

Alzheimer's Remediation Center:

Architecture for Research Innovation and Treatment



Amanda Mauch

Alzheimer's Remediation Center:
Architecture for Research Innovation and Treatment

A Design Thesis Submitted to the

Department of Architecture and
Landscape Architecture
of North Dakota State University

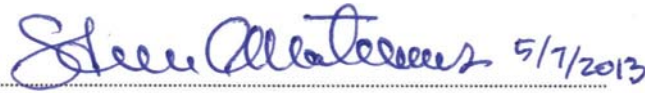
by

Amanda Mauch

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



Thesis Committee Chair
May 8th, 2013
Fargo, ND



Steve Martens, Architect
Primary Thesis Advisor
Associate Professor

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Signature Page



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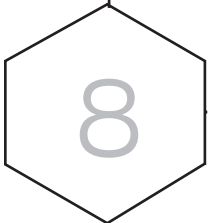


“Alzheimer’s Remediation Center: Architecture for Research Innovation and Treatment” addresses the question, “How can perceived spaces within a structure affect memory retention?” The Typology from which to examine this inquiry is best explored through design of an Alzheimer’s Research and Assisted Living Facility. The research will be guided by the assertion that Architecture can become an environment which triggers mental changes in its occupants, a tool which advances treatment and research of Alzheimer’s disease.

The project justifies itself by the following: Making up a significant amount of the world’s population, the “baby boom generation” is coming of an age where many are being directly affected by Alzheimer’s disease and there is a shortage of personalized design for dementia patients. Scientists have limited tools with which to study this disease. Projected Alzheimer’s rates are at a rise. This project proposes a building which patients inhabit as a research tool; one that temporarily remediates symptoms and provides researchers an environment to directly study the disease. The project location will be an off-site branch of the Mayo Clinic, in Rochester, Minnesota. Proposed location is on a nearby, underutilized parking lot currently owned by the Mayo Clinic.

Key Words

Built Environment
Remediate
Treatment
Research



Abstract



9

How can perceived spaces within a structure affect **memory retention**?

Problem Statement





Statement of Intent





Typology

Alzheimer's Research Facility & Assisted Living

Theoretical Premise



Claim:

Through a design that acknowledges the physical, emotional, and mental needs of Alzheimer's patients and responds to factual knowledge of the disease, the built environment could trigger changes in memory. This would provide researchers with a basis to study Alzheimer's disease and provide and advance treatment.



Supporting Premises:

Premise 1: The Actor: Changes to current institutional settings for elderly care can facilitate an ideal living environment from which researchers can gain knowledge about a disease that is an emerging issue of concern in our nation.

Premise 2: The Action: Serious concerns remain today about the quality of care and quality of life in elderly care facilities; particularly for Alzheimer's and dementia sufferers. By improving this quality of life and placing residents into a living environment conducive to their varying needs, advances may be made in remediating their symptoms.

Premise 3: The Object: This can be done through a design which incorporates patients' mental and emotional needs in addition to their physical "programmatic" needs by utilizing factual evidence of Alzheimer's disease and dementia.



Unifying Idea:

Architecture triggers mental changes in its occupants: Architecture is a potential tool for advancing treatment and research of Alzheimer's disease.



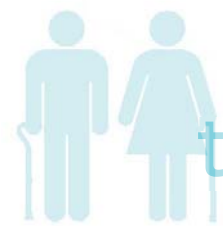
Typology + Theoretical
Premise



As a constantly aging population, Alzheimer's Disease (AD) directly affects each one of us in one way or another. Paul Scherr, a researcher for the Alzheimer's Association, estimates that by the year 2030, the portion of the United States' population age 65 and older is expected to double, making up about 20 percent of the nation's total population. As this number increases, so too will the number of Alzheimer's patients. (Scherr 2003)

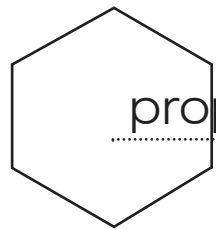
As taxpayers, we are all being affected today by Alzheimer's health care costs. "By 2030, Medicare spending on Alzheimer's patients alone may cost nearly \$400 billion--roughly equivalent to today's entire Medicare budget. Health experts warn that paying for AD could bankrupt the federal health budget." (Dezell, Maureen & Hill, 2009) In addition to all taxpayers being affected, the caregivers of AD patients deal with the direct costs; this can be very emotionally taxing. There is a current shortage of specialized memory care facilities in relation to the number of people suffering from Alzheimer's. Much of the cost of Alzheimer's disease comes from accidents that are prevalent among disease sufferers. Providing Alzheimer's patients with an environment that is personalized to their varying needs would reduce risk of injury and costs of expensive hospital visits would likewise be reduced.

As a whole, Alzheimer's disease is an increasingly urgent reality which needs immediate attention. We hear about cancer research advances and treatment facilities all the time, but as one of the leading causes of death in the United States, this disease needs to be gaining the same amount of public awareness. A facility that treats current symptoms of the disease would provide researchers with an opportunity to directly study Alzheimer's in a clinical research setting in order to make advances in disease research and treatment methods for the future.



the proposal





proposal narrative



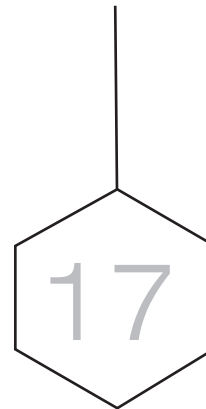
A question was recently asked of an architectural studio class while studying the design of urban spaces:
“What accommodations are made for the elderly within the realms of architectural design?”

The reality that the elderly population have unique and special needs often gets swept under the rug in favor of generic institutional design solutions. Potentially the most impacted, are those inhabitants suffering from Alzheimer's disease and dementia. Alzheimer's disease is a growing concern that will affect each of us directly or indirectly at some point in our lifetime. "It is the sixth-leading cause of death in the United States and the only cause of death among the top 10 in the United States that cannot be prevented, cured or even slowed." (2012 Alzheimer's Disease Facts and Figures)

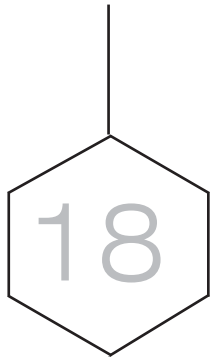
This thesis aims to do two things: remediate the current symptoms of Alzheimer's and advance research of the disease for the future.

r e m e d i a t e

A responsive building design will seek to address the current issues associated with elderly care facilities by considering all forms of wellness: **physical, mental, and emotional**. In current memory-care facilities, one of the major concerns is the ethical treatment of the residents. It is difficult to know if a resident is being abused because of their fragile mental state and the sad reality is that it happens. Most times, the primary caregivers of these patients are a spouse or other close loved one. For this reason, dementia and Alzheimer's patients in this facility are welcome, and encouraged to have personal caregivers visit and or/live with them.



"In addition to relieving patient suffering, research is needed to help reduce the enormous economic and social burdens posed by chronic diseases such as osteoporosis, arthritis, diabetes, Parkinson's and Alzheimer's diseases, cancer, heart disease, and stroke."
-Ike Skelton
Former U.S. House Committee on Armed Services Chairman



Caring for an Alzheimer's patient is a situation that can utterly consume the lives and well-being of the people giving care, just as the disorder consumes its victims.

-Leeza Gibbons
American Talk Show Host

Often overlooked is the emotional toll that caring for someone with these types of special needs can play in their lives. It has been said that the people closest to Alzheimer's and dementia victims suffer the most. A facility design of this type should include public education spaces to train caregivers on the current disease knowledge support strategies. Having a close relative who fell victim to this disease, I have experienced first-hand the feelings of concern and anxiety over how care operations were being handled. For these reasons, this building program will also feature a professional medical staff which can be utilized at the primary caregiver's discretion and provide reassurance that the residents are receiving the care they need.

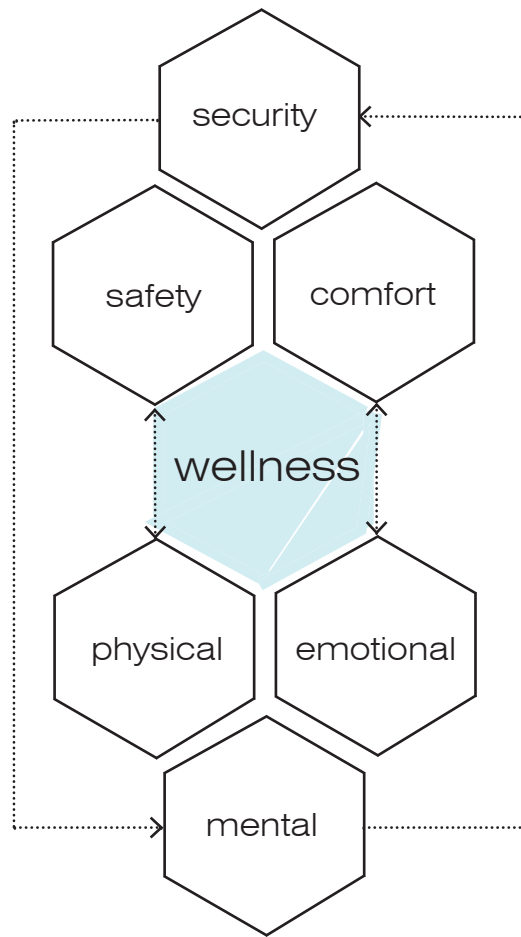
The site of a building of this type is among the most important of its features in order to be a successful, holistic design.

It needs to provide feelings of **stability, security, and comfort**, among others. This project's location in relation to the Mayo Clinic has major advantages to resident health and mental security.

a d v a n c e

The time to take action in working toward a cure for Alzheimer's disease is now. We are inhabitants of a constantly aging world. Aging is a continual process which affects each of us personally. We can not continue to make the mistake of living in the present with no regard for the future. If we are not currently being affected by an issue, then we tend to put it on the back burner: "Out of sight, out of mind..." (Kempis) in a sense. The truth is, the issues at hand will affect us at a time in our lives where we may be incapacitated in such a way that it will be too late for us to make a change. Leaving the problem for future generations to deal with is not a solution.

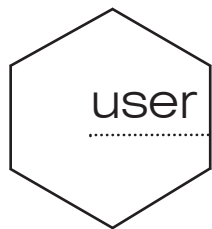
Design Dynamics Chart 19-1



Alzheimer's is an incurable disease which researchers have limited knowledge of. Possibly contributing to this lack of knowledge, is the apparent absence of tools with which to study it. For Alzheimer's and dementia patients, situational cognition and spatial perception are among the most affected areas of the brain (Martens). The environment in which patients reside is a stimulus that influences their emotions, mental stability, and reaction to their surroundings.

A thoughtful building design has the potential to respond to all of these issues by making use of this knowledge, and other various psychological studies of perception.

With all of this in mind, a building can become an instrument for study. Versatile and responsive building design can alter effects on perception, triggering changes in memory retention that could be monitored and observed. Providing researchers opportunities for exploration, it would escalate our current fruitless advances in Alzheimer's disease research and improve quality of life for future generations of all ages.



user + client description

users



Residents

Residents of this building will include persons diagnosed with dementia and/or Alzheimer's disease and their primary caregivers. Caregivers would in most cases, be a spouse or close family member. External stimuli, site selection, and various cognitive responses to spaces will all be considered in the early design stages. Near-by and on-site parking will be available for long-term residents and guests.



Visitors

Family members, acquaintances, or professionals caring for the residents will be allowed in the living quarters and public-use spaces of the building.



Researchers

A staff of researchers will be among the users of this facility. The researchers will be health-care professionals (caregivers) who monitor resident health and happiness. The building design will implement consideration toward resident privacy in such mixed-use spaces that contain multiple users.

USERS [cont'd]



caregivers

These will consist of primary and secondary caregivers. Primary caregivers are those that are currently living with the residents. They could be a spouse or close family member, for example. Secondary care-givers will consist of a team of health-care professionals who will be available at all times to assist the primary caregivers and residents as needed. These professionals will provide feelings of safety and security to residents/ primary caregivers and the building design should reflect their presence in all of its spaces.



client

Owner
The owner will be the Mayo Clinic.
The building will be an off-site branch in the nearby downtown Rochester area.



office personnel

Office staff will consist of record keepers, data filers, and greeters. They will work with the researchers to keep records of the residents' patient history. Support staff spaces will be designated throughout public and private spaces of the building, but with distinct separation from the residential building portion.



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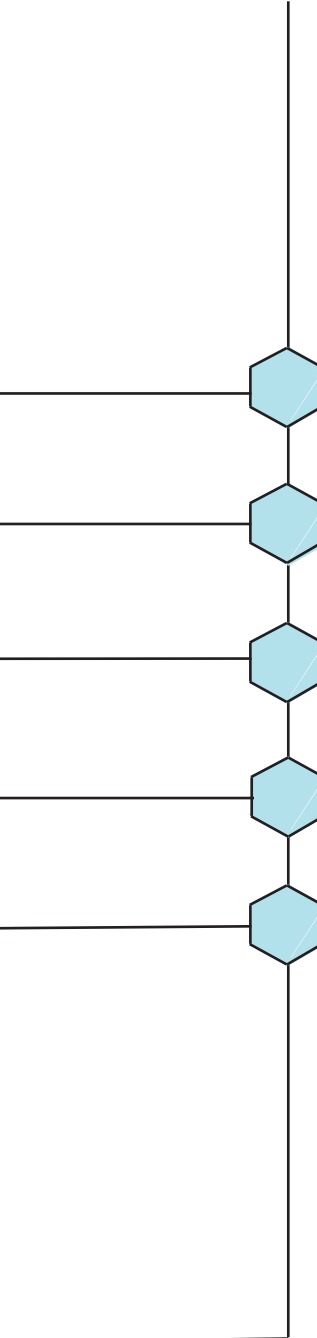
major project elements

- residential — apartment units + restrooms
48 resident units + 3 staff overnight units
+ 4 guest units
- public space — dining, education + multi-use + lobby
2500 sq ft combined public spaces
- recreation — worship + fitness/spa + activity
900 sq ft + 1570 sq ft
outdoor croquet, bocce ball courts
- research — labs, office storage, office space
3775 sq ft
- observation — observation rooms, office space
300 sq ft

other

- pharmacy
- reception
- social gathering space
- mechanical/storage
- circulation





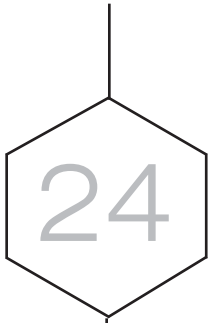
The residential portion of this building will include small, modifiable apartment-style units with living space for the residents as well as their personal care-takers. These units will be personalized according to various patient needs with visual cues and simplified floor plan layouts.

Public spaces will be areas of the building where the residents can spend time with guests and other residents of the facility. They will be both indoor and outdoor spaces. A public kitchen will be available for personal caretaker/resident use as well as outdoor garden space.

Activity/community rooms featuring various recreational activities will be provided for all users of this facility. They will vary in size for large or smaller groups, depending on function within the space. Some of the functions within these spaces may include structured classes such as painting, while some will be dedicated for unrestricted use.

Research spaces of the building will consist of data analysis and physiology labs in a separate portion of the building for Alzheimer's disease study. In these labs will be computers, medical instruments, and a large array of record-keeping materials.

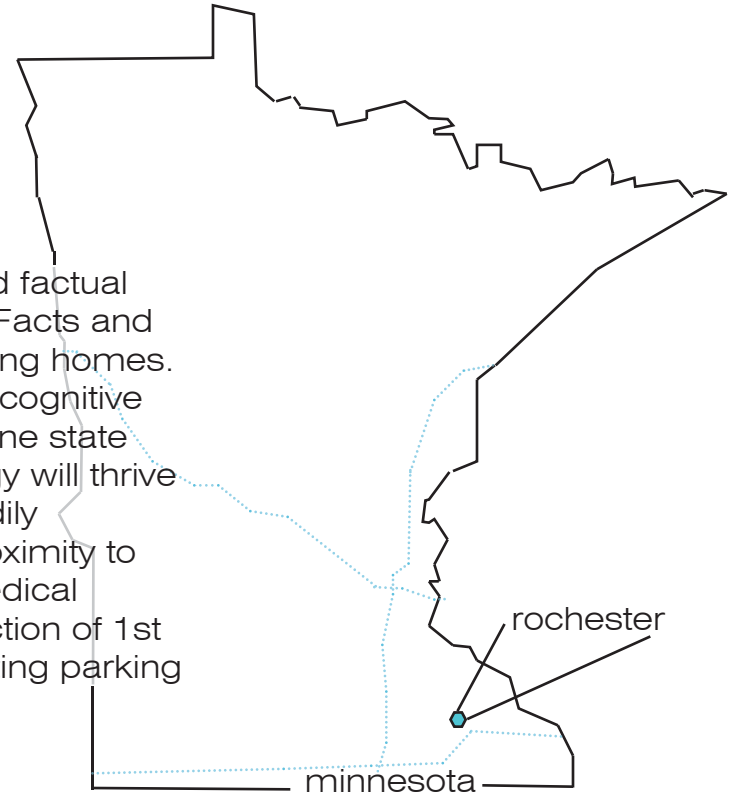
Observation rooms will have a couple different purposes. Some will have functions for therapy and general medical observation. Others will be more discrete in such a way that they are not visible to residents so that researchers can observe residents in their natural routines. This design will consider patient privacy and the patients will be made aware of the areas that monitor their behavior. The facility will be volunteer entry by both the resident and primary caregiver so that they are aware of these conditions upon entry. These conditions are similar to the in-patient studies at the existing Mayo Alzheimer's Research Unit, but will be long-term as opposed to short term study.



site

The site choice is the result of a series of observations and factual information. According to the 2012 Alzheimer’s Disease Facts and Figures, “70,474 people living in Minnesota reside in nursing homes. 70% (49,332) of those residents suffer from some form of cognitive impairment.” With those staggering rates, Minnesota is one state among many in need of attention. A project of this typology will thrive in an area where medical researchers/specialists are readily available. Rochester has these characteristics. Close proximity to the Mayo Clinic plays a vital role in the collaboration of medical studies performed in this building. Located at the intersection of 1st Ave SE and 4th St SE, this location also has plenty of existing parking for all users of the building.

Design challenges that will need to be addressed are the locations of a nearby industrial park, river, and railroad track. The building footprint will be set back far enough from the moderately busy traffic of 4th St SE to uphold safety of the residents. Other nearby functions surrounding the site are a bike path, residential area, some small commercial facilities, and apartment complexes.



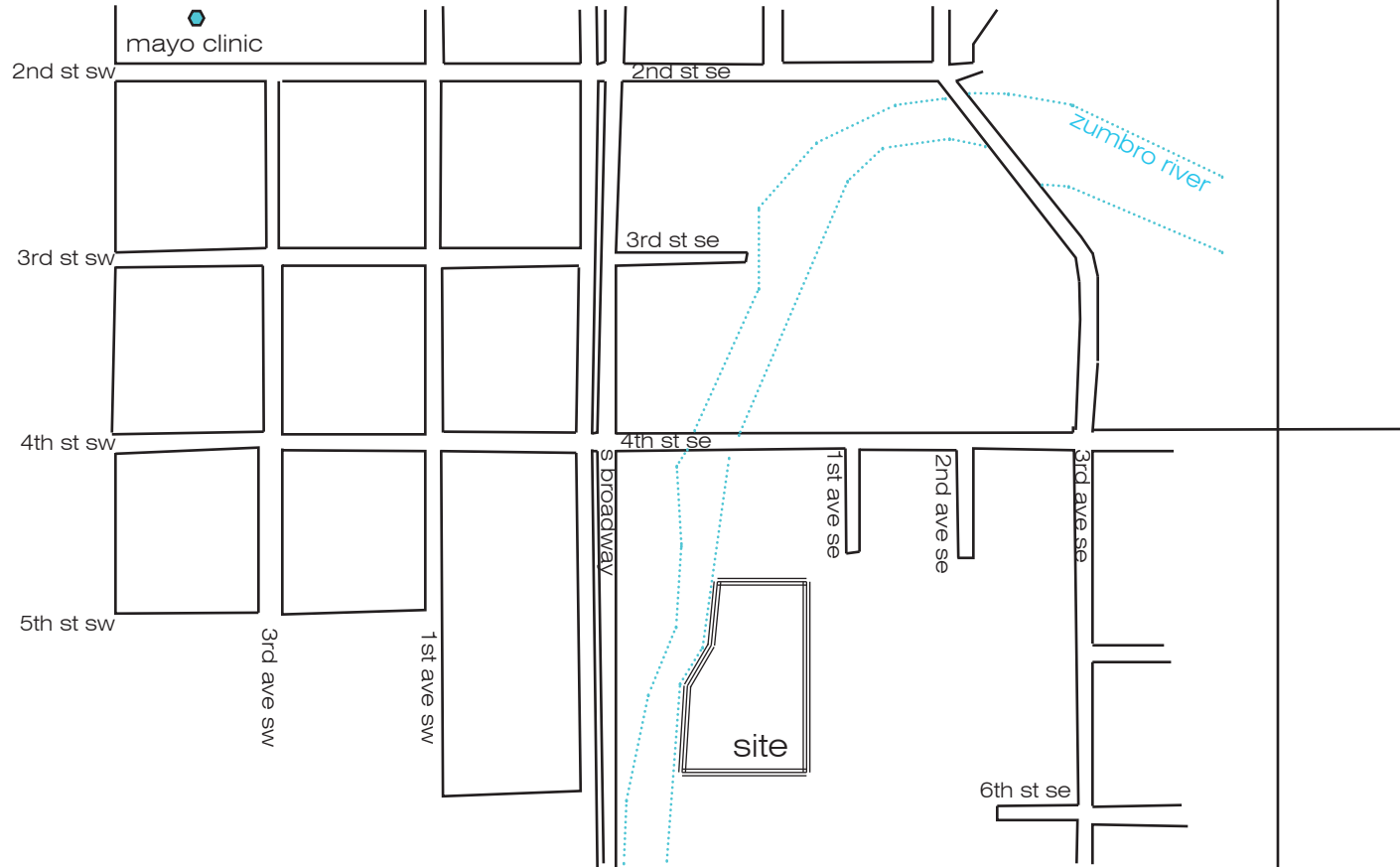
Site Location Map Figure 24-1

overview



rochester, mn
44.0217° N
92.4697° W

The site is characterized as a small, underutilized parking lot in need of repair. Current ownership resides with the Mayo Clinic and use of the lot is reserved for Mayo Clinic users. Location of site is adjacent to a recently re-paved larger lot with the same owner and uses.



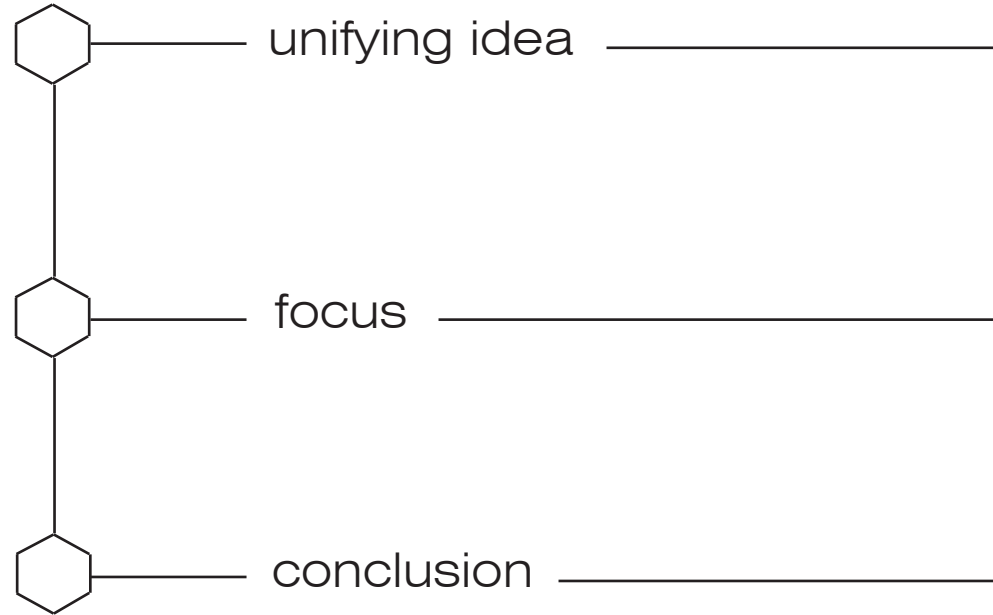
Site Location Map Figure 25-1

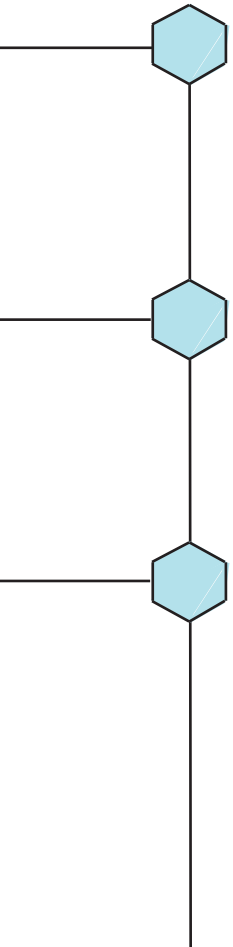
site

25



project emphasis





This project focuses on how a building design can become a versatile instrument in altering mental perception of spaces and triggering changes in memory retention. This will advance research of Alzheimer's disease and its treatment.

The dynamic focus of design is driven by existing psychological information of Alzheimer's disease and the human mind. Using information on existing studies of memory, a design can be formed which responds to those evidences.

Utilizing knowledge that already exists about what influences memory in the human mind can lead to a responsive design solution. Versatility within the design can provide researchers with a variety of stimuli with which to analyze their findings. As a result, our nation's economy, well-being, and overall quality of life can be positively impacted.

"Alzheimer's disease (AD) is a progressive degenerative disease of the brain from which there is no recovery. The disease slowly attacks nerve cells in all parts of the cortex of the brain and some surrounding structures, thereby impairing a person's abilities to govern emotions, recognize errors and patterns, coordinate movement, and remember. Ultimately, a person with AD loses all memory and mental functioning." (NY Times, 2010)

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plan for proceeding

theory

concurrent transformative theory

Quantitative and qualitative data are gathered with equal emphasis placed on both data means as well as the Project Justification/Unifying Idea. This theory allows for constant research implementation into this design which is vital to a successful project outcome. Emphasis to both quantitative and qualitative data should be equal due to the changing perspectives and ideals behind a building of this typology.

implementation

research

case study

compilation

process



Mixed Method: Qualitative and Quantitative research will be gathered concurrently.

Quantitative: Statistics, Charts, Graphs, Data

Qualitative: Research, Analysis/Observation, Interviews, Case Studies

Further research will be explored on past psychological experiments and their outcomes with focus on Project Justification and Unifying Idea. The historical context of past facilities of this typology will also be examined to enhance programmatic requirements. Site Inventory and analysis will play a vital role in the earliest stages of design.

To gain well-informed programmatic data, case studies of existing health care facilities ranging from Memory Care to Assisted Living will be analyzed. Issues and failure of current nursing home and assisted living facilities will be studied similarly. Resident satisfaction in these facilities will be monitored. Analytical findings on this type of information will be compiled from a variety of sources, including but not limited to, scholarly articles, blogs, site visits, interviews, statistical documentation, and journals.

Information pertaining to all relevant subjects will be assembled digitally and some in hard copy form. Sources will be recorded into a table format, compiled sequentially, and saved digitally.

Process material will be saved and documented in accordance with relevance to topics at hand. All hard copy forms of process work will be stored in storage drawers designated for this project. Hard copies will also be scanned to digital form so they have the capability to be shared and submitted as a means of displaying progress. Any process work not shown in the final thesis presentation will be issued as a digital submittal at the end of the project.

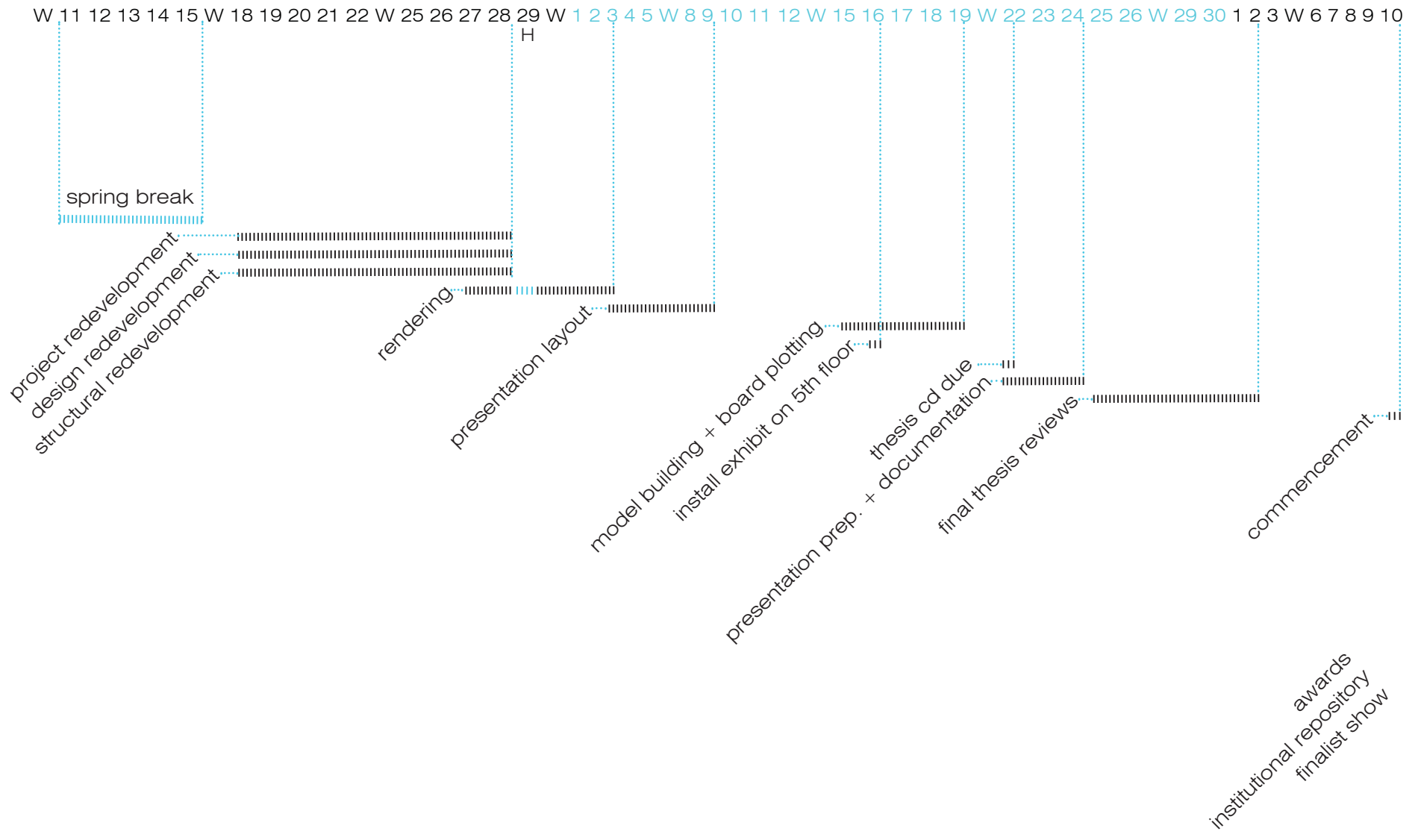


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schedule





schedule

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previous studio experience



fall '09

spring '10

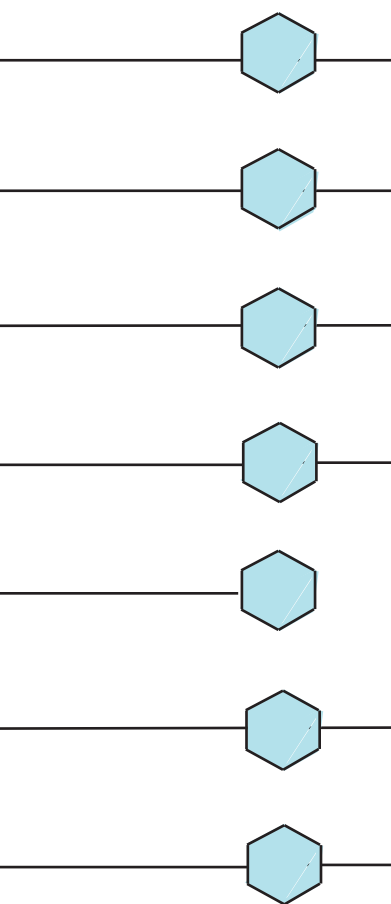
fall '10

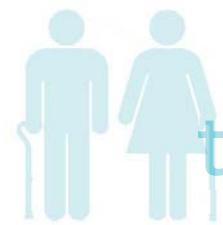
spring '11

fall '11

spring '12

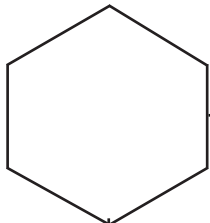
fall '12

- 
- Tea House: Fargo, ND
Boat House: Minneapolis, MN
Stephen Wischer
 - Heim House: Fargo, ND
Montessorie School: Fargo, ND
Phil Stahl
 - Wood Motel: Fargo, ND
Downtown Redevelopment: Fargo, ND
Regin Schwaen
 - Shaker Barn: New Lebanon, NY
Architectural Archive: Chicago, IL
Ronald Ramsay
 - High Rise: San Francisco, CA
KKE Reuse Competition
Don Faulkner
 - Kindred Urban Design: Kindred, ND
Don Faulkner & Frank Kratky
 - Downtown Revitalization: Fargo, ND
Paul Gleye



the program





theoretical premise
research results

Issues with environmental design standards in relation to health care have existed for years. In the publication of their book, "Therapy by Design," authors Good, Siegal, and Bay analyzed different strategies for design improvement. They noted a marked inability of designers to conceive solutions which dealt with all the distinguished functional needs of the patients, including physical and psychological needs. One of their main speculations of the root of the problem was a "lack of concerted research effort in an area that is extremely basic in nature (Good, Siegal, & Bay, 1965)."

The same can be said of facilities for the elderly during past years. However, in the present, research is being conducted today on Alzheimer's and dementia and recent laws have been passed by government to encourage continuing efforts to study the disease. The United States has 34 Alzheimer's Disease Centers (ADCs) which are funded by the National Institute on Aging. Mayo Clinic Alzheimer's Disease Research Center in Rochester is one of these 34 such centers. A second, sister facility to this building could build upon areas of improvement in the current facility with additional features such as long-term elderly care and treatment.





research innovation



Functions of the current Mayo Clinic Alzheimer's Disease Research Center are to provide care and promote research and education on Alzheimer's disease and related dementias. This clinic is organized into 5 cores which are comprised of an administrative core, clinical core, education and information transfer core, and neuropathology core, and statistics and data management core. The purpose of the center is to provide care for dementia patients and promote research and education on Alzheimer's Disease and related dementias. Currently, this facility does not have the space allocation or proper design for long-term care. In other words, applying the research through design methods is not being done at this center. The research which is done here is mainly volunteer human research by control group (normal mental state) persons and those with dementia. Adding a new facility with many similar functions but added long-term and assisted living care would create opportunities for longer-term volunteer study.

For someone whose job requires working through study and analysis objectives in these types of units, communication becomes vitally important in order to strengthen study efforts. Researchers and health-care specialists should formulate a sense of community to stimulate the production of idea flow. This synergy should be provoked for all staff users of the center. Researchers and health-care specialists should be encouraged by a sense of community spaces can bring to stimulate the production of idea flow. One way in which this interaction was successfully advanced through design can be seen in the Michigan Biomedical Research Laboratory case study on the following pages (pgs. 38-41).

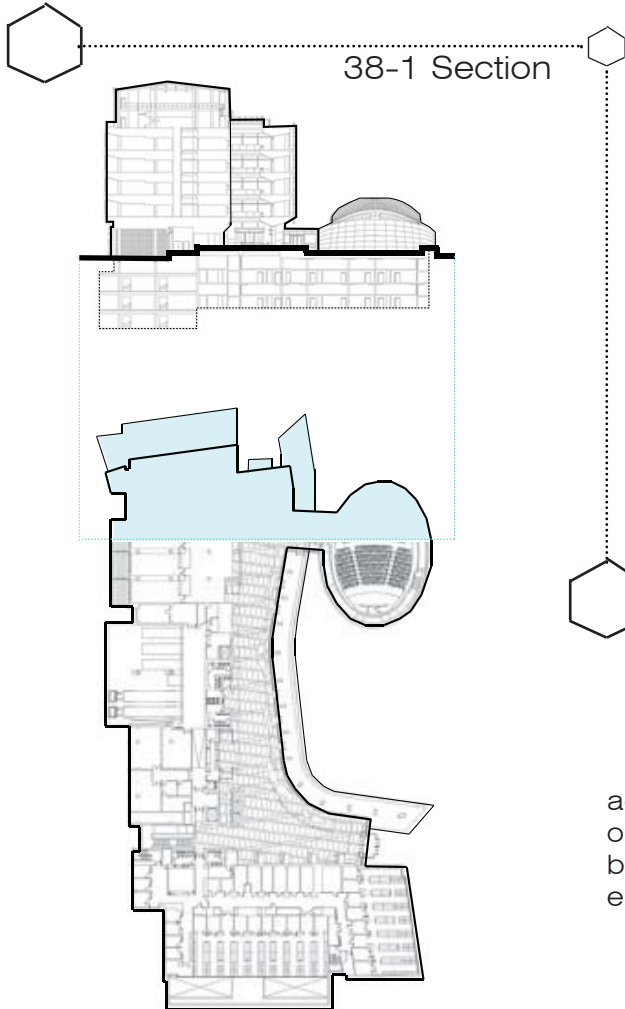
In an effort to improve upon current research methods in the existing Rochester facility, the following research was conducted from which a variety of sources were utilized. A large portion of research direction was based off of studies performed in the Mayo Clinic Alzheimer's Disease Research Center of Rochester.

building upon current
research efforts

37

michigan biomedical research laboratory

- ann harbor, michigan
- university of michigan
- ennead architects



plan to section/elevation

Floor Plan Photo retrieved from <http://ennead.com/#/projects> 11/03/2012. Ennead Architects.



Photo courtesy of Ennead Architects

case study

syn•er•gy: (n)

:combined
action or operation
: a mutually

advantageous conjunction
or compatibility of distinct
business participants or elements
(as resources or efforts)

building program
(major project elements):

- research laboratory building
- atrium space
- offices
- break rooms
- conference rooms
- biomolecular research labs
- common spaces
- seminar rooms
- auditorium (seating for 300)
- 535 car capacity parking garage

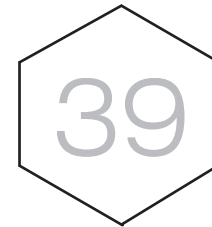
38

CS1

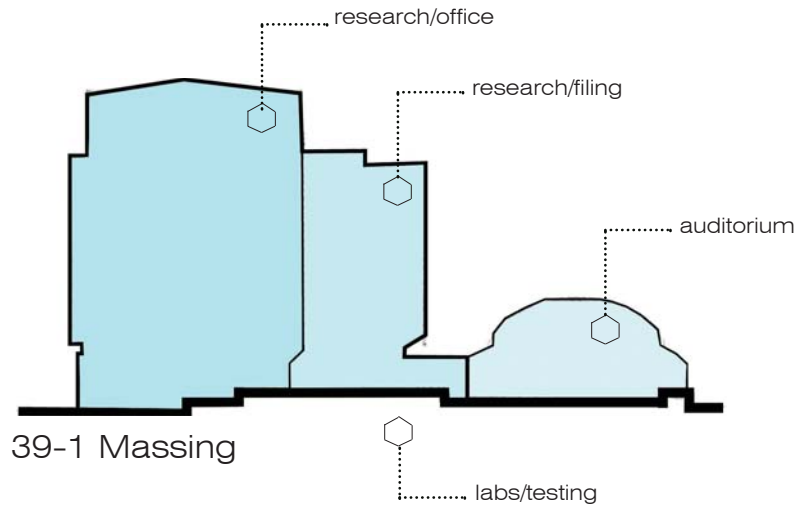
As a new addition to a current medical center campus, it created a whole new personality for the site in Ann Harbor. According to Ennead Architects, their defining aesthetic element in this project was how the building expressed the programmatic functions of the office spaces and research on the exterior facades. They chose to create a “ribbon” of offices which was meant to be of a more organic nature differentiating the rectilinear laboratory spaces from other functions of the building. The research labs simulate a “core” for the building from the exterior.

Particularly important was the link between office spaces and research space within the structure of the building. I looked at the synergy that could be created through a building of this typology. This building was successful in doing so through their sky-lit atrium space functions. The atrium served as a connection point between office spaces and labs, creating a sense of community among researchers. This works to promote interdisciplinary interaction encourage sharing of ideas in research and invention methods.

CS1

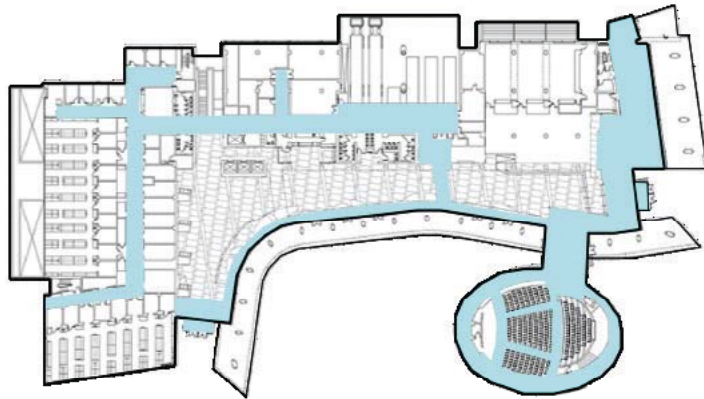


massing study

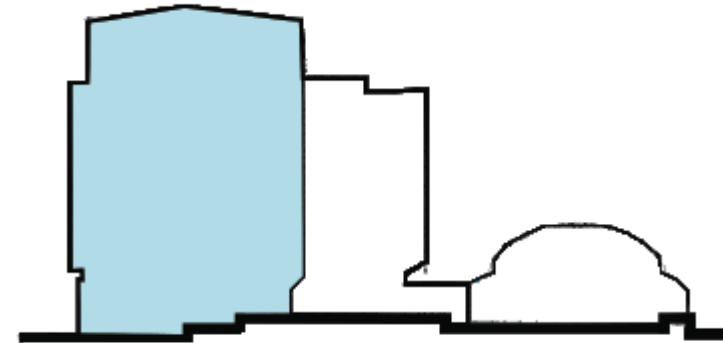


graphic *analysis*

circulation use

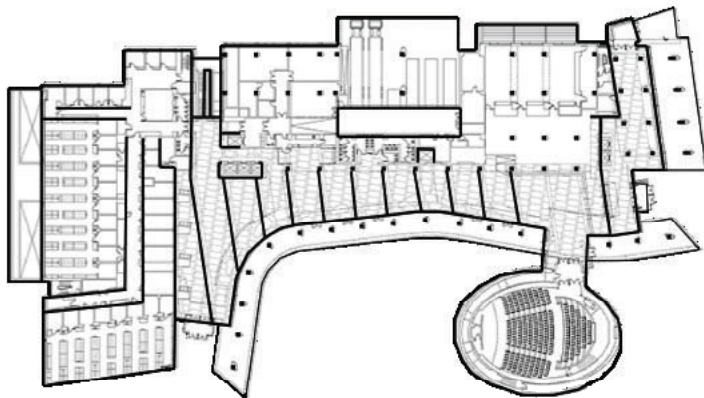


40-1 Circulation/Use



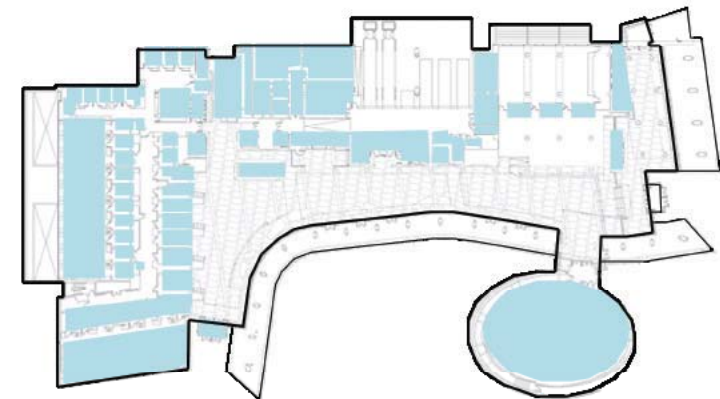
40-2 Hierarchy

circulation/use comparison



40-3 Structure

hierarchy

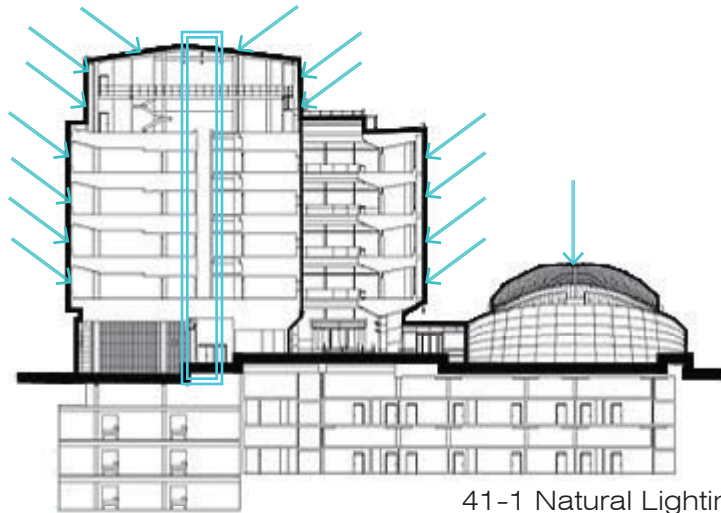


40-4 Geometry

structure

geometry

biomedical research building, university of michigan
ann arbor michigan: ennead architects



..... natural lighting

41-1 Natural Lighting

Natural lighting was a prominent feature in all areas of this building. The atrium space allowed natural daylight to penetrate the internal core of the building at all interior levels. The research areas of the building all received maximum daylighting from glazing oriented on the southeast and southwest building faces.

The double-glazed curtainwall which is the building's main aesthetic feature is made up of a single-glazed exterior and an interior insulated glass office wall. There is a 3 foot interstitial space between the two glazing walls which creates a thermal barrier and insulates the building. Venting through this space is done through continuous louvers and metal grates at each level. Sustainable implementations done in this way not only conserve energy, but include benefits such as office daylighting and shading control which regulates a comfortable internal environment.



design therapy

In order to provide an environment conducive to the treatment and management of Alzheimer's disease symptoms, one must first begin to understand the origins and effects of the disease.

According to medical staff at the Mayo Alzheimer's Disease Research Clinic in Rochester Minnesota, "Alzheimer's disease results from a combination of genetic, lifestyle and environmental factors that affect the brain over time." (Mayo Clinic Staff, 2011) Further research and tests are being conducted to better understand the disease, but there are currently few breakthroughs in treatment and prevention of symptoms. Alleviating environmentally-triggered symptoms that are a result of cognitive impairment can be done through the creation of a well-designed environment specialized to those needs.

theoretical premise
research results



Cognitive impairment is a main issue associated with Alzheimer's disease. It affects the mental, emotional, and physical states of the person afflicted by it. Listed below in Table 43-1 are some of the symptoms from each category of wellness which should be considered in residential environment when designing for these patients.

mental

- language struggles
- difficulty with familiar tasks
- visuospatial impairment
- visio-perceptual impairment
- agitation to outside noise
- aggression

emotional

- depression
- anxiety
- confusion
- absentmindedness
- distrust
- sudden mood changes
- forgetfulness
- social withdrawal

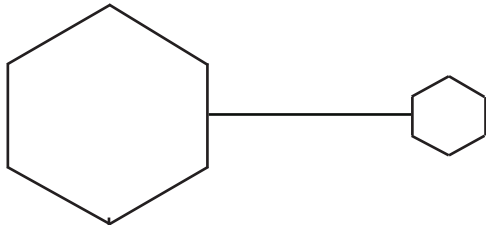
physical

- risk of falls
- mobility impairment
- eye degeneration
- loss of muscle control
- hearing impairment
- insomnia
- visual impairment

Effects on Wellness Table 43-1

No building has the ability to cure Alzheimer's disease. A building can, however, better the quality of life for Alzheimer's patients by responding to evidences of impairment in a variety of these areas.

In doing so, positive memory changes can be provoked by certain environmental stimuli. Studies have shown that environmental factors play a significant role in maintaining wellness in dementia victims. Treatment in many of the symptoms previously described can be applied by implementing responsive environmental factors related to those areas.



brain deterioration

Alzheimer's disease affects all parts of the brain. It affects each individual differently, which is why symptoms vary as different parts of the brain are affected by the disease.



For example, someone with frontal lobe damage in the earliest stages of the disease may feel a lack of motivation and become lethargic. A fitness center and other design strategies that encourage mobility are important design considerations here.

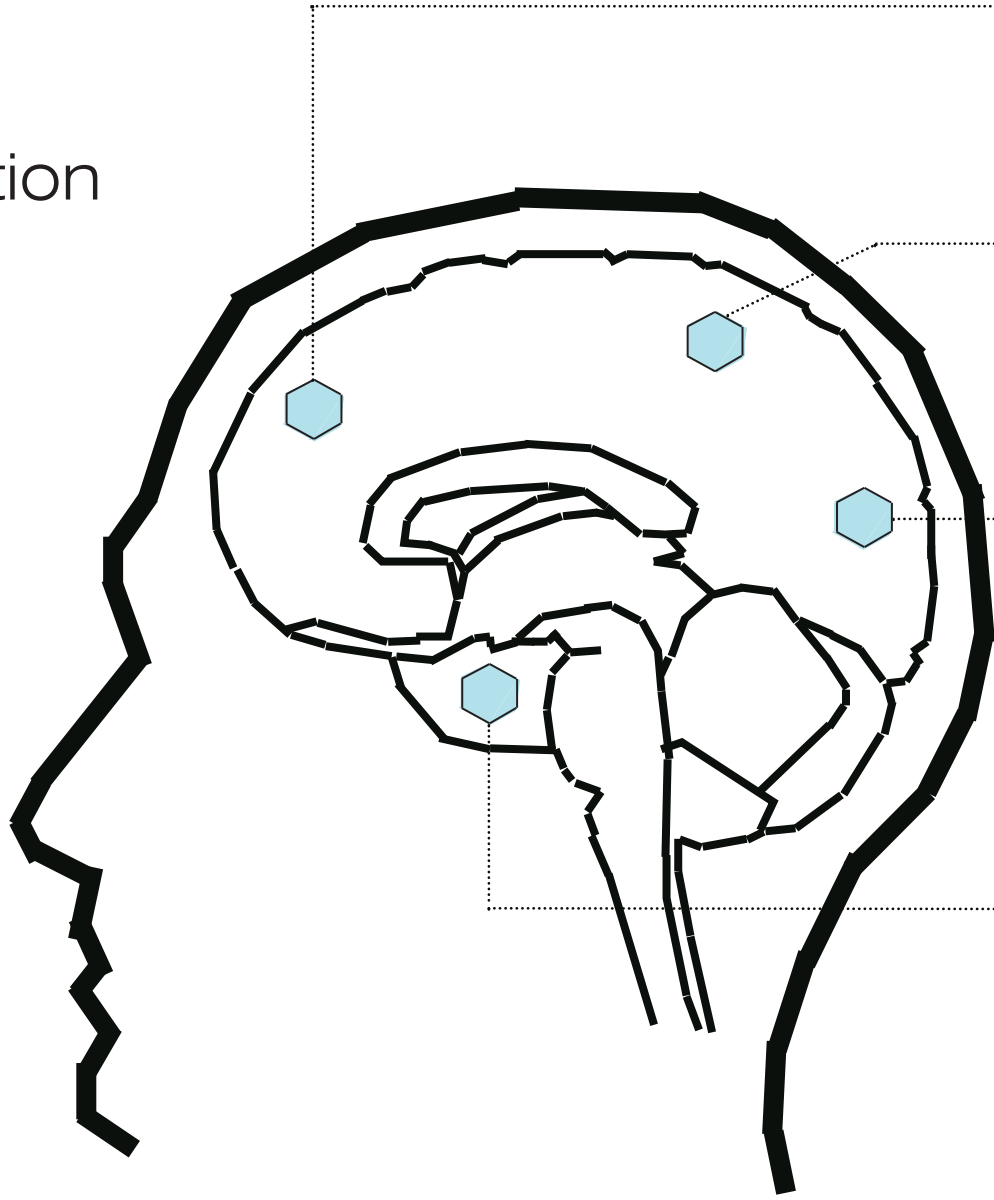


Figure 44-1
Brain Function Diagram



The **frontal lobe** controls functions involving movement, planning, making decisions, reasoning, socialization + personality, and problem solving.



The **parietal lobe** deals with spatial relationships, manipulation of objects, perception of stimuli, reception and processing sensory information from the body.



The **occipital lobe** is the main part of the brain that controls all visual functions.



The **temporal lobe** regulates memory functions, emotions, hearing, and verbal response.



research results



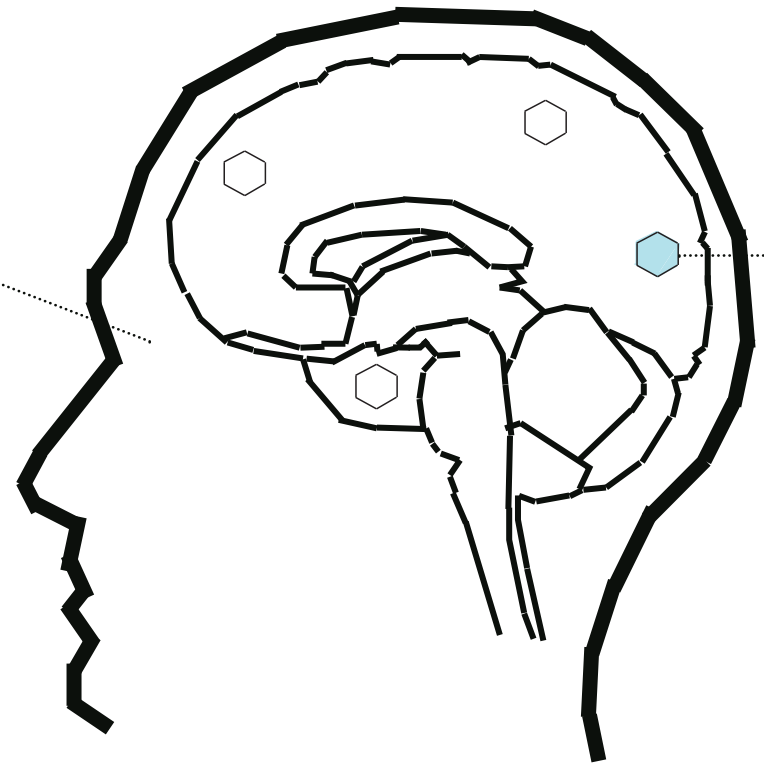
“Alzheimer’s disease (AD) is a progressive degenerative disease of the brain from which there is no recovery. The disease slowly attacks nerve cells in all parts of the cortex of the brain and some surrounding structures, thereby impairing a person’s abilities to govern emotions, recognize errors and patterns, coordinate movement, and remember. Ultimately, a person with AD loses all memory and mental functioning.”
(NY Times, 2010)



Causes of Visual Impairment

A number of things can affect visual acuity in elderly persons. Natural effects of aging eyes can cause problems with vision including: taking more time to adapt to changes in light levels, needing excessive lighting in order to see clearly, reduced peripheral vision, increased glare sensitivity, and decreased contrast sensitivity and depth perception. Changes in the way elderly individuals with impaired eyesight see color is also different than people with normal vision. Gradually, saturation of colors lessens and these individuals begin to lose sight of the blue/violet part of the color spectrum. In addition, similar to a person who is color-blind, pastel shades and darker colors become difficult to differentiate from each other.

Along with the simple fact that aging of the eyes worsens eyesight; medications, deterioration of the occipital lobe and parietal lobe, figure background contrast discrimination, and motion/depth perception are additional issues that dementia patients deal with.



46

visual changes

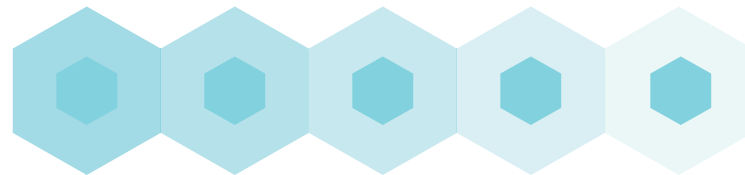
Effects of Visual Impairment

There are many issues associated with impaired vision in elderly care facilities. One of the main concerns when dealing the elderly are their susceptibility to falls and the evidence that impaired vision contributes to that risk. “The most common place where falls occur in elderly care facilities is in the restroom.” (Frisbie, 2012)

To understand the importance of material selection, shown below (Contrast Figure 47-1) is an eye illusion which illustrates how the human eye can be misguided into seeing colors at various contrasts in relation to background. Colors with similar tones become more difficult to differentiate between, especially in relation to other nearby high-contrast tones. This exercise is deceptive to persons with normal vision. To someone with impaired vision, it would be nearly impossible to discern which color is more vibrant or even if they are different at all.

This is where material selection becomes a key factor in the interior design finishes of resident rooms and other interior spaces residents will use.

Contrast Figure 47-1



visual changes

design solutions

Concepts including material selection, natural lighting methods, safety consideration, favorable views, and personalized residential spaces are a few options to consider in designing for dementia patients with visual impairment.

Contrast in the living environment is a high design priority.

One way to inhibit falls in restroom spaces is to increase the contrast between the floors, walls, and bathroom objects in the room. When walls and floors are like colors, people with impaired vision tend to trip more frequently. An example of good contrast in a restroom would be where the walls match the baseboards and have high color contrast to the floors so there is a distinct difference between them.

People with impaired visio-spatial perception will instinctively tend to avoid walking on lighter colored floor areas to decrease their personal fall risk. Darker areas and changes in flooring tend to falsely signify a change in depth for a person with dementia. In addition, dementia sufferers also will try to avoid walking on floors that are overly shiny because they give the illusion of being slippery. Material choices within a building providing these types of care should reflect those evidences. Cohesive, simple, and high-contrast materials all hold advantages in improving visual response. Similarly to contrasts in flooring, wallpaper with patterns may over-stimulate the senses of an Alzheimer's patient and cause unnecessary confusion.

Through evidence found in direct voluntary patient testing, "visual contrast may spark positive changes in food and liquid intake." (Dunne, 2004) Since lack of appetite is also an issue associated with Alzheimer's disease, increasing effectiveness of visual cues in buildings would additionally be beneficial in sparking positive nutrition in the physical health of residents.

In conjunction with high contrast environments, dementia patients require additional lighting (compared to a normal-visioned person) to see clearly. Natural lighting can become a huge benefit in increasing visual clarity, encouraging use of spaces, guiding residents toward spaces of importance, and enhancing the mood of residents.

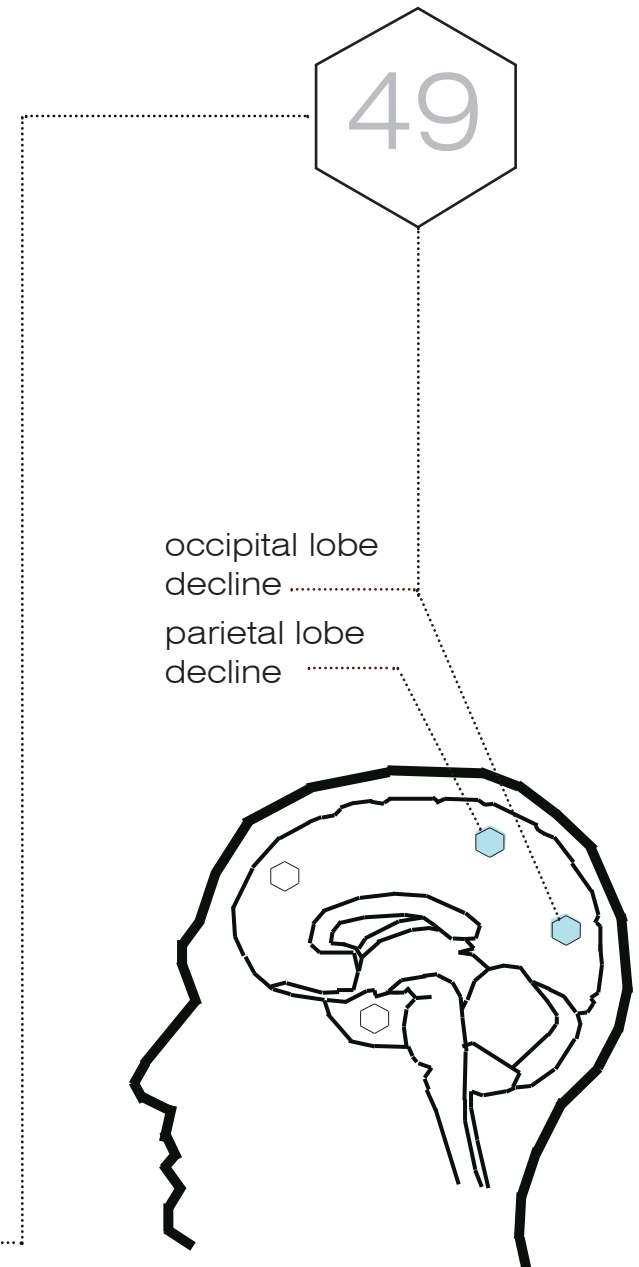


Natural lighting can be incorporated into many areas of a building where use is encouraged. Using natural sunlight in or near resident quarters of a building would help guide patients to areas that they frequent should they forget their way. Because elderly person's eyes take an increased amount of time to adjust to lighting changes, maintaining a steady light content throughout a building is favorable. Indirect sunlight would be ideal in comparison with direct lighting for those same reasons.

Knowing that the blue/violet part of the color spectrum is the first to go in age-related visual impairment, over-use of these colors in a dementia care facility should be avoided in areas of heavy resident use. However, there are areas in mixed-use living environments where dementia sufferers should be discouraged from using for safety. These colors would be appropriate when used in conjunction with building exits/entrances near traffic or staff units where residents are not allowed to enter.

Alanna M. Carter, RSP Architects, gave a presentation at the 2012 Senior Housing Summit (Golden Valley, MN) where she presented ideas on "Need-to-Know Issues about Memory Care Facilities". In her presentation, she discussed the importance that visual cues have in the environment dementia patients inhabit. She talked about the use of courtyards as a stimulus in "guiding residents from place to place when they became disoriented." This concept could also be utilized on the interior portions of the building by encouraging residents to pass by certain areas to promote social interaction, additional mobility, and assistance in locating rooms.

All of these examples are ways in which a variety of techniques may be implemented into designing an ideal environment for the unique visual effects of Alzheimer's disease. The following case study (pg. 50) shows an example of successful lighting strategies in a health-care environment.



case study

- Estudi PSP
Arquitectura,
SCP.
- Manresa, Spain



Photo retrieved from ArchDaily.com

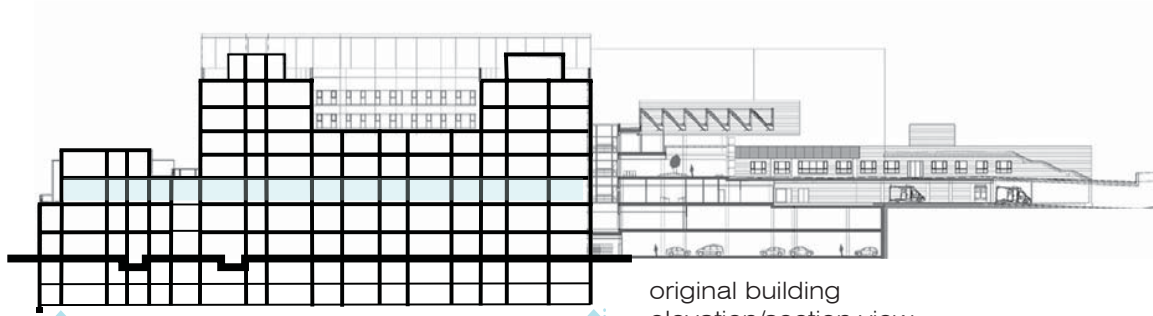
Extension and Remodeling of Hospital Sant Joan de Déu de Manresa

heal•ing: (v)
: to make whole
: to restore to health
(Webster 2012)

building program
(major project elements):

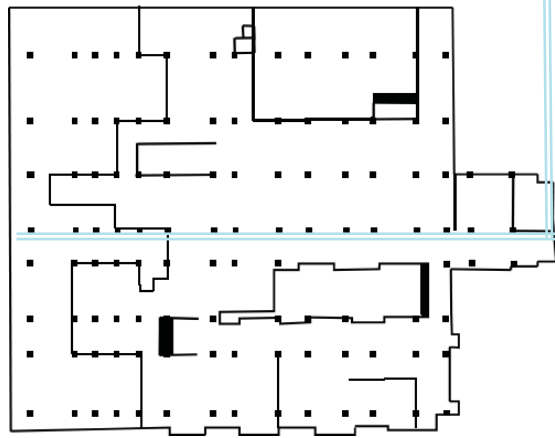
- atrium
- emergency units
- short term care units
- lobby
- medical labs
- x-ray labs
- offices

CS2



new addition
section view

original building
elevation/section view

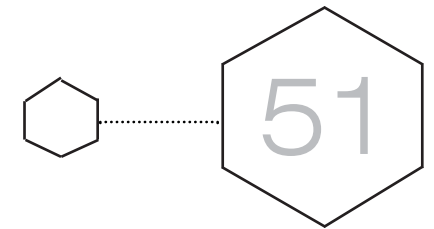


plan to section/elevation
51-1 Section

The conceptual undertones for this project were based on “the rhythm of light.” Design for this project was centered around the natural healing qualities that daylighting can bring into a hospital setting, better known as phototherapy.

Several wings of the hospital have hierarchal meaning for the treatment spaces, while allowing light into a central core. Units surrounding this main core of the building gain the most optimum lighting conditions at all hours of the day. At night the core becomes a prime view as well, featuring a sort of hidden community where operations can be observed from the inside.

Hospital owner and designers felt that the existing hospital building looked like an isolated structure that was tossed into the middle of a field. To remedy this, the new addition will read “like a comb” (ArchDaily, 2012).

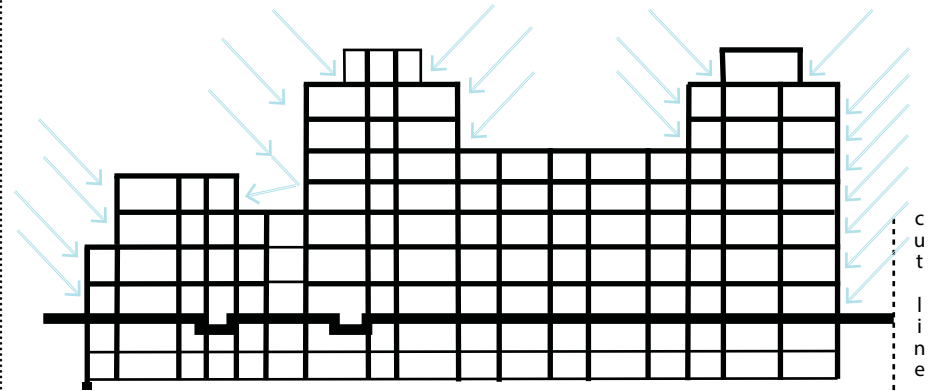


Photos retrieved from ArchDaily.com



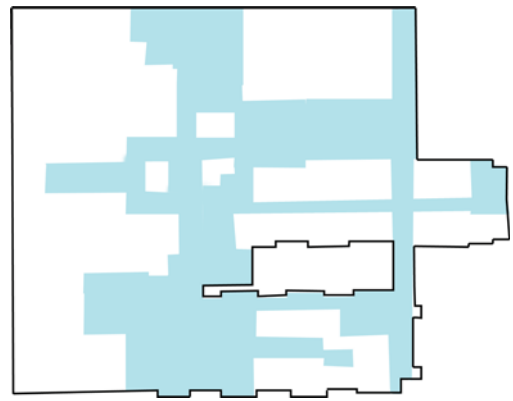
graphic *analysis*

52-2 Natural Lighting



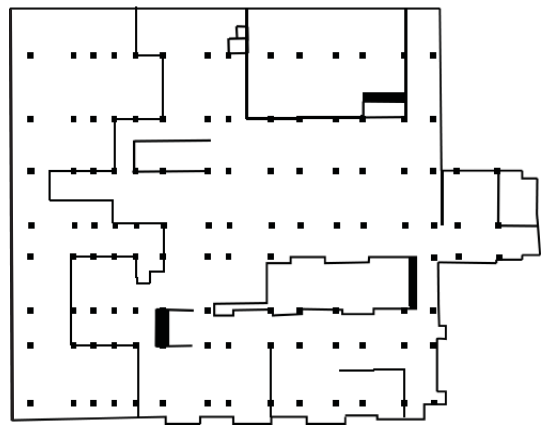
natural lighting

circulation use



52-1 Circulation/Use

circulation/use comparison



52-3 Structure

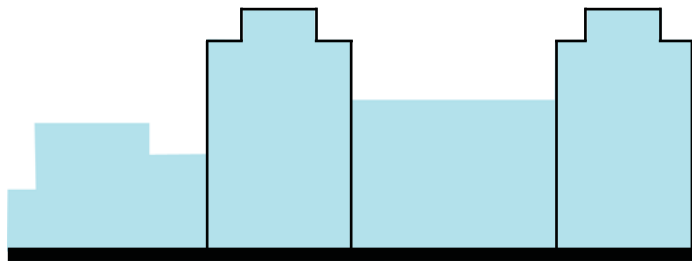
structure

Extension and Remodeling of Hospital Sant Joan de Déu de Manresa / Estudi PSP Arquitectura



52-4 Geometry

geometry



53-1 Hierarchy

hierarchy



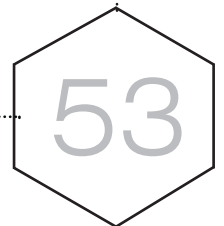
53-2 Massing

massing



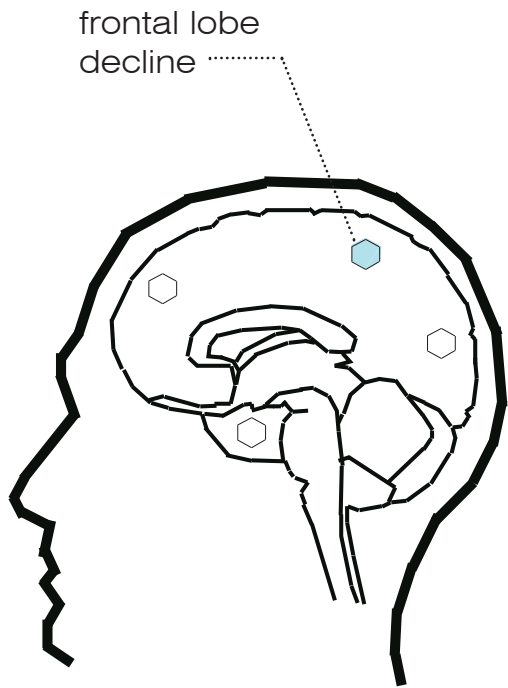
Photo retrieved from ArchDaily.com

The “rhythm of light” can be noted in the above photo which is a 10 foot gap between units, allowing a shaft of light to infiltrate the hospital patient rooms at all times. Circulation corridors cut through the two wings and also take advantage of the natural lighting this break in facades brings.



mood + behavior changes

Effects of Alzheimer's disease on the frontal lobe of the brain can result in changes in emotion and ability to socialize, language comprehension, memory formation, motor functions, creativity, judgment and reasoning (Bailey, 2012). Similar to these symptoms are those of mood and personality disorders which can be classified into three different groups. The first group is known as eccentric personality disorders. These disorders include bipolar disorder, dysthmic disorder, and delusional disorders. The next group is known as dramatic personality disorders. Some of these include paranoia, anxious avoidant, antisocial, and borderline personality disorders. Anxious personality disorders compose the third group and include dependent, avoidant, and obsessive compulsive disorders. (The Critical Thinker (TM), 2008) Many of the behaviors associated with these disorders are similar to those of dementia and Alzheimer's patient indicators; the argument can be made that care facilities for both of these typologies (mental health facilities and elderly care facilities) should have similar functions and spatial layout. A closer look at security measures within mental health facilities should also be analyzed so that safety can be addressed in the design for the aging.



design solutions

Thomas Story Kirkbride (1809-1883) was a physician and advocate of the mentally ill. He was founder of the Association of Medical Superintendents of American Institutions for the Insane, which later came to be known as the American Psychiatric Association. He came up with what is known as the "Kirkbride Plan." This plan was created to improve medical care for the insane, and to form standardization for buildings that housed these patients. (The Critical Thinker (TM), 2008)

Kirkbride believed that a diagnostic classification of patient personalities and types should be conceptualized in early design phases. He used the example of an excitable patient being placed in a quiet ward with other fellow patients. It was observed that in just an hour the quiet ward's character was entirely changed. With this in cognizance, residential units in an assisted living facility should be organized with consideration towards grouping comparable residents in approximating areas.

Shown increase in brain wave activity, stimulates production of adrenaline. Decreases apparent room size, making it appear smaller. Increases perceived temperature of a room which could be useful in rooms on North side of building during winter months.
No apparent consistent mood or nervous system affects.
Associated with life and growth, is the most restful of colors. Has been shown to reduce central nervous system activity, creating feelings of calmness. Makes rooms appear larger than they are.
"Earth-based" color which has similarities to green.
Highly visible color used to portray important messages or areas. Makes rooms appear larger, and thus is good for small rooms where you want a restful atmosphere.

Mood-Color Chart 55-1

The chart above (Mood-Color Chart 55-1) portrays some of the effects these colors have on a majority of the public. Material choices and finishes should be chosen with sensitivity toward the indication that mood may be altered in these ways. Note that these colors are not solely based on the elderly population but a general sampling of effects on people of a variety of ages and demographics.

mood + behavior changes

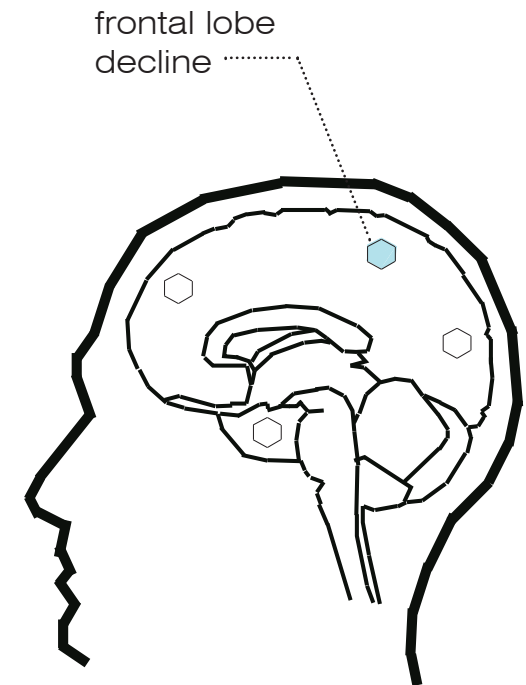
design solutions

The following claims are areas of the Kirkbride Plan which Kirkbride emphasized should be of importance in environmental design tactics for the mentally ill:

Double-loaded corridors are favored and should be at least twelve feet wide. Vacant spaces from ten to fourteen feet wide should be located halfway down the corridor. These vacant alcoves should contain full floor-to ceiling (when possible) bay windows. (Good, Siegal, & Bay, 1965).”

After performing many experiments on patient behaviors and their care environments, authors Good, Siegal, and Bay (architect, psychologist, and ward superintendent respectively) came up with the following statement: “...a major tool that exists for influencing the patient is present in the control that the institution has of the patient’s environment, and that this control is not only social and psychological, but is also physical and architectural. The architectural environment is a part of the patient’s milieu, and it is believed that a scientific manipulation of this environment can be used to produce patient changes (Good, Siegal, & Bay, 1965).”

All of said changes should reflect safety and security through design strategies. The following case study (pg. 57) was conducted with special interest toward security within the building program.





case study

Pima County Behavioral Health Pavilion + Crisis Response Center

- Pima County Behavioral Health Pavilion and Crisis Response Center
- Tucson, Arizona
- Cannon Design
Associate Architect: CDG



Image retrieved from
<http://psychiatry.arizona.edu/node/259>

se•cur•i•ty: (n)

:the state of being free from danger or threat.

:the safety of a state or organization against criminal activity such as terrorism, theft, or espionage: "national security"

A three story Behavioral Health Pavilion merges with a two story Crisis Response together in this project which totals 204,000 sq ft.

building program (major project elements):

- courtroom for mental health hearings
- 48 acute-level psychiatric beds
- outpatient clinic with two helipads
- secure entry to crisis response center
- behavioral health crisis triage
- assessment/stabilization areas
- 15-unit adult area (stays of up to 5 days)
- call center

Pima County Behavioral Health Pavilion + Crisis Response Center



security

CS3

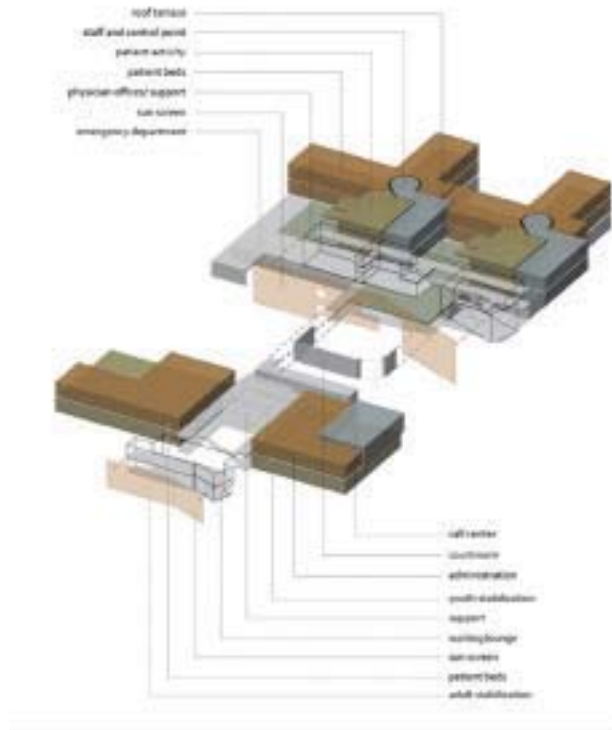


Image retrieved from archdaily.com

The above rendering shows outdoor patio spaces that are enclosed by railings. A 3'-0" fence gates the back courtyard space and is monitored at all times by security personnel. The program breakdown at the left indicates that youth stabilization and patient activity rooms are located away from exterior areas of the building. This increases security measures and safety. The external sunshade device which encases the building also increases security because leaving the facility against regulations through operable windows is not feasible.

security

Other security measures include a separate entrance for first-responders through a secure sally-port entry. In addition, stabilization areas are measures of security that ensure the patients are under control (will not harm themselves or others) for transfer throughout locations in the facility.

According to Karen Cilento, “the collaborative effort brings together the entire community including behavioral health care, physical health care, law enforcement, families, and consumers to deliver an integrated approach to behavioral health treatment.” (Cilento, 2012)

The rendering (above right) shows a secure-entry courtyard which is centrally located and can only be utilized through card access and staff approval. This gives users of this facility an awareness of security measure implementation.



Image retrieved from archdaily.com

sally port: (n)

:A secure, controlled entryway, as of a fortification whose entrance is usually protected in some way, such as a fixed wall which blocks the door that must be circumvented before entering. This type of door could also protect against direct enemy fire. Use of two doors with an airlock is also a possibility.

(Webster, 2012)

Pima County Behavioral
Health Pavilion +
Crisis Response Center

CS3

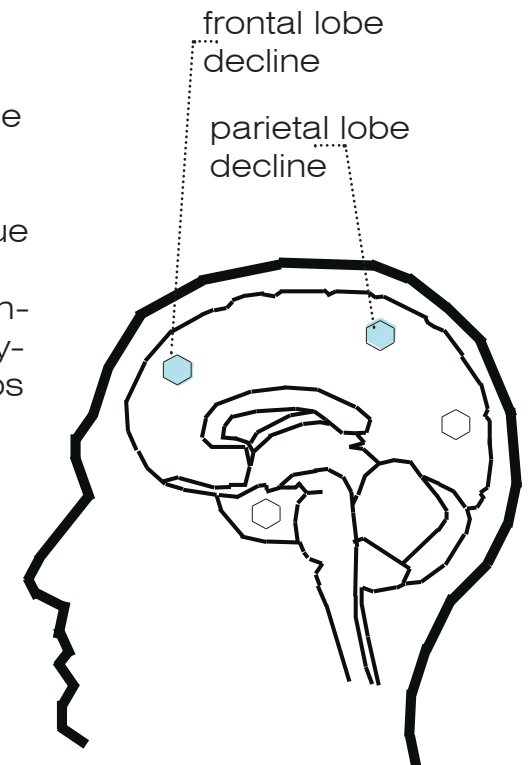
59



mobility + social changes

Another main issue associated with frontal lobe deterioration is limited mobility. For many residents, mobility may require some form of walking aide. These will necessitate storage spaces within a short distance from patient rooms. ADA compliance will also need be strongly enforced in all design stages. For all residents, mobility should be encouraged through building design.

When used in conjunction with sensory-based programming methods such as color-coded hallways and design features for navigation, the residents can be encouraged to become more mobile by certain draws and views in the building program. Mobility can be encouraged through daily activities and routines for residents and would also increase their feelings of self-worth. One design technique could be social gathering spaces on the interior and exterior of the building or activity breakout rooms which promote interaction with other residents and users of the building. Research has shown that staying socially active has cognitive and emotional benefits. Relationships and social interaction have even been known to boost the immune system. Other specific health benefits of being social include: lower blood pressure, reduced risk for other illness, and reduced risk of depression. Adversely, being socially isolated holds some real risks for the aging population. Feelings of loneliness and depression, higher blood pressure, and less physical activity can hold pronounced negative impact because of minimum amounts of socialization. The following case study (pgs. 62-65) shows ways in which interface was successfully promoted through design.



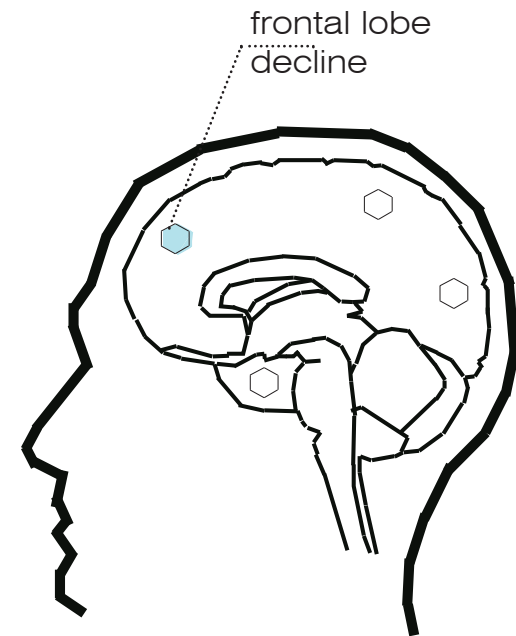
60

design solutions

design solutions

Dr. Humphrey Osmund, former superintendent of the Saskatchewan Hospital for the mentally ill in Webburn, Canage proposed that the “mentally ill, like any other group of handicapped people, require surroundings which allow them to make the most of their assets and which aggravated their disabilities as little as possible (Good, Siegal, & Bay, 1965).”

We know that dementia patients can benefit from simplistic environments which limit their chance of falls or other injury. However, an environment can not retain that home-like quality if it is devoid of any type of personal character or memory of the residents' past. Adaptable residential units (see appendix a) are one design option that could create customized living space which can be changed according to resident needs. The “adaptability” case study on page 67 explores the advantages and challenges a construction of this type holds.



via verdes affordable housing-mixed use:

- south bronx, ny
- dattner architects +
- grimshaw architects



in•ter•face: (n)

A point where two systems, subjects, organizations, etc., meet and interact.
(Webster, 2012)



building program
(major project elements):
294,00 square feet

- residential simplex
- duplex rental units
- terraces
- interior courtyard
- green roof
- 7th floor fitness room
- laundry amenities
- children's play area

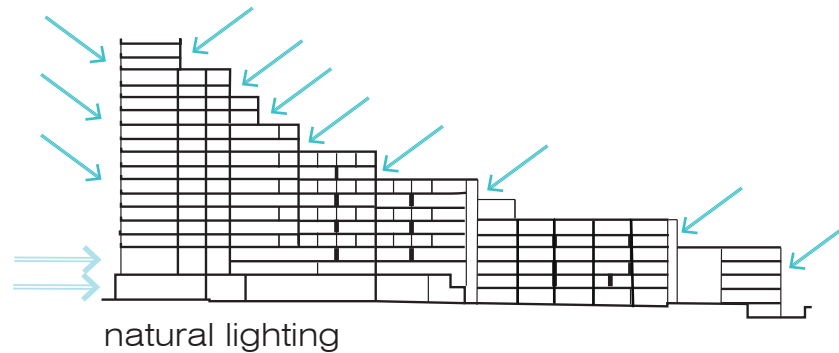
interface



Photo Courtesy of @David Sundberg/Esto

case study

62-1 Lighting





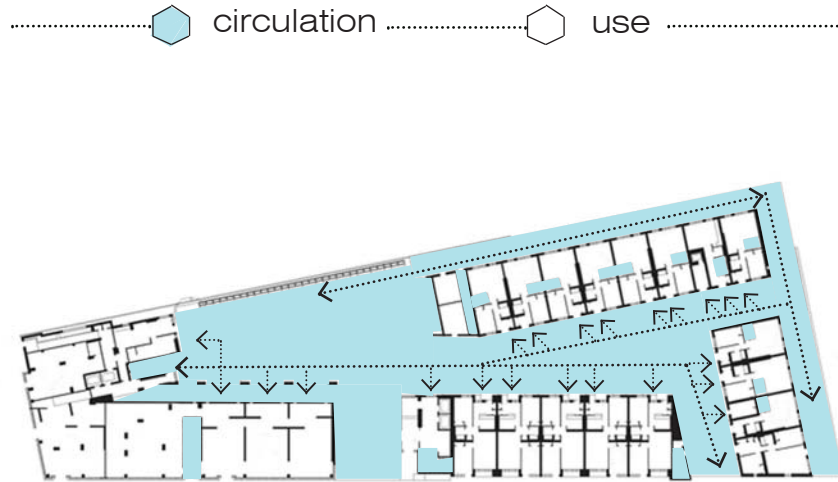
In the South Bronx area of New York which was once a symbol of urban decay, this project takes form as a 222-unit apartment complex for low-middle income brackets. A 20 story tower flanks one end of the building and steps down in segments from there. Vincent Change, partner at Grimshaw Architects, believes that there “should not be a different lens for evaluating affordable housing, but that quality should exist at every market sector (Gonchair, 2012).”

Via Verde’s inner courtyard holds particular appeal in the project. With its stepped profile, it creates a defined space which provides a sense of shelter, safety and privacy to users. Courtyard walls are made up of rainscreen components. The green roofs of the building consist of a variety of vegetation that yield produce for residents. Residents here have the option to grow their own produce by way of planters on the rooftop levels. It is at these spaces in particular, where interface occurs between residents in the facility. In conjunction with being an ideal view, the neighboring soccer field also is a draw for residents to get out of their apartments and engage in activities, promoting social interaction.

graphic *analysis*

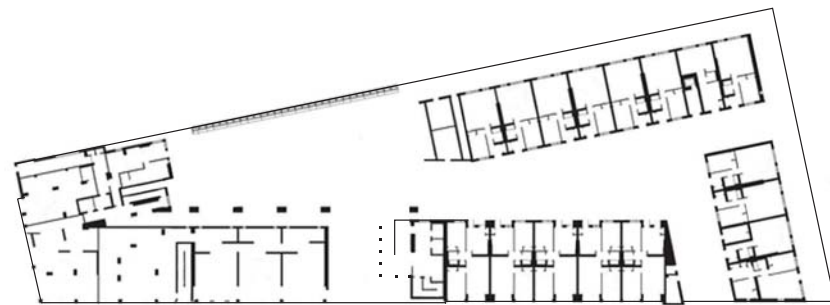
sustainability + materials

- CMU bearing walls and plank
- site-cast concrete at tower
- PV panels at roof
- wire-cut dark iron spot modular face brick
- aluminum exterior open-joint soffit panels
- metal/glass curtainwall
- pre-fabricated rainscreen
- wood + aluminum composite panels
- auria-C fiber cement panels
- corrugated fiberglass panels
- 'cool roof' SBS modified bitumen at bulkhead roofs

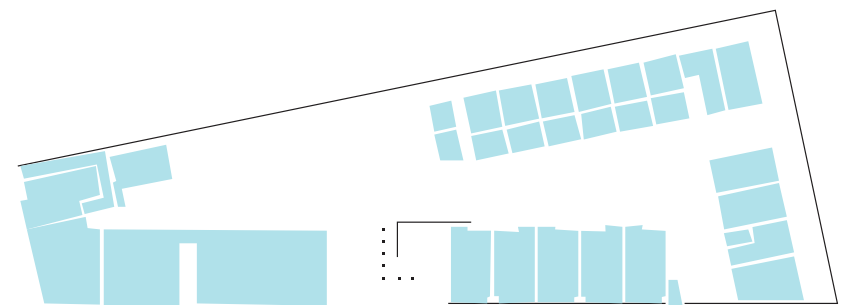


64-1 Circulation/Use

circulation/use comparison



64-2 Structure

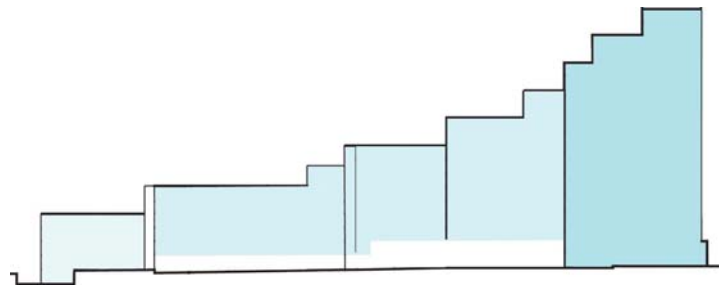


64-3 Geometry

structure

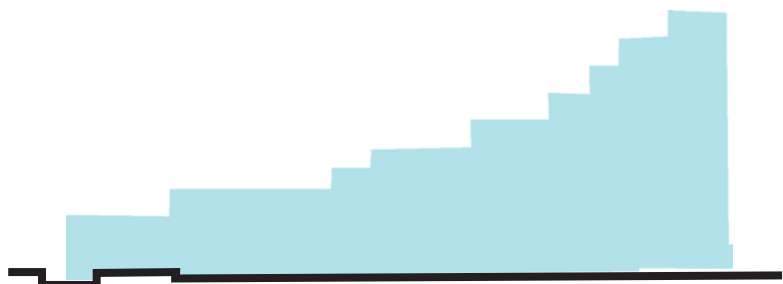
geometry

via verdes affordable housing-mixed use: south bronx, ny
dattner architects/grimshaw architects



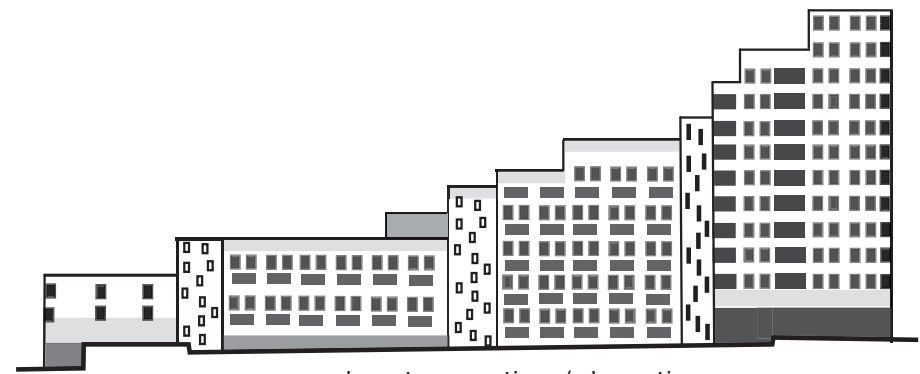
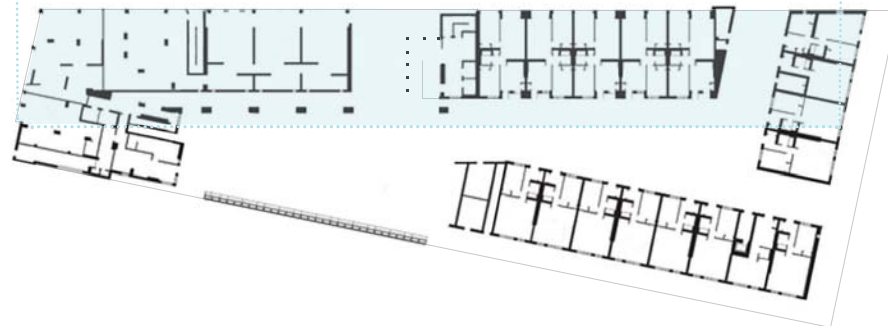
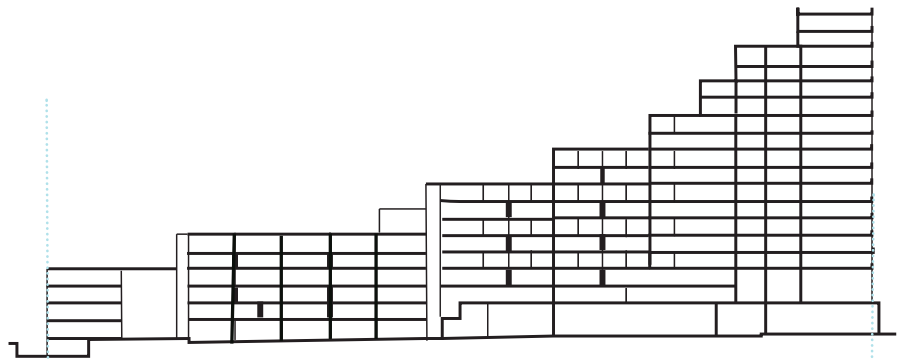
65-1 Hierarchy

hierarchy



65-2 Massing

massing



plan to section/elevation

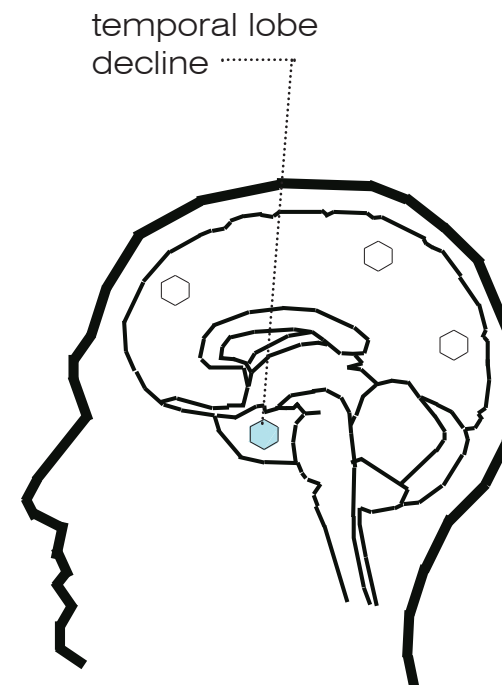
65-3 Section

hearing + concentration changes

As we age, we become increasingly distracted by outside “white” noise. For some one with no mental impairment, sound can be a major distraction. Dementia only magnifies its effects.

A peaceful and home-like atmosphere can not be maintained in a building with out paying special consideration to sound-proofing methods. Construction which strengthens effectiveness of sound control will be a huge design factor in nearly all spaces of the building. Areas which are generally loud include toilet areas, kitchen space, community and activity rooms, and occasionally resident rooms and other areas where elderly individuals may act out by becoming excessively boisterous.

Maximum sound transmission limitations should be incorporated in all partitions and floors. Local code will need to be studied to remain in compliance: other sound limiting methods will need to be studied to maximize sound inhibition. Other connected areas that will require extra sound-proofing will include patient to patient rooms, public space to patient rooms, service areas to rest of building, and observation rooms. Building construction which reflects these requirements includes designing with acoustic sound-absorbing panels, acoustic wall insulation, adding mass loaded vinyl barrier to wall, resilient channel wall construction, and addition of sound-absorbing finishes such as carpet and acoustic ceiling tile (ACT).





case study

modifiable resident space

Creating adaptable spaces which have the ability to be personalized to fit resident needs holds many advantages for the elderly. By simplifying the layout of a room where residents spend much of their time, confusion and feelings of disorientation can be lessened without the permanent effects of a design devoid of detail. The room would be able to be transformed to feature more home-like qualities at other times.

A simple layout in a room would hold advantages for decreasing incidence of falls and other injuries in the residential units as well.

Architect Gary Chang (see appendix a) created an adaptable apartment complex in Hong Kong called the “Domestic Transformer” which can be manipulated by a system of sliding wall panels to create 24 different rooms.

These types of apartments are often found in other cities, such as Chicago, to maximize space in units at different times and for different purposes. (appendix a)

adaptable apartment complex

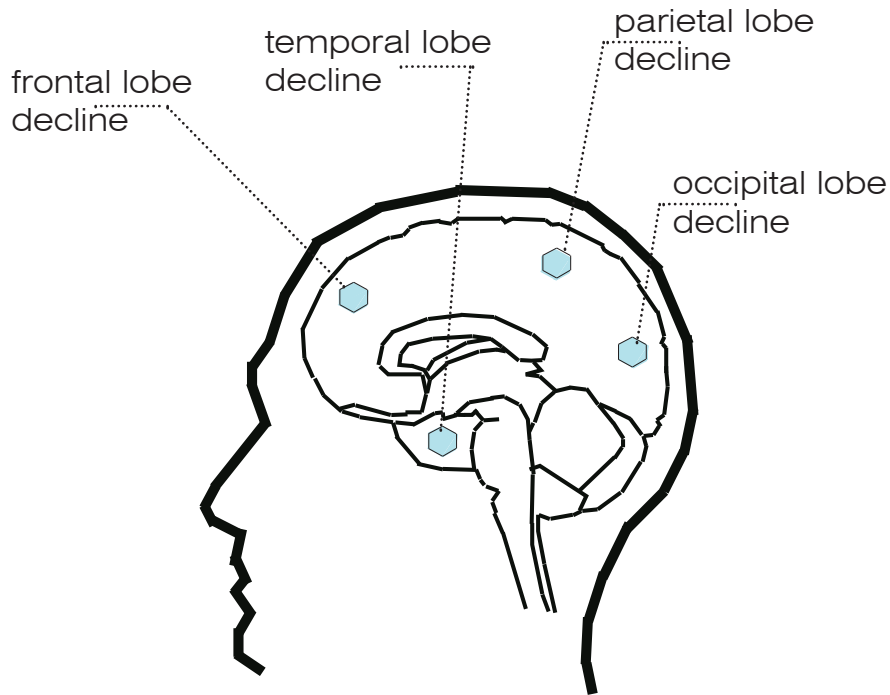
- Hong Kong, China
- Architect Gary Chang



Screen clipping retrieved from [youtube.com](https://www.youtube.com)



biophilic therapy design solutions



There is increasing evidence today on the positive affects nature has on life-enhancing characteristics and current health-care design trends are leaning toward a more natural environmental design response. Some major benefits this includes are improved human health and well-being.

Social ecologist Stephen Kellert has described biophilic design as being “buildings and landscapes that foster a positive connection between people and nature in places of cultural and ecological significance.” Benefits of contact with nature, whether it be outdoor place of respite, therapeutic landscaping such as “healing gardens” or simply natural views, include emotional, physiological, social and cognitive benefits in a wide range of contexts. Past research done in a hospital setting (Ulrich 1984) uncovered the result that patient views of nature as opposed to non-natural elements improved quicker recovery time, lessened pain, reduction in physiological stress, and mood improvement.

Because of the direct correlation of nature to health, we can see that this should be followed through in building design of all types but especially when designing for users who have impairment in health or other areas previously mentioned. The conclusion can be drawn that floor plans emphasizing a more organic layout would hold a more natural sense for residents as opposed to a floor plan which is too boxy or rigid. The floor plan to the right is an example of how architect/engineer firm, Haag-Muller Inc. responded to this in their Franciscan Skemp-Holmen Regional Clinic in Homen, Wisconsin (Mayo Clinic Health System). They incorporated natural design elements and relationships into their building layout.



Image by Haag-Muller Inc.



typological research summary



I chose to explore each of the typologies mentioned in my typological research for distinct reasons which I elaborated on in my case studies. Picking a certain trait that I felt was relatable to the the proposed typology aided in narrowing the program and spatial requirements for the final product.

The final product will be a mixed-use research and residential typology with implemented design strategies from many of the typologies that were examined.

Areas of typological examination included safety, security, biophilic design, material selection, synergy, adaptability, ease of access, therapy by design, handicap specialization, outdoor space and sustainability were examined.

No one typology can be examined in the creation of this building program. For this reason, a series of seemingly un-related typologies were examined to gain completely different views and ideas from a range of areas.

By analyzing distinct fragments of each typology, a singular building program may be formulated which incorporates all of those findings into a single typology. Through my research process of studying different typologies (although very different from each other), I began to see certain similarities between them.

Although a case study was not performed on a child-care facility, similar strategies in security and safety precautions to mental health clinics can be noted upon further observation. From analyzing different building programs, I began to see overlapping functions and spatial layouts and similarities between them. Many of the same spatial layouts occurred in patterns. For example, the dining spaces were never far from public restroom space. Dining spaces were also often located centrally so as to maximize scent transmission through the entirety of the building to encourage use of the dining space. Storage was always within a few yards of major functional building areas.

Mechanical systems were talked about very little in the case studies I examined. This is probably because they are not typically visually attractive and their presence is minimized within structures for safety issues as well.

Further research and code study will have to be conducted in order to learn more about the HVAC and lighting requirements the building will require. Sustainable design with passive mechanical systems will be a primary motivator in choosing an active mechanical system.



research summary

In summation, this proposed Alzheimer's Research Innovation & Assisted Living Facility holds great potential in changing future design standards for creating care environments for the aging population. By utilizing the information we currently possess about Alzheimer's disease and building upon the current ideals implemented by the Mayo Alzheimer's Research Clinic, a sister branch to this unit of the Mayo Clinic could be created.

The building design will be responsive to the physical, mental, and emotional needs of Alzheimer's and dementia patients as aforementioned in the Theoretical Premise Research.

The design may reflect certain experimental stimuli, such as customizable spaces which can be personalized in relation to individual residents' memory response. Researchers on-site will be able to monitor the changes that occur this way and also through separate spaces which serve to provoke positive changes in memory. Some of these spaces could include activity and breakout spaces, lobby spaces featuring different (possibly familiar) views, and spaces that promote social interaction. Any spaces that emphasize routine activities will also be helpful in the memory category. Courtyards which encourage travel back to certain areas (lead back to resident spaces i.e.) would be one such strategy.

Because an Alzheimer's disease research branch presently exists within the city, this proposed new branch should contribute innovative and unique research functions that build upon areas of improvement in the current facility. This new design should replicate current research strategies, with the addition of research and design opportunities for longer-term study than is being practiced at the existing clinic. The "assisted living" part of the typology is the driving factor in design. It will become a specialized elderly care facility designed on principles of research which have yielded positive results in the past. The facility can furthermore be monitored in order to obtain and generate long-term research.

Increased technological advances today can build upon all of the design strategies mentioned throughout the theoretical premise research and should play a part in designing for the "silent generation." Special emphasis will be placed on caregiver and familial satisfaction by incorporating some leading edge technologies into the building program (appendix b).

The new facility in turn, holds opportunity to become a model for future assisted living norms. If new research efforts conducted here are deemed successful, future and existing elderly care facilities in the area could begin implementing those strategies into new or existing constructions of this typology. Regardless, a construction of this type in any area would raise public awareness on the fight against Alzheimer's disease and has the potential to spark similar projects and/or additional volunteer efforts.



historical
context

history of elderly care facilities



Image courtesy of <http://thedailyrecord.com>

Nursing homes have not always been the standard form of care for elderly persons. Relatively recent political and demographic changes have sculpted the care standards we abide by today. Prior to the nineteenth century, no age-controlled care facilities existed for long-term stay. During this time, elderly persons who required temporary housing for various reasons including: isolation by loved ones, becoming physically incapacitated, or financial issues often were detained to an almshouse where they lived for the remainder of their lives.

An almshouse housed other individuals who included clinically insane, inebriated, and homeless individuals. The elderly co-existed in these environments with all of these individuals who (regardless of their varying needs and mental states) were generically labeled as the community's "needy." Inhabitants of the almshouse were often considered to be the most despised persons in society. People who lived in these institutions were often treated cruelly.

At the beginning of the nineteenth century, women's and church groups began to establish special homes for the elderly. (Haber and Gratton, pg. 194) They began to try and assist "worthy" individuals who had once shared similar ethnic/religious backgrounds or had lived respectable lives.

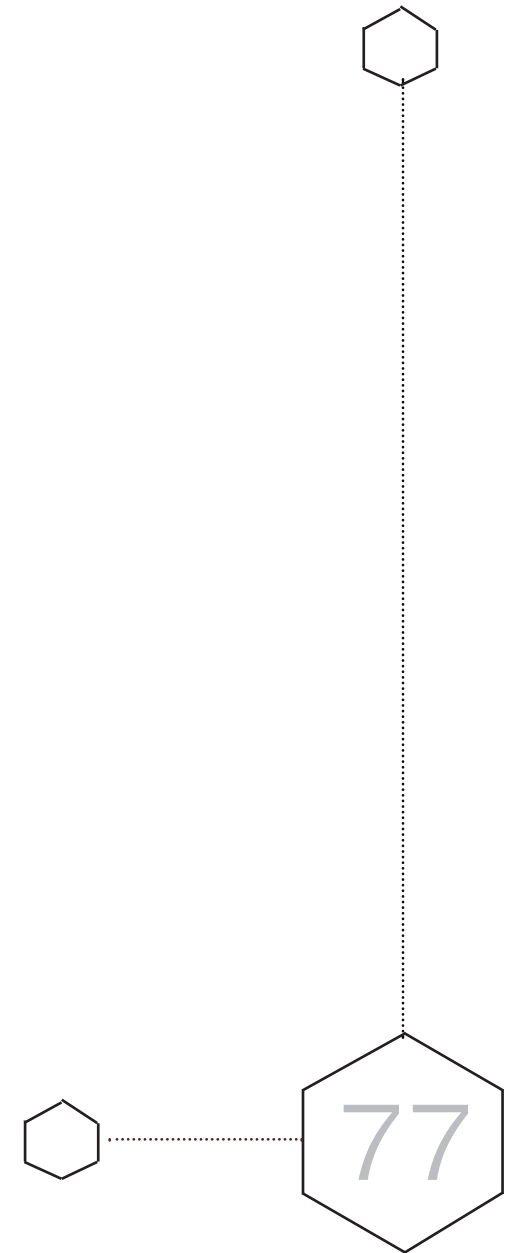
These new types of homes were intended for individuals lacking substantial family support, yet they still required entrance fees as well as certificates of good behavior and character. This was the founders' way of separating their own needy from foreigners who "had taken possession of public charities...just as they had taken advantage of houses where our less-privileged classes used to reside." (Foundation Aiding the Elderly, 2003)

This nineteenth-century old-age home functioned to separate the “worthy” elderly from the most desperate of the aging population. Consequently, the almshouse still acted as the primary refuge for the most impoverished individuals. The elderly eventually became the most dominant population in almshouses.

By 1923, 67% of almshouse residents were comprised of elderly people. As a result, many superintendents of both local and state-owned institutions changed the names of their asylums. In spite of the name changes that occurred during this time period, the almshouse remained hardly a satisfactory long-term living solution for individuals of this nature. It became a symbol of despair, humiliation, failure, and last resort. The nicknames for these institutions became “poorhouses.”

Many supporters of the pension laws at this time began to proclaim that the increasing population of elderly people in almshouses was an indication that the elderly couldn’t compete in the modern society. In the 1930s, government officials accepted this through the assumption that most elderly people would eventually need care and provided small pensions for these facilities.

Eventually, the Social Security program was established. Aging advocates began to argue that only a small percentage of the almshouse population were institutionalized because of poverty. Homer Folks (aging advocate) stated that “the others (almshouse residents who are not living there because of poverty),” he explained, “are physically infirm and sick, and have various kinds of ailments that require personal attention of the kind that you could not get in an individual home; [they] require nursing or medical attention...in some sort of institution.”
(Foundation Aiding the Elderly, 2003)





In the mid-1950's, the replacement of the almshouse was almost wholly successful. In the mid 1960's, creation of Medicare and Medicaid systems added to the growth of the nursing home industry. By the late 1970's, nursing home percentages grew by almost 150%. At this time, the care that was provided in these facilities was less than satisfactory. Many lacked substantial food supplies, medical care, and workers to operate the facilities. The elderly were simply placed into these facilities to die. Feelings of guilt and abandonment were normal for family members leaving their elderly relatives in the care of these institutions. In the 70s and 80s, amendments were made to the Older American acts which provided security for residents and families who wished to stage complaints. This did not raise the standards or ethics of many nursing homes. The fear of entering a home of this type was still a reality for persons coming of age.

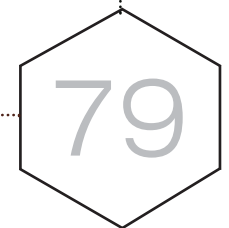
Recent legislative attempts over the past decade have attempted to control and improve the quality of nursing home living environments. Federal funding such as Medicare/Medicaid has assisted in their development, but there are still many issues associated with long-term care for older adults. These issues ultimately stem from the historical development of these types of living and care facilities.

Bill Thomas, geriatrician, in an interview with PBS news station, had this opinion on current elderly care norms: "A hospital and a poor house got together and they had a baby, and the baby was a nursing home. And at its deepest heart, it's an institution, and that is just not any way to live a life." (Thomas, 2002) In response to his distaste for current design and treatment practices, he developed a care practice known as the "Eden Alternative." Some of the focuses on designing a facility of this type include having a variety of ubiquitous plants, gardens, 24 hour security and corresponding spaces, voice-command lighting control, high nurse to patient ratio, and various animals and children wandering about. (PBS Newshour, 2002) Thomas is also looking to develop what he calls "Green Houses" where groups of 6-8 elderly or disabled persons live in free-standing buildings which are as home-like an environment as possible. This type of long-term living is a bit more costly but this typology is also eligible for government grants.

The past 15+ years, independent living with limited services has dominated the senior housing market. Most recently during the past 10 years, a noticeable shift has been seen in nursing home construction to facilities such as memory care and skilled nursing facilities. In a presentation done by Weiss Builders at the 2012 Senior Housing Summit, they discussed current construction trends in the Rochester/Twin Cities areas of Minnesota. According to Rick Fenske from Weiss Builders, the senior population in the area is growing faster than anticipated and not slowing down any time soon. For potential owners of these facilities, now is a good time to get loan approval on a project of this type. Some of the fastest-growing construction project areas of this type include the suburbs of the Twin cities, with high growth in the Rochester area. Also at the Senior Housing Summit, spokespersons for Ebenezer group discussed the demographics of people in need of specialized elderly care. Design for all demographics should be addressed.

Hospitals today are forcing people to leave sooner than ever before and go to other forms of housing in attempts to cut Medicare spending. This means that the elderly faction of society who are in need of more direct medical care are not receiving it as needed. It becomes a vicious cycle. Hospitals force residents into assisted living facilities.

As a result of hospitals not being able to afford the influx of elderly individuals, elderly care facilities today are dealing with “sicker” people. After those residents move to assisted living facilities and they become full, the previous assisted-living residents get put into independent living. We are then left to wonder what happens to the residents who can no longer fit in independent living facilities. Trends have also been moving toward “niche housing” in the Rochester area. Niche housing is independent living housing for elderly persons who want to co-habitate with people who share a main common interest. Some examples of niche housing include housing with emphasis on golf, gay/lesbian support, country music, or military background.



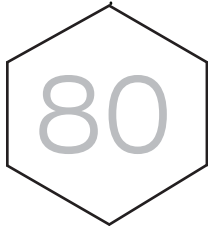


Some of the specialized services that memory care facilities offer are 24-hour supervised care, higher caregiver to patient ratio, secure areas to prevent wandering, and additional help with medications, dressing, and other daily tasks. Beverly Sanborn, Vice President of Program Development at Belmont Village Senior Living in San Jose, California, claims that her facility, and many, are increasing and improving their memory care services due to patient satisfaction and overall success during the last few years.

According to Dana Larson, senior living writer at A Place for Mom, “In a full-scale memory care program, the goal is for the resident to function at the highest possible level and to maintain that level for as long as possible. (Larson, 2012)

If you provide mental, physical and nutritional health at optimal level, you should be able to improve mental acuity for at least a 6 month period. This is very positive for the sense of well-being for the resident, as well as, being gratifying for the family.” (Larson, 2012) It is with these types of facilities that consideration for caregivers’ emotional well-being has been directly addressed in addition to resident care.

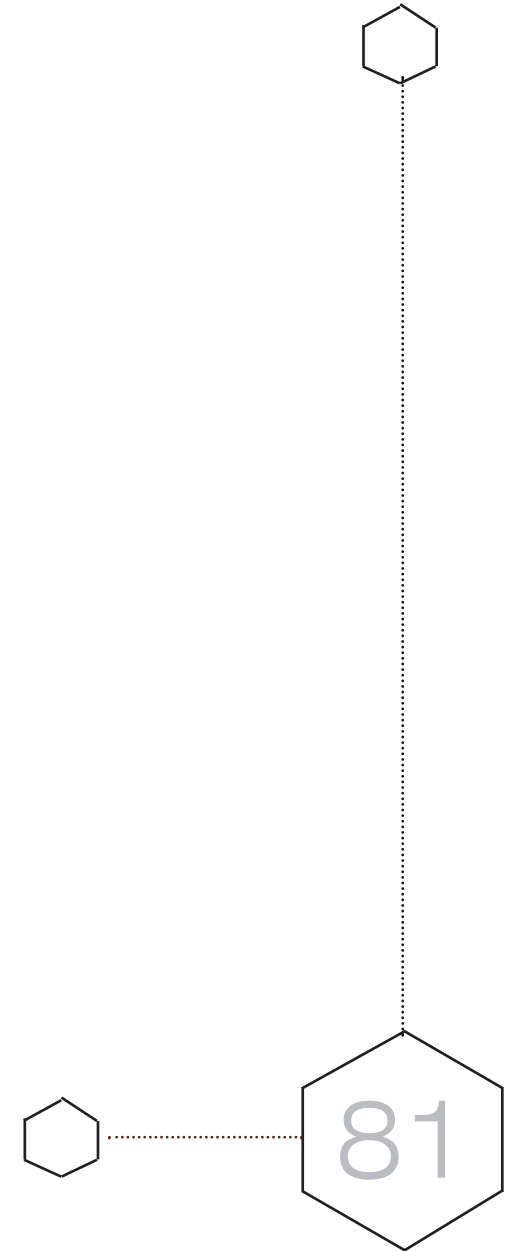
One important reason for the shift from assisted living to memory care may be the fact that as the resident ages, more personalized care will be needed as residents become increasingly incapacitated. Instead of having to move twice, from home to assisted living and assisted living to memory care facilities, residents and their families will opt for living in memory care units right away.



Technological advances have begun to increase the health of residents. The caregivers who work in buildings of these typologies now have the advantage of being able to send a blood-pressure reading to a hospital in seconds, where in the past the process took a trip across the city to get to the hospital before the tests could even be done.

Frisbie architects have done projects in the Rochester area that emphasize the phrase, “This is not your grandmother’s nursing home.” This phrase means that the design is moving forward to reflect our current generation’s culture changes, preferences, changes in transitional care and interests. They focus much of their design toward the “boomer daughter.” The family of the caregiver is just as important to their design as the resident. Newer technology and a menu of social activities and services are a couple new developments Frisbie architects strives to provide in the design of their buildings. One special service they provide is internet availability to all residents. They want the “boomer daughter” to be able to go online and see how Mom’s day is going. This provides peace of mind for family who can’t be near their loved ones at all times.

Even though there is a dramatic shift towards memory-care facilities in Rochester and many other areas across the contiguous United States, there is also an extreme shortage and wait lists are long. It can be very difficult to get into a facility of this type and may take years that the patient may not have.





thesis
goals



thesis goals

to inspire

My inspiration for creating a thesis project around the typology of an Alzheimer's care and research facility sparked from my witness to the struggles my great-grandmother Tracy underwent after she became diagnosed with this disease. As the disease progressed, I experienced first-hand the feelings of concern over the care she was receiving, as did my family. The main worries stemmed from the lack of personalized care she received at the nursing home she inhabited during the last 6 years of her life. In addition, I got the feeling that the other residents at this particular facility seemed unhappy and sad; something I picked up on even as a child. I chose to further explore this typology for a few other reasons as well.

I have always had feelings of empathy for the elderly, particularly those suffering from dementia. As their symptoms progress, they become, in many ways like children. Unfortunately, our society does not place the same amount of attention on design for their quality of life, personal needs, desires, and safety as we do for the needs of young, dependent children.

Alzheimer's disease is one which runs in my own, and increasingly many families in America today. "An estimated 10 million baby boomers are expected to develop Alzheimer's during the next thirty years. By 2030, nearly one out of 5 Americans will be over 65." (Dezell & Hill, 2009) As the number of people diagnosed with Alzheimer's disease continues to increase, there will be a greater need for facilities which respond directly to their personal and unique needs. Generic "nursing homes" can no longer be the answer.

The need for true, altruistic architecture today lies with those who need it most, but have no way to repay the favor. The elderly have lived and served our population their entire lives and now is the time to give back. All the while, we should remember that one day, we will walk in their shoes.



1998 photo of myself, my sister Vanessa Mauch, and Great-Grandmother, Tracy Kuzel at the Assisted Living Facility where she lived.

raise awareness

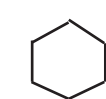
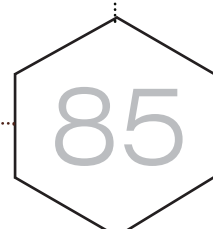
“Thanks to advances in medical care and treatment, death rates from 2000 to 2005 declined for most major diseases, including heart disease (-8.6%), breast cancer (-8%), prostate cancer (-4.9%) and stroke (-14.4%). Alzheimer’s disease death rates increased 45% during the same time period (NY Times. (2010).” Before doing this research, I was unaware of how serious a problem this disease is becoming. Similarly, more needs to be done to educate the public on the reality that Alzheimer’s disease is a major issue in our society. Recent laws have promoted research and study of this disease. By improving upon current facilities and encouraging further research, economic support, and study of the disease, scientists may continue to advance its temporary and long-term treatment.



Image retrieved from Phototravelicious.com

In relation to my professional goals, I want to become an expert on the design of a facility of this typology. I would like to provide an unparalleled insight into the design of elderly care/ related health care facilities should the opportunity arise in the future. I first must learn to understand the client to the fullest extent.

Design for a client of this type should not be driven by efficiency and productivity, nor forcefully manipulated in response to budget or program. The user must remain the first and foremost priority at all phases in the design process. Understanding the user is the first step in designing for that user. I would encourage fellow designers who are creating plans for users of this type to work to wholly understand the user, moving away from generic institutional nursing home design norms and toward user-tailored strategies.



provoke change

In order to transition current institutional nursing home settings to specialized design environments, the public must also become aware of the issues a setting of this type houses for Alzheimer's sufferers. Creating awareness through a responsive design solution is one of my utmost goals. I would like to utilize this opportunity for word-of-mouth communication through creating a holistic, evidence-based design that accomplishes all of these promises by building on ideals being researched today.

My final design should respond to the physical, emotional, and mental needs of its users. It must build upon the current ideals of the existing Mayo Alzheimer's Research Clinic while still retaining a "home-like" environment for the residents.

In order to get to this final point, this typology will challenge me to think beyond the structure and aesthetics of the building and discover how a design can be manipulated to provide treatment in all three states of wellness.

The "experience" of the building becomes a driving force in program and design stages. A designer must become the user by putting oneself in the shoes of a dementia sufferer at all stages of design, always questioning design intent and potential impacts.

This requires thinking outside current mindsets and seeing the world from a completely new perspective.



At some point, this experiential architecture will need to unite with technical design. It needs to become a solution that is well-rounded and respectful of a variety of distinctive humanistic needs. The final design should incorporate a variety of mixed uses into a single typology. Areas including residential, research, therapy, and social activity spaces will need to come together cohesively; with overall wellness of its users at the forefront. This project aims to emphasize the immediate need for personalized care facilities by educating the public on what our generation's elderly population needs in order to have the best quality of life possible. Those changes must begin by tweaking the current norms of nursing home facilities as the elderly population's needs evolve. I aim to create a model of a design which has accomplished these things and encourage other designers to completely understand their user's needs in addition to designing for budget, efficiency, and productivity.

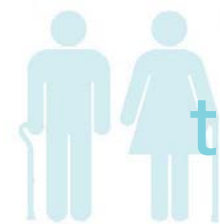
It is my hope that the elderly population in future generations will acquire the specialized care and living environments from which a better quality of life may be attained. To improve quality of life, symptoms need to be remediated. In order to remediate symptoms, research and study must be advanced in the fight against this incurable disease. Incorporation of a medical research and living/care facility into one typology aims to promote those suggestions and improve upon existing research practices by creating longer-term study.

Raising awareness is the first step in making a change.



“Be the change you want to see in the world.”
Mahatma Gandhi





the site



 site selection *narrative*

After choosing the typology of an elderly care facility, I did various investigative tasks on what areas of the United States were in most need and would stand to benefit directly from the typology I was proposing. For Frisbie Architects, (an architecture firm in Minneapolis, MN) the process of site selection for this kind of typology ranges from 3-4 months prior to beginning the early stages of design development. Likewise, I began the site selection process several months ahead of time by analyzing the typology and what basic needs were encompassed within the typology itself.

Through my research efforts, I discovered that a large percentage of people in nursing homes of these types had cognitive impairment and various stages of Alzheimer's disease. I concurrently ran into many reports stating a general dissatisfaction of patients in these facilities who were lacking specialized care. As my interest in a more specialized typology grew, I learned that a new law was passed by Congress in 2010 and enforced by President Barack Obama in 2011. This law, called the "National Alzheimer's Project Act (Public Law 111-375)" required the "creation of a national strategic plan to address the rapidly escalating Alzheimer's disease crisis and the coordination of Alzheimer's disease efforts across the federal government." (National Alzheimer's Project Act (NAPA), 2012) Earlier this year (2012), the National Alzheimer's Plan was put into action. The Mayo Clinic in Rochester, Minnesota had an Alzheimer's disease research center.

This area held a prospect of a "sister facility" to the existing Mayo Research Clinic. I saw areas for improvement in this facility; a main one which was long-term residential care/living environments. Longer-term research opportunities also exist in a facility of this proposed typology which have the potential to be explored as successions of technological and research advances are being made in this area of the Midwest.

Due to the residential nature of my project, the neighborhood to the east of the site was a welcoming transition point between downtown and full-on residential area. Far enough away from the central area of downtown to avoid the heaviest traffic and other safety hazards, the site is still close enough for ease of transportation from existing clinic to new proposed construction. This is crucial for a facility of this type which will receive overflow patients from the existing clinic who are in need of longer-term care.

In addition to proximity to the current Mayo Research Clinic, other prospects that would benefit the site were taken into consideration. These included recreational and pedestrian-friendly attractions as well as juxtaposition to local bus routes. The area chosen is currently underdeveloped, as it is an existing parking lot owned by Mayo with Industrial utilities to the South and Zumbro River directly to the West. Some small local businesses which seem to be struggling economically lie directly North of the site.

Due to the under-developed nature of this site, a health-care facility of this type would revitalize this portion of city and create a kind of safe-zone between Industrial functions and the city. This would encourage pedestrian use and bring benefits economically for existing small businesses in the area.

site history

The site itself has been used predominately for parking since the erection of the Mayo Clinic in 1889. At this time, Mayo was named Saint Mary's Hospital and has grown exponentially over the years. It is now a major employer of more than 56,000 combined students, nurses, and allied health staff. Additionally, 3,700 physicians and scientists practice medicine and medical research at Mayo. The city's history of medicine and specialized integrative care makes it a prime location for a project of this typology.



site *analysis*



The location is a pleasant area where crime rate is very low.

Compared to neighboring cities, noise levels are minimal in the city; even in downtown areas. Rochester being the county seat of Olmstead County, its historic district gives a feeling of timelessness and hierarchal elegance. The site itself was kept very clean so that the amount of debris/clutter onsite was virtually nonexistent. It is a more open area which contrasts the typical building densities of the downtown cityscape, due to its parking functions. The residential areas nearby are maintained as well. Potted plants and vegetation can be found scattered throughout the city at store-fronts and outdoor patio areas, which shows that the city residents and business-owners have retained a certain sensitivity toward aesthetic details.

site measurements

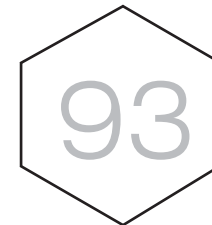


Site Measurement Figure 93-1

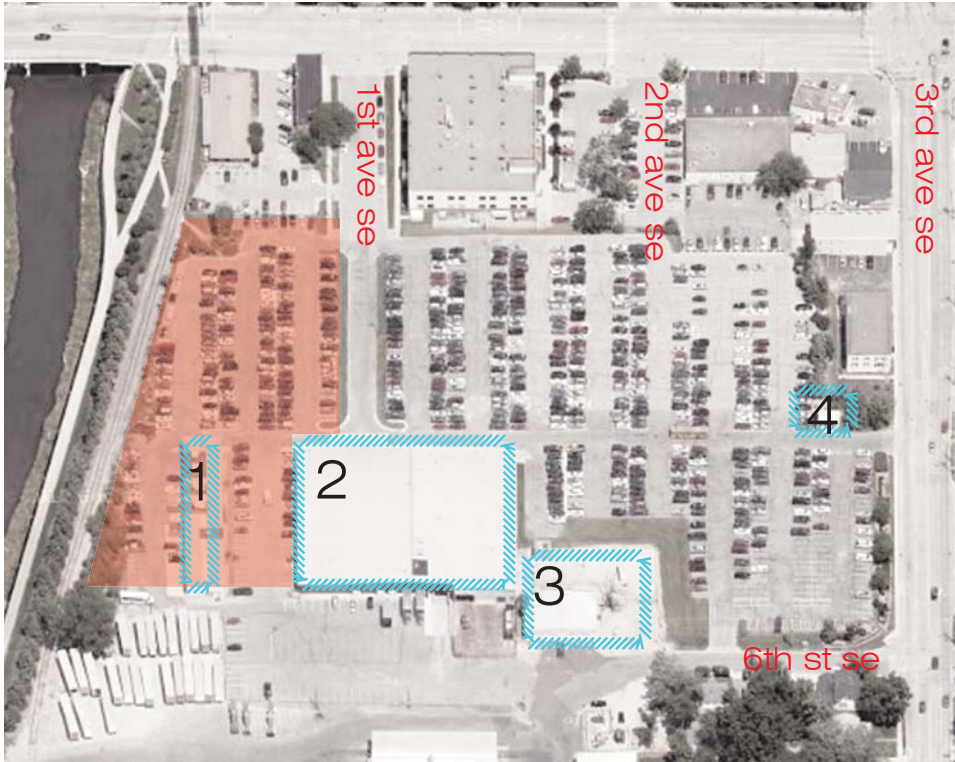
Image Retrieved from Google Maps 12.07.12

The lot measurements can be found in the Site Measurement Figure 93-1 above. They are pretty archetypal lot measurements as per typical parking space code compliance.

Site location is a parking lot currently owned by Mayo clinic which is joined with another larger lot, repaved earlier this summer. The existing lot is in need of repair and is the current site of a Mayo warehouse building and smaller storage shed. It is set back South of 4th St SE with main lot entrances on the North and East.



existing buildings on/near site



The existing warehouse is fairly large, measuring 28,700 square feet. Because the proposed design is an innovative healthcare and research building, re-using the buildings on-site is unlikely. Demolition would need to be performed for all buildings on-site. The smaller storage shed measured 5,510 square feet and was virtually vacant at the time of the site visit, housing only one Doosan Bobcat® skidsteer loader. This smaller shed will either need to be repaired or removed from the site at time of new construction.

Existing Buildings Figure 94-1
Image retrieved from Google Maps
12.03.12.



1
description: wood-frame construction. aged corrugated metal siding. west-facing facade (northwest end) lacking overhead door and exposed to the elements.

size: 5,100 sq ft (38'-0" x 145'-0")

use: mainly vacant. previous use may have been machinery or small-scale motorized equipment.



2
description: combination of wood and steel framing. aged corrugated metal siding. service entry + overhead doors on south end.

size: 28,700 sq ft (205'-0" x 140'-0")

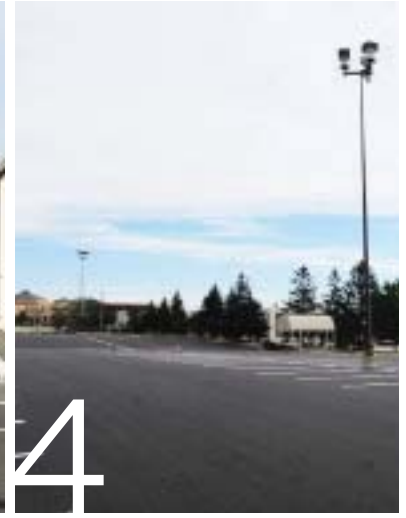
use: warehouse building for medical equipment/ file storage owned by the mayo clinic.



3
description: off-site (south) delapidated cmu-masonry building in need of repair. owner unknown

size: approx. 1750 sq ft (50'-0" x 35'-0")

use: possible industrial storage



4
description: located on adjacent lot. tent/canopy structure with metal leg supports

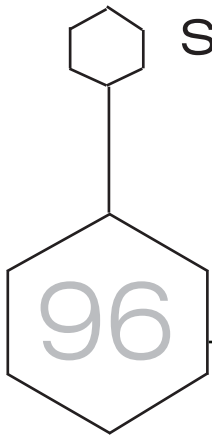
size: 180 sq ft (15'-0" x 12'-0")

use: bus shelter





site aesthetics + views

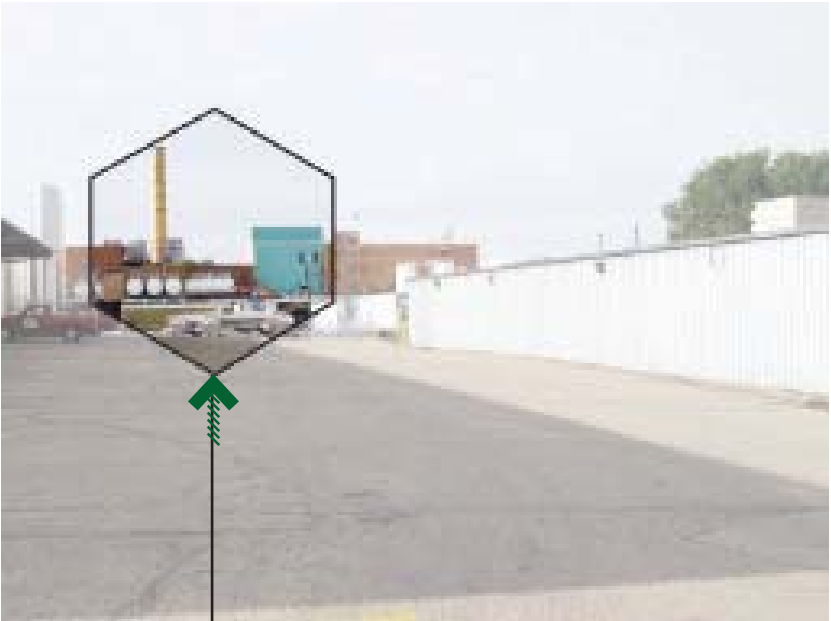


Located on the very outskirts of the downtown area, 4th St Southeast is a fairly quiet street which begins to phase into residential and a smaller business district just East of the site. Views to the North (above) from the site offer a look into a small-business sector of town with plenty of green outdoor spaces, skywalk circulation, the Zumbro river, and pedestrian-friendly areas.



Views to the Northwest feature an ideal look at the Rochester skyline. (bottom right) To the West is the Zumbro River which runs directly through downtown Rochester. Eastward views reveal quiet residential areas and side-streets where a slower-paced lifestyle can be observed. The wide range of views from this site reveal many looks into different cultures, routines, and lifestyles in the city.

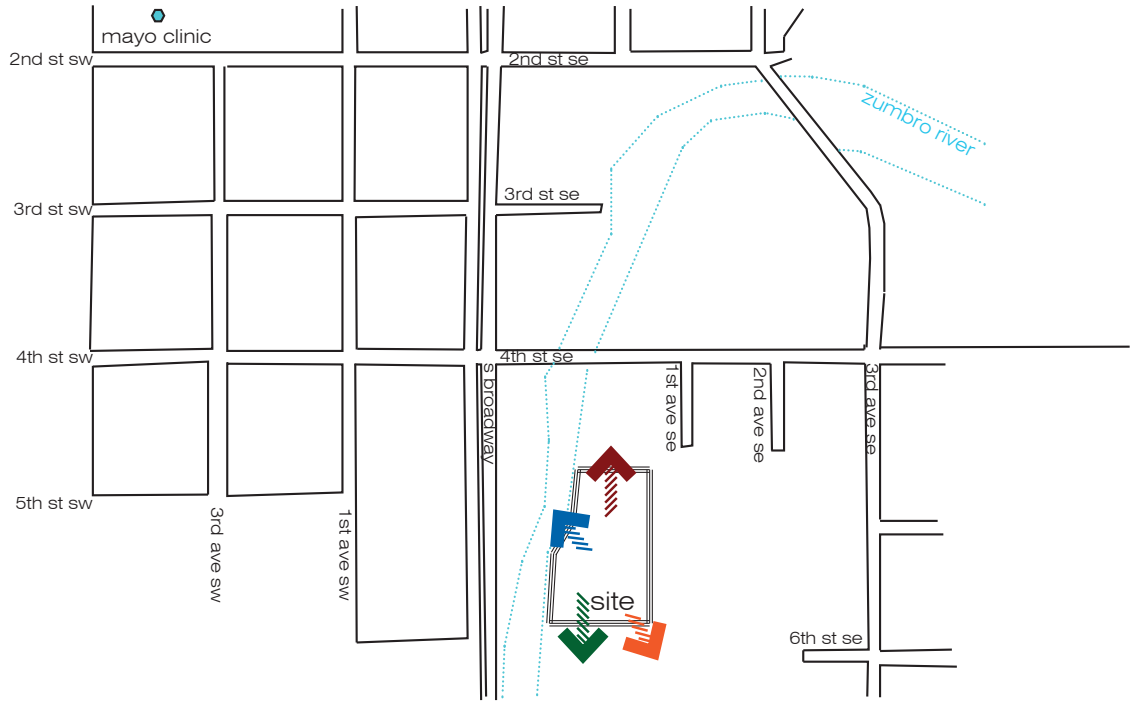


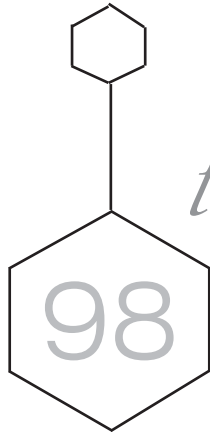


Views directly South of the site are not primarily ideal. Located here is an industrial park. There is frequent truck and heavy machinery traffic in and out of this area which is located within 1-3 blocks of the site. Design strategies will need to be implemented to ensure safety in closing off these hazardous areas from the site.

Although the south side of the site is a heavily-industrialized area, just a half-block from the industrial park to the southeast is a residential area which is home to mainly middle class citizens. (below right)

Site Views Figure 97-1





traffic patterns

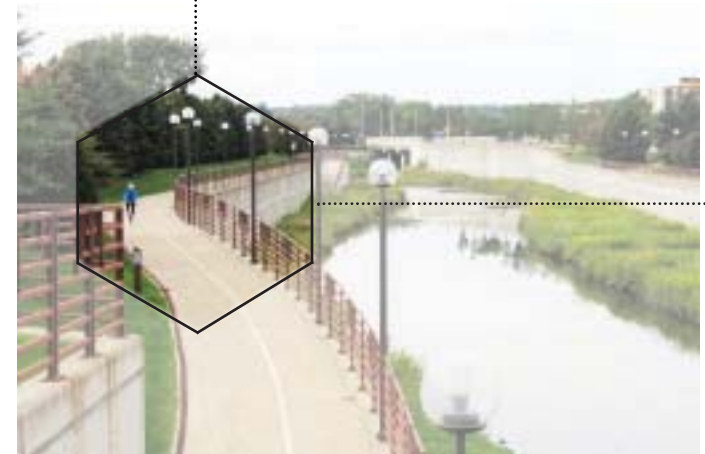
vehicle + pedestrian traffic



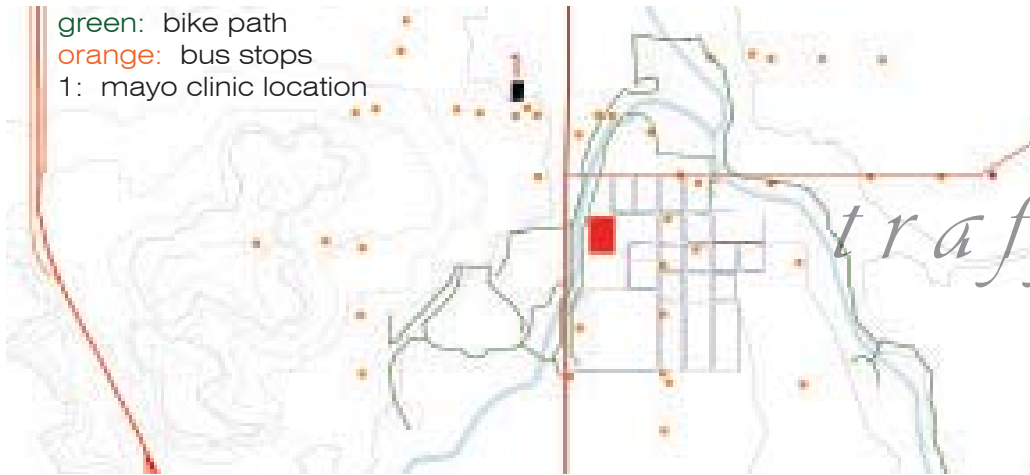
Average traffic speeds within the few blocks surrounding the site are typically 25-30 miles per hour on average. Pedestrian traffic in the area is especially active as there are many businesses, nearby parks, schools, and government buildings near the site. Additionally, the Zumbro River is known as a particularly scenic natural attraction with features such as bike paths that span along its banks (see Transportation Map 99-1 for bike path locations).



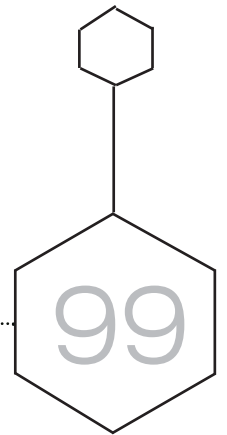
For recognizable reasons, safety will be a concern where traffic exists and special design strategies need to be implemented to reflect those realities. However, in a presentation given by RSP Architects at the 2012 Senior Housing Summit, Alanna M. Carter discussed the benefits of a site near a high-traffic area. Elderly care facilities have typically been erected near slower-paced areas but recently, trends are occurring in busier city areas. The reason for this is residents wanting the “action” view as opposed to the old “ducks and pond” views (Carter, 2012). This site provides limitless opportunities for both.



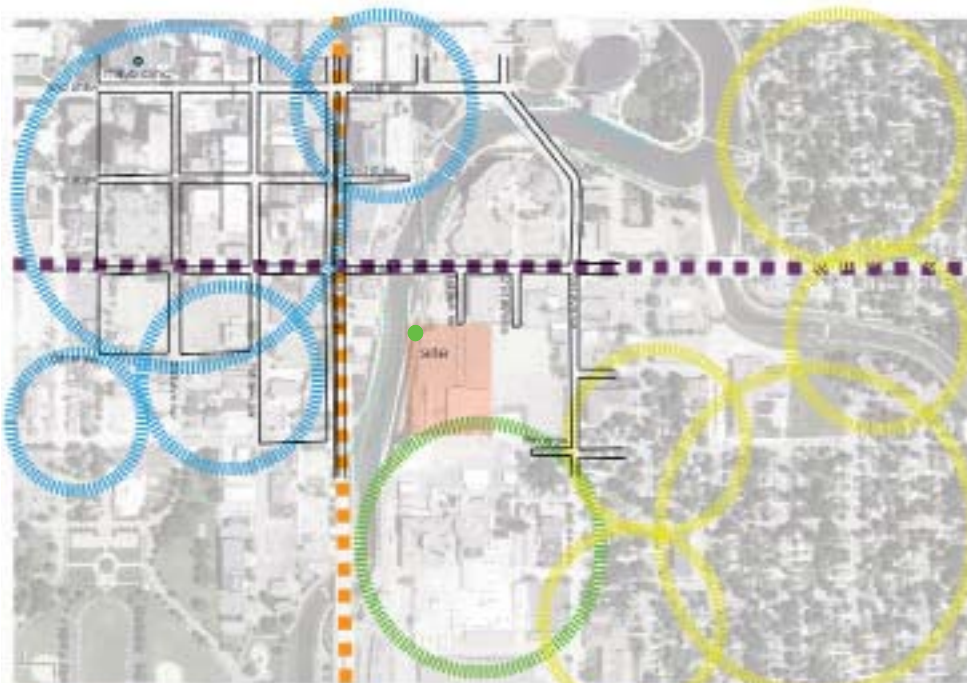
- Photo location indicated by green dot symbol in Transportation Map 99-2 (Right).


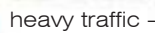
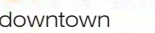




traffic patterns
transportation



Transportation Map 99-1
Transportation Map 99-2



-  heavy traffic - downtown
-  low to moderate traffic - residential
-  truck/heavy machinery traffic - industrial
-  2-lane street: moderate traffic
-  4-lane street: moderate-heavy traffic

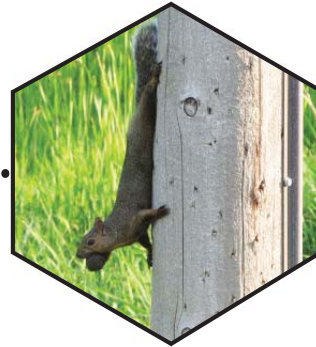
Site location is in an area with numerous bus stops on almost every block. This presents advantages for both the residents who would like to travel outside the facility but can no longer drive as well as guests traveling to the center. Bus routes nearby in the area will help to promote sustainable travel options in this region.

Especially important will be screening off the South side of the site from the truck/heavy machinery traffic (see Transportation Map 109-2). One of the gains from having the industrial amenities in the “backyard” of the site is the fact that a service entry and back alley already exist at this location.

◻ habitat + wildlife



view onto site
from northwest



red tree
squirrel

black-capped
chickadee

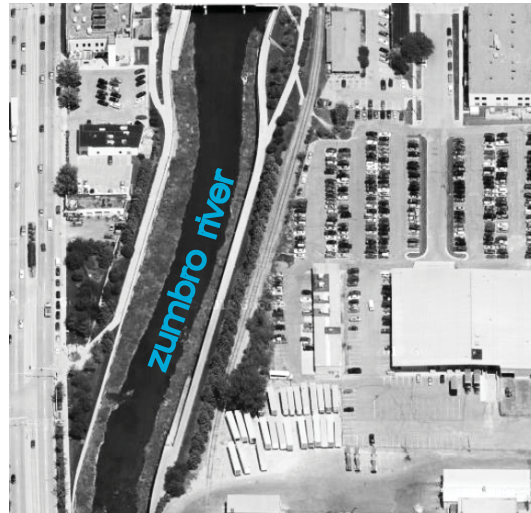


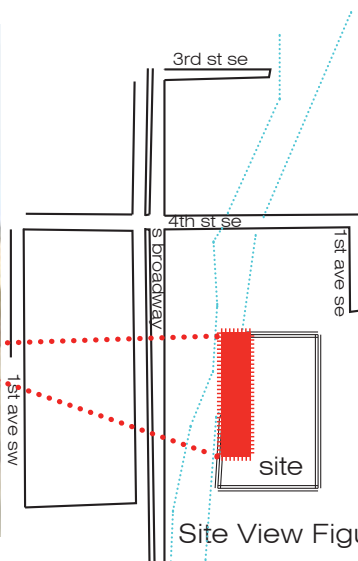
image retrieved from Google Maps

Small mammals such as squirrels and songbirds can be found on-site at nearly all times. These animals are attracted by the Zumbro River as it is their main water source within the city.

Larger wildlife have been reported being seen along this stretch of river including grouse, eagles, herons, and larger mammals such as deer and fox. The river is one of very few rapids, but is a fishing attraction. Anglers can expect to catch catfish, bullheads, suckers, and smallmouth bass. ("Zumbro river," 2012)

vegetation

Due to the riverside location of the site, vegetation and natural green space thrive in this area. Although noxious, weeds such as dyer's woad (*Isatis tinctoria*) and sandburs add to the aesthetically pleasing views of natural landscape on-site. Man-made green space such as grass parking islands lie on the site as a transition from river to city.



An existing grove of spruce trees (coniferous) lines the Zumbro river to the West (photo at left) and provides resistance against soil erosion on this section of river. In addition to the beautiful natural scenery this vegetation provides for users of the riverside bike path, it also acts as a natural barrier between the current parking lot and river. This is useful for blocking wind and snow accumulation from the west, southwest & northwest.

infrastructure + parking



Existing infrastructure on-site includes a natural gas pipeline that runs adjacent to the site. Surveying will have to be done to determine exact location of this pipeline, sewage lines, and other electric lines which run adjacent to the existing lot. Power line connection will be easily accessible and new construction will be conveniently connected to the existing power lines as there are many neighboring businesses and residences in the area.



The site also has a set of train tracks directly to the west (on the East bank of the Zubro) which gets used moderately often; mainly for shipping purposes. Parking is limited on the busiest streets nearby including 4th St SE (shown above). However, access to parking will not be an issue for those who utilize the current lot the site is located on. The site will be limited to the smaller, west lot which is in dire need of repair. Any parking spaces that would be eliminated for new construction have the potential to be re-located underground or with the addition of a parking ramp to the current neighboring lot. Mayo Clinic currently owns the site which has been designated for parking purposes. New construction will be a Mayo clinic branch so staff members/users of the new proposed facility would still be able to utilize parking amenities.





nearby businesses

Economic conditions in the area directly surrounding the site are in need of revitalization. Commerce seems to be at a stand-still with some of the nearest small businesses. Bringing new construction to this site will increase travel to the area and revive some of the lacking business in this area.

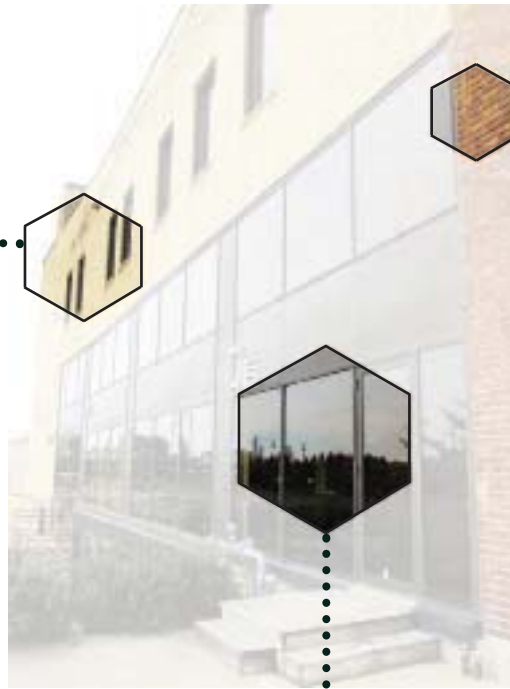
Businesses nearest the site include a small bike-repair shop, Mexican Restaurant, Lingerie Store, and Hair Salon. Benefiting some of the struggling businesses here could have many economic recompenses for local business owners.



regional materials



A building in this area should be designed with conscious respect toward traditional regional materiality while retaining its own personal, unique style.



Rochester uses a wide variety of materials in building construction. Innovative new constructions featuring glass facades and metalwork can be noted in the Mayo Clinic Building downtown, while historic brick masonry buildings can be seen in the business sectors of the area.



- limestone
- granite
- marble
- travertine
- dolomite

LVL (laminated veneer lumber)
OSB (oriented strand board)
glue-laminated beams

- aluminum exterior columns + canopies
- aluminum curtainwall mullions

- masonry
- CMU block
- structural glass block
- brick
- stone

- Tempered Glazing
- Aluminum Door & Window Frame

- wood lumber landscaping material
- metal accents + railings

-brick in a variety of colors, predominately brown/warm hues



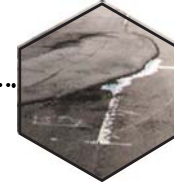
site texture



cracked asphalt in need of repair



newly constructed concrete parking curb

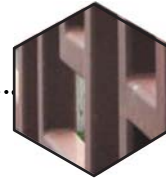


Discrepancies in uniformity of new asphalt

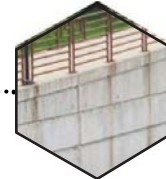
Site Texture Figure 105-1



Image retrieved from Google Maps.



metal bridge railing



concrete retaining wall & rusted metal railing



brick & mortar in need of repair



natural limestone building finish



gravel lot space



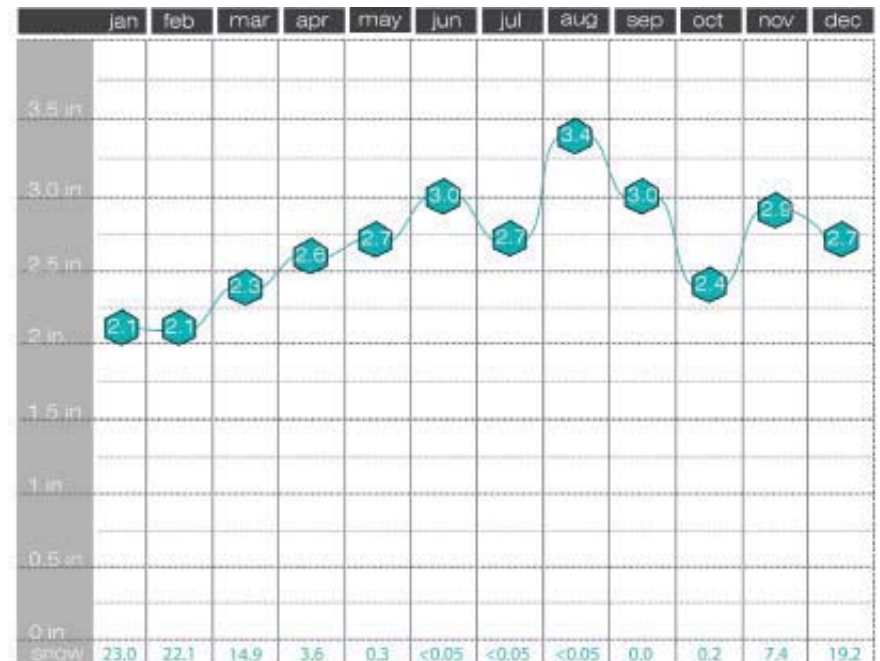
metal siding

rochester *precipitation* range

flood precautions

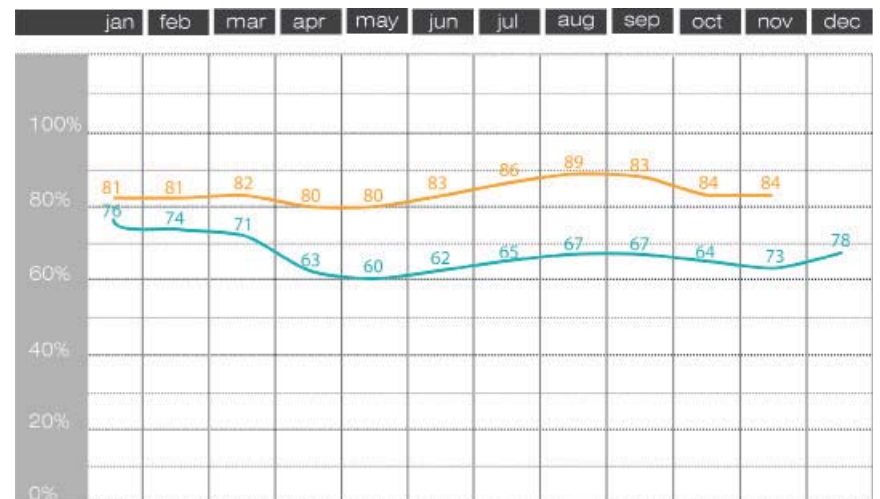
As is the case with any area that experiences moderate snowfall in the winter season, there is the potential of flooding in spring due to snow melt and water run-off. Fortunately, the City of Rochester has taken measures in what is called the “Flood Protection Act” which was established after the great flood of 1978. The city has designed a flood control system that has the capacity to “handle any spring snow melt /flood event situation that has occurred thus far in the city’s history (Flood Preparedness, 2012) .”

Areas of the Zumbro River channel were deepened to handle major flooding. Seven flood reservoir storage structures were also put in place to hold back waters that exceeded a 200-year storm from 35% of the watershed that flows into Rochester. our flood protection is designed to handle any flood event that the community has experienced thus far. The Corps project deepened and widened the Zumbro River channel and Bear and Cascade Creeks to handle major flood flows. The NRCS project installed 7 flood storage reservoir structures to hold back flood events exceeding a 200 year storm from 35% of the watershed that flows into Rochester (Flood Preparedness, 2012) .” Although the system isn’t fool-proof, there is less than a 1% chance that there will be major flooding issues after this act was put into place.



Precipitation Chart 106-1

relative humidity range



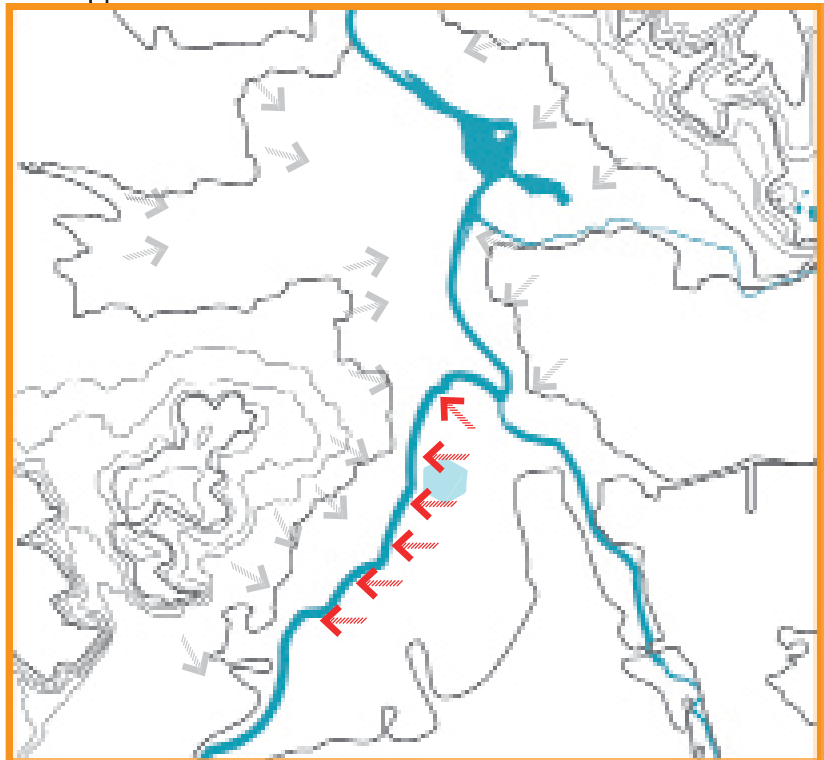
Relative Humidity Chart 106-2



107

water table

Rochester is located in the Southeastern Province. Groundwater characteristics here are thin. According to DNR Headquarters, natural ground water is less than 100 feet of clayey glacial drift over Paleozoic sandstone, dolostone, and limestone aquifers. Karst characteristics are common in this type of bedrock. (DNR, 2012) This means that the underlying rocks in this area contain their own drainage systems such as sinkholes, springs, seeps, and sinking/disappearing streams caused by acidic water over the years. The subregion which the site lies on is the Missouri Subregion where depth to the water table varies. Typical depth to bedrock within this area is around 100 feet and the water table is within 25-40 feet of the land surface.

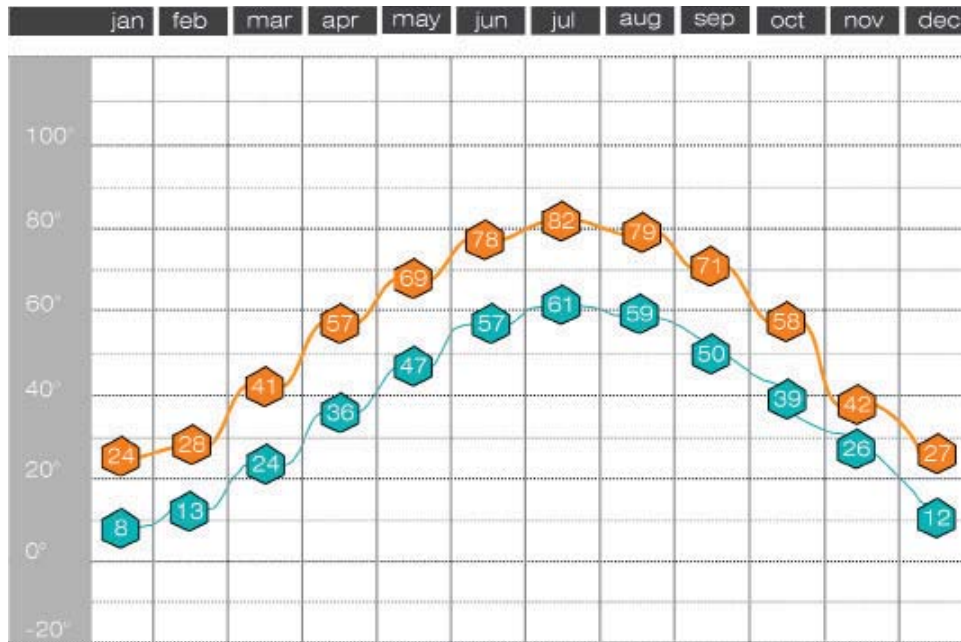


Site Drainage Map Figure 107-1



temperature range

Temperature Range Chart 108-1

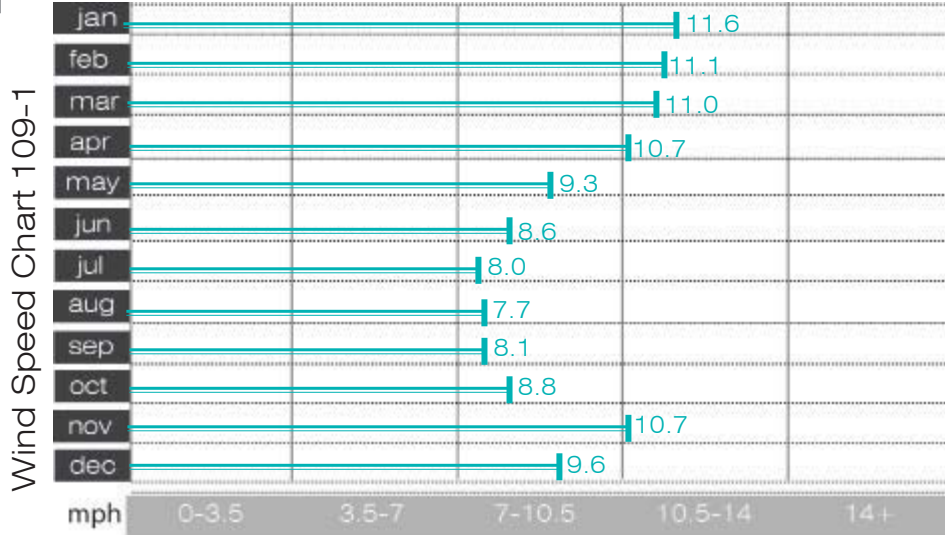


*Note that all temperatures are given in degrees Fahrenheit
 Average Yearly Temperature:
 52.6 degrees F

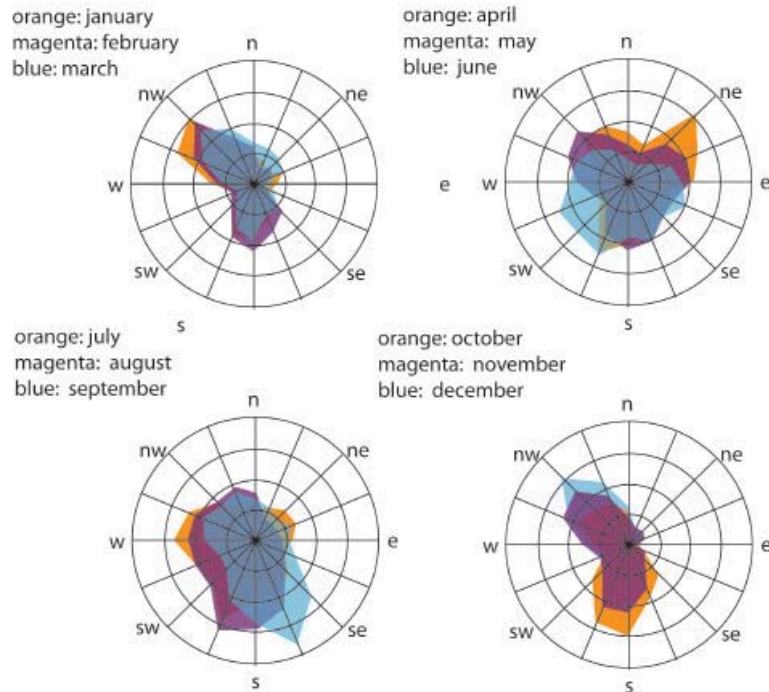
Many insulation construction methods can achieve R-values exceeding R-40 levels. When used synchronously with other insulation methods, efficiency can be improved in walls, roofs, and glazing systems. It is important to achieve the highest R-value possible to protect against temperatures that have been known to dip to under -30 degrees below Fahrenheit.

Rochester is part of a humid continental climate, undergoing very warm summers and especially frigid winters. Building codes require structures to meet certain R-values deemed necessary for the specific climates they are in. A precise level of sustainable efficiency can be achieved by these means. Rochester is in Zone 6. Code requirements for this zone must be complied with. Using the LTRR Calculator for Polyiso Insulated Roof Systems from GreenZone, I determined that the minimum roofing requirements for this area were to be at a minimum R-value of 20 (GreenZone, 2012) Anything above this would only add to the operative efficiency of the building. Wall values would be of similar R-values to this as well.

wind patterns



Wind Direction Chart 109-2



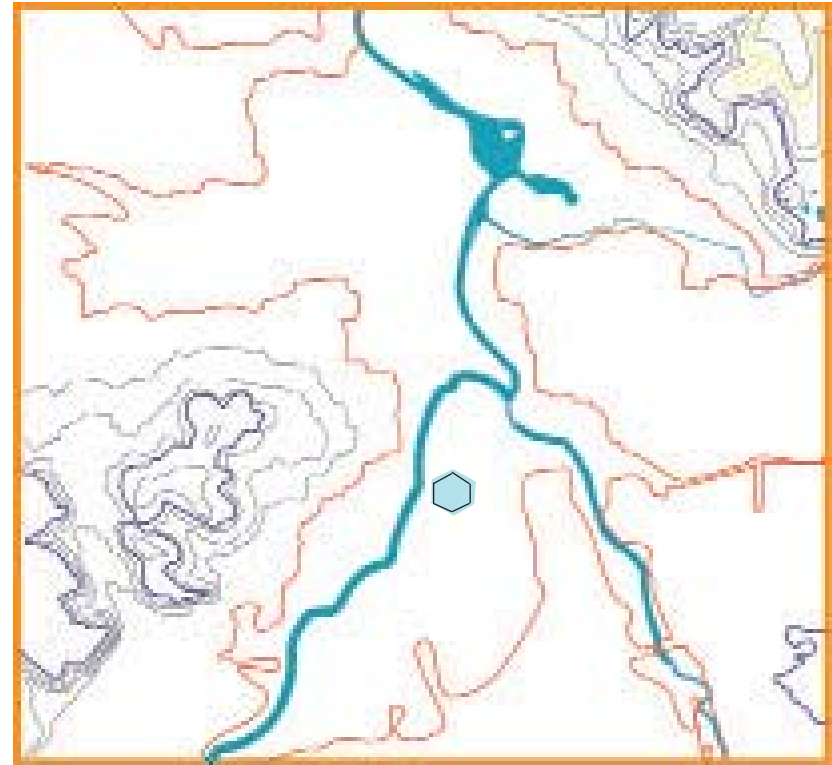
Typically, the Midwest states of the US have been known to have some frigid winters. Minnesota is no exception, with winds predominately from the Northwest during winter months. Design solutions must be executed to protect against those winds. A natural windbreak already exists on the west side of the site which will greatly benefit during these months. Other strategies that could be applied are walls that act as wind barriers and avoiding placing an unprotected courtyard in areas where winter winds will become an issue. Furthermore, snow accumulation due to gusts of wind need to be understood when placing the structure.

rochester *topography* study

According to Minnesota's DNR Headquarters, "human and natural modifications made in one watershed may be spread many miles downstream to another." (DNR Headquarters, 2012) DNR headquarters is involved in any construction processes that would involve sloping land for drainage near a main water source, such as the Zumbro River. Site water typically flows from Southeast to Northwest towards the river. As a parking lot, the site's slope is very minimal, with small gutter drainage on-site at all parking islands and curbs. River slopes become as steep as 11% along the banks of the Zumbro River near the site, which is where the main groundwater runoff will flow towards.

regional land elevation map

Land Elevation Chart 110-1



- 1000 ft above sea level
- 1100 ft above sea level
- 1200 ft above sea level



soil study

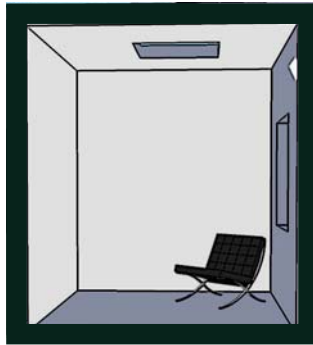
All soils within zoned areas of the Rochester, Minnesota region (Olmsted County) are suitable for building. There are several suborders of soils in the area. All of these suborders are known to have a high mineral content. This includes aluminum and iron hydroxides, titanium oxides, and quartz. Most of the soil that predominately exists across many regions of Minnesota and the Rochester area is known for its fertile, high nutrient content and dark surface. For the majority of the year, this soil retains its moisture. Unlike soils containing more clay, this soil has a more slack consistency and is favorable for Minnesota's agriculture. The soil nearest the river (excluding the riverbanks) is a clay-loam texture with around 33% clay and a pH of around 5.8. (Fang, Brezonik, Mulla & Hatch, 2002) Found on the slopes of the Zumbro River near the site are Alfisols, an order of soil which is found in areas of excess drainage. Because of the soils' natural tendency to erode near the riverbank, construction should not be built too close to the river's edge. A construction project in this area will have to be mindful of keeping the area clean and free of debris at all times so as not to pollute the river.



solar study

3:00 pm sun/shade study
rochester mn site

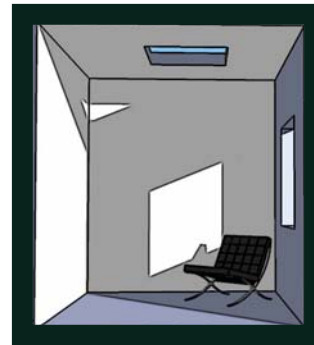
Shade Study Diagram 112-1



east glazing
north window
3'-0" x 3'-0" skylight



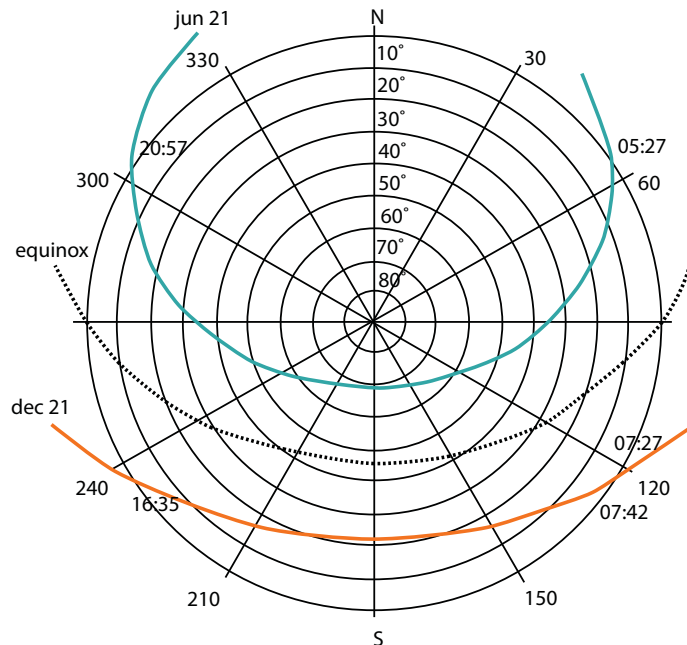
north glazing
south window
3'-0" x 3'-0" skylight



south glazing
west window
3'-0" x 3'-0" skylight



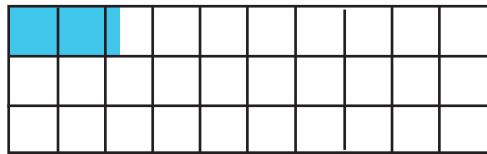
west glazing
south window
3'-0" x 3'-0" skylight



Sun Path Diagram 112-2

The site was very bright and the temperature was warm; some of which was a result of the asphalt on-site creating an excessive heat gain. There was little reflectance from the neighboring new asphalt parking lot, but the smaller lot site had some reflectance because the asphalt was much older and lighter in color here. There was minimal shade on-site. The shadows that existed resulted from the existing buildings on-site. Overall, the river area is bright and lively and features some great day-time views. A shade study was performed for the area (Shade Study Diagram 112-1) where solar effects from one glazing wall, skylight and window were analyzed. Glazing on the North facades would be favorable for summer to avoid excessive heat gain, while South-facing glazing would be beneficial in the winter to maximize solar gains. The addition of various sun-shade devices would be beneficial during all seasons.

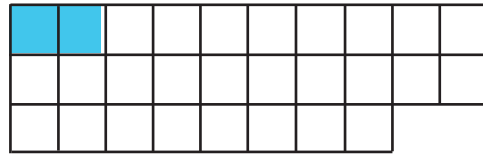
january 7%



2.17 : 31

cloudy to sunny days

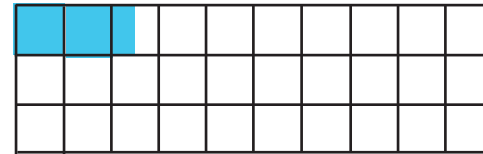
february 7%



1.96 : 28

cloudy to sunny days

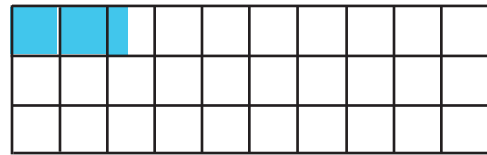
march 8%



2.48 : 31

cloudy to sunny days

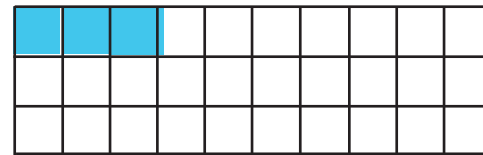
april 8%



2.4 : 30

cloudy to sunny days

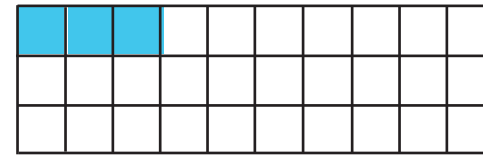
may 10%



3.1 : 31

cloudy to sunny days

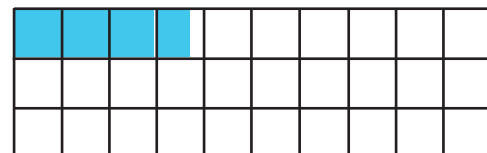
june 11%



3.3 : 30

cloudy to sunny days

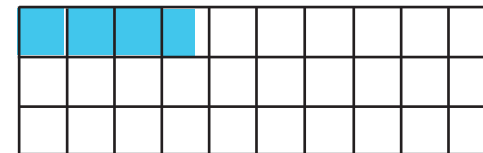
july 12%



3.6 : 30

cloudy to sunny days

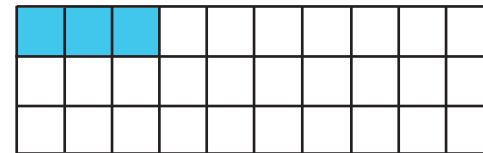
august 12%



3.2 : 31

cloudy to sunny days

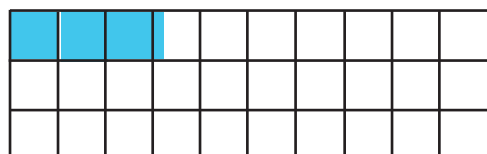
september 10%



3.0 : 30

cloudy to sunny days

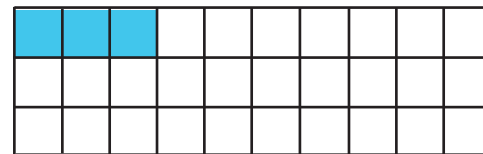
october 10%



3.1 : 31

cloudy to sunny days

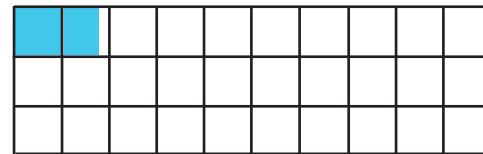
november 8%



2.4 : 30

cloudy to sunny days

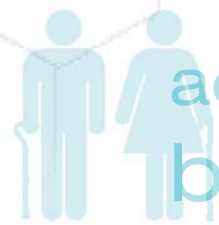
december 6%



1.86 : 31

cloudy to sunny days

Cloudy to Sunny Day Ratio Figure 113-1



activity/spatial allocation
breakdown



Square Footage Breakdown

4,600 General Office + Nursing Stations

200 Admissions Unit

650 Caregiver Therapy

2,390 Fitness + Physical Therapy

1,200 Lobby + Lounge

300 Staff Lounge

500 Kitchen

2,600 Cafeteria

5,800 Mechanical + Storage

11,810 Circulation

6,700 Observation + Pharmacy

8,900 Research

5,200 Public Education + Multi-Use

5,060 Community + Activity

1,000 Social Gathering

24,050 Staff Residential

650 Guest Residential

950 Patient Residential

500 Laundry

Total Square Footage: 83,060 sq ft

116

Residential Breakdown

- Long-term residential will be home to 48 Alzheimer's/dementia residents. Additionally, there will be space for 48 resident care-takers which does not include medical staff.
- Temporary-stay guests will have 3 rooms allocated for their use at all times.
- Staff temporary-stay units will include 4 separate overnight units.

Fitness + Physical Therapy will include a therapeutic pool which is not to exceed 4 feet in depth. It will be wheelchair accessible and include railings per ADA compliance.

Kitchen calculation does not include kitchenette spaces located within resident rooms and staff breakrooms. Those square footages were included in the residential space and staff lounge estimates, respectively.

interaction matrix

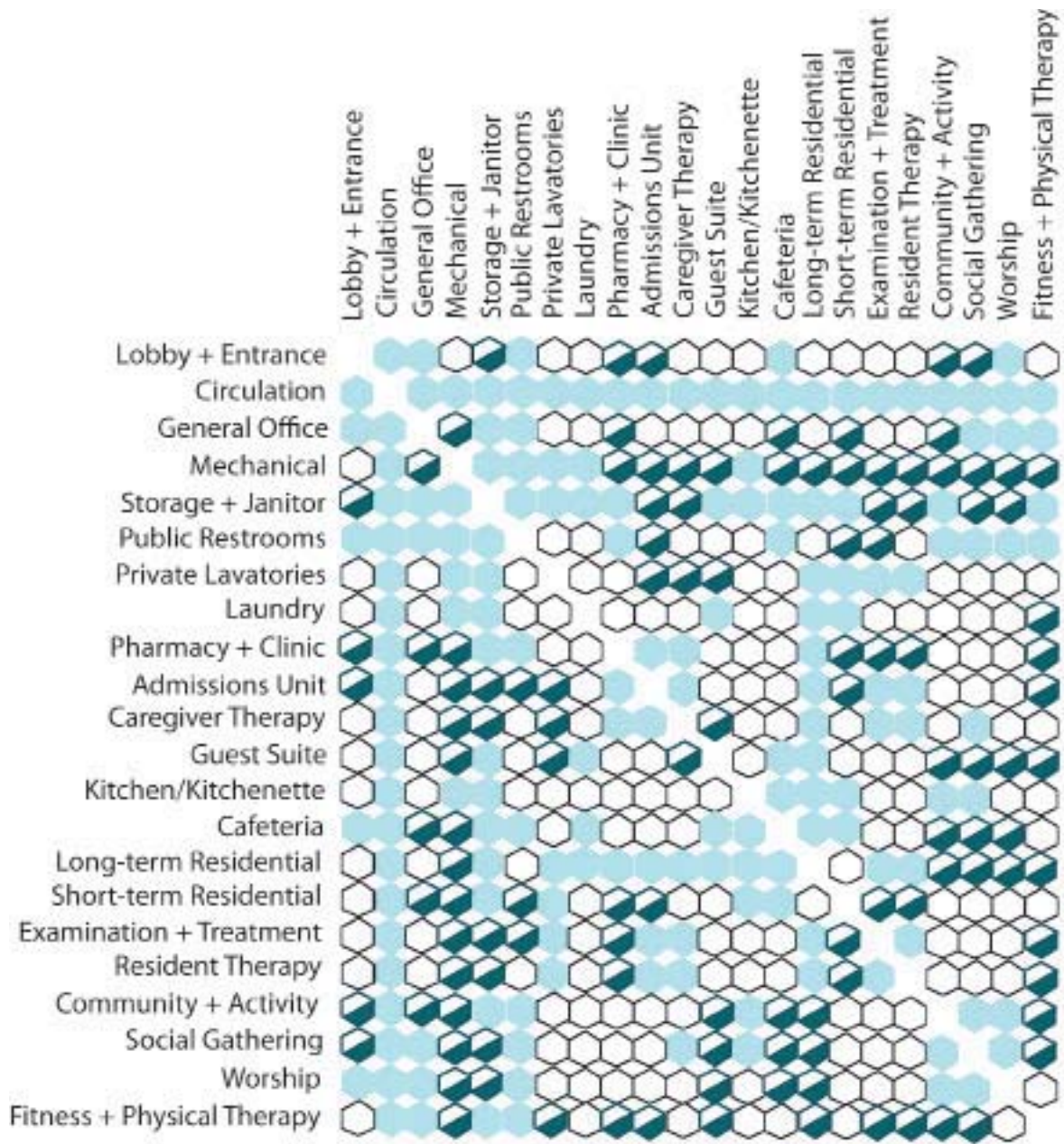
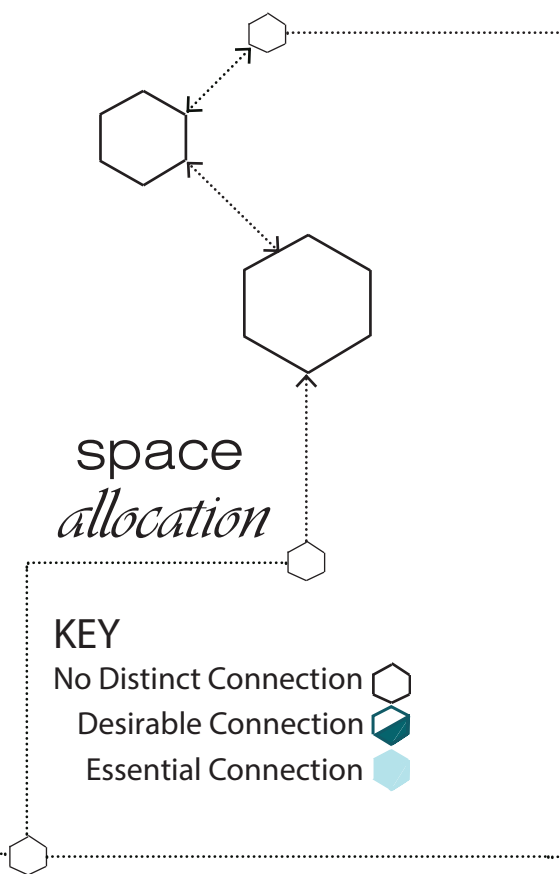
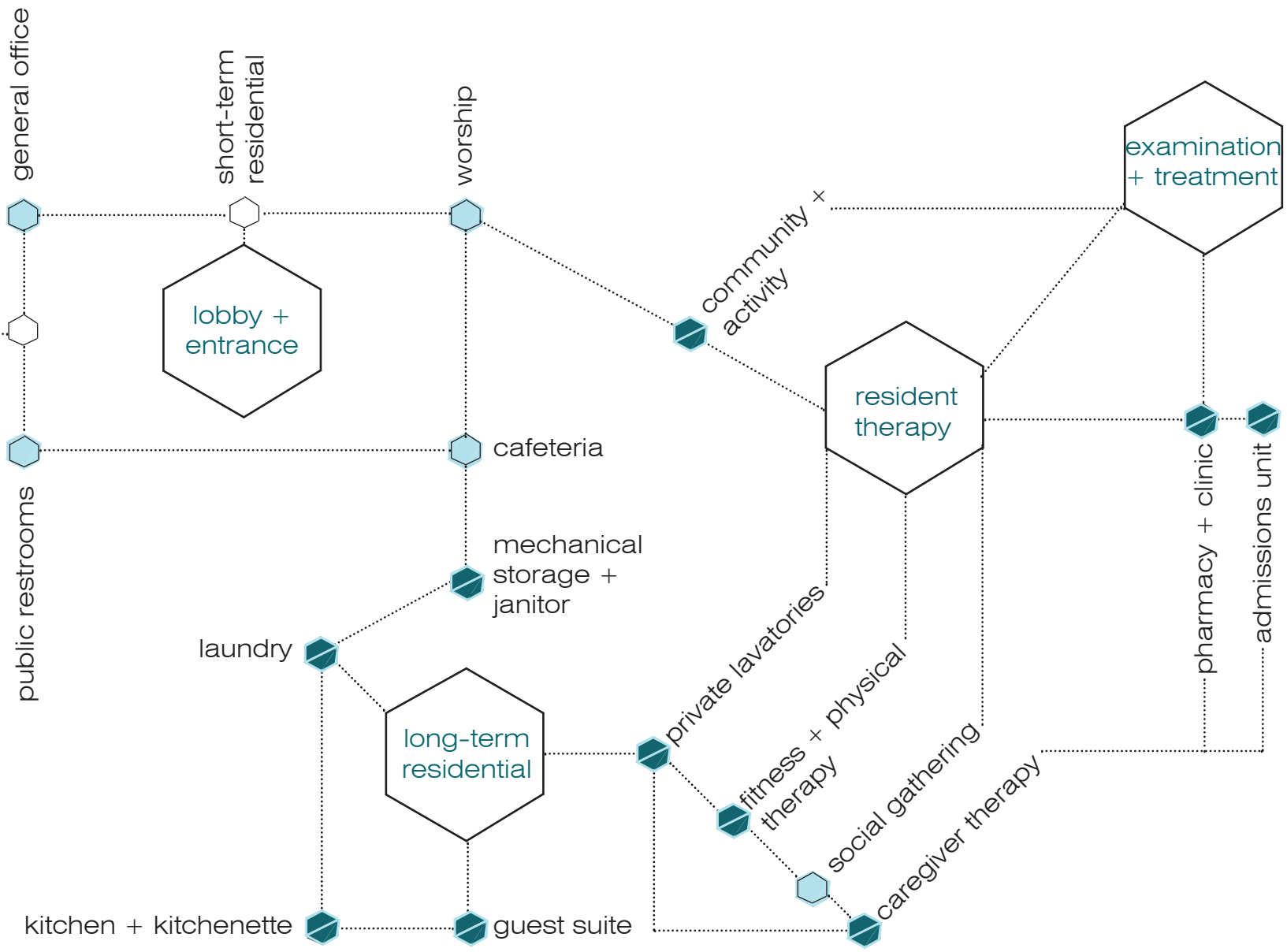





figure #-1





-  public function
-  private function
-  encouraged circulation paths

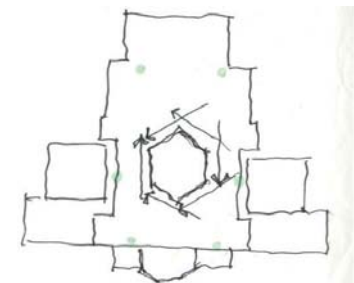
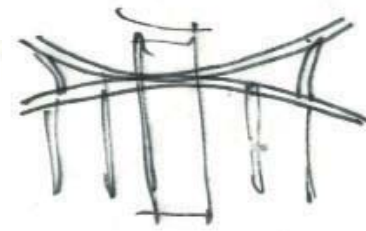
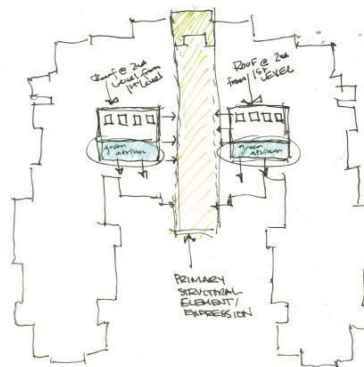
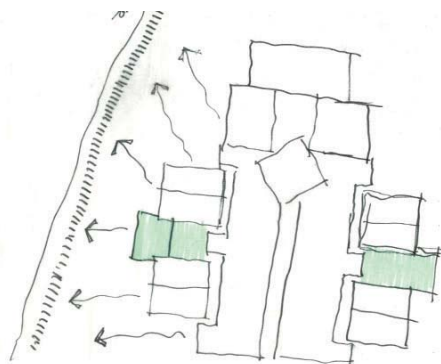
interaction net

figure 119-1

design solution

beginning
concepts

creating permeable borders to promote security, encouraging pathways and relationships between spaces, forming synergy between building users and spatial relationships between certain areas, utilizing a central core which unites all of these spaces



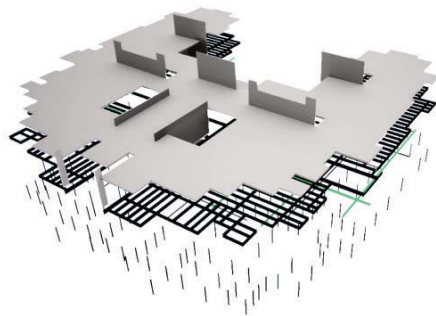
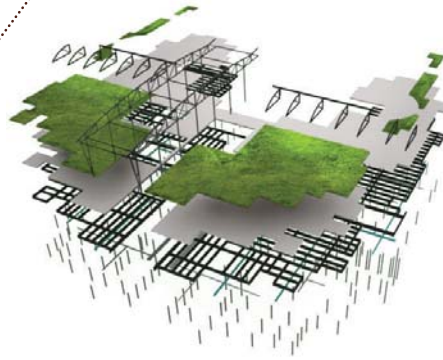
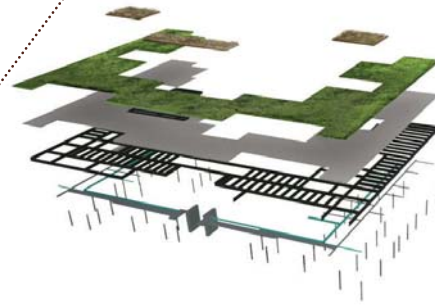
120

process



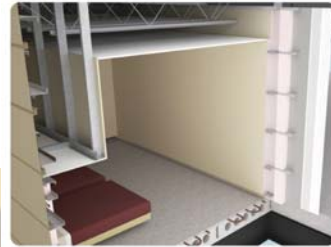
The final design solution should address areas of safety, visual clarity and cues at circulation areas, material selection for dementia patients, clear and guiding pathways, ease of access for impaired individuals, and unique design elements which spark memory change.

No building has the ability to cure Alzheimer's Disease. A design which becomes an innovative research icon and catalyst for future construction of this type of research facility would however, stimulate the interest and awareness of Alzheimer's Disease while working to remediate the disease's current symptoms through the built environment.



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design considerations

sound control at all interior spaces, public education spaces, sustainable systems such as closed loop geothermal and radiant floor heating, social gathering spaces, niche community rooms





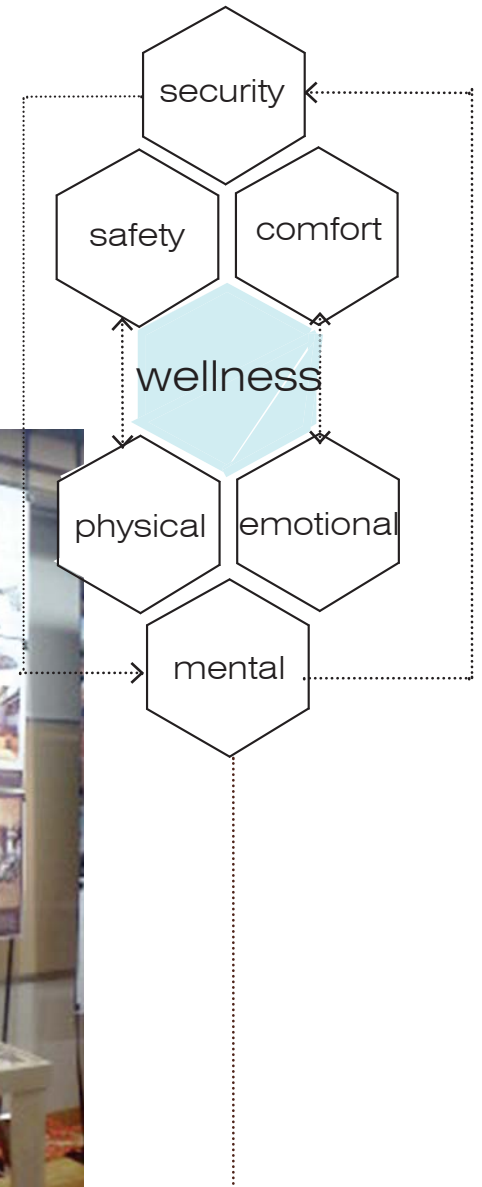
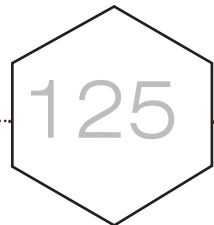
the building materials
e v o l v e and
t r a n s f o r m
with the passing of time
as a way to signify and
celebrate the aging
process of the structure
as well as the users of
the spaces within



The built environment has the ability to produce changes in memory. By utilizing this information and using a building as a research tool, we may begin to advance our knowledge of Alzheimer's Disease and other cognitive disorders which are influenced by environmental factors.



moving
forward



final project installation

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appendix

Appendix a:

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Appendix b:

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Retrieved from <http://www.youtube.com/watch?v=9DJr8QwgLEA>
appendix b:

Special thanks to my late great-grandmother Tracy Kuzel for being the inspiration behind this project. May God bless and keep you.

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It does.

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North Dakota State University
is a campus that
provides limitless educational
opportunities without
inhibiting students'
creativity and allowing
us to grow as individuals.