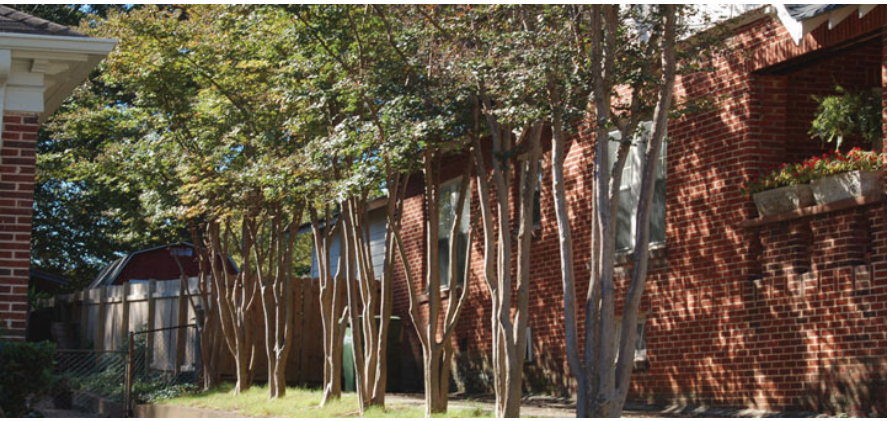
SHADE/LIGHT

Plants are used to provide natural lighting and also shade your building from the glare of the sun.

Advantages: daylighting, natural cooling and heating, lower energy use, aesthetic, privacy, wildlife.

Disadvantages: maintenance of plants, block views.

https://articles.extension.org



VENTILATION

Using plants to cool the air around and inside the building from the wind flow.

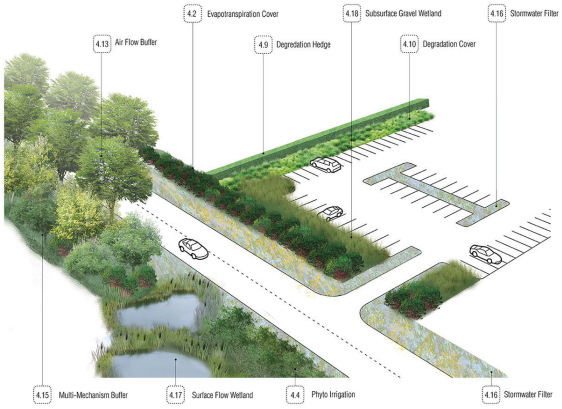
Advantages: natural cooling, lower energy use, aesthetics, wildlife, cleaner filtered air, create micro-climate.

Disadvantages: maintenance of plants, block views, proper design required.

https://inhabitat.com

Vegetation:

Plants



https://www.asla.org

https://inhabitat.com

Parking Islands

Parking islands are the spaces at a vehicle is not able to park or drive. They are usually placed at the end of rows and in between parking aisles.

Advantages: better aesthetics, lower air temperatures, filters air, provides shading, wildlife habitat,

Disadvantages: small space for plant growth, poor soil in islands, increase in toxins from vehicles, maintenance.

https://sites.google.com/site/xiezuopitaiceshi/

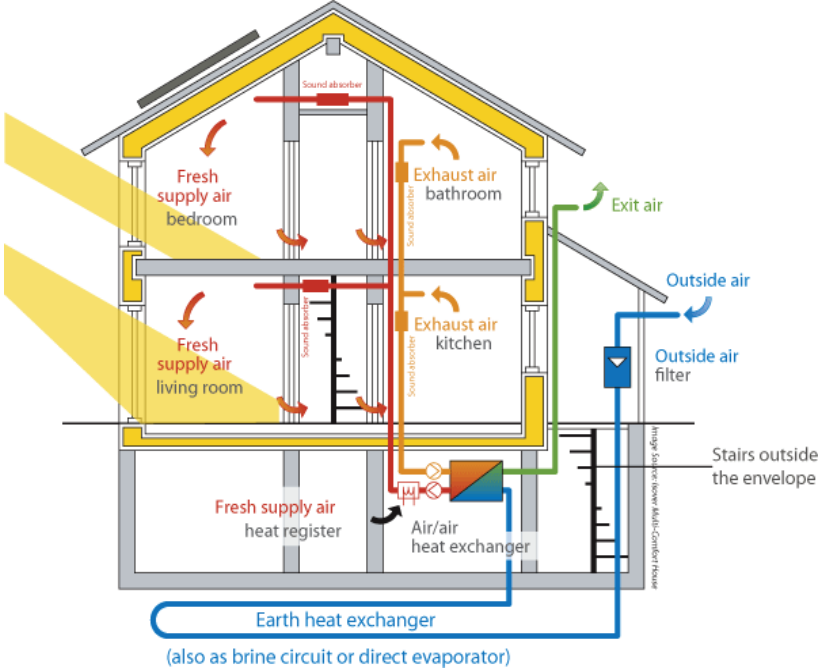
Garden/Market

Community gardens are spaces that are operated by the local community. People plant, care for and harvest the vegetables and plants from the site.

Advantages: community building, natural food source, reduce harmful environmental elements, reduce food islands, improve air and soil quality, improve water infiltration, reduce waste, provide physical activity, use existing vacant lots.

Disadvantage: maintenance of plants and area, large amount of space needed,

https://blogs.cornell.edu



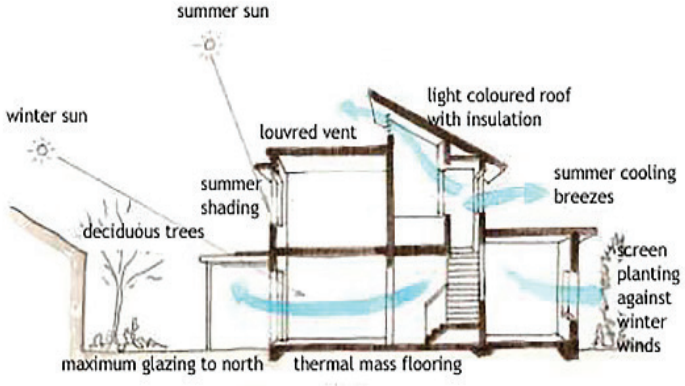
https://sustentarqui.com.br

Thermal mass is the use of material to absorb and store energy to provide heating and cooling to a building. This is accomplished due to the thickness and type of material being used. Thermal materials include concrete, bricks and tiles.

Advantages: lower energy bills, consistent temperature, increased comfort.

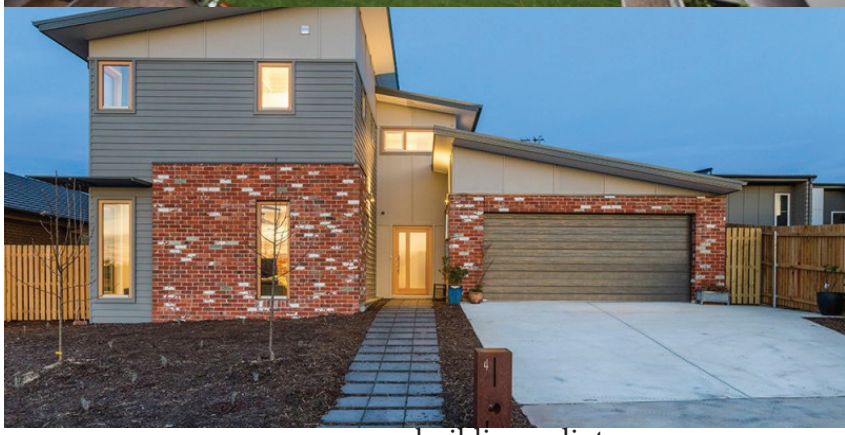
Disadvantages: block views. cannot use insulation, must be isolated from ground in cold climates, carefule desing is needed.

http://www.360building.com.au



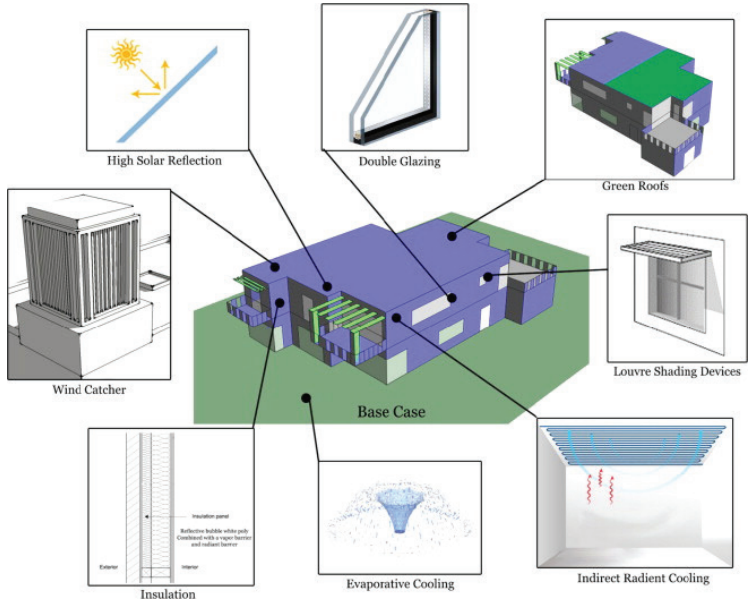
Building Mass:

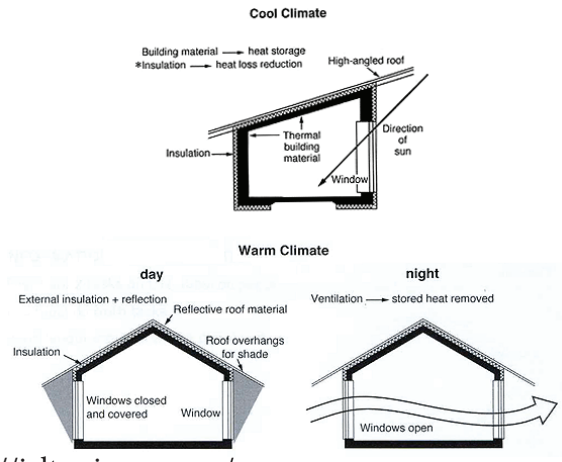
Environmental Conditions



www.greenbuildingaudiotours.com

https://www.sciencedirect.com

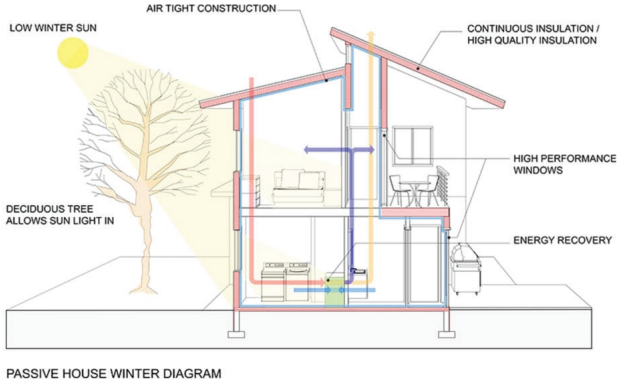




http://ielts-simon.com/

Building Mass:

Environmental Conditions



https://jorgefontan.com

Thermal/Heat Bridge

Also called a cold bridge is an item that has higher conductivity than the surrounding items, creating a path for the heat to transfer from one object or space to another. Areas that bridging occurs include masonry walls, curtain walls, roof - wall joints, door - wall junctions, and other joining locations.

Advantages: Air flow

Disadvantages: loss of heat and energy, increase in energy use, drafts, condensation, poor air quality, insulation degradation,

https://www.archdaily.mx

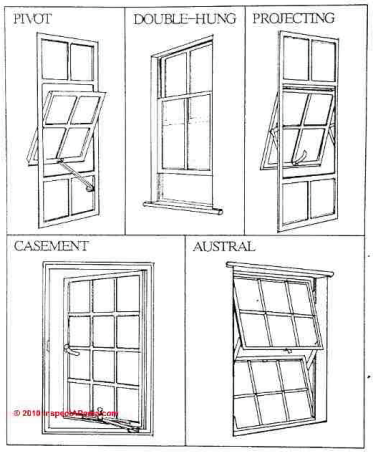
Insulation

A substance that prevents heat loss or gain from one space or item to another. Types include glass mineral wool, rock mineral wool, rigid foam and sheep's wool.

Advantages: Glass rock is made from recycled glass bottles, available in rolls for easy installation, fire safety included, added strength, acoustic dampening, lessen or stop temperature leaking, lower energy use, can be used throughout the building walls, floors and ceilings.

Disadvantages: some types can cause itching, lung issues,

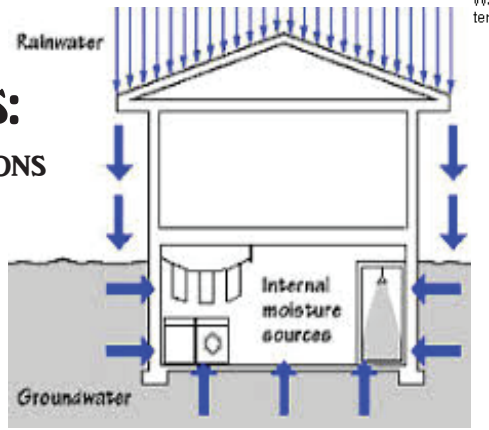
https://www.geopathfinder.com



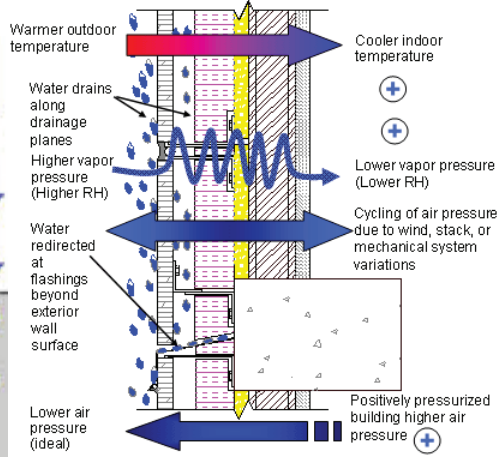
https://inspectapedia.com

Building Mass:

Environmental Conditions



http://busianews.com



https://www.wbdg.org

Windows/Glass

Glass is a transparent material that is used to allow light into a space, provide views, and add visual interest. They are hard surface that can be designed and molded into any shape.

Advantages: absorb, reflect or transmit light, allows daylighting into space, weather resistant against wind and rain, does not rust or degrade, is smooth, easy to use and clean, variety of colors, shapes and sizes, recyclable.

Disadvantages: uses high amount of energy to produce, expensive to make, rigid and brittle so it easily breaks, broken glass is sharp, low impact resistant, etching can appear, increases the R-value of space,unsafe in earthquakes, poor heat insulator, high risk of security, glare,

/www.ecocor.us

Moisture Control

Moisture in the building can cause problems to the interior including mold, rust and illness. If properly designed moisture in the form of humidity can provide better thermal comfort, illness prevention, and pure clean air.

Advantages: lower illness, lower electrostatic shock, better skin and hair, clean pure air, less dust.

Disadvantages: too much humidity can increase dust mites, rust, mold, increase in illnesses, higher energy use. rushed installation causing material to retain moisture.

www.askthebuilder.com/

Project Justification:

This project is important because there is a growing number of abandoned industrial sites in the US. and the city of Detroit has an abundance of these abandoned industrial auto plants and is in need of revival. Passive design is something I want to learn more about and use in my building designs. I want to learn more about passive systems and how they can be better utilized in not just new buildings but in existing buildings. This research increase my knowledge in passive that can be better utilize in building designs.

The rise of energy shortages in parts of the US are concerning and need to be addressed. The need for passive systems to be implemented within existing and new buildings needs to be a major consideration with each design. Buildings in cities are the largest draw of energy and using passive design can reduce the energy draw in cities. The cost of the implementation of the passive system is traditionally more than active systems, but the long-term energy use is cheaper. If the building is designed from the beginning using passive systems including building orientation and massing the client can save money in the long run. Compiling a list of passive systems to determine which should be used in an industrial building will create energy savings that are implemented into an existing building. The impacts of this project will include the increase in thermal comfort for the building occupants along with increased energy saving. The environment impact is that using passive systems uses the earths natural energy to create things like heat, cooling, and air filtration. The lasting results would justify the implementation of these systems because the energy they are using will be free to use and will preserve the natural resources that are quickly being used up or contaminated with in the US. Computer simulations will be used to determine the qualities of the passive systems to consider all aspects of each in the end design.

The city of Detroit has declared bankruptcy and needs help to revive its city with auto plants littering the now abandoned neighborhoods that were once lined will houses and people. This building and the use of passive design to create a mixed-use space could be the start of life that Detroit needs to be great again. Putting all the passive systems together in on document will make it easier for others to know the benefits and problems with each system. The matrix produced will create a table for design professionals to use to compare and mix the different systems together to find what they need for their specific building design. Learning about passive systems and seeing how they fit together will help me and others improve the redesign of industrial buildings. Others have done similar things but this appears to be the first combination all the passive systems to be used in an existing industrial site to create a mixed-use space. Someone else could do more work to the project after I am done, and I hope that there will be more work done to increase the knowledge of others.

Social & Cultural Context:

Socially the project is important not just to use passive design in an existing industrial site, but to give new life to the neighborhoods and cities that these buildings are currently standing in. This project will bring people to the city to live, work and socialize. Passive design is becoming increasingly popular because of the long-term costs and energy use of the systems. People are wanting to save energy while still having the conveniences of today's life style, so passive systems can help people do just that. Using fewer active systems takes the demand off the electric companies and allows the energy rates and usage to improve. The re-purposing of an existing industrial building will turn back the impact the weather and scrappers have had on these neighborhoods. The deteriorating buildings with their broken windows, water dripping through the structures and vegetation swallowing up the facade will again be useful in reviving a dieing city.

F66

Historical Context:

The Fischer Body Plant 21 was built in 1919 on Piquette Street in Detroit, MI and made car bodies for Cadillac, Ford, Studebaker and Hudson. The new stamping process they created was revolutionary at the time, originally starting as designs made from wood, this new process used steel frames, for higher efficiency in manufacturing. The building was built and designed by Albert Kahn who created an open building with large windows on the exterior to allow in daylighting and rows of columns running through out the interior. These large windows will be used to allow natural light into the remodeled building and the rows of columns will help create sight lines and walkways. The remodeled design will incorporate Kahn's inspiration into the building. The site is contaminated and research about how to clean up a contaminated site and cost will be conducted. The structural integrity of the building will have to be analyzed since some of the floor sections have caved in.

F67

Fisher Body History Time–line:

1904-05 Fisher brothers move to Detroit and work for C.R. Wilson Company making horse-drawn carriage bodies.
1908 Fred & Charles Fisher start Fisher Body Company.

1913 Fisher Body Company was producing 100,000 car bodies per year for
Ford, Hudson, Chalmers, Cadillac & Studebaker.
1914 Largest auto body manufacturing plant in world
1916 Became the Fisher Body Corporation & produced 370,000 bodies per year.

1919 Fisher Body Plant #21 building built by Albert Kahn.
1919 GM buys 60% of Fisher Body.
1919-25 Fisher Body 21 was building body's for Buick & Cadillac.

1925 Buys Fleetwood Metal Body
1926 Entirely in-house coach-building division of GM.
1926 3.7 million sf for floorspace 200x581' =536,000sf.
1928 Fisher Office Building is built.
1929 Fisher Body became engineering facility.

1956 Fisher 21 made Cadillac Limousine bodies.

1974 Fisher Body Plant 21 closed
1984 Fisher Body was dissolved by GM.
1990 The Fisher Body Emblem is no longer used.

1990 Building bought by Carter Color Coat Company
1993 Building abandoned by Carter

2000 Detroit City owns building through default
2004 Michigan Dept. Env. Quality – asbestos, lead waste, ind. Equipment, storage tanks, other hazardous mat.,
contaminated soils & concrete in & around plant. Severely contaminated.

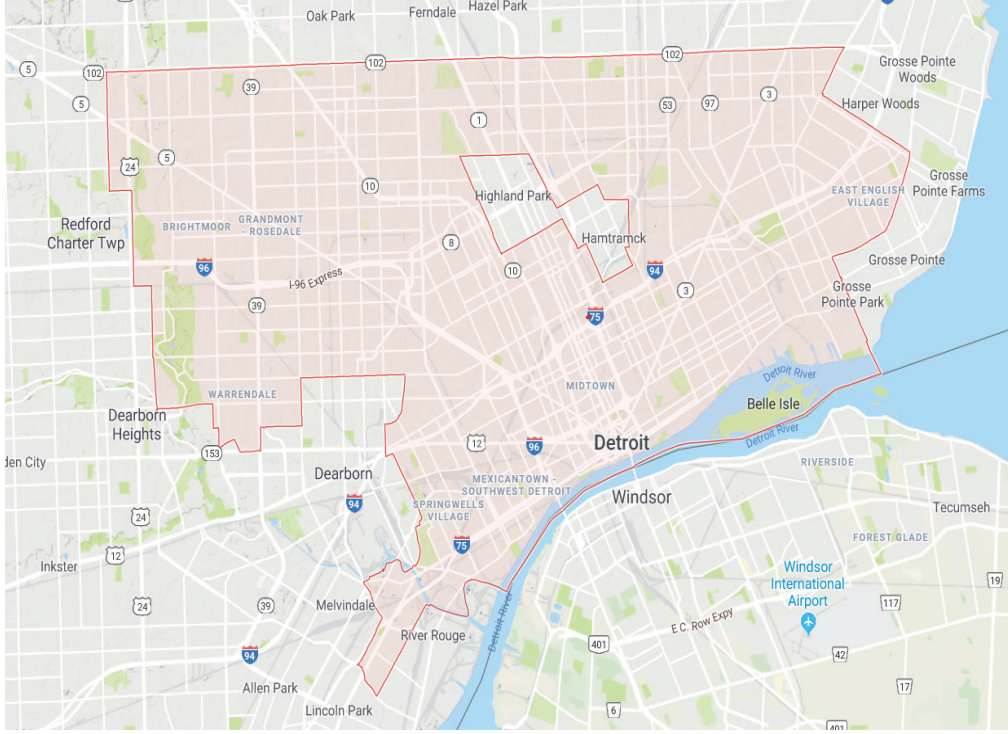
2008 EPA start removing soil & equipment. Wooden brick in floor & sections of concrete removed.
2010 Remove underground storage tanks.
2018 Still contaminated by EPA, police auto impound lot, Floor sections caved in, cement deteriorated by water & ice, fire on ground floor.
For sale from city for $300,000. Close to midtown & Wayne state univ.

Site Analysis:

Fisher Body Plant #21

Fig. 68

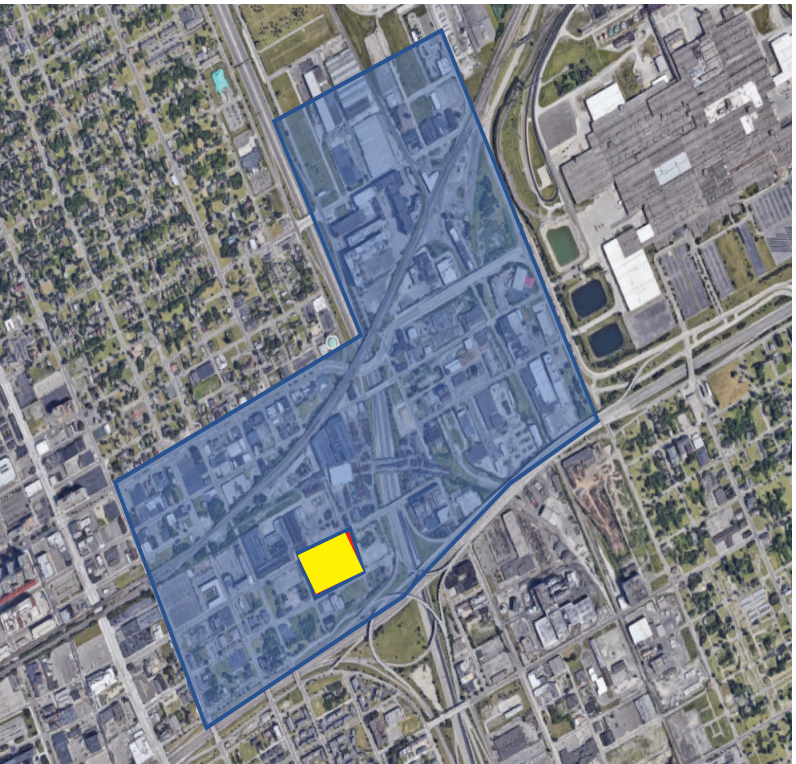
STATE – MICHIGAN
Fig. 69



CITY – DETROIT
Fig. 70

N

Site



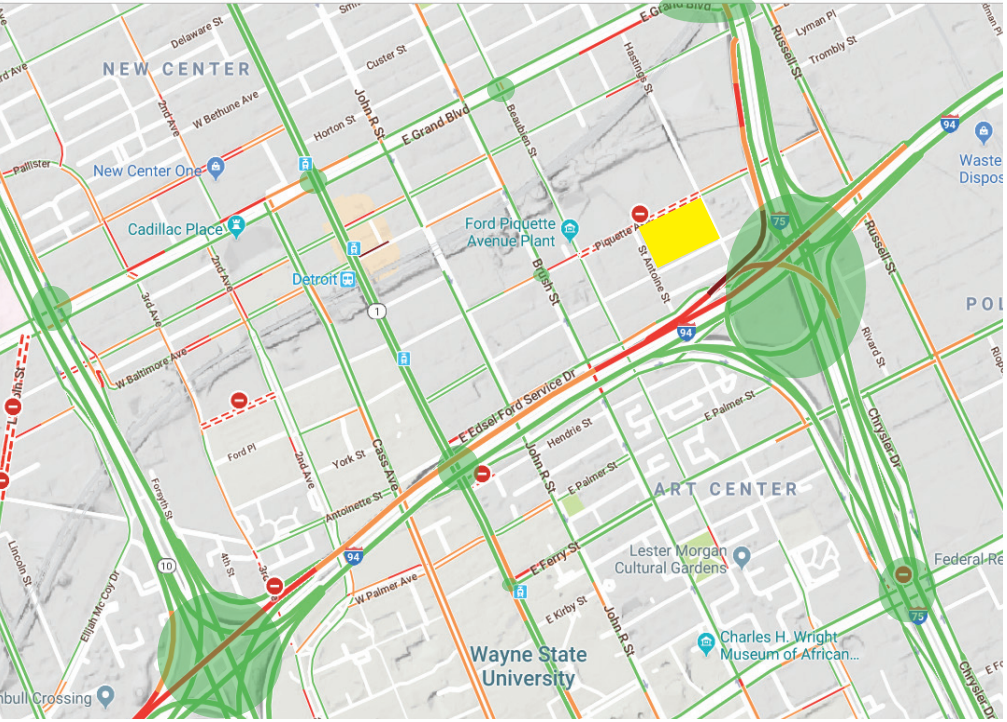
NEIGHBORHOOD – MILWAUKEE JUNCTION
Fig. 71

SITE – FISHER BODY PLANT #21
Fig. 72

Transportation Links:

The Fisher Body Plant #21 is bordered by I-94 or E Edsel Ford Service Fairway to the south, I-75 or the Chrysler Fairway to the east, Hwy 1 or Woodward Avenue to the west and E. Grand Boulevard and a railroad line to the north.

Roads and interstates bring large levels of traffic near the site including I-94, I-75, Highway 10, Brush Street, Woodward Avenue and E Grand Boulevard highlighted in green on the adjacent image.



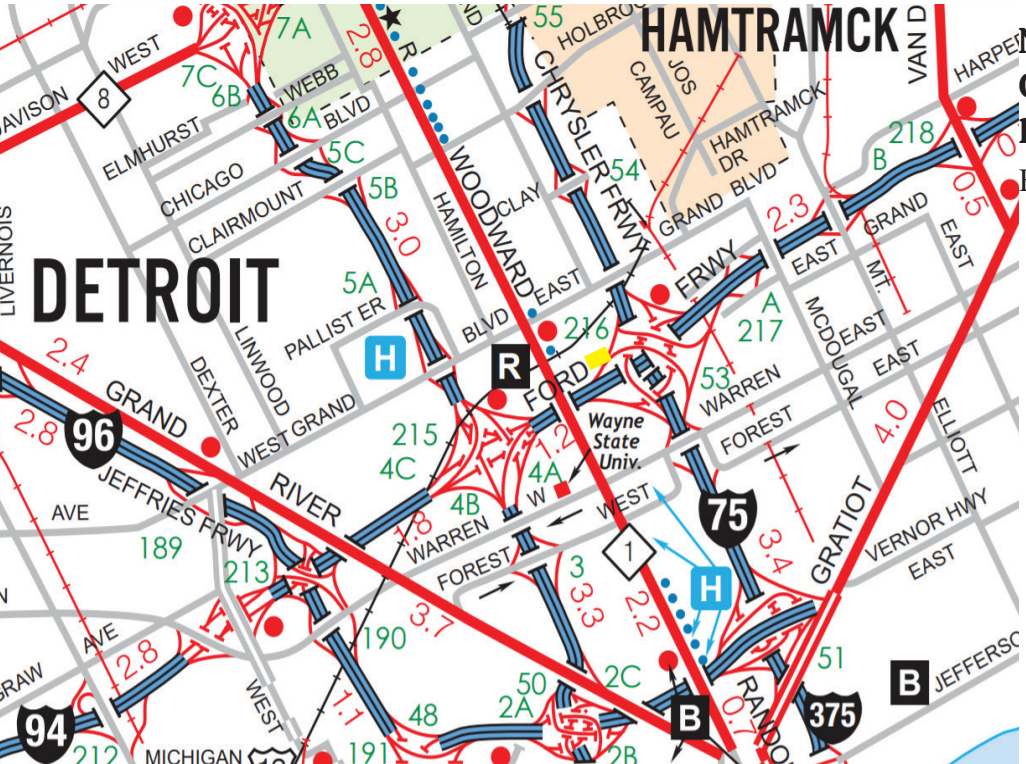
N

Site

Nodes

Transportation Nodes Roads and Traffic

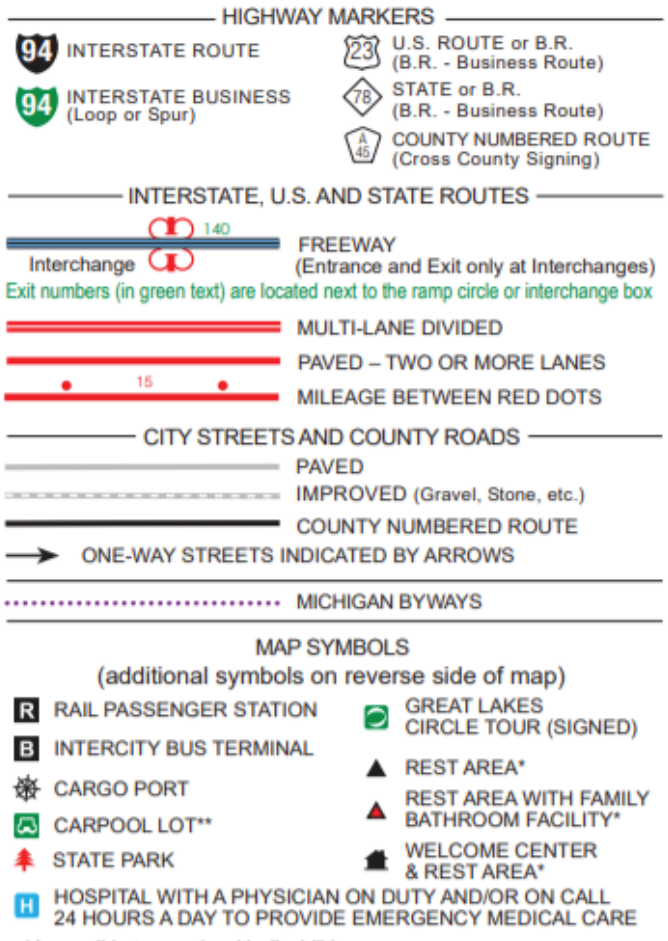
Fig. 73



Map: City Transportation Routes

Fig. 74

Map Legend



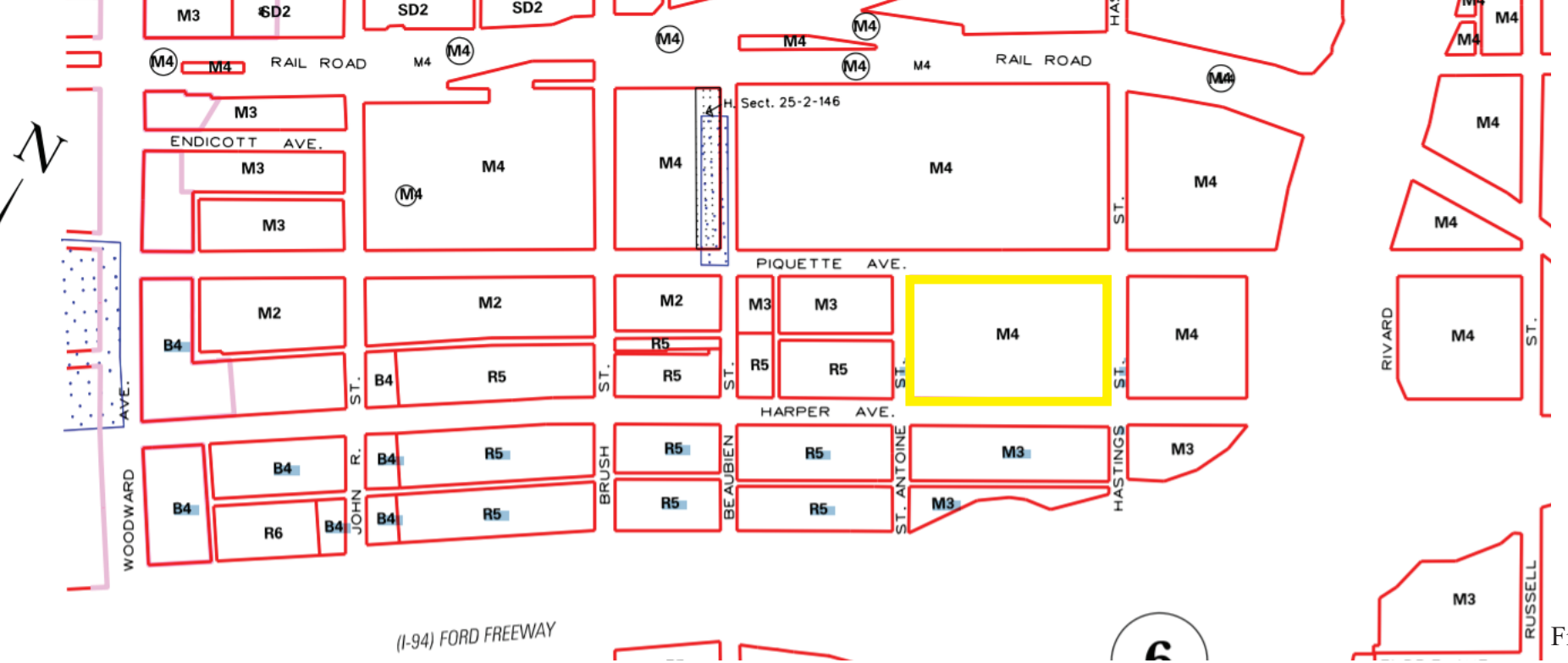


Fig. 75

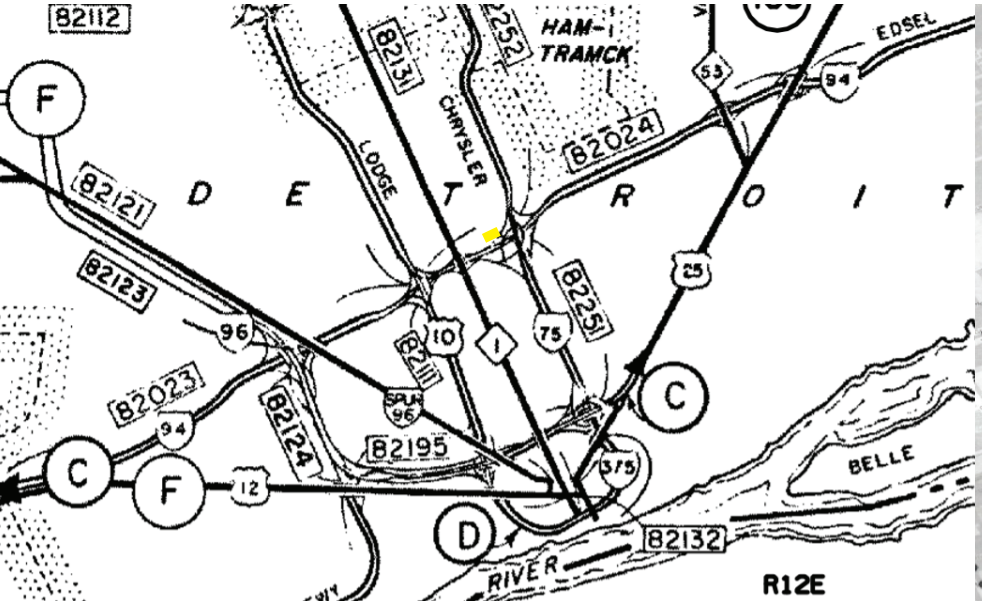
Zoning and Points of Interest:

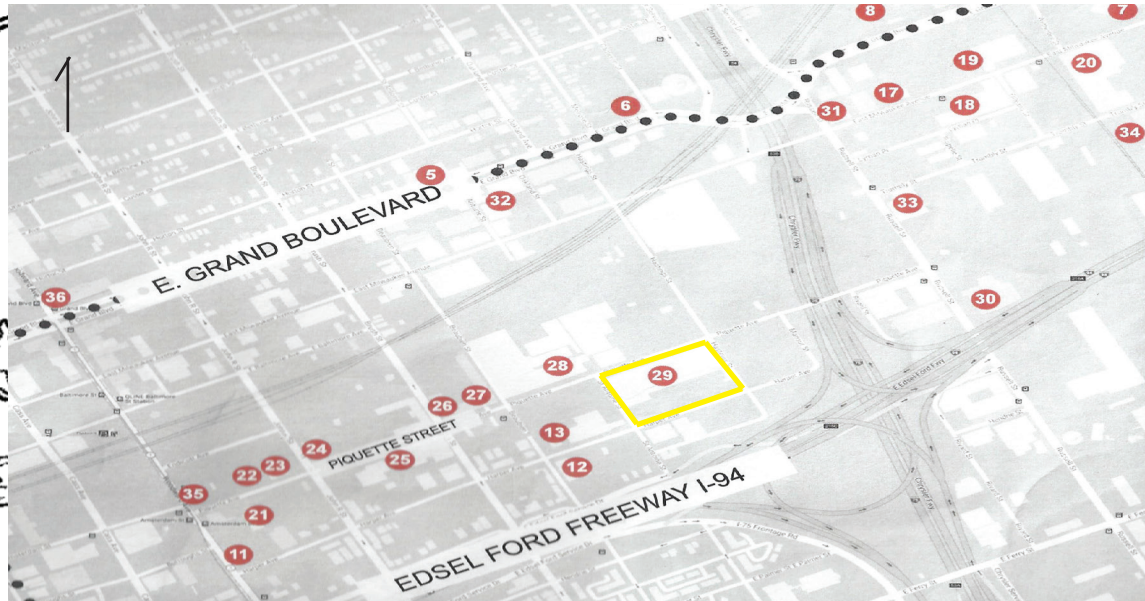
Site

Points of interest in Milwaukee Junction include the Ford Motor Co. Museum #27, Studebaker #26 and the Detroit Wax Paper Co #13.

The Fisher Body Plant No 21 is #29

Fig. 76 Fig. 77





Site Narrative:

The Fisher Body Plant 21 is a six story building designed and built in 1919 by Louis Kahn. The building is rectangular in shape with its axis running east to west. This axis allows sunlight to permeate through the floor to ceiling, blue glass windows that surround the entire structure. The building structure is reinforced concrete walls with a brick facade and brick base.

There are symmetrical dormer topped columns that line the interior of the building. They are in even lines spanning in not only east to west and north to south but also at a diagonal. The floor is concrete once covered in hardwood planks and bricks. There is an additional space or partial floor on the roof of the building. There are three sets of stairwells and elevators on the south side of the building, two of them lifted people and the middle elevator moved car bodies from floor to floor. The south side also includes a covered loading area that was added onto the original building and a parking lot surrounded by chain-link fence and vegetation.

Fig. 78

Fig. 79

There are remnants of railway lines to move auto parts and painting booths. After GM closed the plant in 1990 the Carter Paint Company added ventilation shafts onto the south side of the building. The Carter Company abandoned the site in 1993 and the space was left to scrappers and spray paint artist. The scrappers removed every piece of metal from the building, painting can be seen on most walls, the windows were broken out from vandals and weather. The EPA has removed contaminated soil and underground storage tanks, but the site is still considered contaminated. The site is overrun with vegetation on the south sides, broken glass litters the sidewalks surrounding the building. The city imploded the stairs to limit the access to the upper floors after part of the 2nd story floor caved in. The neighborhood is mostly vacant lots with piles of debris mixed with dirt and plants. There are a couple of industries nearby the site, but they are small and run down. the other buildings near by are industrial or vacant. The area gives the impression of abandonment, despair and loneliness are prevalent.

floor to ceiling, blue glass windows allow natural daylighting for the interior of the building.

Fig. 81

Fig. 80

Interior structural concrete columns are evenly spaced and lined up in diagonal lines.

Fig. 82

concrete flooring with brick and hardwood planks removed.

Fig. 83

One of three imploded stairwells and elevator shafts on the south side of the building.

Fig. 84

Deteriorating and collapsing loading area and vegetation on south side of building.

Ventilation shafts on south side of the building and chain-link fence surrounding site.

Fig. 85

Fig. 87

Interior of Fisher Plant were the scrappers have removed every piece of metal, spray paint is walls, water drips through from the upper floors and part of the floor is caved in.

Fig. 86

Fig. 88

Fig. 89

Fig. 90

The site is overrun with vegetation, broken glass land debris litters the sidewalks and site.

Fig. 91

Fig. 92

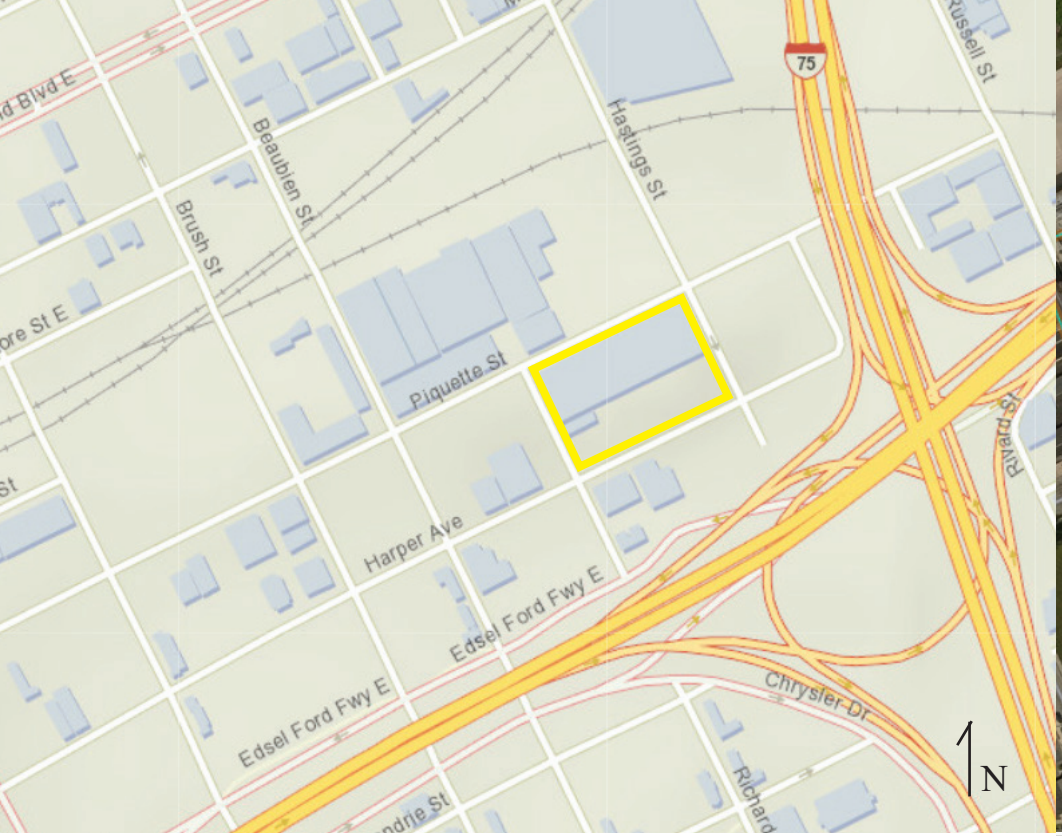
Fig. 93

Fig. 94
Looking
East

The adjacent lots and surrounding neighbor-
hood consists of vacant lots, empty buildings
and an industrial plant.

Fig. 95
Looking
West

Fig. 96

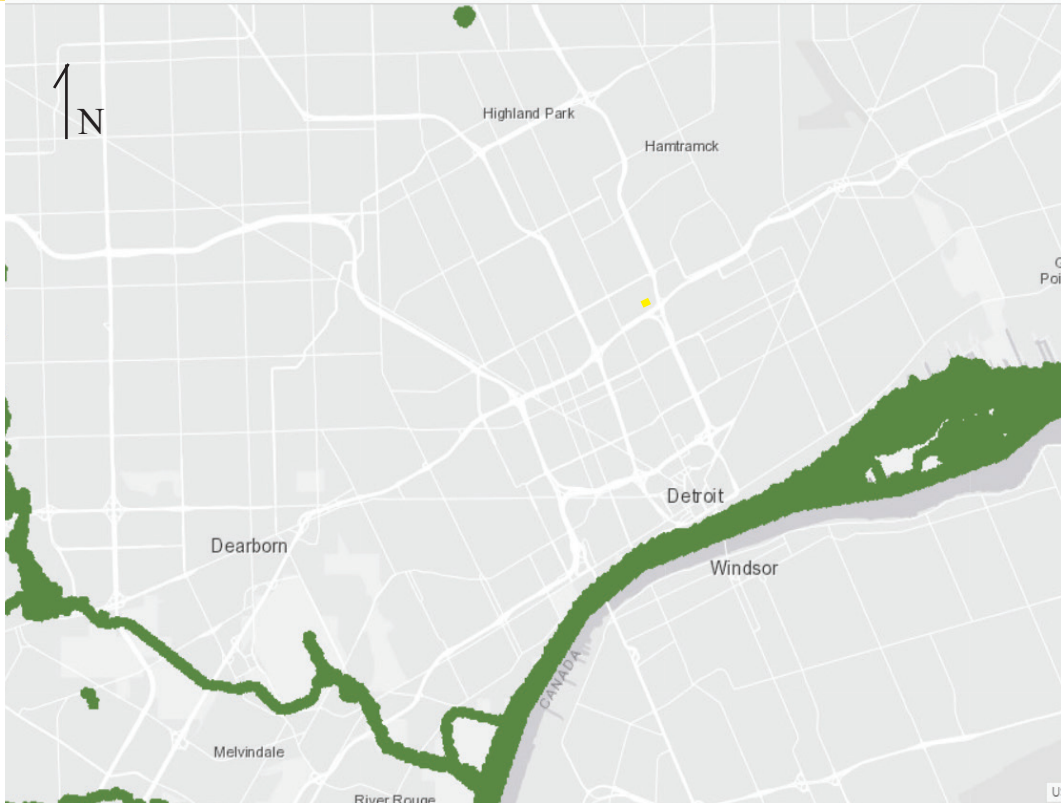


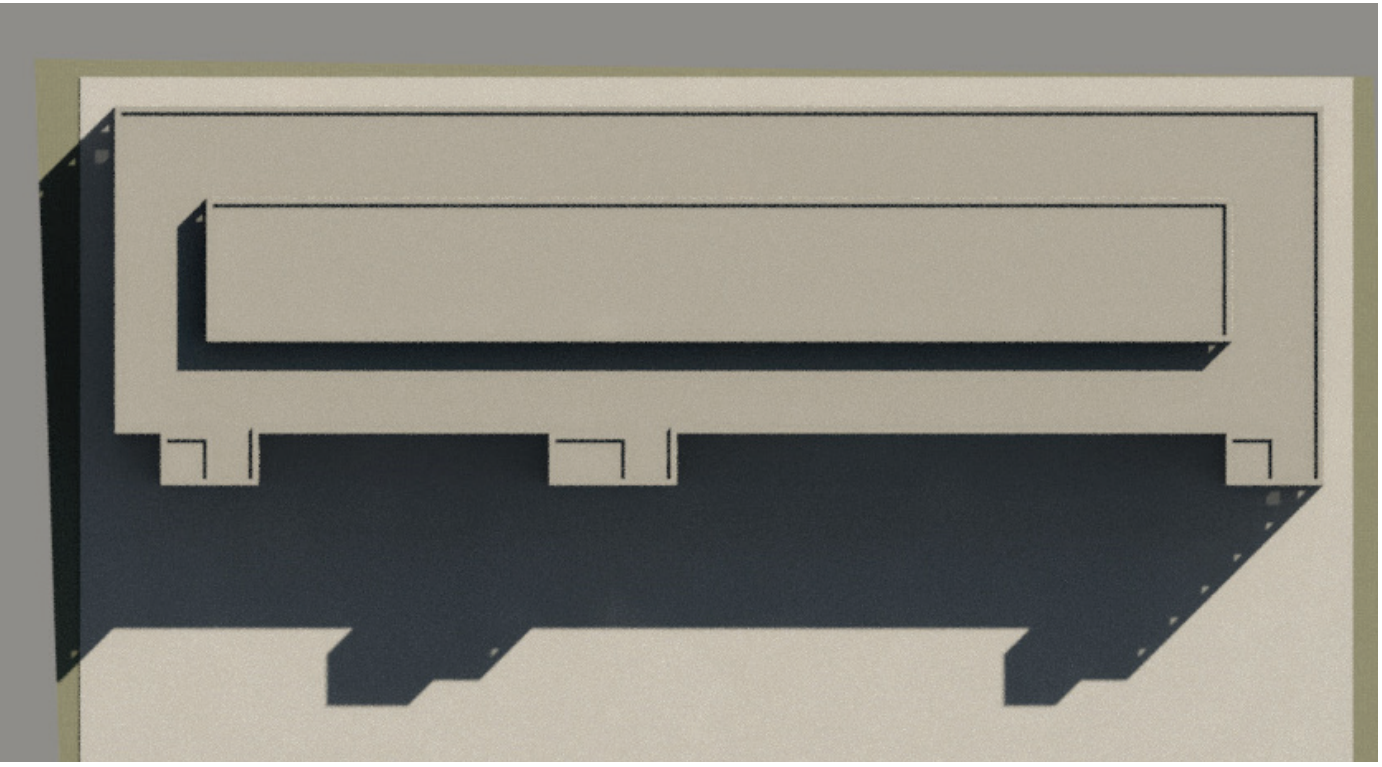
F97- Above: Site with area structures
F98- Corner: Image showing surface area: concrete with overgrown vegetation
F99- Right: Water ways near site

TOPOGRAPHY:

It is a flat site with a 0-4% slope which is good for development, but doesn't help with blocking solar affects or wind. The site is covered with concrete in an urban area and considered a riverfront complex with dense substratum soil.

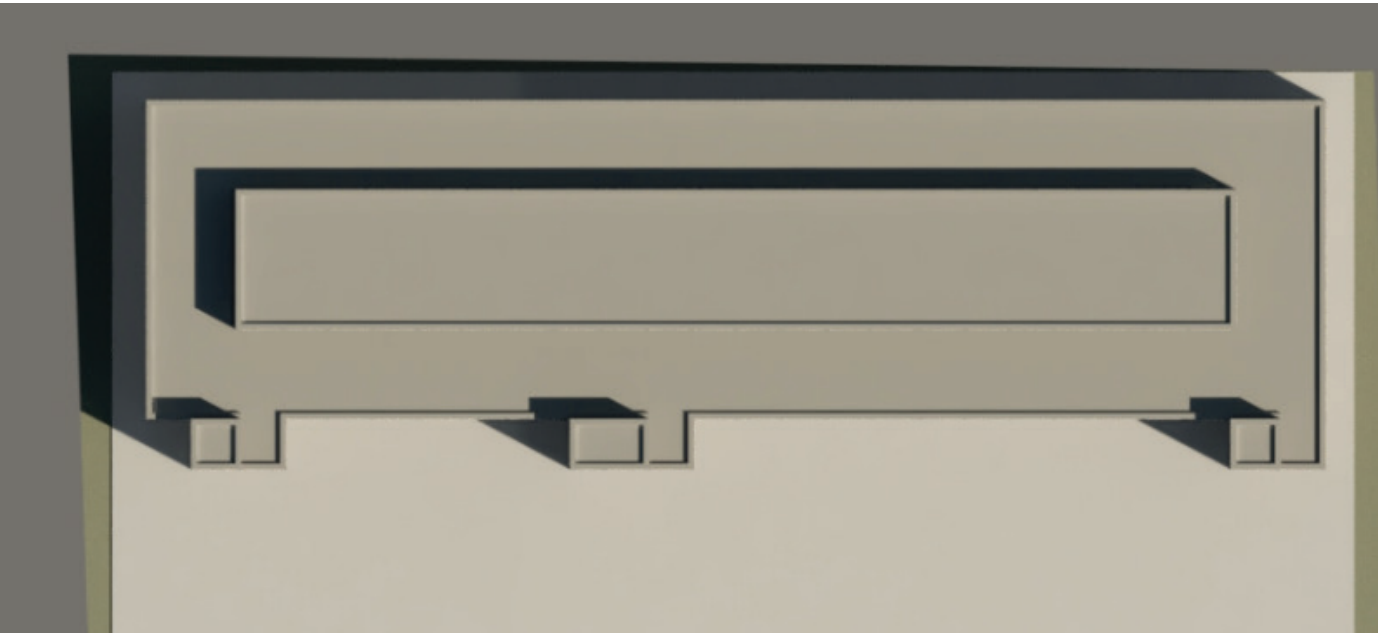
Site

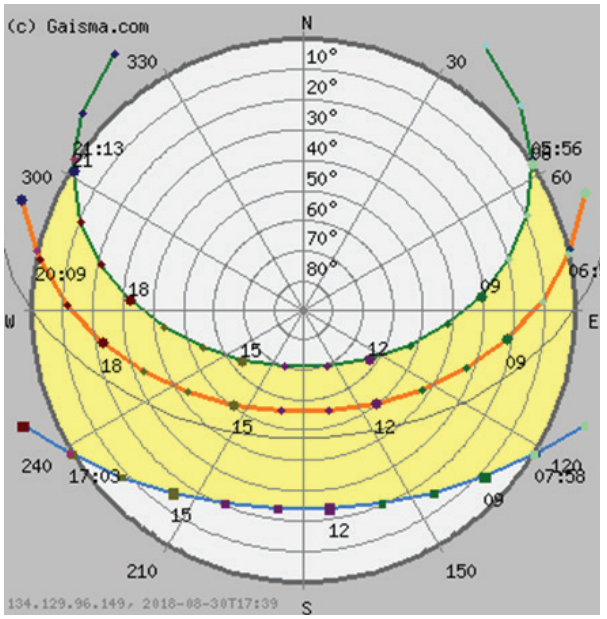




F100 Summer Solstice: 8am

F101 Winter Solstice: 8am





SOLAR STUDY:

The Fisher building during the summer and winter solstice showing the solar effects on the building. The sun during the summer creates more shading in the morning, but the southern facade will have an increase in heating and thermal comfort as the day progresses. The sun during the winter months shows less shading in the morning and thus increasing the solar benefits and added additional heat and thermal comfort earlier in the day and continues though-out the day.

CLIMATE:

The temperature in Detroit ranges from around 5’ F in the winter months to over 80’F in the summer months. This large temperature shift makes passive design difficult, because there is an abundance of solar heat gain in the summer and strong winds in the winter. Buildings need to be properly insulated and shaded to keep out both the strong cold winter winds and the hot summer sun while allowing the sun to warm during the winter and the wind to cool in the summer.

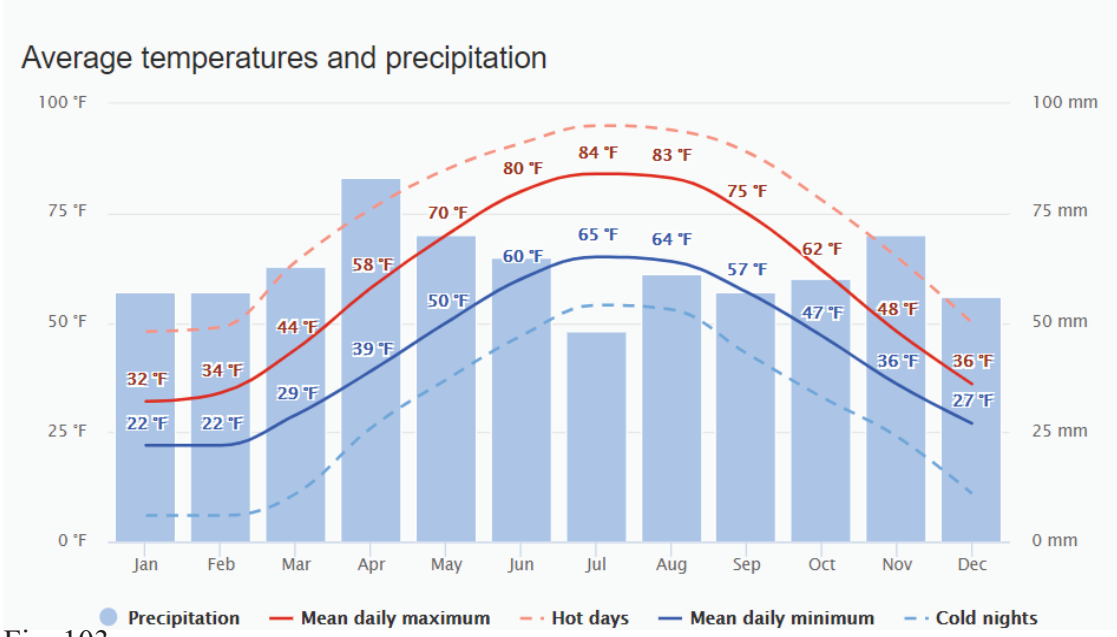


Fig. 103

WATER:

The most precipitation is during the months of April, May and November with an average of 3” of rain per month and into the summer with July having the lowest precipitation. The Winter months receive a steady amount of snow with an average of about 2” per month. The amount of precipitation per month averages to about 10-15 days per month.

Fig. 104

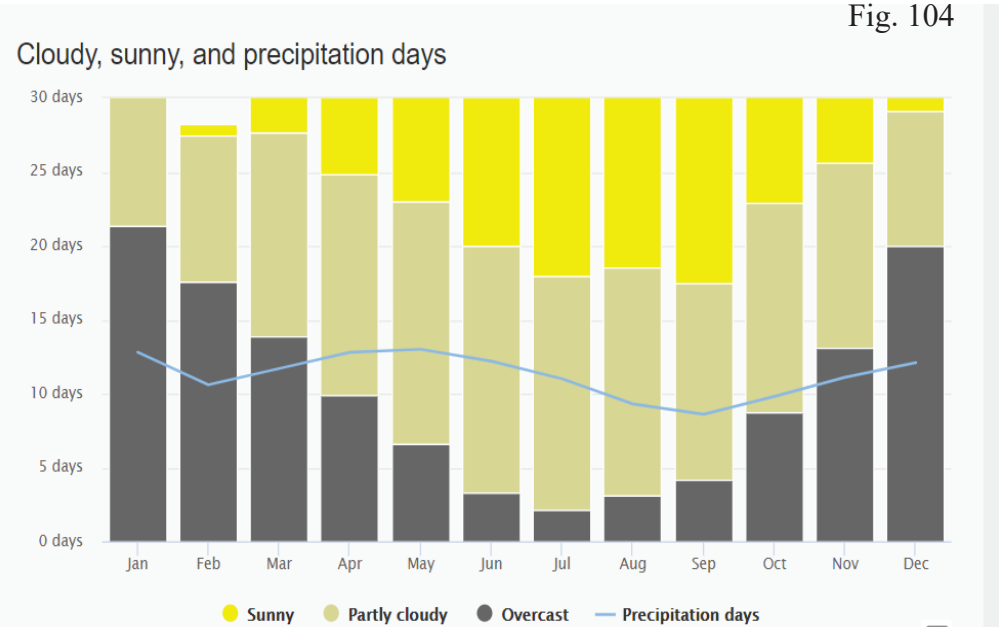
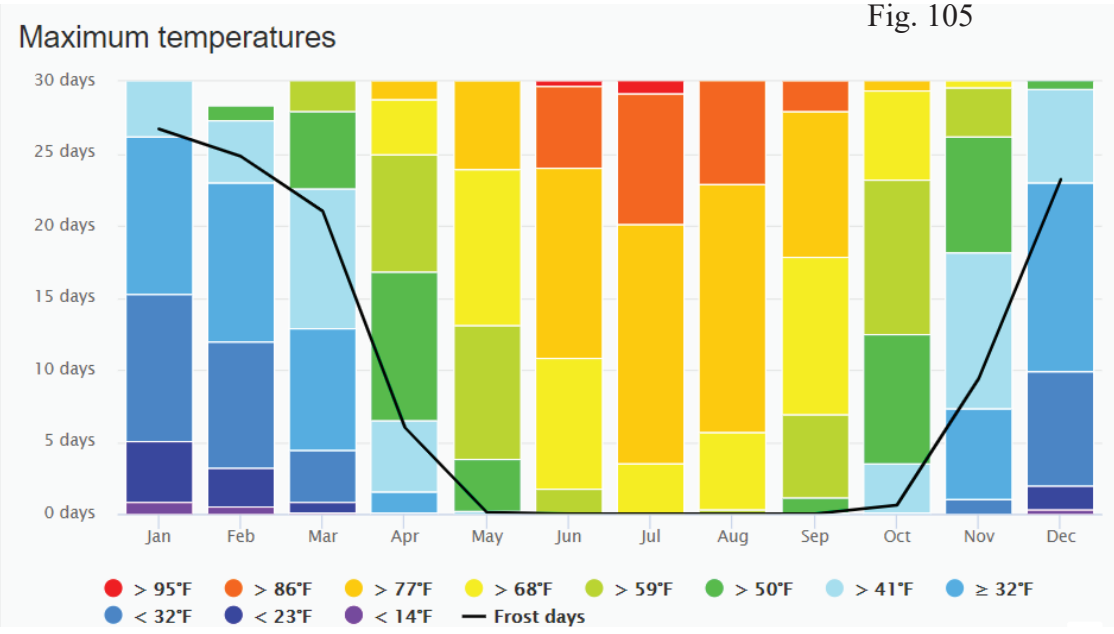
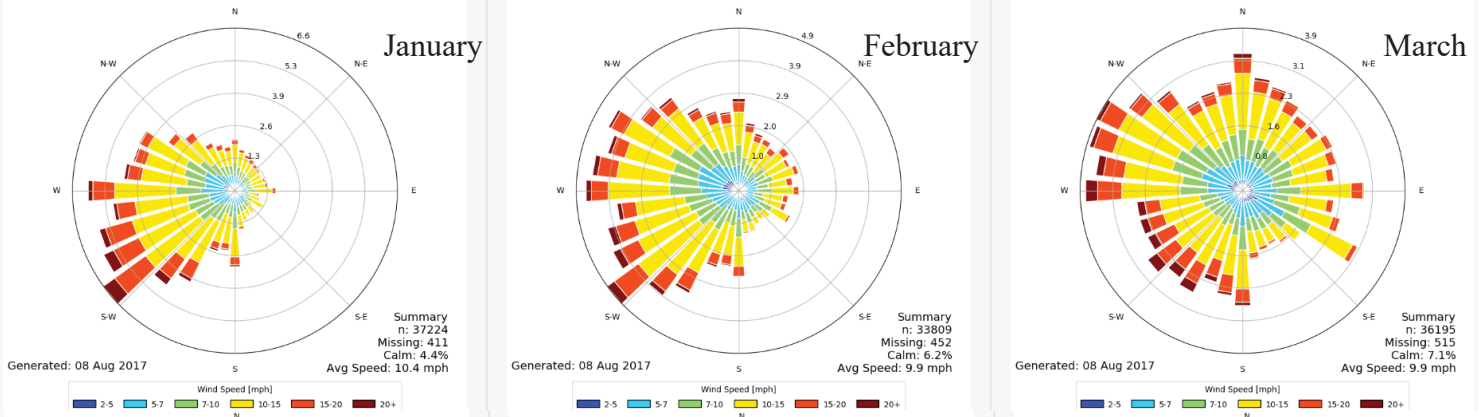
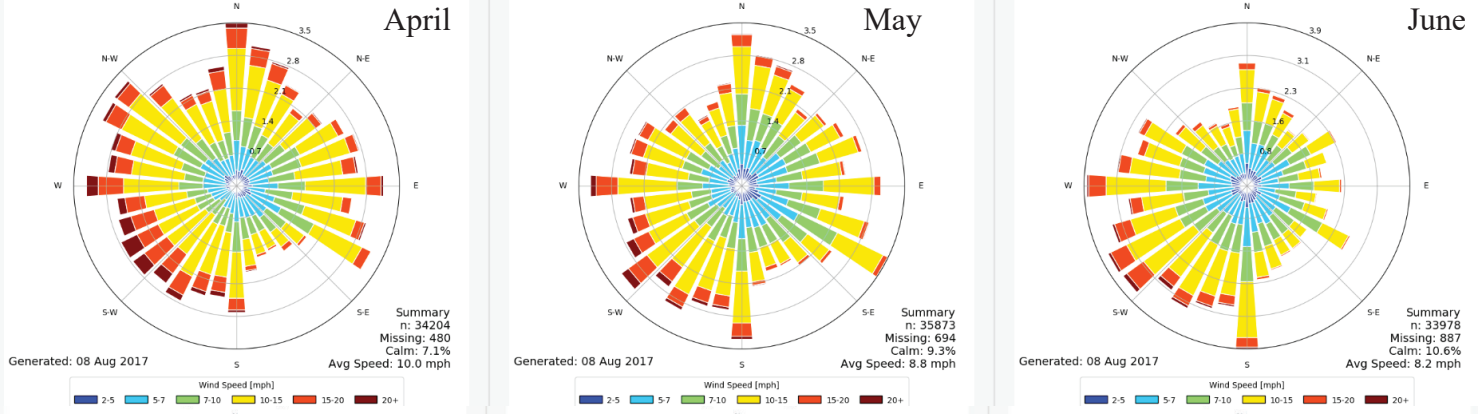
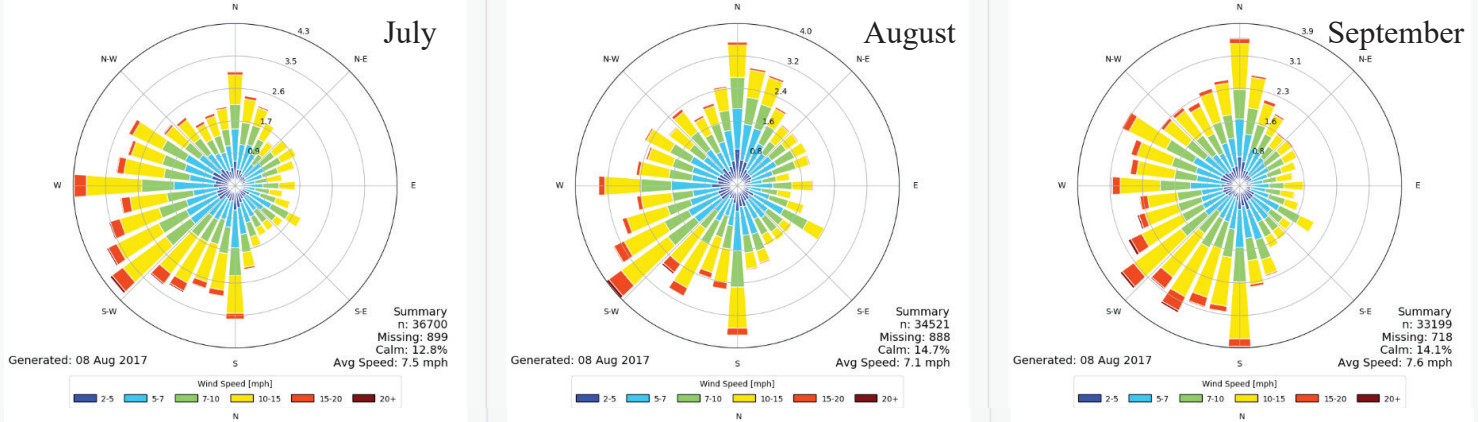


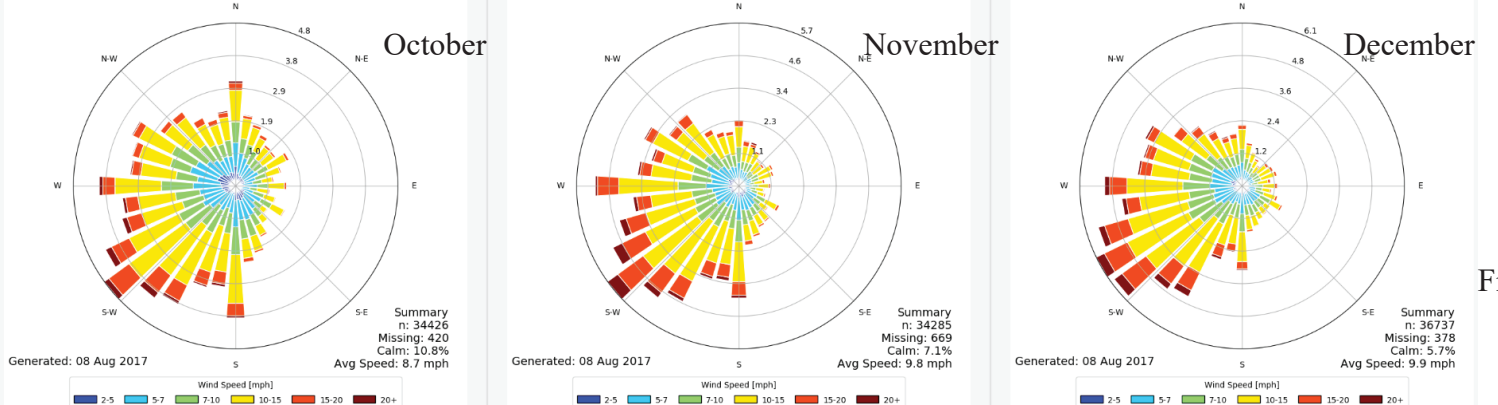
Fig. 105











WIND ROSES:

The wind is predominately from the southwest with the strongest wind speeds during the month of January through April which will decrease the average temperatures during the winter months.
The warmer summer winds from the southwest will bring in added warmth to the site increasing the changes of overheating.

Fig. 106

Performance Criteria:

Space Allocation & Behavioral Performance The space will be a mixed-use space that includes residential, retail, restaurants, farmers market, education training center, entertainment space (theater), parking and transit. An inventory of the buildings use will be cataloged, and sizing of units will be done per square footage of the building and floor. Analysis of the building and the placing of the various uses of the site will be conducted when remodeling is done with Revit software in the spring semester. I will have met the performance criteria when all the spaces fit with in the building and on the site.

Residential:

low income, student & regular.

100,000sf per floor on two floors for a total of 200,000sf. Around 100 units/floor for total of 200 units with average 980sf of living space per unit.

Bedroom, living, dining/kitchen, bath, storage, utility

Laundry – washer, dryer, folding, hanging space

Workout space? Utilities- water, heat, air, elect. Sun, wind, rain collection

Apartment used by renters and students will be rented by people enrolled in the training program, owners of the shops and restaurants in the building & farmers market owners. The others will and can be rented by the public to include 1, 2, 3 bedrooms and have 200 apartments. Peak usage time will be in the morning and evenings when people are returning home for the day. Parking will require that each apartment have 1-2 parking spaces depending on the number of bedrooms.

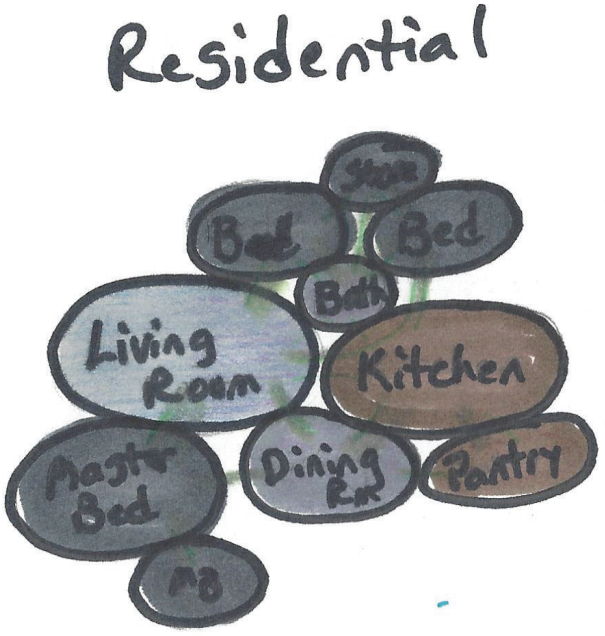


Fig. 107

EDUCATION SPACES: TRAINING CENTER & TRADE SKILLS.

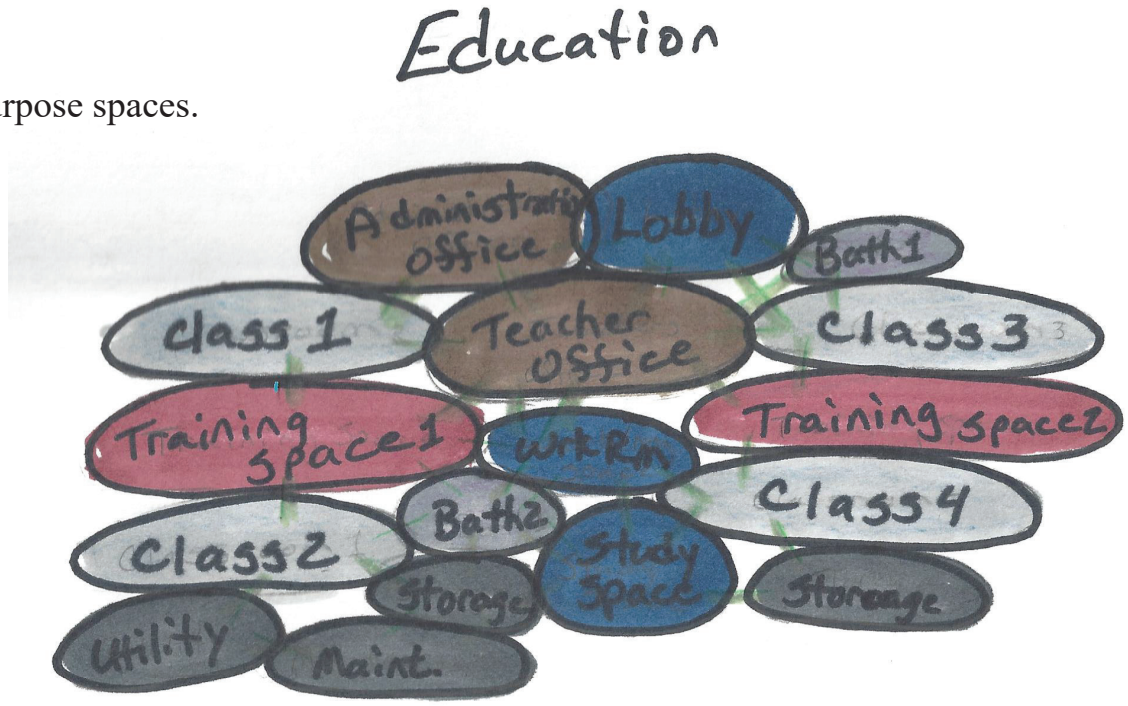
Education center/school will be used by office employees of the school and students, peak time is during the day when classes are in section. The education floors will have about 150 classrooms and 150 offices along with 18 training/workshop spaces. Parking will be 1 per employee & 3000-3500 students. Office spaces in the building would be used during the day as part of the training program for the school and parking would be included in the school parking. There may be a few additional employers who will need parking spaces. Used during the weekday about 10-12 hours per day with occasional weekend or evening use. 700 units for classroom, office space with around 30 students in 1024sf of classrooms. Offices will be average of 150sf with smaller offices being about 75sf.

Classrooms, student work spaces
Teacher offices, facility offices, work space/break-room.
Storage, copy room, computer rooms.
Dining space & prep, eating, student & workers?
Bathrooms, meeting spaces, breakout space
Office staff & work space, offices.

Work, offices, meeting spaces, trades, manufacturing, creative spaces.
These spaces will be used during the weekday for average of 10-12 hours per day.
These are included in the education center sizing and square footage.

Office space, meeting rooms – office.
Large meeting/convention space.
Multi-use space, easily movable partitions. Re-purpose spaces.
Learning spaces/classrooms.
Storage art supplies, tools, etc.
Utility space
Other stuff

Fig. 108



SHOPPING RETAIL SPACES.

Shopping retail spaces will be used by employees and the public mostly during the day and evenings with peak times being after work or school 4-6pm with 100 shops. Parking will be used by shop owners and the public, 1-2 spaces per shop and spaces for the public.

1000sf per unit with 200 units total

Large space for retail items.
Storage space, break room
Bathroom – public/private?
Store front, back entrance, loading door/space.

GARDEN, FARMERS MARKET, GROWING SPACE.

Farmers market will be used mainly on weekends and after work 4-7pm with parking spaces for each owner and some for the public. The gardens will require green spaces to grow efficiently and watering systems. These 50 spaces can be placed within the building or outside on the adjacent lots near the gardens. The gardens can be located on the roof and possibly in the vacant lots adjacent to the site.

Theater/entertainment will be used mainly on weekends and evenings with parking spaces being used by the public and theater actors using the retail parking. Meeting spaces will be used during the day and will need parking spaces.

Stands for food, garbage & recycling centers
Growing space – exterior garden, indoor greenhouse.

Fig. 109

RESTAURANT, CAFE'S, COFFEE SHOPS.

Restaurants will be used by the owners and public with 50 restaurants. Peak usage time will be during the day and dinner times, mornings around 7-9am, lunch 11am-1pm & supper 5-8pm.

Used during the meal times, weekday and weekends depending on type of food served about 12 hours per day.

Average of 50 units using 200sf for kitchen and 600sf for customers with total size 800sf per unit.

Space for customers, food prep & cooking.

Bathrooms – public?

Loading space, entrance, break rooms

Storage space – freezer/fridge & pantry.

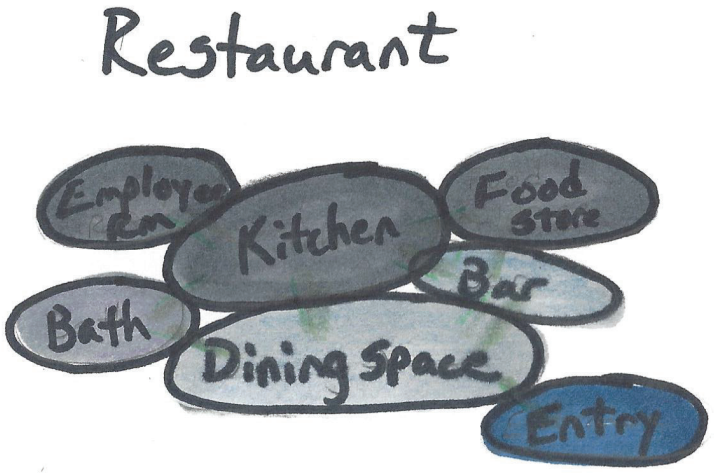


Fig. 110

ENTERTAINMENT, THEATER, MUSIC ARTIST SPACES AND DISPLAY AREA.

Mainly used in evenings and weekends about 4 hours per time.

Have not calculated yet

Theater space, stage, backstage – prep area

Seating for audience, entrance space/lobby, bathrooms

Rehearsal space/rooms,

Music rooms, sound proof – practice space. Storage

Display spaces – art, creative spaces, meeting spaces

Transit, car parking, bus & train lines.

Used constantly for movement of people evenings and days, weekdays and weekends.

Will be placed on site or underbuilding.

Parking space, cars, trucks & buses.

Train rail lines, ticket office? Parking ticket office?

Underground? Driving lanes, entrance & exit space.

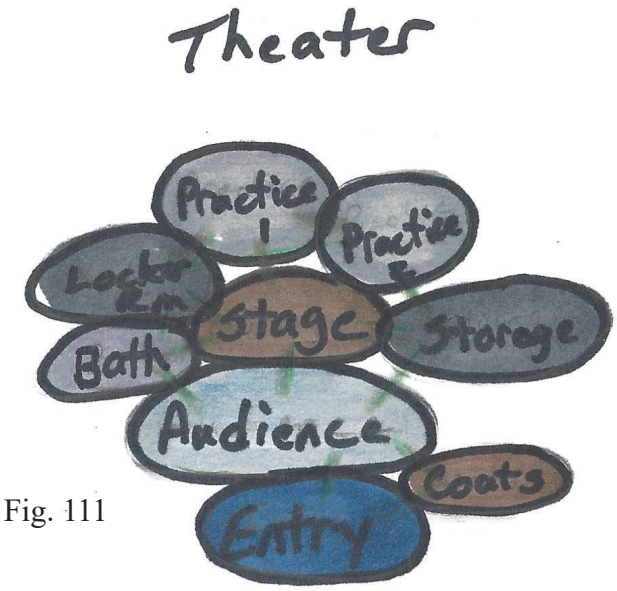


Fig. 111

Transit, car parking, bus & train lines.

Parking space, cars, trucks & buses.
Train rail lines, ticket office? Parking ticket office?
Underground? Driving lanes, entrance & exit space.

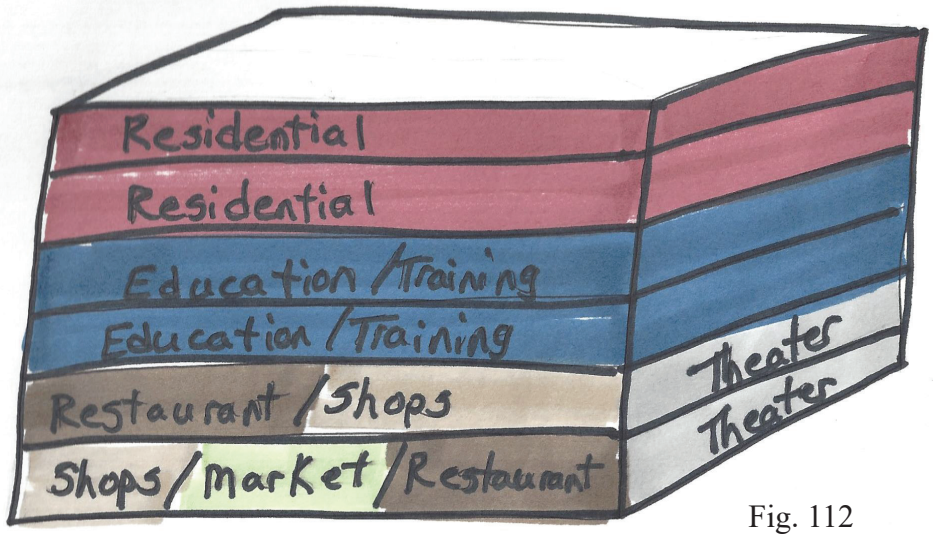


Fig. 112

The project will be designed for a variety of people and users including, students, renters, gardeners, shop owners, public entertainment, office for personal and public including locals and tourists.
Ownership of the building will be by one person with the spaces being rented at a reasonable rate. There is a possibility that the owners of the retail spaces would have a percentage of ownership in the building and that they would in fact own the building eventually, like a co-op. There will be ADA compliant requirements included in the design and remodel of the building. There will be consideration made for families and elderly who want to go to the theater, farmers market and for those who go to the school for training and education. The population of the area is poor and will need considerations to help them to be trained in a new field, find jobs and be productive members of the community. The remodeling of the industrial site using passive design will create a positive impact within the neighborhood of Milwaukee Junction. Passive systems use the natural energy provided by the earth in the forms of sun, wind, water, vegetation and noise. These systems working to the benefits of each other can create an energy efficient building. The sun heats the interior of the building while providing lighting, the wind cools the building that is warmed by the sun while the vegetation provides filtered and cooled air. Computer modeling will provide a base for using the different passive systems. The main systems will be added to a base model and compared to determine the best passive systems to be used on the site and building. Validating the research will be conducted when the industrial building, the Fisher Body Plant 21 is created and loaded into the InSight software and it is shown to be energy efficient.

Energy Consumption:

The energy use of the space will be as close to net zero as possible using passive systems. The passive systems will be included in a matrix that will be used to compare the systems to determine the benefits of each. These benefits will show which systems will work best together on the site to create an energy efficient building. A base model will be constructed in Revit and analyzed with InSight to determine the energy cost of the building. Different applications will be used including window size, shading, roof construction and occupancy to compare on a graph. Passive systems will be added to the base model and analyzed to compare to the original to prove or disprove the theory that an existing industrial site can be remodeled into an energy efficient space using passive systems.

Environmental Impact The impact on the surrounding community will be significant because the remodel will draw people back into the neighborhood. The neighborhood is currently barren and filled with industrial plants and vacant lots. The remodel of the site with passive systems will not impact the site or neighborhood negatively but create an aesthetic pleasing space for people to gather. The passive systems use the earth's free and natural energy making minimal environmental impact after the systems are implemented.

Cost The cost construction cost will not be included in the initial research but may be added later. The passive systems use the energy from the earth, so the only cost is the implementation of the systems during the remodeling process.

Fig. 113

PROGRAM: OBNOVIT – RENEW

PROCESS:

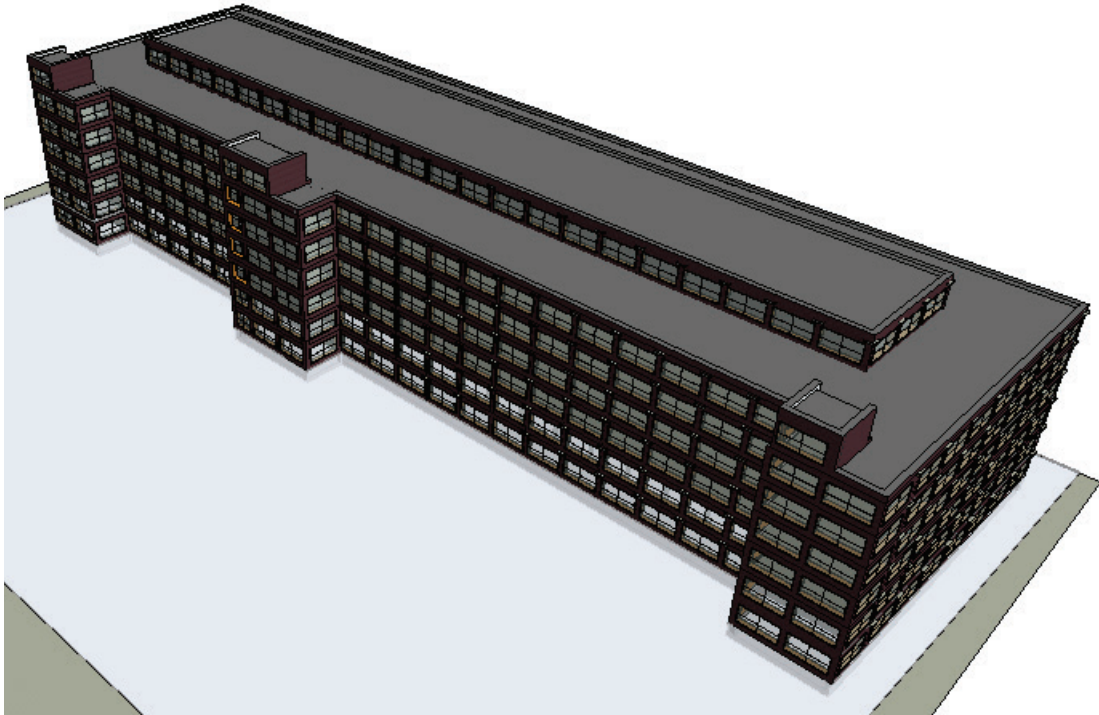
The design of the building was restrained because of the existing building form and design. The process of research and building form developed as the interior of the building was designed. The middle stairwell was removed and replaced with a main entrance which allowed a circulation corridor to be designed on the north side of the building. The roof was the most changed with the additions of a pool, lounge, exercise space, pet area and green roof vegetation. The saw the addition of a 1st floor covered sitting area, and balconies created on the 5th and 6th residential floors. Vegetation and parking were added and improved on the site as well as adding community gardens, parking and outdoor spaces to the adjacent east & west lots.

Fig. 114

Left:
Rip and tear model of building to show lighting on first floor

Right:
Original building

Fig. 115



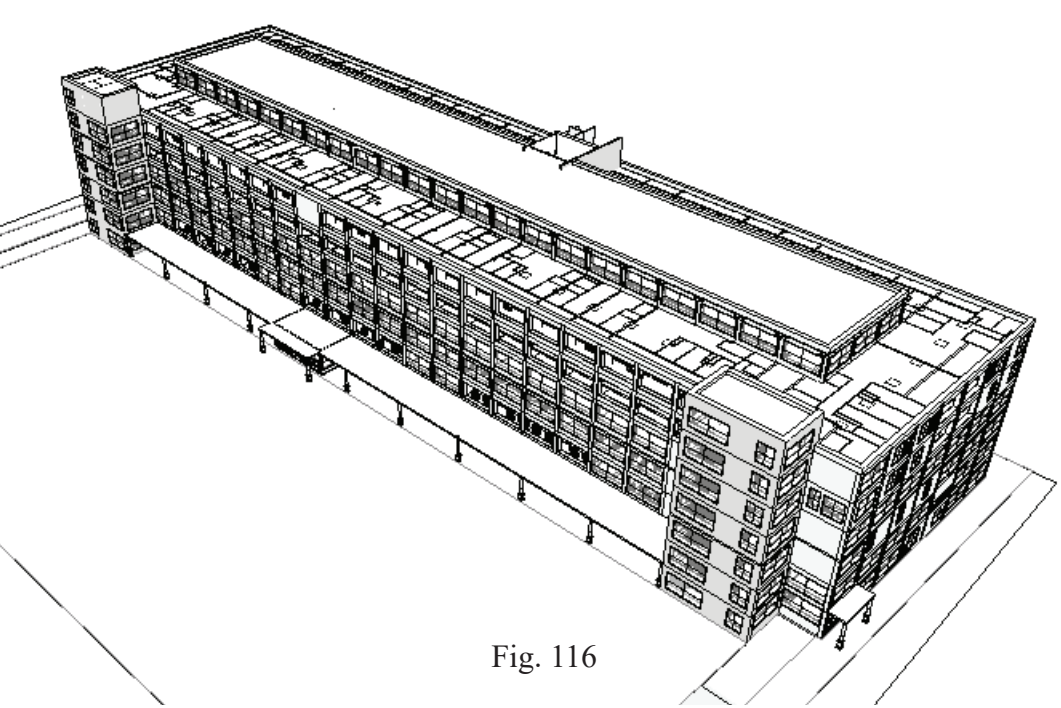


Fig. 116

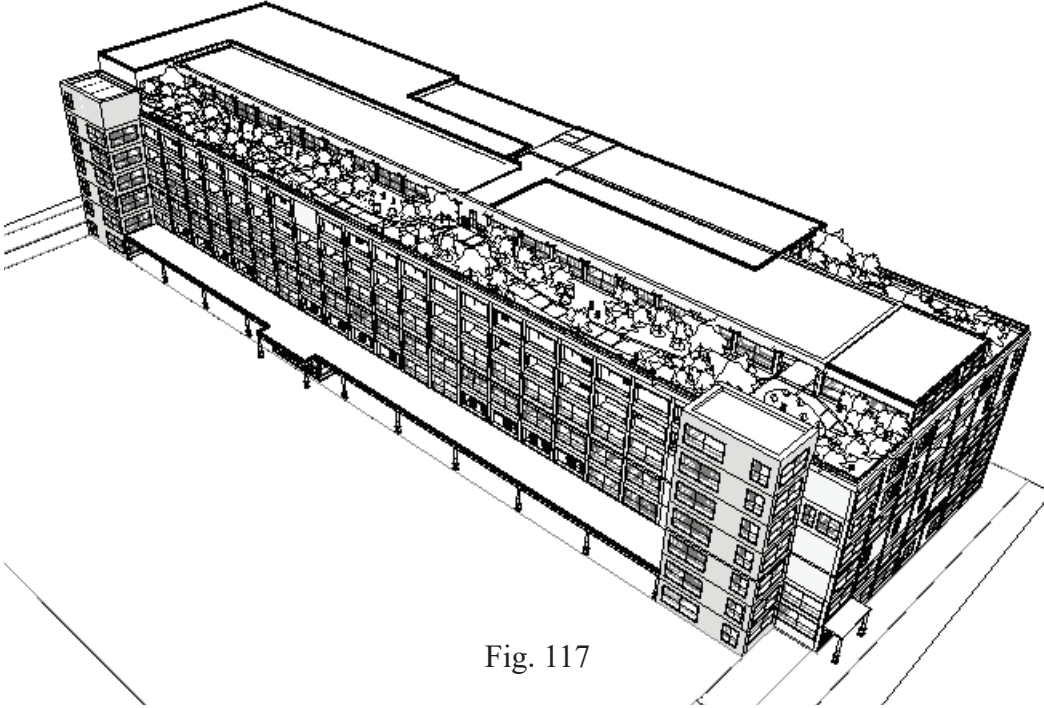


Fig. 117

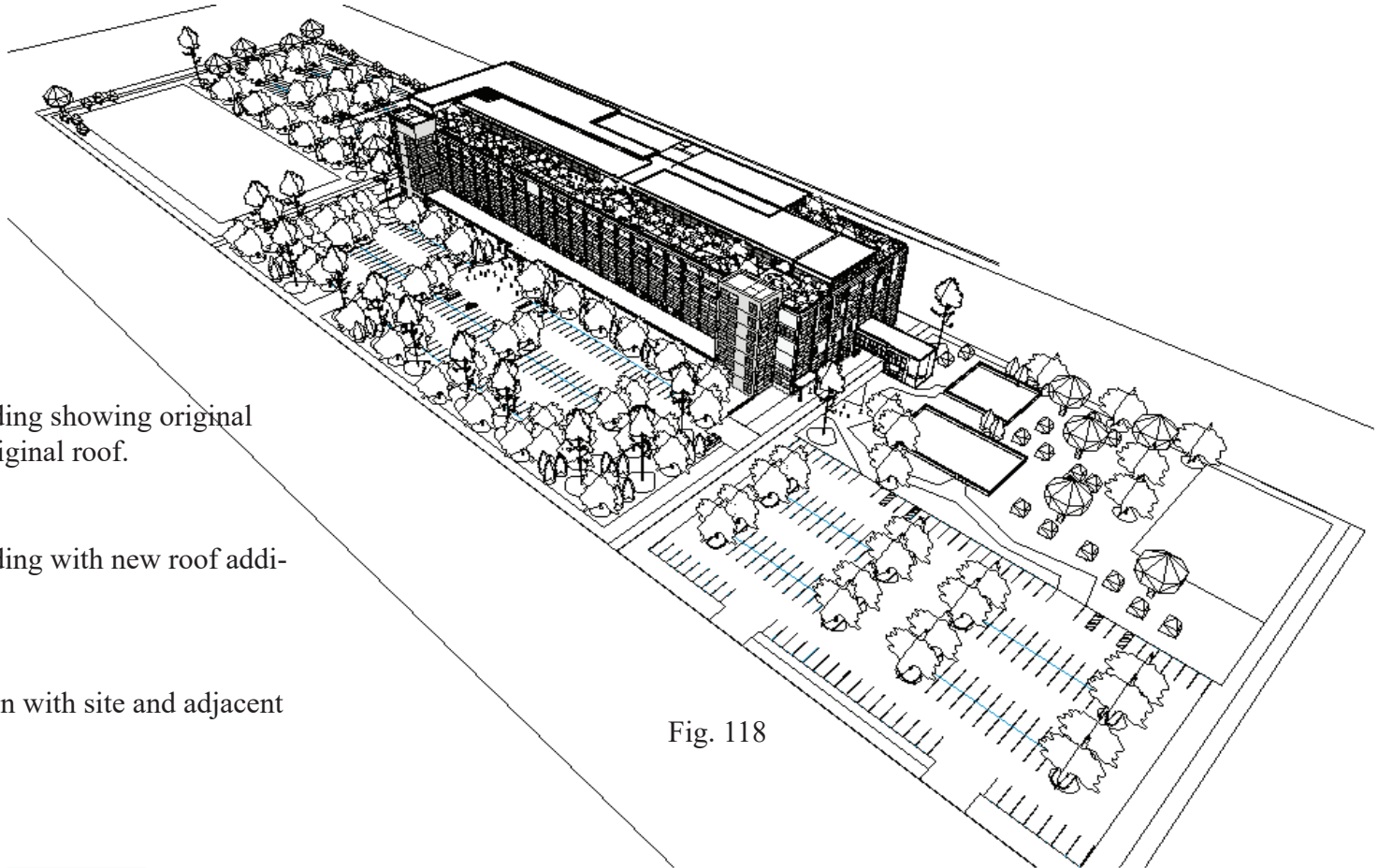


Fig. 118

Top Left:
Model of building showing original design with original roof.

Top Right:
Model of building with new roof addition

Bottom:
Building design with site and adjacent sites

Project Solution:

Right:
Model of building

Bottom:
Model with adjacent sites
Showing the vegetation, green roof, parking and roof addition.

Next Page: Presentation Board

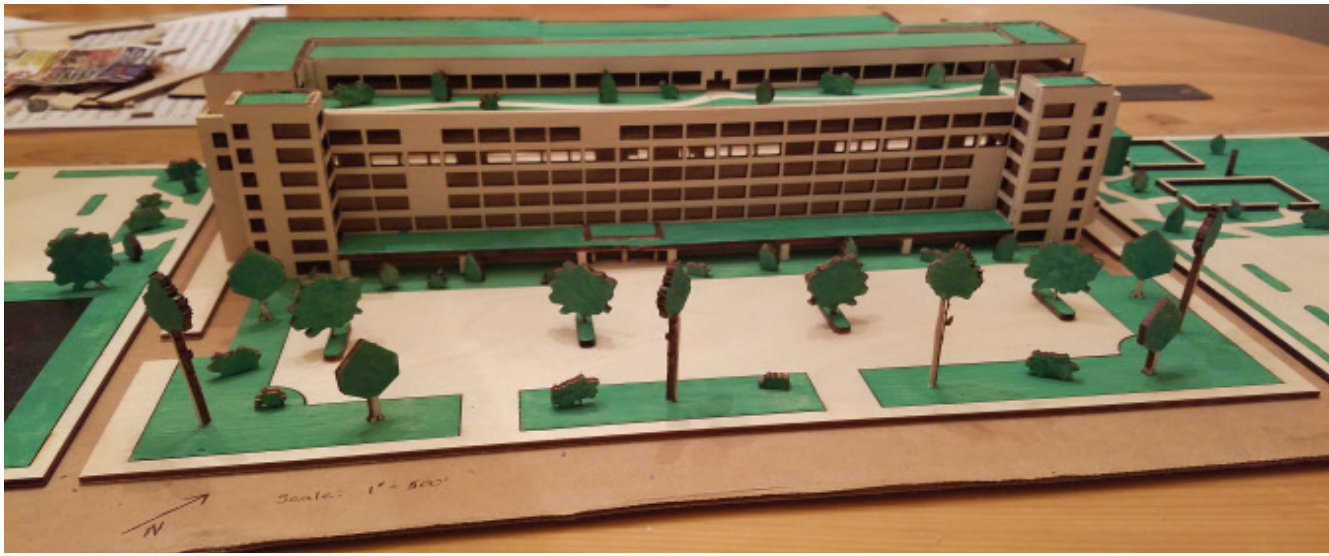


Fig. 119

Fig. 120

Fig. 121

Performance Analysis:

Site Response:

The building design responded to the conditions of the thesis project by using passive design to create a mixed-use space. This was achieved by creating a light/ventilation tower through the center of the building. The addition of a green roof for rainwater collection and vegetation added to the overall passive design and energy efficient use of the building.
Additional space was created on the roof of the building by adding a pool area, exercise space, lounge, pet activity center and walking green space. The concrete walls add additional thermal comfort to the interior spaces as well as the balconies created on the the 5th and 6th floors.
This design with the exception of the roof addition and the removal of the middle south stairwell is similar to the original design intent for the design and use of the building and site.

Fig. 122

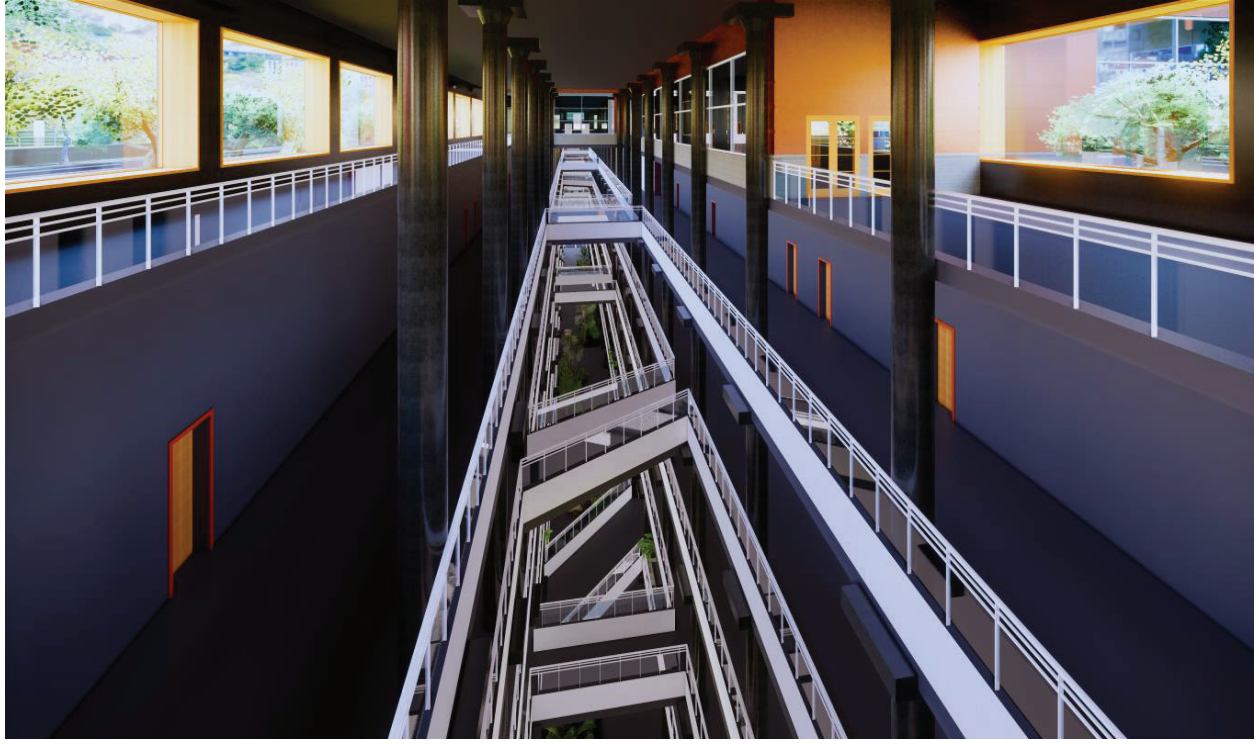


Fig. 123

Views of the light tower as it cuts through the center of the building allowing daylighting to enter the lower floors.
Thermal images of the 1st floor during the day show how the light is illuminating the space.
This center space also allows fresh air to flow through the building providing warmth or cooling depending on the season.

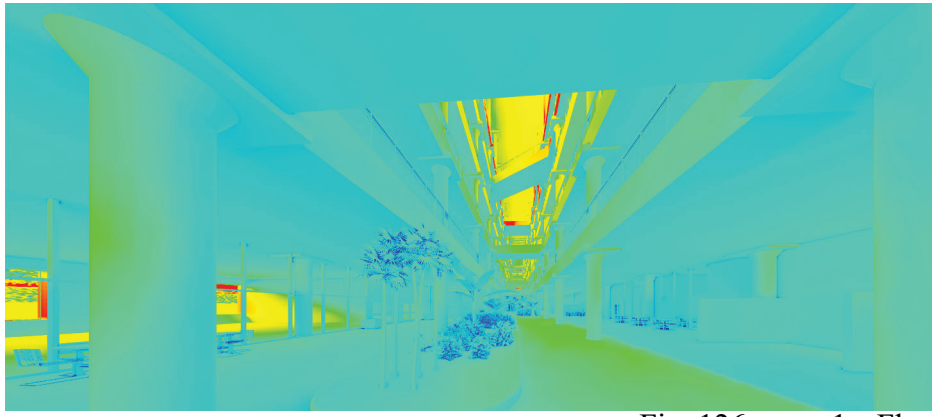


Fig. 124
1st Floor Thermal Image Morning

Fig. 125 1st Floor Thermal Image Noon

Fig. 126 1st Floor Thermal Image Afternoon

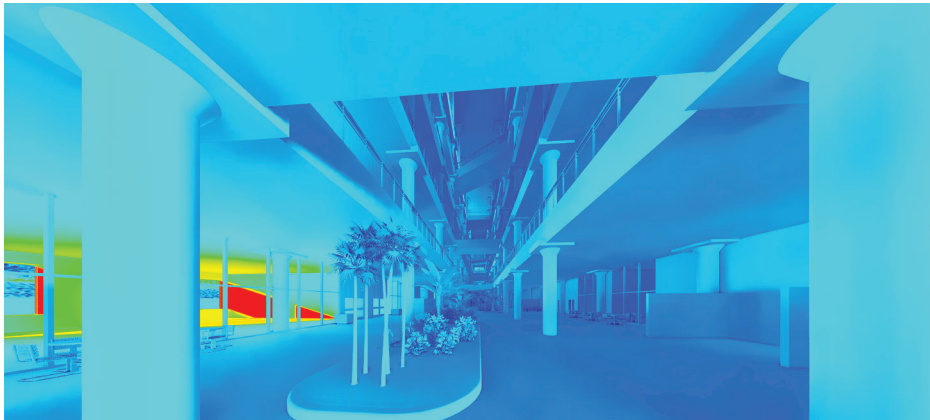


Fig. 127

The green roof adds views and cooling for the building with the addition of the grass and plants. The roof also is used to collect rainwater for use in the building.

The idea that an abandoned industrial plant can be designed into a mixed-use space using passive design is possible. Even though is one design, it can be modified to fit the form of any man-ufacturing or warehouse to create an energy efficient, destination space for the surrounding community.

Fig. 128

Fig. 129

The two adjacent sites to the east and west of the building site have been incorporated into the overall and future site design. These sites will add additional parking as the building and site become more popular. The sites also contain community gardens for the building occupants and the surrounding neighborhood. The east lot will also have outdoor spaces for the daycare and pets. These two sites show the future expansion of the building site into the surrounding community and the positive impact renewing an industrial site can have on the neighborhood.

Goal Response & Emphasis

Passive Design and A Building:

This thesis program has taken a deteriorating industrial building, the Fisher Body Plant #21 in Detroit, MI built in 1919 by Albert Kahn and has created an adaptive reuse space using passive design. There are apartments on the 5th-6th floors, shops, restaurants, farmers market, daycare and pet boarding on the 1st-2nd floors, offices, meeting spaces, theater and an education center on the 3rd-4th floors incorporating both commercial and residential spaces. Passive systems include a light tower cut through the center of the building to provide daylighting and ventilation to the lower floors. A green roof was designed to collect rainwater and melting snow into storage tanks located under the parking lot, which will collect and filter both rain water and gray water for use throughout the building for flushing toilets and watering vegetation. The roof also has a pool, exercise space, pet area, lounge, and park. Other passive systems include vegetation around the site for shade and filtered air, solar panels on the exterior and shading devices on the south and west sides. The exterior windows on the 5th and 6th floors were taken out and a new exterior wall was set in to the building to create balconies for the residences providing shade and garden spaces for the building users. Parking was added below grade and on vacant lots adjacent to the site along with transit lines. The two adjacent sites provide green space, parking and community gardens for the farmers market.

Fig. 130

Project Installation:

Fig. 131

Appendix:

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Previous Studio Experience:

2nd year	fall: 2013, Joan VanBruggen Tea House; spring: 2014, Cindy Urness, Dance Studio
3rd year	fall: 2014, Paul Gleye, Visitors Center spring: 2015, David Crutchfield, Library
4th year	fall: 2016, Don Faulkner, High Rise spring: 2017, Ron Ramsey, Study of Architectural Style
5th year	fall: 2018, Ganapathy Mahalingam, Thesis Project spring: 2019, Cindy Urness, Design Thesis

Personal Identification:

Emilee Olstad
35690 Fawn Oaks Trail
Dent, MN 56528
H# 218-758-2535
C# 701-371-4198
emilee@arig.net

Hometown: Cornell, WI – go Packers!

NDSU Quote: “It was an inspiring place to learn.”