Grand Coulee Living and Retail

Christopher R. Wetch

An Environmental Approach Towards Sustainable Living

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Department of Architecture and Landscape Architecture
of North Dakota State University

By

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Thesis Abstract

Will there be a paradigm shift in the way people build and live because of varying economic conditions? The building typology will be a sustainable mid-rise mixed use building. The world's population currently and in the future will need to be more attentive to the general standard of living and reduce the economic burden placed on people through more efficient renewable/ recyclable design.

All of humanity utilizes some form of space from birth to death. New building methods, along with sustainable practices, can benefit both the environment and the dweller by reducing operating costs and reducing the carbon footprint. The space we occupy and the approach to design will change the way we live and continue to live in the future.

In order to build and live, currently, and in the future, humanity will have to strive towards a new set of standards of the built environment. Sustainable practices will not merely become an addition to a design, but instead sustainable practices will become the distinct means by which we design. By changing our view on what a standard of living, is we can reshape our current beliefs on what it means to be truly sustainable.

If we do not do something soon our children may have undue burdens placed upon them with no way of reversing the process. The primary user of the building will be the tenants and the secondary users are retail and office employees, public and professional practitioners. The building has a single owner.

Building typology will incorporate: sustainable wood products, glazing, recycled metal products, steel and concrete. The buildings functions will be of a sustainable mid-rise mixed use building also including multiple multifamily dwellings. Major elements of the project include: resident units, retail spaces, office spaces, professional practice space, public space, and parking. The site is located in the midwest state of North Dakota in the capitol city of Bismarck. Within the city, the site is on the north end of town located within close proximity to schools, major roadways, banks, and retail stores.

Sustainability and efficiency of living will be the primary main project emphasis. All research will be a mixed method approach, collecting both quantitative and qualitative data, which will be gathered concurrently. Documentation will occur digitally and data will be compiled every two weeks in two different locations: on a hard drive and on a disk. All material will be preserved and be available to scholars through the thesis book and important information highlighted on the final project presentation.

Thesis Abstract

The scale of the project will incorporate around 6.75 acres of currently unused land in the north central developed section of Bismarck. A single mid-rise mixed use building and multiple multi family dwellings will inhabit the site. The overall scope of work could easily be scaled larger in size and incorporated throughout currently undeveloped areas in or around Bismarck , North Dakota.

Key Words: economic conditions, sustainable mid-rise mixed use, future, general standard of living, efficient, efficiency, renewable, recyclable, dweller, carbon footprint, reshape, residential units, retail, office.

Problem Statement

Will there be a paradigm shift in the way people build and live because of varying economic conditions?

Statement of Intent

Christopher R. Wetch

Building Typology: A sustainable mid-rise mixed use building

Theoretical premise/ Unifying Idea:

Claim: The world's current and future population will need to be more attentive to the general standard of living and reduce the economic burden placed on people through more efficient renewable/ recyclable design.

Supporting Premises:

- All of humanity utilizes some form of space from birth to death.

- New building methods, along with sustainable practices, can benefit both the environment and the dweller by reducing operating costs and reducing the carbon footprint.

- The space we occupy and the approach to design that will change the way we live and continue to live in the future.

Theoretical premise/ Unifying Idea: In order to build and live, currently, and in the future, humanity will have to strive towards a new set of standards of the built environment. Sustainable practices will not merely become an addition to a design, but instead sustainable practices will become the distinct means by which we design.

Project Justification: By changing our view on what a standard of living is, we can reshape our current beliefs on what it means to be truly sustainable.

Proposal

Christopher R. Wetch

The world's population is losing sight of what was once theirs: the earth and all of its binding parts. The reason for losing this battle is quite possibly pollution. These days, pollution can be the blame for everything from global warming to cancer. The way to combat and someday reverse, if not try to slow these conditions, is to build in a more sustainable recyclable/ renewable fashion. The days of people building huge mansions that consume tons of energy and materials are over. With an ever unstable economic market and people losing houses and jobs at an astounding rate, we as designers need to develop new means that can be sustainable and reduce the economic burden that is placed on the individual.

All of humanity utilizes some form of space from birth to death. Seemingly this would make everyone a dweller, but the fact is, not everyone has a place to live anymore and the number is on a constant rise. Why is this? Should we, as designers be trying to solve this problem?

New, sustainable building practices are being developed everyday around the world. Incorporating these techniques and inventing new ones will benefit not only humanity itself, but more importantly, it will also benefit the earth by reducing the carbon footprint. The future belongs to our children and they should not have any burden placed upon them that would affect their quality of life. Who's decision should affect the outcome of a structure to become sustainable?

It is the space we occupy and our approach to design that will change the way we live now and in the future. The general standard of living will need to be reprogrammed into many of us in order for all of us to become better as a seamless whole. Should people be regulated on the size and how much power or material they can use to build a dwelling?

If we do not change the way we are currently going, we will eventually run out of renewable resources and leave nothing viable for future generations to use. We can start now and be able to stop, or even reverse, the negative effects that we have caused long before anyone realized there effects. These questions are the basis of the research into the character of the theoretical premise/ unifying idea.

User/ Client Description

This mixed use, mid-rise project will be designed for multiple users, including but not limited to: the building residents, retail employees, retail patrons, office employees, professional practitioners, the public, and maintenance staff. There will be one owner with assistance coming from the United States Department of Housing and Urban Development (HUD).

Building Residents: The building residents will make up the majority of this complex and are there for the primary users of the building. The dwelling units will be broken down into two categories. The categories of housing will be either assisted or unassisted living, meaning if a resident qualifies for HUD approval, HUD will provide them with financial assistance. Unassisted living will be described as average income citizens that will provide 100% of their rent themselves. This will provide a diverse range of individuals.

The final number of units will be determined at a later time following research. Peak usage times will vary, however, it could be assumed that evenings and nights would have higher sustained usage. Parking spaces for vehicles, motorcycles, and bicycles will be provided. A lesser amount of automobile spaces will be provided to encourage the use of public transportation and carpooling. Physical restrictions may be encountered by anyone and all spaces will be designed to meet the standard of Americans with Disabilities Act (ADA).

The primary individuals or families living in this complex will be people who have possibly lost their previous homes to foreclosure or have decided to move to a new, more cost effective living condition. The other group of individuals or families will be persons who simply do not have the means to live on their own without financial assistance.

Retail employees: The second function of the building will be to house retail businesses. The revenue created by the rent paid from the business will help offset the rent paid by the buildings residents. The businesses also provide the possibilities of working in the same building you reside in.

The amount of businesses will be determined at a later time following research. At the current time, I believe it is necessary to include as many as feasibly possible to reduce tenant economic burden. Peak usage will occur during normal business hours assumed to be 8:00 a.m. through 9:00 p.m., Monday through Friday and weekend hours determined by the specific business.

Parking will be included, however, priority will go to the residents of the building. Sustainable transportation practices will be encouraged. Any physical, mental, or medical issues will be handled accordingly on an individual basis. Every space will be accessible to all users.

Retail patrons: The number of retail patrons may vary greatly depending on many variables. Peak usage for patrons will be during normal business hours. Separate parking will be provided for all retail patrons. This will be the second highest priority next to the resident parking. Exact numbers of parking spaces will be determined at a later time. Any physical, mental, or medical issues will be handled on an individual basis. Every space will be accessible to all users.

Office Employees: The number of office employees will vary depending on the number of offices, size, and type of office. Peak usage for office employees will be during daylight hours and it is possible that a few employees may work overtime outside normal hours. Parking will be shared with the retail employees and sustainable transportation will be encouraged. Any physical, mental or medical issues will be handled accordingly on an individual basis. Every space will be accessible to all users.

Professional Practitioners: Professionals practicing in their field of practice will be provided the same amenities as the retail and office employees. They will operate during normal business hours and share parking with the previously described users. Any physical, mental or medical issues will be handled accordingly on an individual basis. Every space will be accessible to all users.

The Public: The public will be encouraged to use this space as there will be seminar space along with multiple green spaces designed for the inhabitants and the public. Numbers of the public could be limited to only a few or large groups, depending on the function they are present for. The public may be unknown to the inhabitants or could be related to them in some way.

Peak usage will depend on the function and will be determined at a later date following research. Any physical, mental, or medical issues will be handled on an individual basis. Every public space will be accessible to all users.

Maintenance staff: In order for the building to function properly and all systems to run efficiently, maintaining the equipment and systems will be very important. A very small trained staff will be in charge of all systems of the building. They will perform most maintenance for the resident spaces and the public spaces. The staff will be, provided storage facilities for tool and other equipment.

Any physical, mental, or medical issues will be handled accordingly on an individual basis. This space will only be for the maintenance staff and will be off limits to all others except the owner and possibly trained outside professionals.

Major Project Elements

The building typology for this project is a sustainable mid-rise mixed use complex. The purpose is to provide sustainable housing for individuals and families and also to provide sustainable spaces for retail stores, offices, professional practices, and the public. The major spaces will be defined by the typology below.

Residential Living Units: One of the major benefits to being sustainable is the efficiency at which spaces can operate. This leads to reduced costs of operation which can be passed on to the tenants of the building. There can also be many health benefits to living in a sustainable space. By building sustainably we can reduce the impact we are having on our environment.

The major element of this project will be the development of the residential units. These units will need to be comfortable and be within the economic needs of the people who will be living there. In order to incorporate the many statuses of the individuals, many sizes, features, and options will need to be available. Sustainable practices will be encouraged for the tenants. By developing a mixed use building, we can encourage occupants to live, work, and socialize in very close proximity to one another. Doing so will reduce the dependence on daily automobile travel.

Retail Spaces: Retail spaces will become very important to this project as they will provide revenue from renting the space; this will offset the tenant rent. They will also enable the tenants to purchase everyday material items without the need to use an automobile or other transportation. These spaces will also incorporate the surrounding neighborhood and continue to reduce the carbon footprint by providing the same material items for everyone within a much closer proximity.

Office Space: This space will again provide revenue and will be leased out on a longer term contract. This will provide the revenue security to the individuals that occupy the living units and help to keep the costs of living down. The offices will also give more opportunity to work in close proximity to where one lives. This may provide services to the individuals depending on what type of offices are included in the building.

Professional Practitioners: Professional practice space will also provide revenue, but more importantly the services to the people of the building. The spaces will be a Pharmacy, small medical facility and a Dentist/ Orthodontist office. Providing these services can reduce the need to travel longer distances.

Green Spaces: The green spaces are design to break up the hard built spaces of the building. They provide places to socialize and to enjoy nature. They also may serve a function such as rain water collection or reducing the heat island effect. The green spaces will all be public.

Public Multimedia Space: This space will be used to give seminars and presentations to the public in order to inform and educate them on sustainable practices. It is an important part of sustainability that we pass on the knowledge to others.

Parking: Although automobiles are the cause for some of the worst pollution around the world, the fact is, many of us have no other means of transportation and therefor still need to use a typical automobile. The building, however, will have a reduced number of automobile parking spots and have priority spots for alternatively fueled vehicles or hybrids. Sustainable transportation practices will be encouraged by providing bicycle lockers, estimated time schedules, and maps for public transportation.

Secondary Spaces:
Entrance Lobbies
Service corridors
Public rest rooms
Mechanical space
Storage spaces
Break spaces for Retail and Offices
Main building office
Bicycle Storage Lockers with Shower facility

Site Information

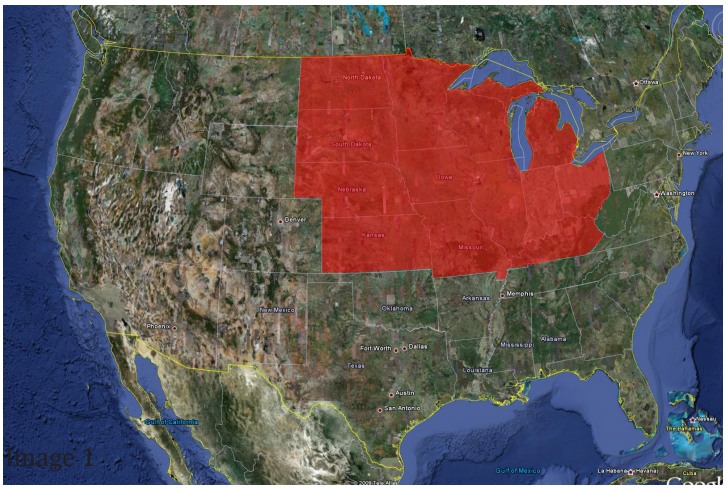


Image 1

The Midwestern Region is one of four regions in the United States of America. It is located in the north central portion of the USA. The Midwest shares a border with Canada to the north and also borders four of the five Great Lakes. The Midwest contains twelve states: North and South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana and Ohio. The region's climate can be characterized as having four distinct seasons: summer, fall, winter and spring. Temperature differences can sometimes be well over 100 degrees Fahrenheit. The area is known mainly for its agriculture due to good soil conditions and a warm moist climate.

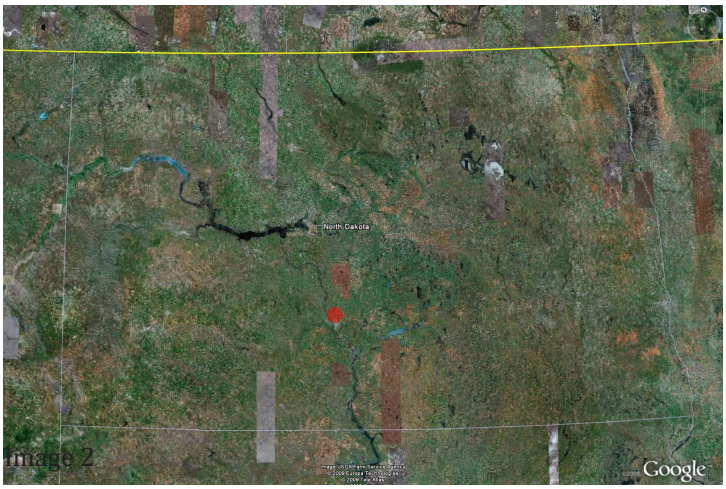


Image 2

Bismarck is the capitol city in North Dakota. Bismarck is the second largest city in North Dakota with Fargo being the only larger city. The population of Bismarck is approximately 63,000 people. The Missouri River passes through the west side of Bismarck and to the west of the River lies the city of Mandan. Together, Bismarck and Mandan make up the core of the metropolitan area. Bismarck holds North Dakotas tallest building, The North Dakota State Capitol building, which is located in the central part of Bismarck. The state government employs many people within the city. As a hub of manufacturing, retail trade, and health care, Bismarck is the economic center of a large portion of south-central North Dakota and north-central South Dakota.

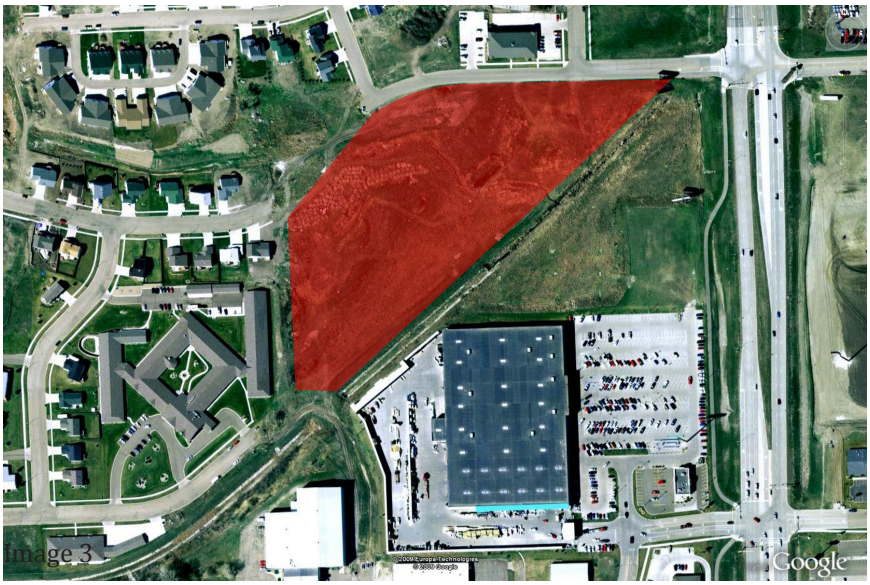


Image 3

The site for this project is located on the north central side of Bismarck. This site is important because it has a close proximity to a mall, grocery store, grade school, high school, bank, many retail stores, public transportation, restaurants, and major Highway 83 (to the East of the site). Being close to these other amenities will allow the people who use the building to use efficient means of transportation and not have to travel a great distance. There is a city bus stop located about half a block to the south of the site.

The site contains roughly 292,500 square feet, or close to 6.75 acres. The site is bordered to the west by 10 Street North and the north by Calgary Avenue. There is a drainage ditch that runs Northeast which borders the back of the site. The topography of the site runs uphill to the Northwest from around 1800 feet above sea level to around 1815 feet above sea level.

This thesis will focus on sustainable design. People will need to change their views on what the general standard of living is and what is really needed to inhabit space. There needs to be some options out there for people who want to make the move to being more sustainable. Currently, very few options exist for mixed use living and business opportunities in Bismarck. My belief is that there are very few options in the whole state of North Dakota. Mixed use is only one of the viable options that needs to be ascertained by the people of Bismarck. The building should not work against nature, instead, nature should become a part of the building and the two should coexist together.

Definition of a Research Direction: The direction of the research will be conducted with the precision and care at the level of a graduate student. This research will be conducted in the following areas: Theoretical Premise/ Unifying Idea, Project typology, Historical Context, Site Analysis and the Programmatic Requirements.

Design Methodology: All research will be a mixed method quantitative/ qualitative as well as digital and graphic approach. Interviews of both single persons or groups may also be used to gather data regarding information or consensus on various topics.

Data will be collected using a concurrent transformative strategy that will be guided by my theoretical premise and unifying idea. Both the quantitative and qualitative data will be gathered concurrently. Priority will be assigned by the requirements of the theoretical premise / unifying idea.

Integration of the data will occur at several stages in the process of my research: it will be analyzed, interpreted, and reported. This data integration will be presented both in text and graphically.

Quantitative data, including but not limited to statistical data and scientific data will be gathered and analyzed locally or obtained through an archival search. Scientific data may be obtained through instrumentation and or experiment.

Qualitative data, may be gathered from or through: direct observation, local survey, archival search and from direct interviews.

In order to preserve data, it will be compiled digitally in two different locations on disk and hard drive. All hard copy data will be scanned to a digital copy and the hard copy will be placed in folders. The data and design process will be available to scholars both in the thesis book and extremely important data will be highlighted in the final design presentation. All design data will be compiled every two weeks in order for the process to become as thorough and complete as necessary.

Second Year:

Fall Semester 2006 Architecture 271 Professor Stephen Wischer
Project 1: Tea House Fargo, North Dakota
Project 2: Boat House Minneapolis, Minnesota
Project 3: House for Twins Fargo, North Dakota

Spring Semester 2007 Architecture 272 Professor Bakr Mourad Aly Ahmed
Project 1: Montessori School Moorhead, Minnesota
Project 2: Prairie Dance Academy Fargo, North Dakota

Third Year:

Fall Semester 2007 Architecture 371 Professor Cindy Urness
Project 1: Center of Excellence Bismarck, North Dakota
Project 2: Cranbrook Library Bloomfield Hills, Michigan

Spring Semester 2008 Architecture 372 Professor Ron Ramsay
Project 1: Dakota Heights apartments Fargo, North Dakota
Project 2: 66 West Congress Office Building Chicago, Illinois

Fourth Year:

Fall Semester 2008 Architecture 471 Professor Don C. Faulkner
Project 1: The Crossing High-rise Design San Francisco, California
Project 2: KKE Competition Cigar Box

Spring Semester 2009 Architecture 472 Professor Darryl Booker
Project 1: Nueavo Mundo: Especio de Cummunidad Community Center for Santo Domingo, Dominican Republic
Project 2: Marvin Windows Design Competition

Fifth Year:

Fall Semester 2009 Architecture 771 Professor Regin Schwaen
Project 1: Fargo Airport Hotel Fargo, North Dakota

Program

Christopher R. Wetch

Throughout history people have been building shelter to get inside and be protected from the elements or possible predators. Early shelter was relatively small and was built to be purely functional. A smaller shelter was easier to heat and keep heated, and it was also easier to construct and required less material. The design was typically very simple and often was built with natural materials that one would gather from the surrounding area. When the user of the space moved on, the shelter was either left behind or deconstructed and moved with the use; which is another benefit to being small. If the shelter was left behind, it could be used by anther user or it would just simply decay and become one again with the earth. These shelters left a very minimal, if any, footprint and did not place any burden upon those who were to come in the future.

As the population of areas grew and became more civilized, the shelters became much more like homes. Early materials utilized were are wood and later concrete. The knowledge of building structures was passed on from generation to generation. Through the passing of this knowledge, more advanced methods and materials were developed. The sizes of the structures themselves were also growing in size. Everyone wanted more and more space for themselves and their possessions.

The psychological impact of having a very large house to live in was important to some people. Having a large house was a sign of power and wealth.

During the early years of building, no one seemed to truly understand what impact they were having on the environment. When the first "apartments" were built in the early eighteenth century in Paris and other European cities, no attention was focused into the design and style of the building. Unsanitary, overcrowded conditions were a large problem in these early "apartments". This led to many people becoming very sick and diseases being spread easily in the first multifamily buildings. The only reason they had for building such buildings was in response to the urban congestion. It seemed to be that the only concern of the builders was how many people could occupy a single space. Many times the owner or builder could make a very decent living providing shelter that was less than desirable to the working class people who just needed a place to live. These people were taken advantage of, but had no other option. Single family homes were far too expensive and the distance one needed to travel from a rural setting to the city in order to work was impractical.

During the twentieth century after World War II, the government became involved in providing subsidized apartments for the elderly and those living in poverty. Many of the structures were poorly designed and built. Usually the apartments turned into slums and ended up being demolished. Why did the government buildings turn to slums?

Poor design is the only feasible answer. Interaction between environment and tenant in the past was inconceivable in many situations. People were cooped up with inoperable small portholes for windows.

Green spaces and gardens are essential to apartment complexes. They need to be incorporated into designs to allow people to somehow connect with the outside world. Natural lighting through large windows and the ability to get fresh natural ventilation is a must for the design to function properly.

Building sustainable buildings should be important to everyone. If we keep building and polluting our environment there will be nothing left for future generations.

The world is already experiencing the global impact of pollution. This causes a lowered pH levels, which has a detrimental effect on our oceans. It has been said that all life depends upon our oceans. Greenhouse gasses are depleting the earth's ozone layer. The ozone layer are our only protection from the intense ultraviolet rays of the sun. This leads to global warming, or the increasing rise of the earths temperature. Global warming, however, is an extremely controversial concept and we will not know if it is really happening until more time passes. Reports of cancer are at the highest levels to date. Could this be because of all the new chemicals and pollution we are creating?

If we do not want to place this burden upon our children, we need to change the ways in which we build and live.

We can build our living structures in order to be much smaller and much more efficient. By using material that are renewable and natural, we will be protecting our natural resources from being depleted. If we use materials that can be reused, we can give life to new buildings by using the components of old, this could be more cost effective and better for the environment.

Simple principles currently exist that will help promote a smaller, more efficient design. To build smaller, more efficient shelter only requires an understanding of basic human needs.

As future architects and designers, we manipulate space all the time, we just need to have the mind set to manipulate the spaces in a much smarter, creative way. We need to abandon the old assumptions that bigger is better.

The first principle is proportion, which is a mathematical relationship between the anthropometrics, or human scale, and its surroundings. The height, width, and depth of a space should relate to the proposed function of the space. Well proportioned rooms project order and a calmness to the occupants. We have all at one time or another been in a very large space such as a stadium. The large space makes you feel uneasy or nervous because it does not relate to you on a human scale. In our dwellings every component or room should reflect each other and be proportionate to ourselves.

Modularity can be extremely effective in reducing the overall project cost and the on site construction time. The practice of modular design can deliver a cost effective alternative to traditional building and is well suited to apartments or hotels. Two of the three case studies I viewed used modular design. The Esplanade used a single modular design to create almost the entire apartment building. In contrast, the project by ONL developed four individual modules that could be connected together in an infinite number of configurations.

The later design seems to be much more versatile and could allow the structure to embrace the site. Modularity is related to proportion in the same sense that if you can build modular you directly control proportion. Many building materials that we currently use already have a modularity built into them, such as masonry brick or windows.

Scale can be tied back to proportion, however, scale relates to the relationship between overall sizes of elements. Take a window for instance: proportion relates the mathematical relationship between the height and width. Scale of the window is the relationship of the window compared to the wall in which the window is placed. Scale can be used to either inform or give the illusion of something. Relationships within a project need to remain fairly constant throughout. If something is drastically out of scale from its surroundings, it throws of the balance of the design. Scale has sometimes been used for just that because it has been used to show emphasis on something. This practice is very difficult to master and needs years of experience and practice to be done effectively.

Hierarchy is the organization of space with a level of importance. It is important to establish the appropriate location, physical size and volume of a space to be effectively perceived. In a small dwelling the living room may be more important than the bathroom, so the living room is given more space and is placed in a position to receive more natural light and ventilation.

Volume, which is in direct correlation with hierarchy, is a three dimensional element. The void that is formed by the placement of walls, floors and ceilings is a volume. Volume can be used to provide the feeling of compression or opening up. A space with higher ceilings feels larger than a space with the same physical size which has a lower ceiling. In some buildings, it is nice to have a room that encloses space or compresses you, then opens up again.

Lighting plays a major role in the effective use of small spaces. Louis Kahn once said, “no space, architecturally, is a space unless it has natural light”. Our bodies run on an internal clock of twenty four hours, and it is usually the natural light which wakes us and the lack of natural light that puts us to sleep at night. In far northern climates, such as Alaska, the drawback of having very little natural light for months at a time can lead people to suffer from depression an seasonal affective disorder.

Shade and shadow can be affective in animating a small space. The sun’s natural daylight can accentuate many materials, colors, and textures. Window placement and building orientation all affect the quality and quantity of light that enters a space. Typically, bathrooms which are dark spaces can benefit from opaque, transparent walls. A well lit, small space will always feel larger than a dark small space.

The final principle I would like to talk about is the ability of a space to be multifunctional or multipurpose. Every square foot in a small space has to somehow earn its place. Old dwellings of the nineteenth century were masters when it came to multipurpose spaces. One room was used for cooking, eating, sleeping, bathing and socializing (Ward, 1999). [19] It was easy to keep heated and easy to ventilate during the warm summer months. Furniture was rearranged to accommodate any single function. Even later in history products were developed to take advantage of space. One example would be the Murphy bed, which could be folded up into the wall and provide the rather large floor space for another function ("History Murphy Bed", 2010). [7]

Finding numerous functions to occupy one space can be difficult. Comparisons need to be made and the function of each task needs to be examined carefully. The intent of this study is to provide the maximum function while using the minimum amount of space.

We have the opportunity to do more with less space, but rarely take advantage of the situation.

From my research I have found that multifamily living is nothing new and has been done for hundreds of years. The same problems of urban congestion faced the people of yesteryear. Today, many of our major US cities are overcrowded and in the need for more housing.

By sharing common things such as centralized heating or cooling, apartments can be more cost effective than a single family house. The minimal footprint can also benefit the environment. Less property is used per occupant and therefore property is maximized.

Building smaller can be effective in reducing both the building and operating costs. Many principles can be used, such as modularity and hierarchy, to make a small space seem much larger. Natural lighting and ventilation are vital to urban apartment buildings. Lighting can affect mood and the well-being of tenants.

Green spaces and gardens are important because they allow people to interact with the environment. History has shown that without green space and gardens, typical large apartment buildings have failed. Interaction between tenants can be beneficial and provide an overall sense of community.

Research Summary

Many sustainable materials are available, are much safer to use, and many provide health benefits because they do not contain volatile organic compounds. Recycled materials can be used which may decrease the cost. Renewable materials can benefit the environment by not depleting natural resources.

A good and efficient design must be well thought out. Spaces and function of those spaces be researched and compared in size and type of activity being performed. It is vital to a small space that the maximum function be retrieved using the least possible area. Our vision of “bigger is better” is not necessarily true. Something that is very small can impact an individual.

Sustainable buildings will continue to develop in the future. Materials will become more advanced. Renewable power options will become cheaper and more available. Efficiency of mechanical systems and insulating techniques will continue to strive forward.

I am looking forward to diving into this project and making it a very cost effective, efficient solution to the problem faced by many large cities in the United States.

Esplanade Condominium Apartments

The Esplanade condominium apartments is a mixed use multifamily mid-rise building. Esplanade is located at the edge of the Charles River in East Cambridge, Massachusetts, on one of the last waterfront sites in the area. At 13 stories tall, the Esplanade houses 206 luxury residences. Completed in the Fall of 1989, the Esplanade gave residents the opportunity to enjoy spectacular river and skyline views as well as the greenery of the nearby Eliot and Fronts parks.

Image 1 Street Level View

The Architect for the project, Moshe Safdie, wanted to create a housing system based upon a flexible module manufactured off site. (Note: Safdie also received recognition for the design of Habitat at Montreal Expo 1967.) The modules could be assembled to form different combinations based on the local conditions of the site. With these modules Safdie could build more than one housing unit almost anywhere and in any configuration he wanted. Safdie demonstrated his idea of what "habitat" of design could be and his concept could be realized in a dense setting using contemporary construction techniques (Gissen, 2002). [5]

Image 2 Aerial View from building terraces

In the end, Safdie realized the entire building could not be composed completely of these prefabricated units, however, many of the building's irregular spaces, such as the lobby, still were made from prefabricated, precast concrete panels and traditional brick veneer in a standard structural concrete frame.

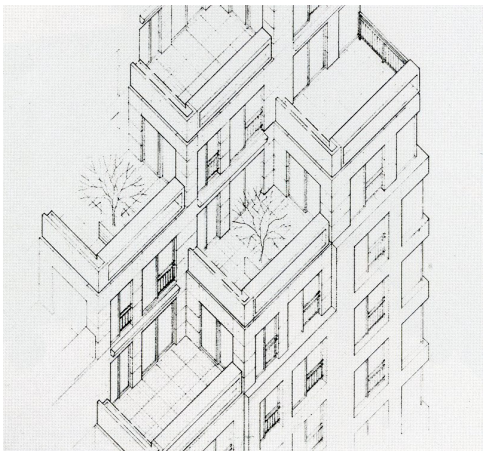


Image 3 Axonometric of Units and Terraces

Case Study #1

The design features Safdie included in Esplanade are:
•Outdoor spaces •Windowed kitchens •Bays •Floor to ceiling windows
•Natural lighting •Separate dining rooms •Balconies
•Incorporated Views •Landscaped 12' x 18' canopied terraces •A health club
•Indoor lap & wading pool •Exercise room •Saunas
•Function/ Conference rooms •Lobby with sitting area •Fireplaces
•4 levels of secured parking as well as guest parking.

I believe this building has most of the common amenities that mixed use multifamily buildings usually have, such as the lobby and conference rooms. The part of the design that I enjoy and is somewhat uncommon is the modularity of the design. The green spaces and the fact that every apartment has its very own 12' x 18' canopied terrace gives the tenant a chance to experience the outdoors even though they live in an apartment building. Safdie built this building on a site that provided access to public transportation. The site itself was reused; once there was a large rundown building occupying the space. Safdie used some sustainable techniques in the design of the Esplanade such as taking advantage of natural lighting and ventilation through the use of large operable windows. By being modular, the project cost and construction time must have been less than that of a traditional building. In conclusion, I believe Safdie designed a rather well thought out building and made an attempt towards sustainability.

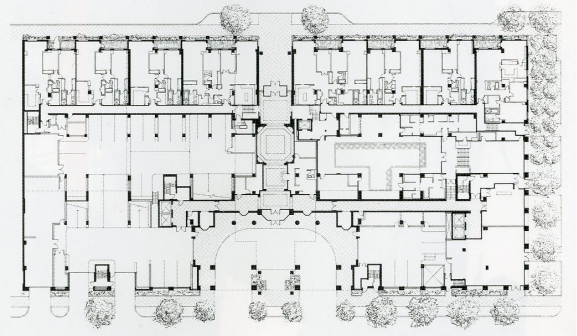


Image 4 (Left) First Floor Plan

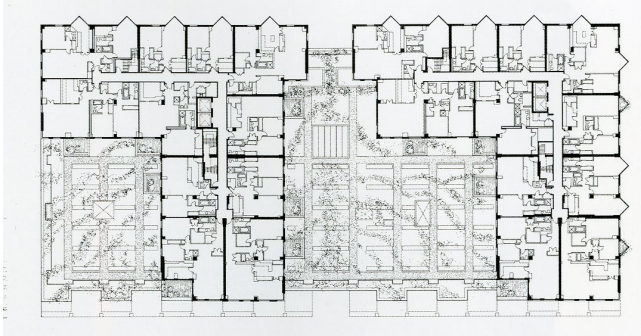


Image 5 (Right) Upper level Plan

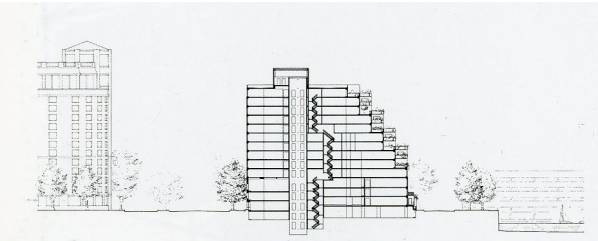


Image 6 (Left) Building Section

Rice Welch Apartment

The Rice Welch apartment is a flat, personal entrance type tenement building. The apartment type is also known as the "railroad" flat because of its long narrow rooms that are aligned back to back, without halls for circulation. Previously, the building was abandoned and in ruins when architects Paul Rice and Ward Welch purchased it. The apartment is located in the West Village area of New York City.

I chose this case study mainly because of its physical size. At 475 square feet, the apartment is very modest in size and therefore needs to be extremely efficient with the treatment of its spaces. The overall length of the apartment is fifty feet with a width of 11 feet at the ends and 8 feet wide in the middle section.

The four room apartment maximizes space by not having any walls between the rooms. Even the width of walls could jeopardise usable space. Windows are located only at the ends of the apartment; because of this circumstance, the living area and bedroom were placed at the ends to use the available natural light. Kitchen, bath, and the changing area are situated in the middle narrow section.

Some of the space saving techniques that Rice/ Welch used are a tank-less wall hung toilet. The kitchen is completely open to the living areas east facing windows to gain natural lighting.

Image 7 Living space

Image 8 Looking from the Living space back towards bedroom

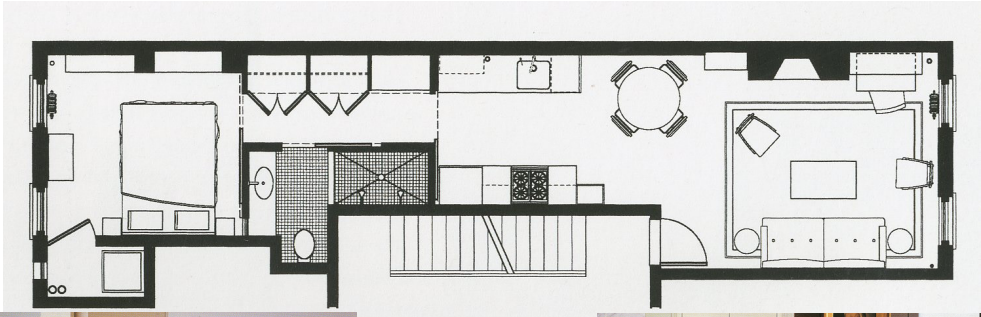
Image 9 Kitchen

The kitchen is also used for circulation due to its eight foot total width, minus cabinet space, in an effort ending up with a four foot circulation space. The bathroom has no windows so to bring light in from the bedroom a frosted floor to ceiling glass panel was incorporated.

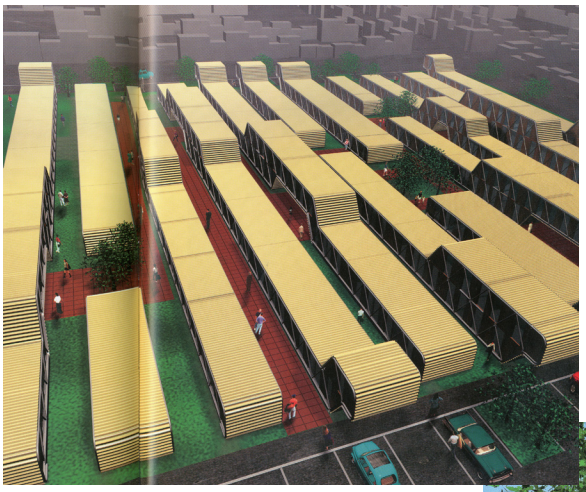
Color is also used to give the apartment the feeling of being larger than it really is. Muted dark woods are paired with warm whites and beiges. This gives the room the illusion of being larger; the contrast between light and dark fools the eye. As quoted by Rice and Welch, “no space is wasted, none taken for granted.” “We sought to determine what was essential and anything not needed was not done.”

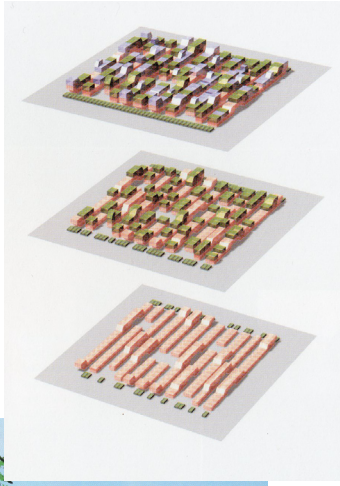
The typical bedroom, bathroom, and living spaces are the same as a typical apartment, but the size is much smaller than that of any apartment I have ever seen. In my opinion, the apartment is smaller than most hotel rooms in the entire state of North Dakota, yet it has incorporated all the essential spaces one needs to live. Environmentally, the footprint of such a small space does not impact the environment as much as a larger single family household would. This apartment would be fine for a single person or a married couple perhaps, but and how would the design change to accommodate for a larger family?

Images 10-13 (clockwise) Floor Plan, Bathroom, Bedroom, Hall to Bathroom/Bedroom



Elemental House





Images 14-16 (above) Aerial view, (top right) 3 schemes showing the ability to stack units both horizontally and also vertically, (right) Open green spaces

This is a proposed project by Rotterdam, Netherlands Architects ONL for a competition sponsored by, Element Chile Housing Organization. The competition was held in 2003 and financed by the Chilean Ministry of Housing. The competition challenged architects to design housing in Chile for 150 families on a one hector (roughly 2.5 acres) site. Each unit needed to be expandable by the resident up to 75 square meters (about 807 square feet). The maximum budget was $7500.00 US per family and the initial budget would provide 30 square meters (about 323 square feet) of space (Jones, 2005). [8] At 520 submissions, seventy percent which were foreign, the competition was fairly large. I choose to use this case study because of the density of the buildings and the efficient use of space. The modularity made it cost effective and the ability to expand also of interest to me.

The project is designed to use 11 fluid linear elements that fit on one hector of land which is just a little smaller then our typical city block in North Dakota. The buildings are composed of modular “building blocks” that are set into rows. Four design blocks used for the entire building, the central open ended block, the closed end block, the elevated open end block and the elevated end closed block.

Case Study #3

The elevated end block can be combined to form walkways either under or through the buildings.

Building block sections are based upon a triangulated "mega beam", or giant trusses, where the living sections are actually within this truss. The buildings needed to be strong and stable enough to allow the buildings to be stacked vertically on top of each other. The units sit on a concrete pad with landscaped green spaces between the long rows. Partitioned walls inside the units are constructed from sandwiched wooden panels.

A few of the important design features include: modular construction with the ability to have multiple different configurations. By being modular, using low cost materials and taking advantage of the giant truss as the only structure the building cost is kept very low. Green open spaces to promote interaction and a sense of community. Parking is situated only at the perimeters, which promotes safety. Shallow floor plans and operable windows generate the ability to use natural light and ventilation.

This concept of modularity is similar to the Esplanade by Safdie, but in this case there is more then just one style of unit. I believe this allows for much more freedom in design and the different configurations break the monotony of having one single module. Unlike the Esplanade, this project is much more about the low cost of building the units using low cost materials and a structural system which actually creates the space.

Image 17 Parking lot at perimeter

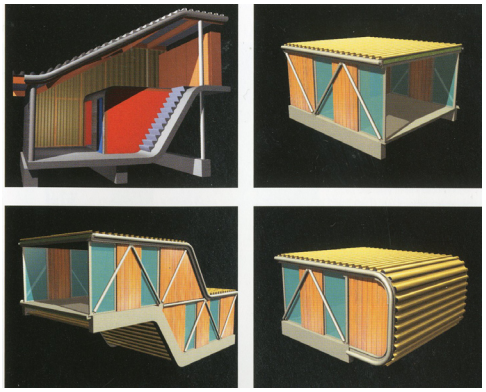


Image 18 Single and Double story kit

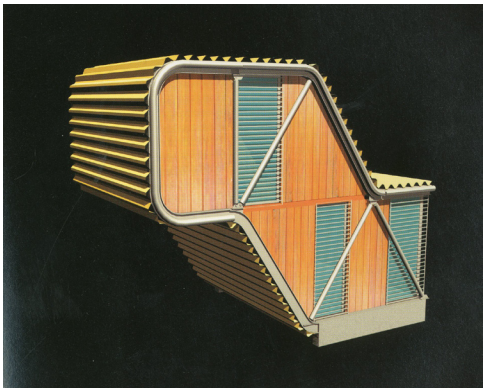


Image 19 Elevated end unit to provide ground level walkthrough

By studying the three case studies and also looking at many other projects, I have formed some conclusions about the spaces.

One can inhabit a much smaller space and utilize the space very efficiently. When designing a small space, no area can be wasted and if something is not needed it should be left out of the design. Something as simple as wall thickness of interior partitions, if done incorrectly, can jeopardise usable space. There are physical restrictions as to how small we can build. The anthropometrics of the human body require some standards of width and height to be functional. Other restrictions, such as building codes, can also determine the size of some of the spaces we design.

Large window size and placement coupled with site orientation become vital design decisions in the ability to utilize natural lighting. Keeping floor plans shallow can also facilitate natural light to enter deep into features of a space. Offsetting floor plans or taking the floor plans and physically spreading them apart from each other which the advantage of having operable windows on more then one side of the space. Currently, typical apartment units usually have most of the windows on one facade and possibly a few windows on the other adjacent facade.

Case Study Summary

Space created by spreading apart or offsetting spaces can be effectively used as green space. The green spaces promote interaction and also help aid sustainability features. Heat island effect is a rise in the ambient temperature of an urban setting due to the replacement of natural land cover with roads, buildings, and parking lots. The heat island effect can be reduced by retaining the natural surfaces, such as grasses or plants. Many natural grasses and native plant species require very little or no water to sustain themselves. Another benefit of the green spaces is the permeability of the green space. Permeability reduces runoff and flash flooding that can occur with a surface that is impervious such as a parking lot .

The expendability of a building is of great interest to me. The ability to add and adapt to different population densities is a great solution to a much larger situation, such as urban sprawl. From a sustainability point of view, the ability to expand on an existing building greatly reduces the impact of using greenfield (land which was previously not built upon) for new buildings. This land can then remain natural or can be used for the production of food. The use of greenfield space for new construction is one of the most important sustainability issues to protect. As we use up the natural grainfields we are shrinking the amount of land available for farming and the production of food.

The City and it's people:

This thesis project will be set in the wonderful context of the city of Bismarck, North Dakota. Bismarck is located in Burleigh county, one of 53 counties in the state. Burleigh county is located in the south central portion of North Dakota. Bismarck was founded in 1872 and has been the capitol since North Dakota became a state on November 2, 1889 ("Encyclopedia Britannica Online", 2009). [4] The geographical coordinates of Bismarck are 46° 48' 48" N and 100° 46' 44" W.

Image 20 Welcome to Bismarck Sign

The Missouri River defines the western edge of Bismarck. According to the 2000 census, Bismarck had a population of 55,532 making it the second largest city in North Dakota, coming only second to Fargo ("Populations ND", 2009). [12] Mandan is a smaller sister city (Population 16,718 as of the 2000 census) [12] which is located to the west of the Missouri River. There are three bridges which allow travel between the two cities. Liberty Memorial Bridge, which is the newest of the three bridges, was dedicated on November 11, 2008, following the demolition of the old Liberty Memorial Bridge built in 1922 ("Liberty Memorial Bridge", 2009). [9] The other two bridges, one to the North of the Interstate 94 bridge and the other bridge to the south the Expressway Avenue bridge, provide adequate means of travel between the cities.

Bismarck Liberty Memorial Bridge at night

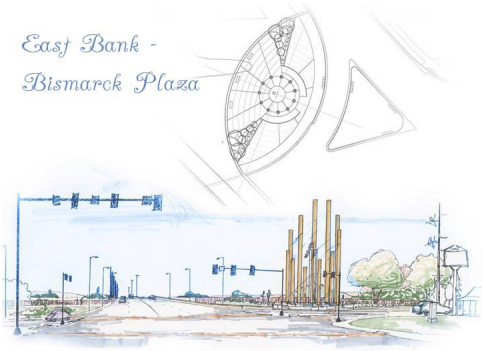


Image 21 Liberty Memorial Bridge Public Involvement Plan

Bismarck houses the state governor John Hoeven and also the city mayor John Warford. Bismarck houses the tallest building in North Dakota at 241 feet 8 inches the Capitol Building also referred to as " the skyscraper on the prairie" ("Capitol Building", 2009).[2] The Capitol towers over the central part of Bismarck. The state of North Dakota houses a 27 member Senate and a 94 member House of Representatives ("Encyclopedia Britannica Online", 2009). [4]

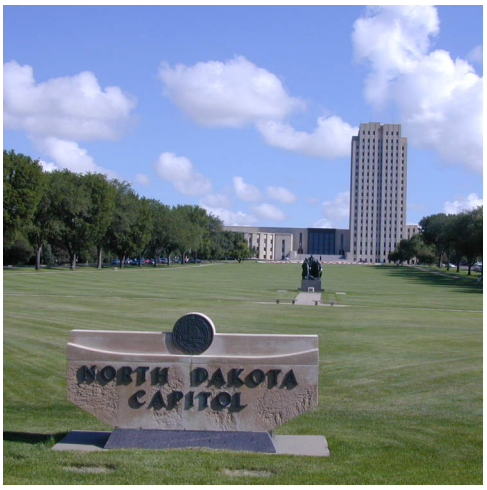


Image 22 ND state Capitol

Bismarck is the economic center of a large portion of south central North Dakota and North central portion of South Dakota.

Image 23 Typical Farm

Bismarck is a major distribution center for the agriculture industry. North Dakota is an agricultural state which has many grain and livestock farmers. Services and retail trade continue to dominate the local market. Together the services and retail portion employ more than 50 percent of the non-agricultural workforce ("Stats US Cities", 2009). [15] The state government is the largest employer in Bismarck, which employs About 4,300 workers. [15] Additionally the health care industry employs around 4,100 workers, split between two major medical facilities: Medcenter one and St. Alexius. [15]

Image 24 St. Alexius. Medical Center

Some of the items produced in Bismarck include: energy in the form of coal and natural gas, food and food products, and heavy equipment.

The people of Bismarck and the state of North Dakota are generally found to be very loyal and dependable with a good Midwest work ethic. The data supports this. 85.2 percent of employers reported daily absenteeism to be below 6 percent and the average length of employment at a current job to be more than 8 years. [15]

Image 25 Bank of North Dakota

Demographics:

The people who call Bismarck home are traditionally of German descent and are on average 36.5 years old ("Census", 2009). [3] Families comprising 62.3 percent of the population and the averages for household and family sizes are 2.32 and 2.94, respectively. [3] The data recorded in 2000 by the United States census bureau shows there were 24,217 housing units in the city of Bismarck. [3] Of the 24,217 housing units, 63.4 percent were owner occupied and the remaining 36.6 percent were renter occupied housing units. [3] Renters comprise roughly just over one third of Bismarck's population.

In 2006 Bismarck was voted 77th best city to live in out of 100 ("Business Financial", 2009). [1] The judging was based upon a multitude of variable factors such as: financial, housing, education, taxes, quality of life, leisure, culture, and many other factors. Average family income was $56,141, almost $20,000 below the national average of $76,893. [1]

The History of Multifamily Living:

Multifamily living is nothing new and can be found as far as the great cities of the Roman Empire. This was because of urban congestion. [12] Individual housing gave way in early imperial times to communal dwelling. In Mandan, Bismarck's sister city Native Americans lived in communal earthen lodges. Only those who had immense wealth or power built large, single family residences. Apartments with four stories were the most common with some apartments reaching six, seven, or even eight stories.

Another form of middle ages apartment building used was transforming large, luxurious single houses into subdivisions so servants or guests could stay with the owner of the house. This method was not like the apartments we visualize today, instead, they were more of a separate suite or guesthouse built within the original structure.

In contrast to these suites, the more modern vision of the apartment first appeared in Paris and other European cities in the 18th century ("Topic ND", 2009). [16] Tall blocks of flats for the middle class society began to appear. The tall blocks of flats usually decreased in size and cost as the building ascended to a higher story from the ground level. Today what does seem to be the exact opposite while apartments or condominiums at the lower floors tend to be cheaper and smaller. The uppermost floors tend to cost more and are the largest in terms of square footage.

By the 19th century the United States and Europe had large numbers of apartments were built to providing living spaces for the huge number of industrial workers. The apartments of the time were usually poorly designed and poorly built. Overcrowding and unsanitary conditions were frequently a problem.

The typical New York City apartment was built around the 1830's, much like what we see today was. These apartments were typically known as "railroad flats" because they consisted of many rooms aligned end to end in a row like railroad boxcars. [16] Most apartments constructed before 1918 were not designed for either comfort or style, but were purely functional.

The second half of the 19th century showed great progress towards a comfortable, reasonably priced, and stylish apartment. The first truly modern apartment building that contained elevators, central heating systems, and other shared amenities emerged in the 20th century. Apartment buildings continued to grow in importance due to the increased land values within the cities. Single family homes became less practical and not very cost effective.

The United States government became involved and provided subsidized, or public housing, for individuals who were elderly or living in poverty. Ever since World War II, apartment and multifamily facilities have become more and more popular.

The mid or high-rise apartment building has become a major fixture in the skylines in many US cities. The most common form of occupancy has been renter based, although there has been a movement towards the condominium practice where the occupant owns his/ her dwelling unit.

History of Sustainability:

Early sustainability issues go as far back as the 1950's, with the introduction of the Clean Air Acts of (1956 and 1968) ("US Environmental", 2009). [17] Environmentalism seemed to become fashionable with the hippies of the 1960's and became the mass publication of material for an environmental cause.

The United States government first became involved in the 1970's when they proposed the 1972 Limits to Growth Report at the Stockholm Conference. In the 1980's, there was a significant gap between what the public expected of businesses and what businesses were actually doing in terms of the environment. The public soon lost faith in both the government and what businesses were attempting to do.

Then, in 1993 the United States Green Building Council (USGBC) was founded and re-ignited the public's interest in green building design and practices. To date, the USGBC has over 20,000 member companies and more than 100,000 accredited professionals ("USGBC", 2009). [18]

There are four major project elements that I intend to focus on during this thesis project, the first being sustainable design. Sustainable building and living is the gate into our future. Not only will it benefit future generations, but hopefully we will be able to see the results of our efforts in our lifetime. In order to see these results, we need to change how we view sustainability. By lowering energy consumption and increasing the use of renewable, recyclable, natural systems, and materials, we can not only enhance the experience of the user, but also increase the lifespan of the building. By increasing the lifespan of our buildings we reduce the need for new buildings. In my opinion, some of the best architectural buildings of the world are the buildings that push current technologies of sustainable design. Our knowledge of current sustainable strategies and materials will only increase over time. Past economic hardships have tended to decrease the value of residential and commercial properties. The addition of sustainable features can increase the value of the structures when compared to that of a traditional building of the same type, size, and geographical location that does not have sustainability built into it.

The second element of my interest is the function of efficient living. Currently and in the past, the populations of the United States of America have lived in much more space than is necessary. There seems to be a multitude of wasted and inefficient use of space in which we live. By designing more efficient dual functional space, we can concentrate our living space and therefore decrease the cost of operation, and material volume, while increasing density where important and decreasing urban sprawl. There are many more benefits which will be discussed in another section. Currently there is a disconnect among individuals in the United States between showing power and wealth. Those who see themselves as powerful and wealthy tend to show it with the housing they build. A move towards a more modest approach can express the same feelings, if done correctly.

The third element I want to address is the mixed use or multipurpose space. The duality of space can achieve many beneficial things. In Bismarck, as in all of North Dakota high, population densities are not a problem yet. In future it may become a problem as it currently is in many major cities such as San Francisco, California or New York City. The mixed use function is a way to offset living, or rent costs, by providing revenue from the businesses that will be recycled back into the building. Mixed use can also provide the potential for some of the tenants to live, work, dine, shop, and entertain all within one building. Even though it is impossible to perceive if everyone living in the building is using all the functions of the building, it is perceivable that tenants will use some of the functions. By having a mixed use, dual purpose building we can reduce pollution from nonrenewable transportation methods and decrease travel time involved with leaving the building for everyday necessities.

Finally, but no less important, is the ability to comprehend the standard of living now and in the future, compared to the past. With a widely fluctuating economy I do not believe you will see many individuals building grossly overdone residences. We as a community and world need to change our perceptions and perspective of what a standard of living should be. The notion of building inefficient, wasteful space should be replaced with smart efficient designs that allow us the same functions of our past housing. In my opinion, multiuse and multifamily spaces are the future of inhabiting space.

Direct Goals:

•To acquire knowledge through the process of research and design of a sustainable, mixed use, efficient, and economical design.

•As a professional, this project solves a complex problem by reducing our economic burden and ultimately reducing our carbon footprint. We as designers are facing ever increasing population growth and therefore need to develop new ideas and designs to accommodate this for our future generations.

•I have great interest in becoming as sustainable as possible in current times, although this is not yet completely possible because of many situations where technology or strategies are not in place within our area. The technology and advanced material development is a field in which I would like to participate in. I would like to get involved with educating the public on the benefits of such systems and materials.

The site I will be using for this project is currently not built upon and is used for drainage. The views from the site include:
•North- a single family residential community with a few small businesses
•East- State Street with six lanes total: three north and three south. East of State Street is the currently empty Home Depot business and many other smaller retail stores and restaurants.
•South- Menards, a large retail building
•West- A multifamily complex and also single family homes
The view towards the northwest, north, northeast and east are the best out of the site.

State street runs north and south all other roads within close proximity are curved in nature. The curved roads provide a breakup of the traditional North South, East West grid that most of Bismarck adheres to.

The site is fairly rectangular with the small drainage stream running diagonally from the South West to the North East.

The site sits about ten feet below the grade level of the streets. About a quarter mile to the North is a hill that is around sixty to seventy feet higher in elevation than the site. The site has a nice rhythm in terms of building heights which surround it. The residential houses are not as tall as the retail buildings to the South, but are situated further up the hillside so they appear to be at the same level.

The site is in direct sunlight with no shading from buildings or trees. The light quality entering the site is very intense. Light is white in color and has a color temperature of natural sky and sunlight which is 6500 ^{o} Kelvin ("Sizes of Things", 2009). [13]

Vegetation on the site includes native grasses of the area. Water in the drainage stream was not present when I visited the site, although it would appear during rainfall or springtime thaw water would be present. There were no signs of pollution around the entire site.

Since the site is around ten feet lower than that of the road bed it seemed to be slightly sheltered from the wind. The only Human intervention I could recognize was the rather thin drainage stream bed which is about three feet wide and two feet deep. The drainage bed is extremely straight and not a natural feature. People are currently not present or utilizing the site. The only noticeable distress on the site is the slight erosion from the drainage stream. No trees currently exist on the site.

Soils that compose the area are: ("Soil Survey", 2009) [14]
•(AgA) Arnegard and Grassna silt loams level
•(TnC) Temvik silt loam rolling
•(WzE) Williams - Zahl loams hilly

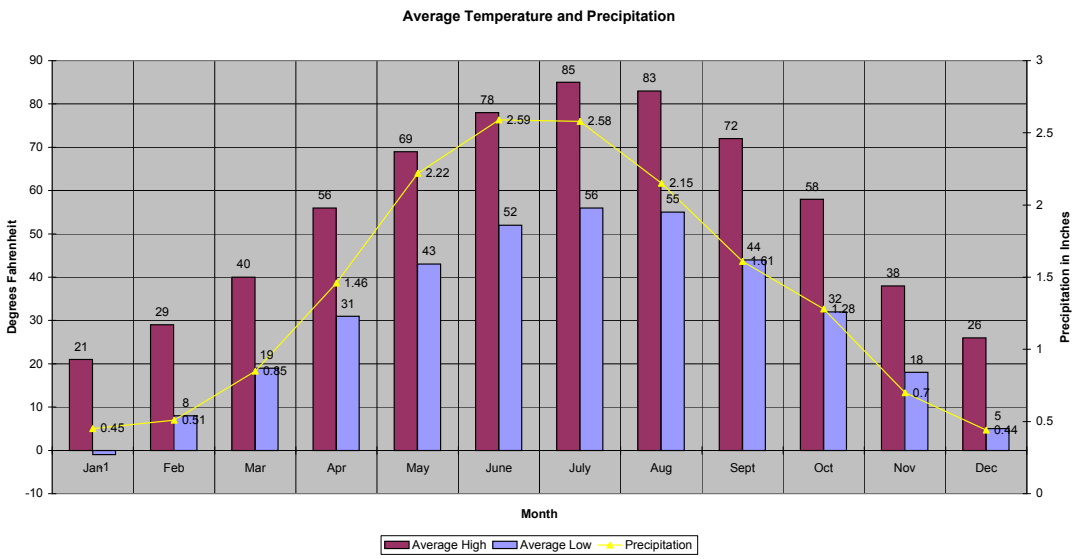
The water table around Bismarck gets more shallow the further you move south and west towards the Missouri River. The South side of Bismarck is lower then the North. Currently, I do not believe any utilities run through the site. Vehicular traffic is the heaviest to the East of the site on State Street and minimal on the streets to the North and West. Currently, no pedestrian traffic exists as their are no sidewalks or paths on the site. The slope of the site is estimated to be between 4 percent and 6 percent.

Setbacks required by the city for new construction are as follows: ("Official Web Site", 2009)[11]
•25 feet to the street side
•20 feet to the rear of the building
•20% of the average lot width or a minimum of 6 feet for the side yard
•Corner lots must maintain a 25 foot setback from all property lines

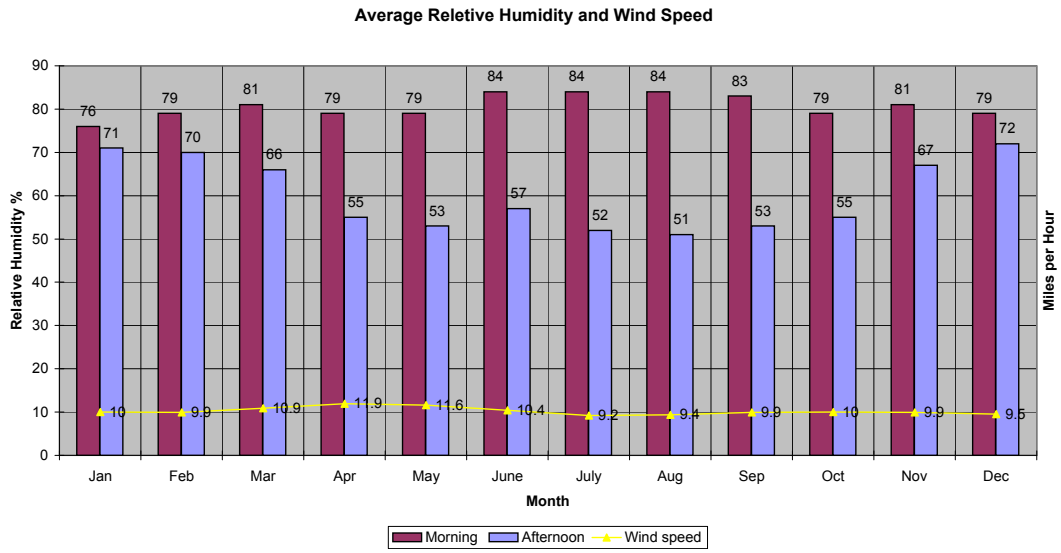
Bismarck is located on the 46th latitude north which translates into a short pleasant summer and a dominant winter season. Existing on the 100th west longitude, Bismarck can be categorized as having snow and frost during the winter months.

Altitude is, on average, 1,900 feet above sea level. Since there is a correlation between temperature and elevation that is about 3.5 ^{o} Fahrenheit per 1,000 foot rise or decrease in elevation it can be assumed that Bismarck is about 7° F cooler then a coastal city near sea level ("Weather Facts", 2009). [20]

Noise on the site emanates from vehicular traffic on State Street to the East. Some noise is possible from the Menards parking lot, however this noise is less then that of State Street and would only be during regular business hours.



Data ("National and Local", 2009)[10]



Data ("Golden Gate", 2009)[6]

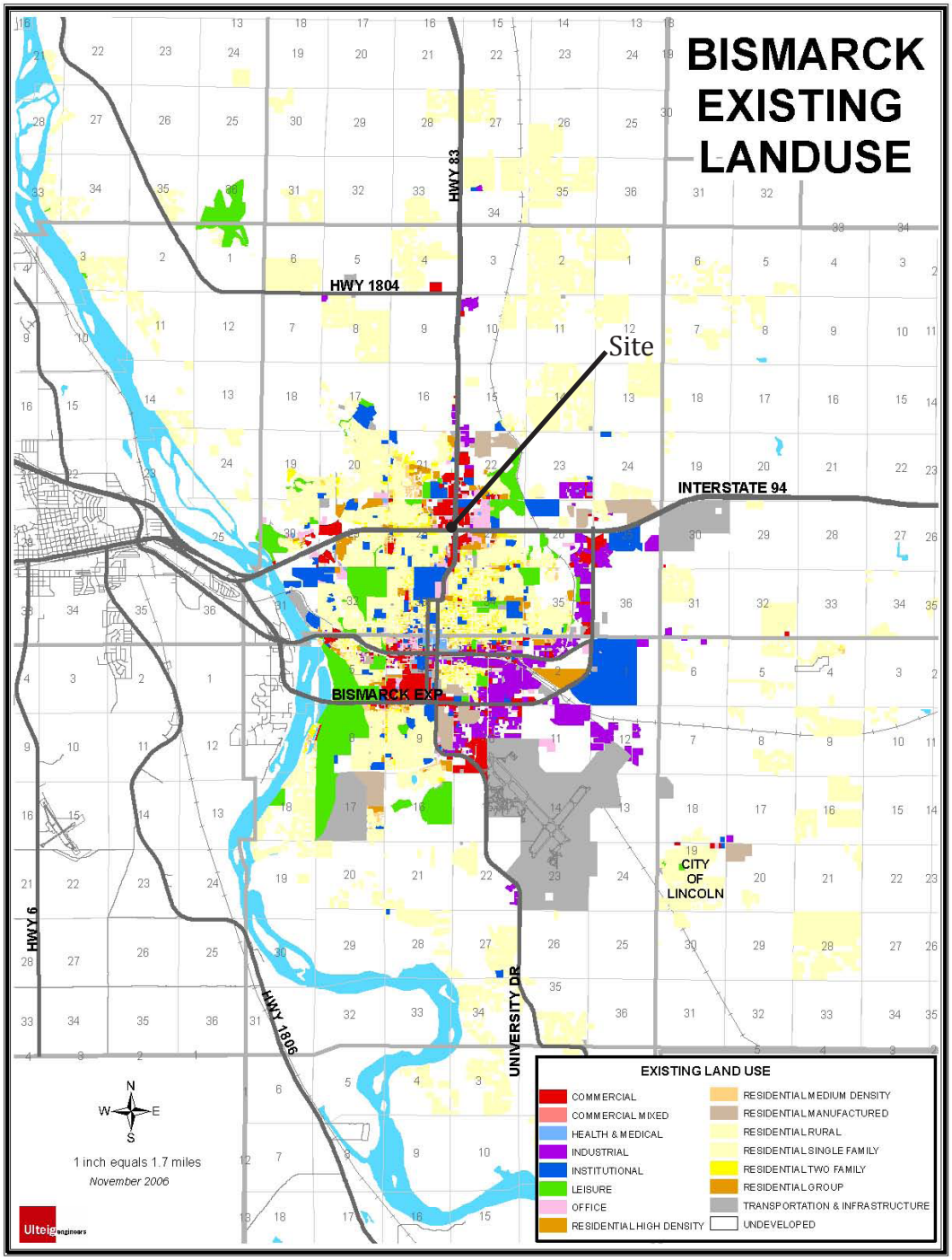


Image 26 Bismarck Existing Land Use

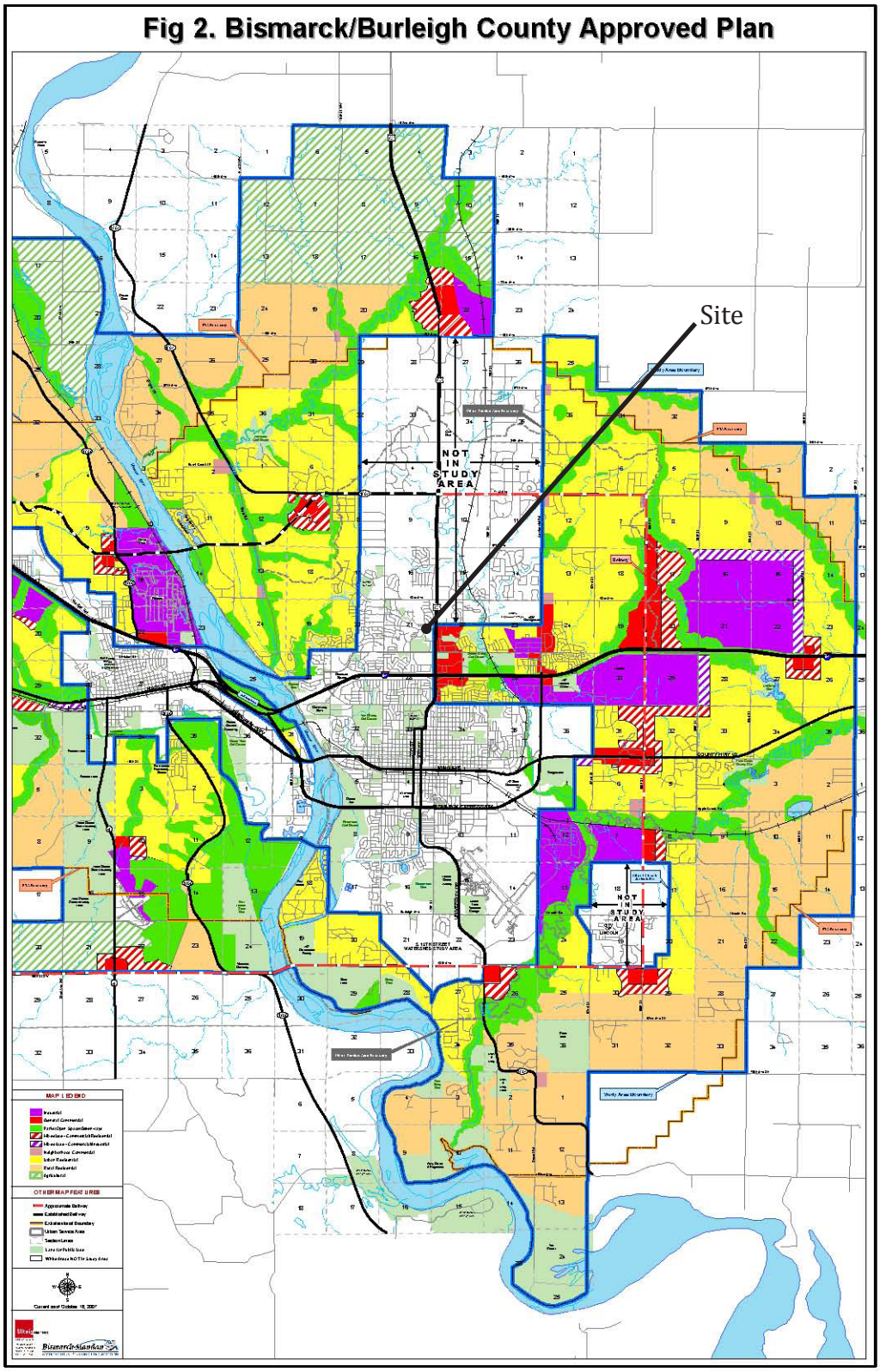


Image 27 Future Land Use Plan

Programmatic Requirements

In order for this mixed use multifamily building to maintain a strong sense of community there needs to be improved connections and interactions between neighbors. The spaces will rely on paths and area centers that allow for unexpected meeting of individuals. The close proximity and concentration will provide the means necessary for this to occur. Interaction between the tenants of the building will become an everyday experience.

Master plan Programmatic spaces:

•Living Units:	
Single occupancy	400 Sf / Unit
Double occupancy	600 Sf / Unit
Family	800 Sf / Unit
•Retail spaces	6 @ 2500 Sf
•Office spaces	2 @ 6000 Sf
•Professional Practice space	1 @ 6000 Sf
•Green space / gardens	
•Conference Rooms:	
Meeting room	2 @ 1200 Sf
Multimedia room	1 @ 2000 Sf
•Entrance Area / Lobby	2 @ 500 Sf
•Public Rest rooms	2 @ 400 Sf
•Exercise room	1 @ 1000 Sf
•Pool / Recreation room	1 @ 4000 Sf
•Parking facility for 60% of Tenants	
•Parking spots for 20 customers	
•Mechanical room	
•Service room	1 @ 300 Sf
•Bicycle storage for 30 bikes	

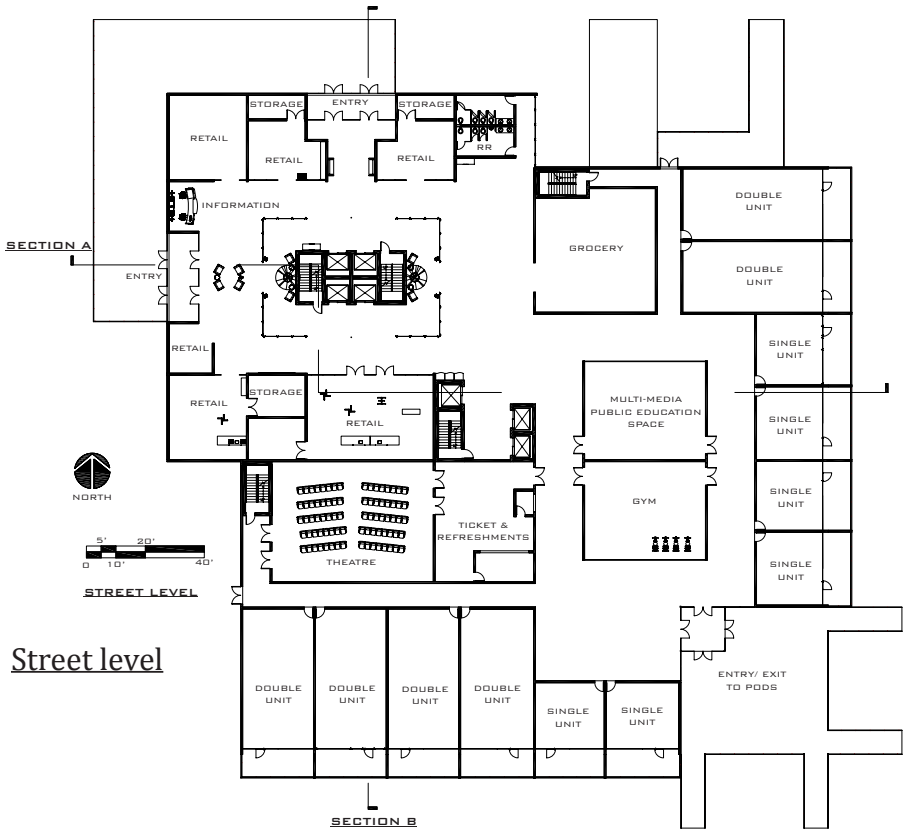
GRAND COULEE LIVING AND RETAIL

Bismarck, North Dakota

Will there be a paradigm shift in the way people build and live because of varying economic conditions? The world's population currently and in the future will need to be more attentive to the general standard of living and reduce the economic burden placed on people through more efficient renewable/ recyclable design. If we do not act soon our children may have undue burdens placed upon them with no way of reversing the process.

Site Plan

Multipurpose: by developing a space which contains both retail as well as everyday services, and residential dwellings can provide a large benefit to the occupants. Providing work, everyday essentials and by being in close proximity to the occupants it reduces our economical and environmental footprint.



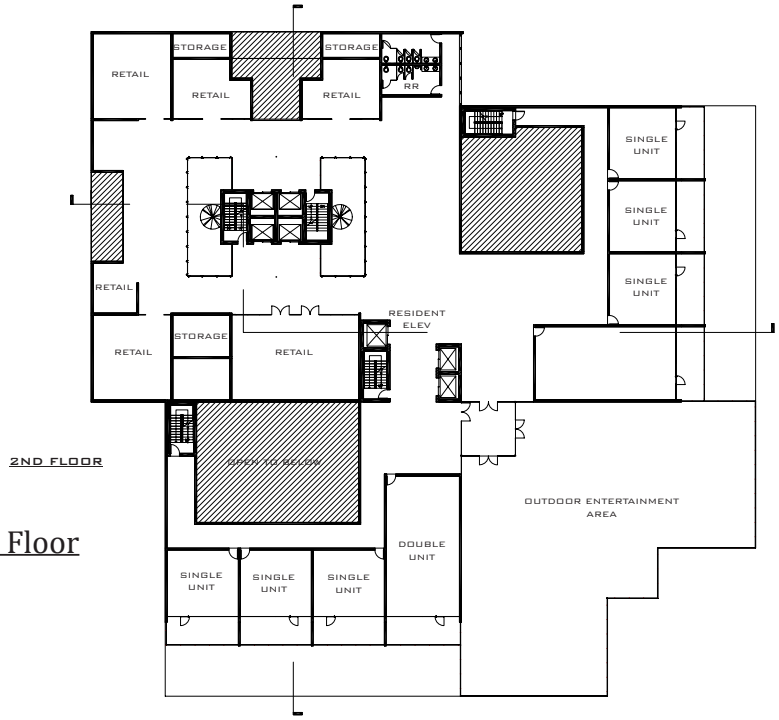
Street level

The basement or ground floor of this building which is a direct footprint of street level houses mainly parking along with mechanical equiptment.

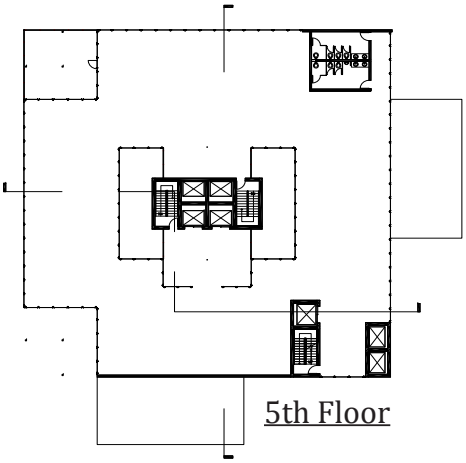

Entry level mall

Proportion:the mathematical relationship between the anthropometrics, or human scale, and its surroundings. Well proportioned rooms project order and calmness to the occupants.

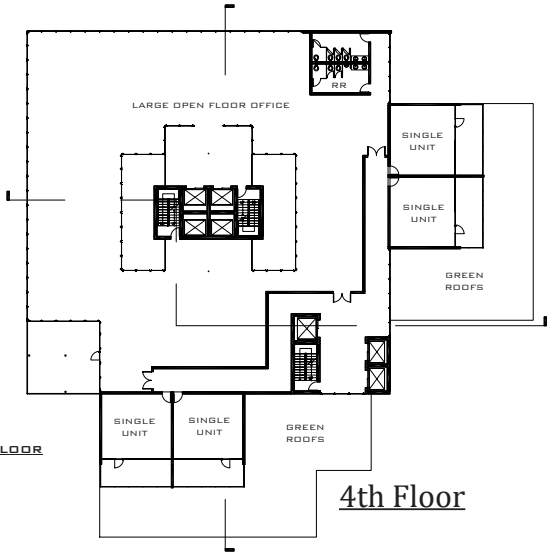
A mall can provide vital revenue from the retail spaces. This generated revenue can offset the cost of living for the residencial sector. Many local products our produced in Bismarck, and I felt that these small retail spaces would be reserved for the sale of such products.



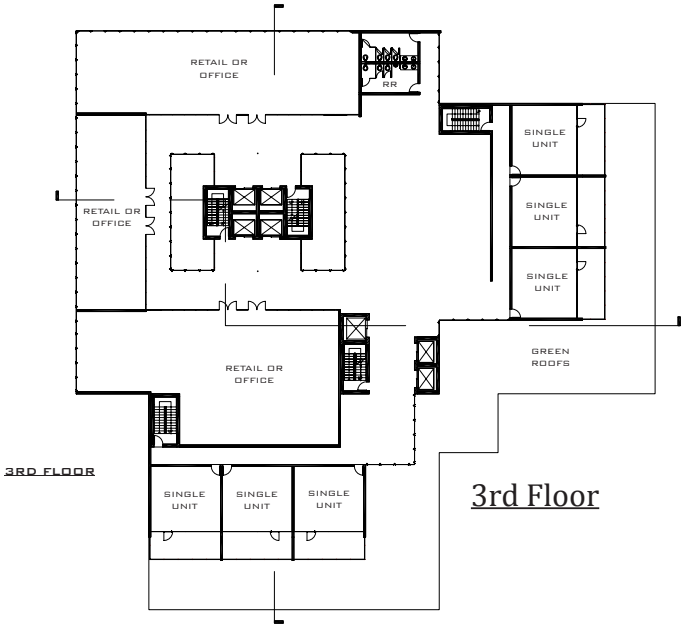
2nd Floor



5th Floor

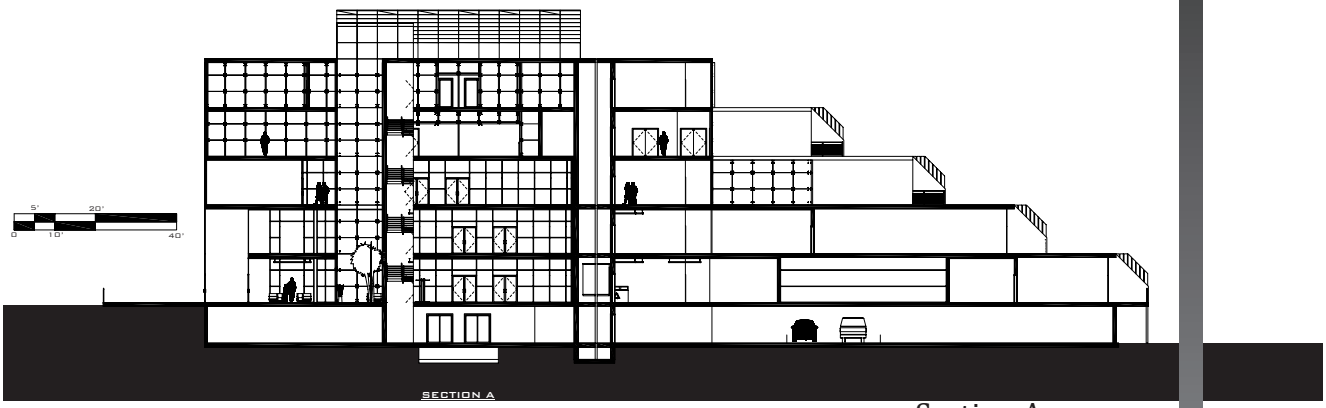


4th Floor



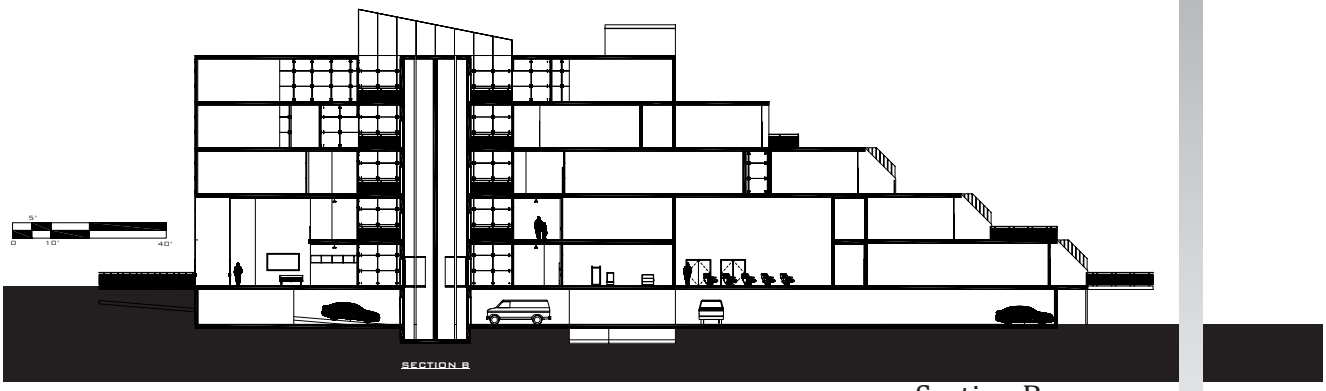
3rd Floor

On the 3rd floor there are larger retail spaces that could also be office space. These spaces would be for more domestic retail chain stores. The 4th and 5th floors house large complete open floor office space. Both the 4th and 5th floor have separate break spaces that exit the building onto 25 foot by 25 foot outdoor spaces. Floors 4 and 5 are comprised of roughly 15,000 square feet. Floors 3 and 4 also house single residential units. There is a separate elevator and stair bank for these residential units located in the southwest corner.



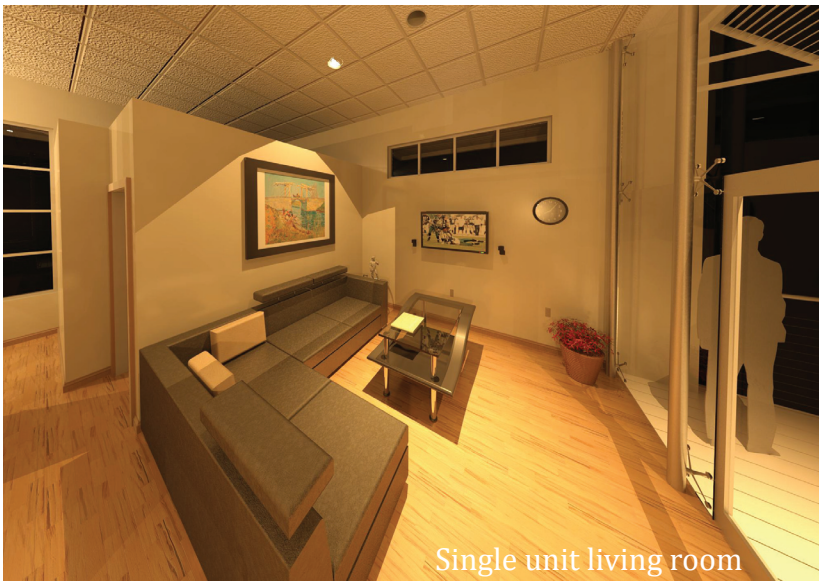
Section A

In the sections you can see the central shaft housing the elevators and stair wells. The walls of this core would be comprised of spider glass allowing for maximum light transfer down to the lower levels. Two main floor openings allow light to pass through from the glass roof down to floors below. Also visible is the main or ground floor parking spaces, double height theatre, and main north entry space.



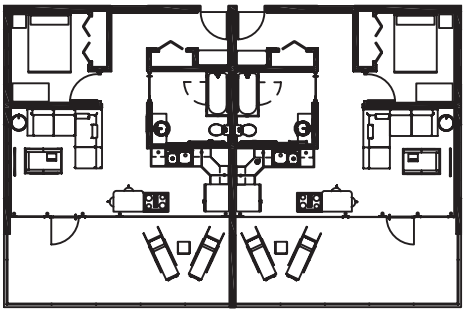
Section B

LIVING PODS

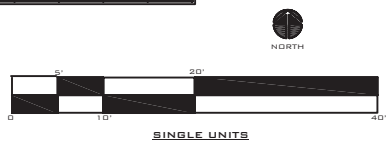

Single unit living room


Entry


Kitchen



Single Units

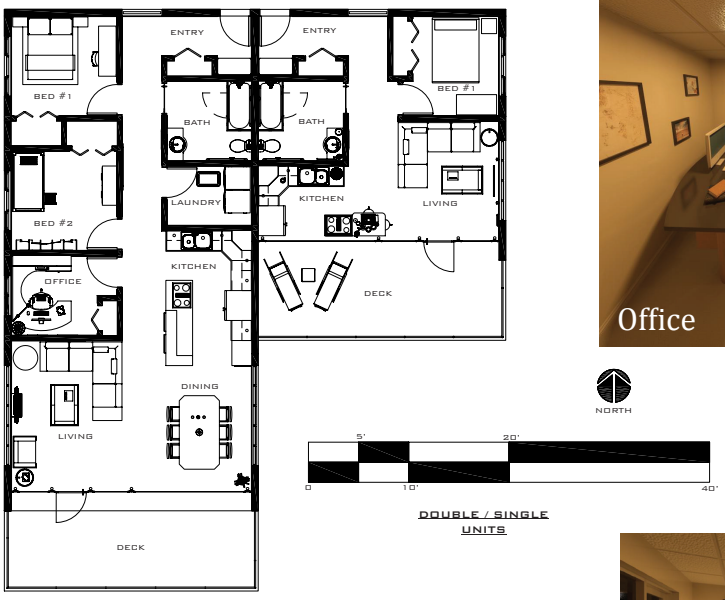


Proportion:the mathematical relationship between the anthropometrics, or human scale, and its surroundings. Well proportioned rooms project order and calmness to the occupants.

Lighting: lighting plays a major role in the effective use of small spaces. Window placement and natural light can accentuate many materials, colors, and textures. A well lit, small space will typically always feel larger than a dark small space.


Sectional Perspective

Single/ Double Units



DOUBLE / SINGLE UNITS


Office


Adult Bed


Living/ Dining Double unit


Children Bed

DOUBLE UNITS

Double Units

Google Earth. *images accessed October 3 through December 11, 2009*

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"Early in my educational experience I believed getting accepted into Architecture school was going to be the hardest part"

I would like to thank the only people who could have made all of this possible, my mother and father, Robert and Myrna Wetch and in memory of my sister,
Melissa A. Wetch