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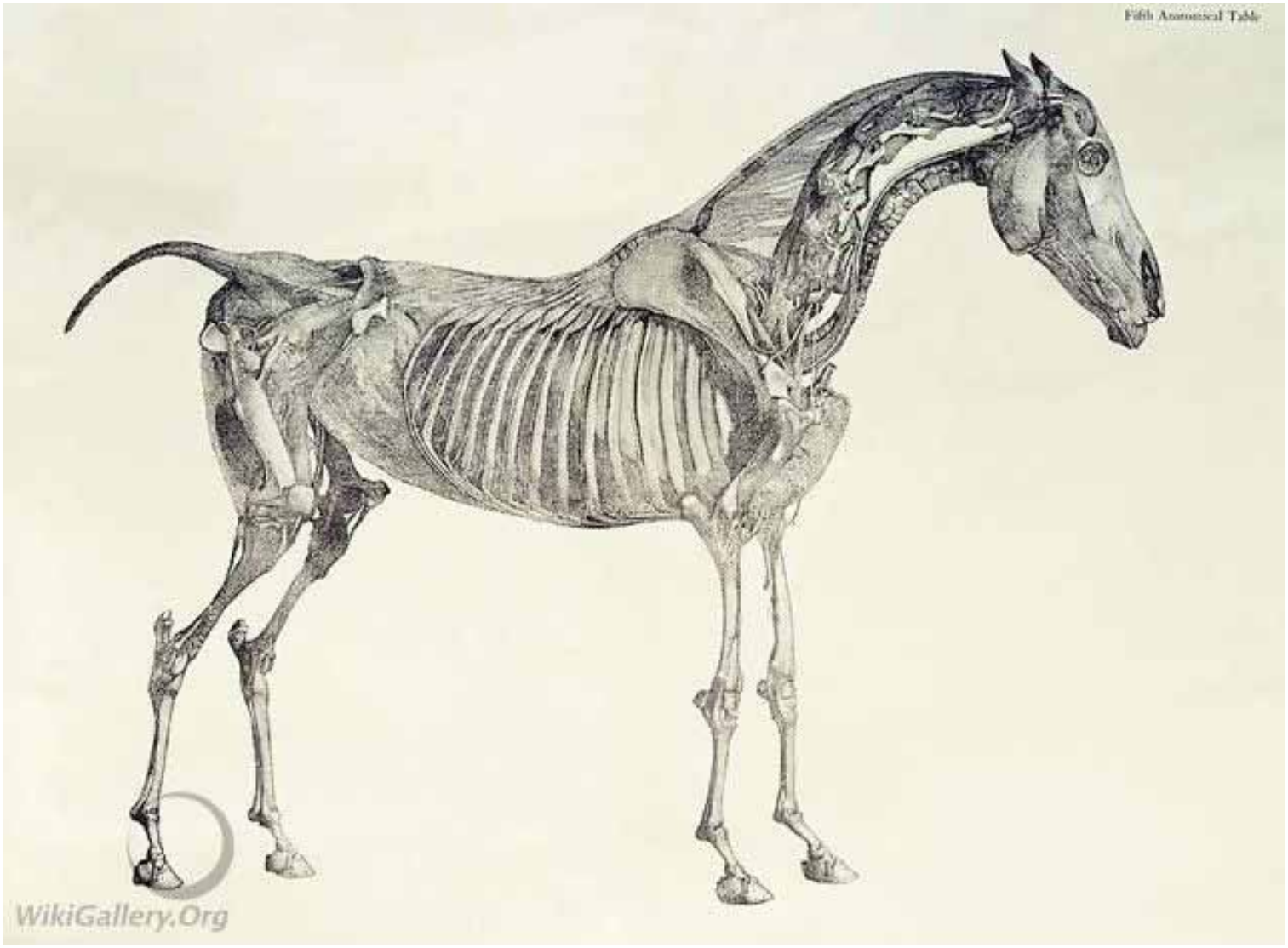


(Stubbs, n.d.)

On the Living Horse

The Fargo Equine Hospital and Education Center

On the Living Horse: The Fargo Equine Hospital and Education Center

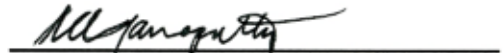
A Design Thesis Submitted to the Department of Architecture and Landcape Architecture of North Dakota State University

By

Jen Upcraft

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

Primary Thesis Advisor



Thesis Committee Chair

May 2015
Fargo, North Dakota

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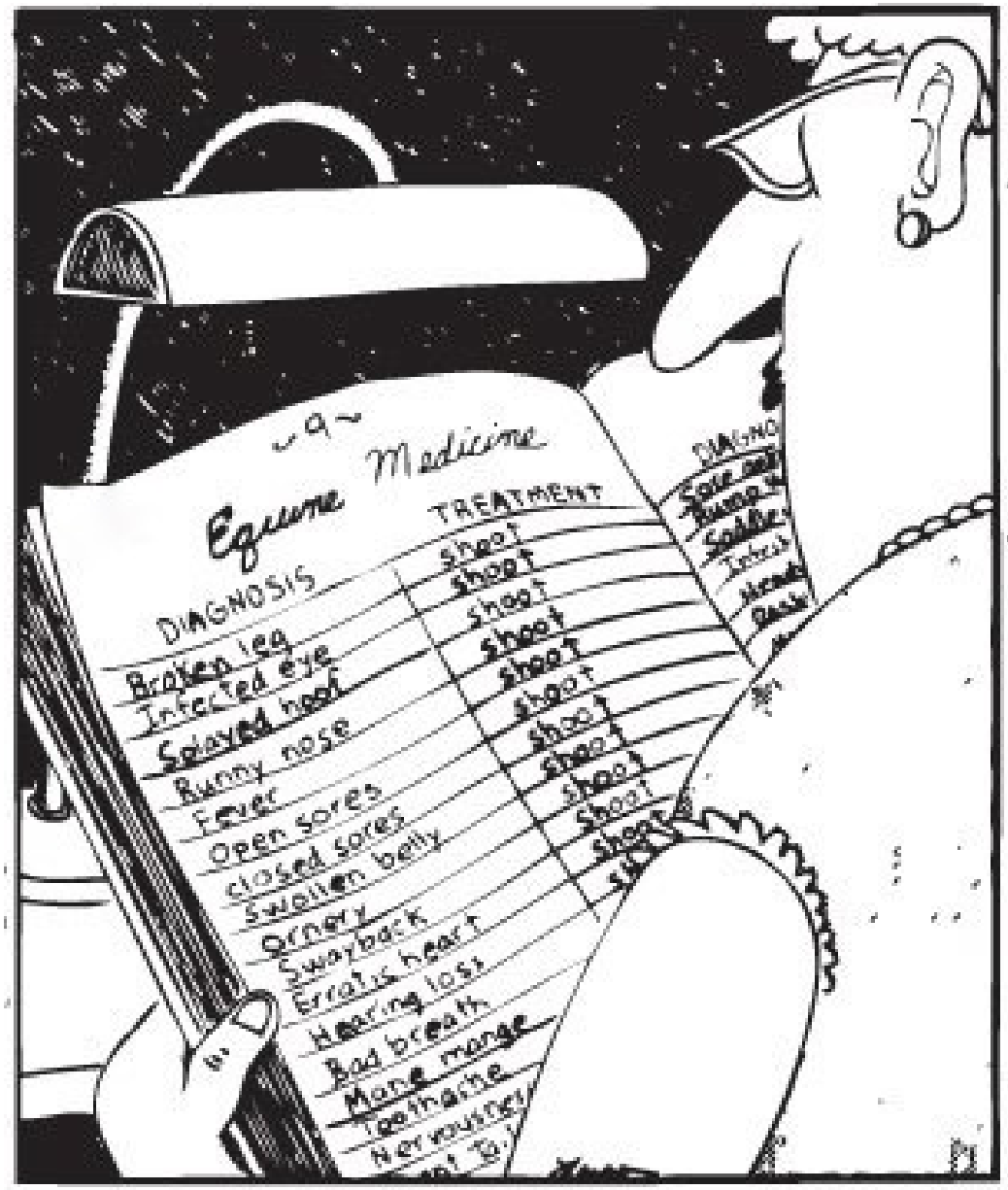


Like most veterinary students, Doreen breezes through chapter 9.

(Larson, n.d.)

1 - ABSTRACT

Horses and humans have been connected throughout history, and each has impacted the other so much that neither species' history would be the same if the other had not existed. There are countless stories of horse-human pairs – from Alexander the Great and his horse Bucephalus to Roy Rogers and Trigger – and each one illustrates the unique relationship that exists between humans and equines. Horses, while no longer an integral part of human life, continue to influence us, and this is evident in how we perceive and treat the animal.

My thesis project is a 17,000 square foot equine veterinary hospital and learning center in Fargo, North Dakota which is intended to help make the connection between humans and horses clearer by using hands-on experience. The philosopher Hans-Georg Gadamer described health as a kind of equilibrium, and said that healthcare should be a balancing act between art and science. That act is played out in the building as students, professionals, and enthusiasts learn more about the art and science of horse care.

Keywords:
Equine medical facilities
Horse/human relationship
Equine design

2 - NARRATIVE

It is the first Saturday in May – Derby day. A line of sleek Thoroughbred horses has pranced, pawed and paced their way out to the starting gate, but now they've arrived. A hush falls over the track as even the wind seems to hold its breath, and then the starting bell's harsh ring breaks the silence. They're off!

For years, the Kentucky Derby has been one of the most high-profile horse races in the country. Fans crowd Churchill Downs, and many others tune their televisions to watch the most exciting two minutes in sports. There is glamour and culture aplenty here, but racing also has its dark days. According to the *New York Times*, more than 3,600 horses died racing or training at state tracks in the years between 2009 and 2012 (Bogdanich, Drape, Miles, & Palmer, 2012). The most famous breakdowns are those which take place in high-profile races, but many more go unnoticed in the lower tiers of the racing world.

While horse racing is the most well-known of equine sports, it is by no means the only one which presents dangers to both horses and handlers. Any work with or around horses is inherently dangerous, but competitions often receive the most press for accidents.

While riders and handlers are often injured due to their interactions with horses, equine medical conditions are those which present the most difficulty for medical professionals. Horses are large animals, which can make them difficult to work with, and they do not understand that their handlers are trying to help them, not hurt them. Facilities which are designed to accommodate horses during recovery and which allow for ease and simplicity in medical procedures are ideal for the safety of both horses and humans.

Injured horses are not the only ones who require attention. Hospital staff work long, grueling hours and thus equine hospitals must see to the care and comfort of both human handlers and non-human patients. In order to understand and address this topic as fully as possible, I will examine existing case studies, relevant research, and other publications before creating a final architectural design. In addition, an understanding of philosophical concepts and history will help my work.

Throughout history, horses have been an integral part of everyday life – both in rural and urban areas. In the past horses served as transportation and power, but today their role has shifted to that of companionship and sport. While much research has been done on the function and efficiency of human hospitals, equine hospitals – due to their specialized nature and relative scarcity – are unknown territory to the majority of designers. This specific typology presents a variety of different design considerations for architects to examine, and so it is a project which I believe is worthwhile to pursue. It requires that I as a designer consider variables which are different than those which I have previously worked with. The equine hospital is specific enough in its use to require detailed research and planning, but small enough in scale to be manageable for one student to design over the course of a single semester.

Personally, I chose this project because I have been riding and caring for horses since I was very young, and it is not a hobby which has faded with time. I have often toyed with the idea of working on an equine-focused project, and my thesis seemed like the best opportunity for me to do so. An equine hospital was the best choice for me to exercise my research and design skills, and I am looking forward to seeing where the project goes.

3 - DESIGN QUESTION

How can architecture facilitate safe and efficient care in an equine hospital, seeing to the safety and comfort of both equine patients and their human handlers? In addition, how can architecture express the relationship between man and horse through history?

4 - PROJECT TYPOLOGY

Equine Medical Facility & Learning Center

5 - TYPOLOGICAL RESEARCH

Case Study One: The University of Minnesota Leatherdale Equine Veterinary Center

Case Study Two: Carolina Equine Hospital

Case Study Three: UW Cancer Center

CASE STUDY: UNIVERSITY OF MINNESOTA LEATHERDALE EQUINE VETERINARY CENTER

Type: University Equine Center and Veterinary Teaching Hospital

Architect: Gralla Architects & Rafferty Rafferty Tollefson Architects

Location: St. Paul, Minnesota

Size: 60,000 square feet (Gralla Equine Architects, n.d.)

Cost: $14 million ("U of M Unveils New Equine Center," n.d.)

Completed: 2007 (K. Vallandingham, personal communication, October 11, 2014)

Project Features:

Phase one of two - phase two is not yet scheduled (University of Minnesota Equine Center, 2011)
80'x180' climate-controlled indoor riding arena
Clinical space for evaluating equine mobility issues
Digital x-rays
Wing dedicated to reproductive medicine
High-speed equine treadmill & submerged equine treadmill
33 box stalls
200 person conference center (University of Minnesota Equine Center, 2014)

Project Details:

Structural steel and concrete masonry unit construction
Radiant in-floor heat
Cold-poured, seamless rubber flooring
Sand and cedar chip arena footing (University of Minnesota Equine Center, 2014)

The University of Minnesota Leatherdale Equine Veterinary Center (EVC) is the premier equine health facility in the Midwest. The building, located on the St. Paul campus near Larpenteur Avenue and the Minnesota State Fairgrounds, serves U of M students and the surrounding community. Both veterinary students and area vets who are in search of further education take classes at the Equine Center (University of Minnesota Equine Center, 2011). The building also hosts horseback riding clinics and competitions in the indoor Barenscheer Arena, while other events, classes, and conferences can take place in the Nutrena Conference Center (University of Minnesota Equine Center, 2014).

The EVC makes the most of a site on the U of M's farm campus which originally hosted a single storage building. That building was incorporated into the design of the new facility and currently serves as a storage area for horse feed and bedding (K. Vallandingham, personal communication, October 11, 2014). The EVC makes a strong visual statement through its red metal roof and beige siding. Due partially to its color and size, and partially to the flat terrain, the EVC is visible from a distance and catches the eye. It is one of the first buildings that visitors have the option to access in the farm campus, and it serves as a statement of the university's commitment to quality education.

The EVC is similar to both the Carolina Equine Hospital and the UW Cancer Center in that it takes great care in providing adequate circulation for clients. The best example of this from the EVC is the main entry. The entry is highly visible and easily accessible from the access road. It is covered by a large porte-cochere which keeps the worst of the weather away from clients hauling in their animals. The most innovative part of the EVC's entry, though, is evident in its configuration. The entry is set up to be pull-through, which keeps horse owners from the necessity of backing up a trailer. In addition, fences enclose the area under the porte-cochere, and gates can be closed both in front of and behind clients' pickup trucks and trailers, thus preventing patient escapes before they happen.

Figure 5.1 - U of M EVC Front Entry Porte-Cochere with Gates (Photo by Author)

Figure 5.2 - U of M EVC Barenscheer Arena (Photo by Author)

Outside of the building, public entryways are clearly marked. Within the building, every room is labeled and numbered. Maps throughout specify exits, entries, and current location. Hallways are wide, high-ceilinged, and straight, allowing easy visual access from one end to the other. This assists in both safety for horses and handlers, but also in wayfinding, as visitors can see their destinations from a distance.

The U of M EVC is unique primarily in its size and scope. The building serves a large portion of the veterinary medical needs for the University of Minnesota, and it houses areas for research as well as treatment. Instead of simply having the base requirements of patient care, the EVC goes above and beyond by utilizing advanced treatment and diagnosis options including a high speed treadmill, an underwater treadmill, and a large digital x-ray.

Security at the EVC is a high priority. Various areas of the building are card, key, or code accessible only. The pharmacy is also highly secure, using thumbprints and a database to identify users and the drugs they are permitted to obtain. In addition, the public areas – Barenscheer Arena and the Nutrena Conference Center – are separated from the hospital both architecturally through their inclusion in a separate wing of the building, and securely through card-access only doors.

Overall, the University of Minnesota Leatherdale Equine Veterinary Center serves the university and the surrounding community well. Its convenient, easy-to-access location as well as its user-friendly configuration help to make it an excellent example of equine hospital design.

Figure 5.3 - U of M EVC High Speed Treadmill (Photo by Author)

Figure 5.4 - U of M EVC Barn Aisle w/Automatic Doors (Photo by Author)

Diagrammatic Analysis:

Images by Author, Based on Diagrams from Gralla Architects Provided by Kelly Vallandingham

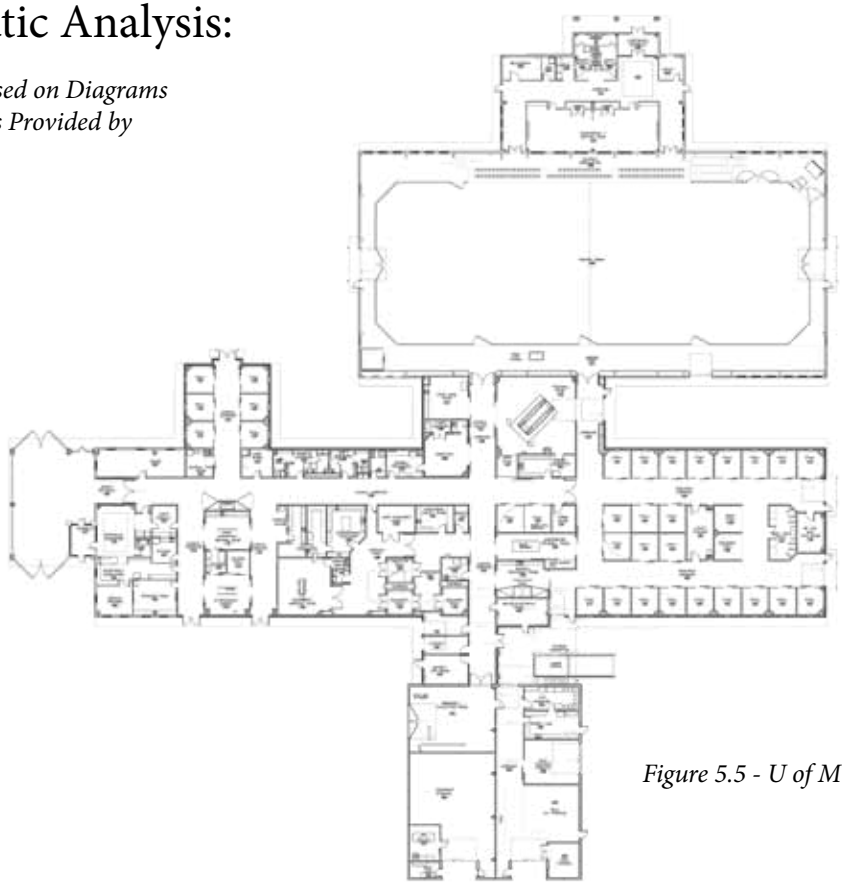
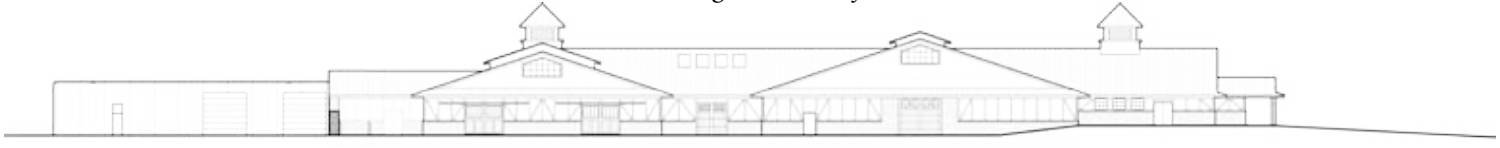


Figure 5.5 - U of M EVC Plan

Figure 5.6 - U of M EVC Section

Figure 5.7 - U of M EVC Elevation



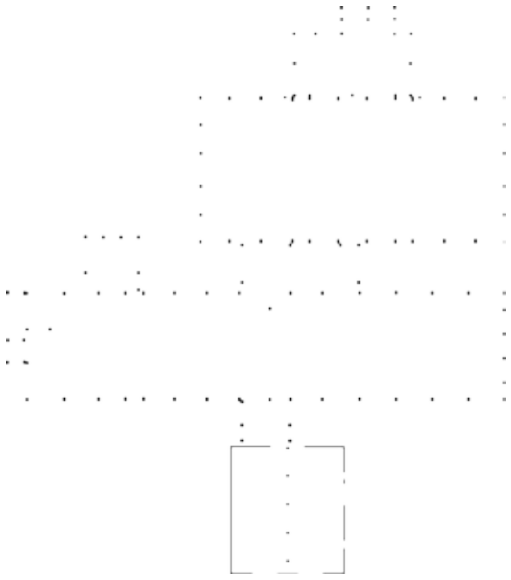


Figure 5.8 - U of M EVC Structure

Figure 5.9 - U of M EVC Natural Light

Figure 5.10 - U of M EVC Hierarchy

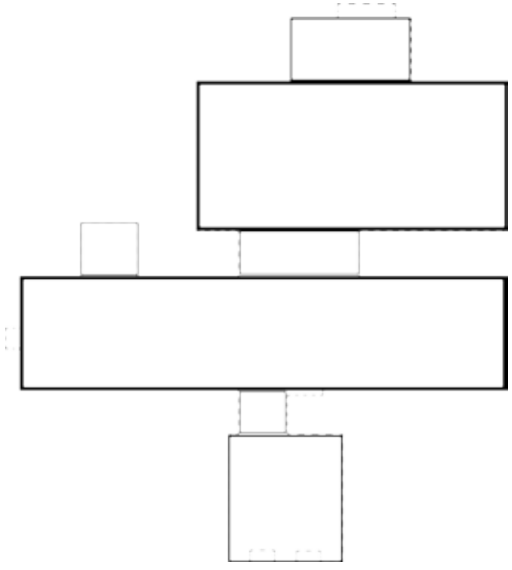


Figure 5.11 - U of M EVC Massing

Figure 5.12 - U of M EVC Plan to Section

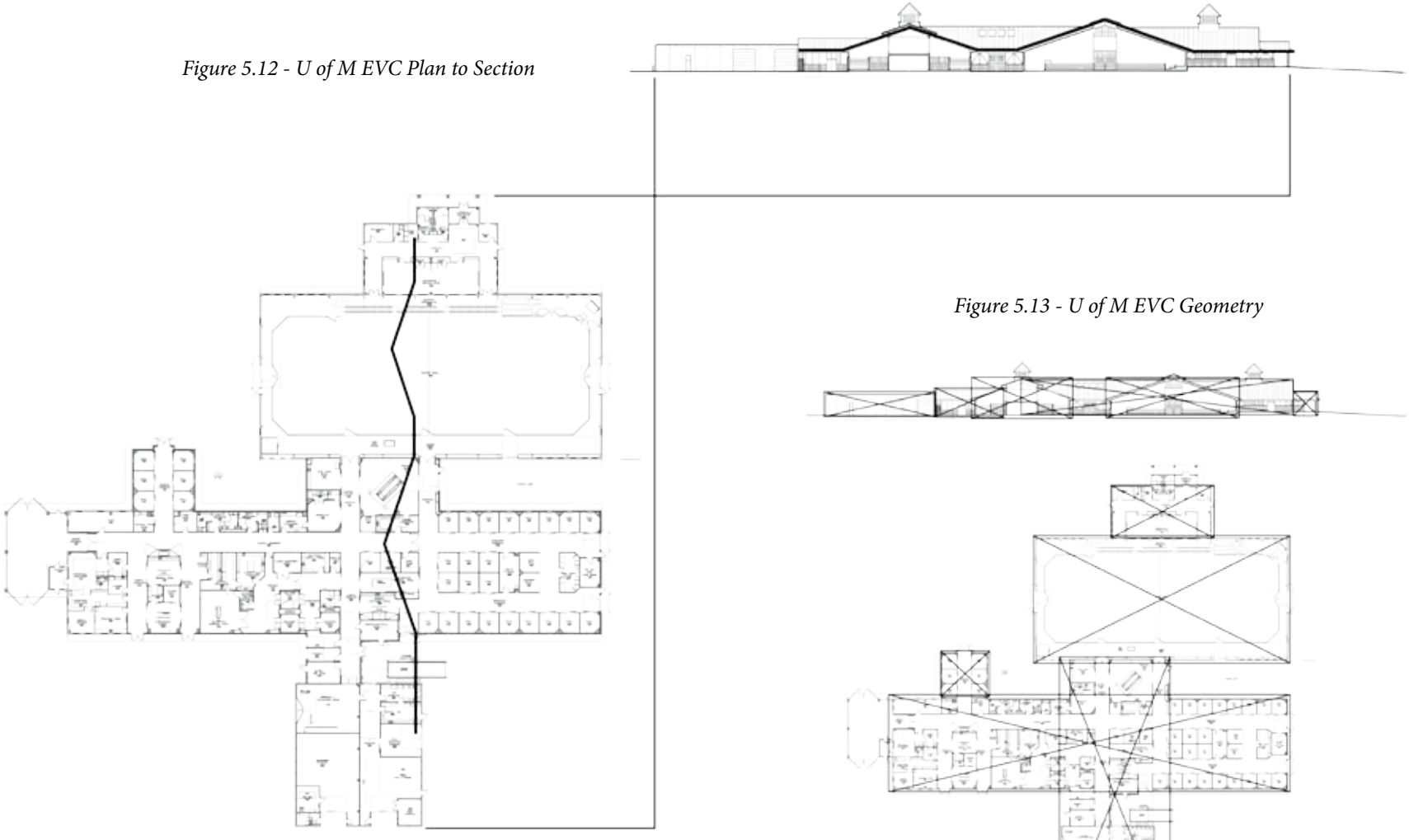
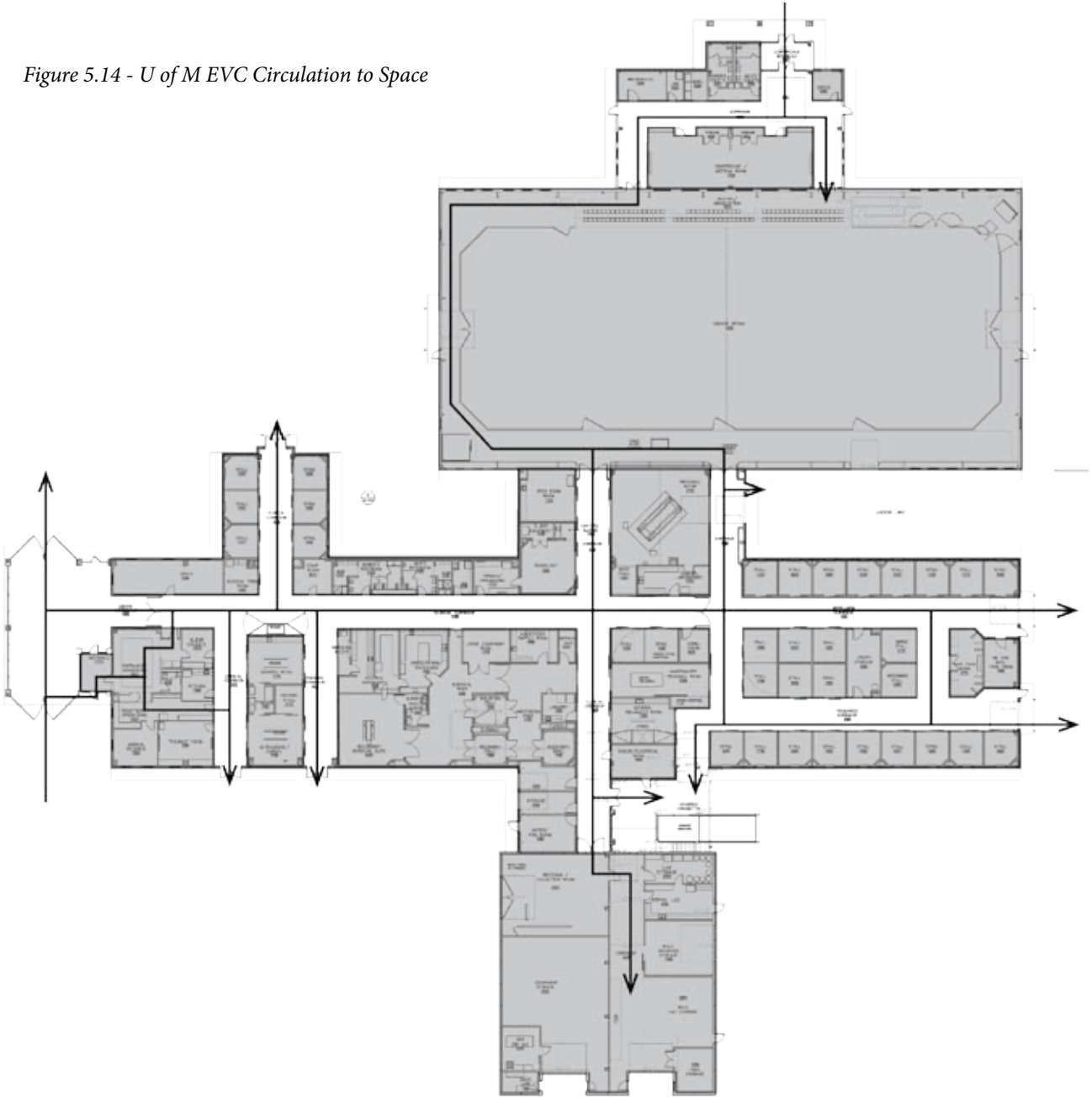


Figure 5.13 - U of M EVC Geometry

Figure 5.14 - U of M EVC Circulation to Space



CASE STUDY: CAROLINA EQUINE HOSPITAL

Type: Rural Equine Hospital

Architect: Joe Martinolich for CMW Architects and Engineers

Location: Browns Summit, North Carolina

Size: 8,000 square feet (JMM Architecture, n.d.)

Completed: 2013 (J. Martinolich, personal communication, October 6, 2014)

Project Features:

Three box stalls and one isolation stall
Single surgical suite
Designed for possible expansion
Two treatment rooms (J. Martinolich, personal communication, October 6, 2014)
Turnouts and round pen on site (CMW, Inc., 2011)
Multi-purpose spaces for maximum building efficiency
Sleeping room for staff on call (J. Martinolich, personal communication, October 6, 2014)

Project Details:

Office area - steel with brick facing; patient area - concrete masonry units with brick facing
Positively pressured surgery suite
Small outpatient barn to the rear of the main hospital
Drive-up pharmacy and restocking area for veterinarians focused on ambulatory care
Covered trot-up for lameness diagnosis (J. Martinolich, personal communication, October 6, 2014)

Figure 5.15 - Carolina Equine Entry View (CMW, Inc., 2014)

The Carolina Equine Hospital was built for a partnership of four veterinarians whose practice was growing. The partners wished to expand their practice – which was primarily focused on ambulatory care – and include a haul-in clinic. Despite its ability to handle inpatient care and surgeries, the facility was designed with ambulatory care in mind. Close to the pharmacy there is a dedicated location for parking the veterinarians' trucks; that way, the vets can easily restock their supplies before heading out to farm calls (J. Martinolich, personal communication, October 6, 2014).

Overall, the Carolina Equine Hospital functions as an extension of an already-flourishing practice which serves the rural Browns Summit area.

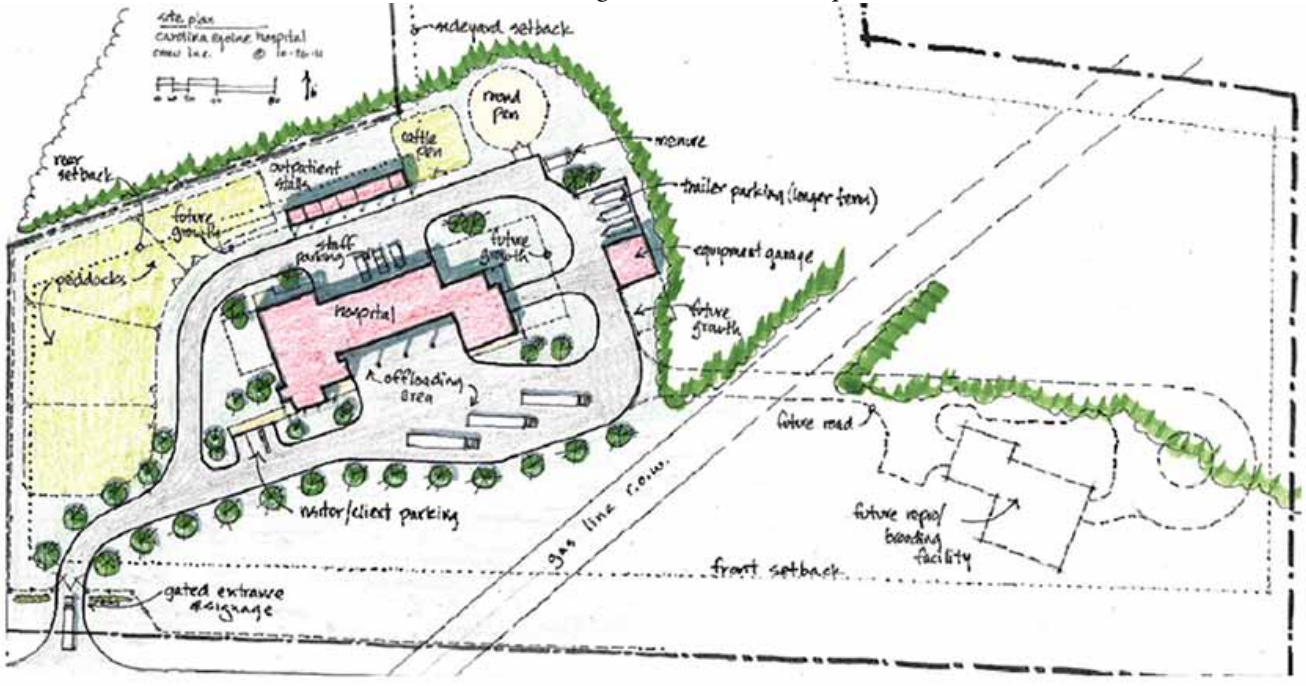
The hospital is located in rural North Carolina several miles outside of the town of Browns Summit. It is a handsome brick building with a hipped roof and arches which accent the entryway and barn area. The building fits well with its site, using details such as cupolas and dormers as a nod to the architecture of the farmsteads which dot the surrounding countryside.

Similar to the Leatherdale Equine Center and the UW Cancer Center, the Carolina Equine Hospital was designed with circulation in mind. The building's drive extends around the structure, allowing a continuous driving lane for pickup trucks and trailers. In addition, the central part of the building, a long connector between the entryway and the barn which includes exam rooms and a trot-up for assessing lameness, is accessible on both sides of the building. This allows easy circulation between the rear of the facility and the front.

The hospital also shows similarities to the other projects in organization. Each of the buildings is long and organized around a circulation "spine." This allows each building to be separated into zones for clients and staff, which improves efficiency and safety.
Unlike the Leatherdale Equine Center, the Carolina Equine Hospital is small. While each project has a single surgical suite, Carolina Equine is primarily set up as a support service for the existing ambulatory care service, and it is only 8,000 square feet with a total of four stalls. The Leatherdale Equine Center, on the other hand, is 60,000 square feet and includes space for 33 horses. It encompasses research and specialty care, while Carolina Equine covers basic surgery and care, and refers more difficult cases to larger hospitals.

Figure 5.16 - Carolina Equine Schematic Site Plan (CMW, Inc., 2014)

The schematic site plan (CMW, Inc., 2011) shows the project's overall site arrangement, including areas that were planned for possible future expansion to the west and northeast.



Another important feature of the Carolina Equine Hospital is natural light and ventilation. While the UW Cancer Center emphasizes natural light, the Leatherdale Equine Center is noticeably dim. Carolina Equine was designed with the goal of providing light and views, as well as natural ventilation, to as many spaces as possible.

Finally, because of the hospital's size, many of the spaces are multi-use. When budget and space are limited, it is important to pack as much utility as possible into as little space as possible, and the Carolina Equine Hospital achieves this. It is an aspect which is mostly absent from the other two cases.

The Carolina Equine Hospital provides a home base to an ambulatory practice which serves rural North Carolina. Despite its small size, or possibly because of it, the project is efficient and well-organized. It is different from the Leatherdale Equine Center, but its main objective and clientele is also different. The hospital fulfills its users' needs and blends well into the countryside. All of these aspects combine to create a successful design.

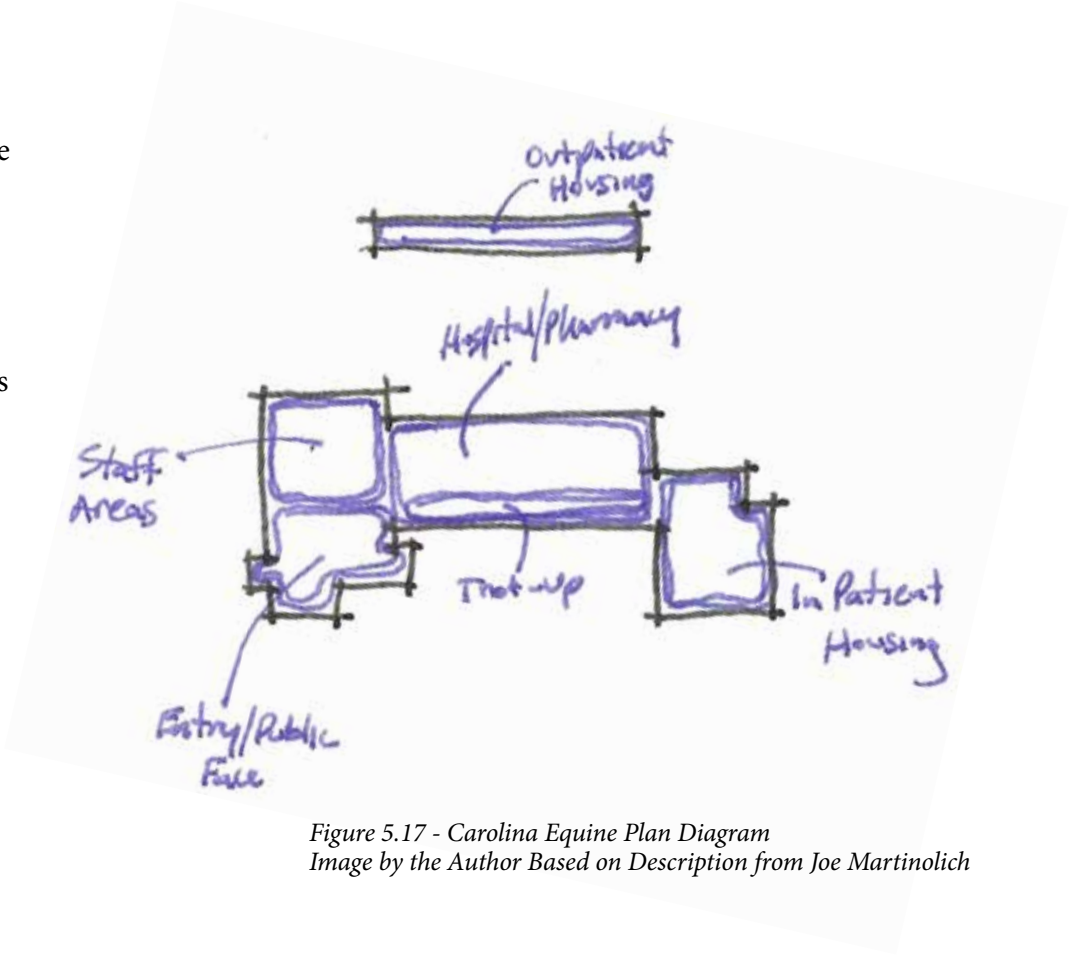


Figure 5.17 - Carolina Equine Plan Diagram
Image by the Author Based on Description from Joe Martinolich

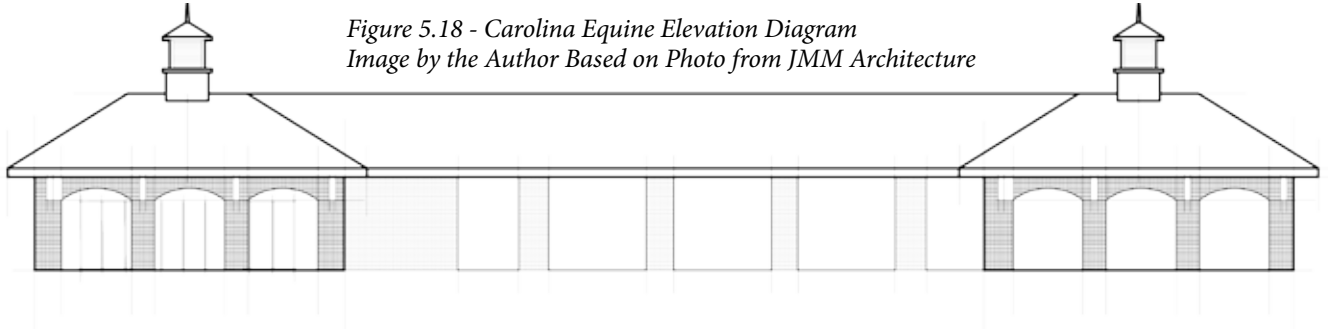


Figure 5.18 - Carolina Equine Elevation Diagram
Image by the Author Based on Photo from JMM Architecture

Figure 5.19 - Carolina Equine South-Southeast Elevation Photograph (JMM Architecture, n.d.)

The hospital's front elevation shows an awareness of the importance of fenestration on the south facing facades. On the far left of the photo is the building's public entry. The center portion of the building is a parking area for the veterinarians' pickup trucks. This parking area is close to the pharmacy so that vets can quickly and easily restock for farm calls. In addition to providing ventilation, light, and circulation, the hallway in this portion of the building serves as a trot-up area for evaluating lameness in patients. The far right end of the building shows the doorways to the three inpatient housing stalls. The doors provide light and views for patients housed within (J. Martinolich, personal communication, October 6, 2014).

Figure 5.20 - Carolina Equine Inpatient Housing Stalls (JMM Architecture, n.d.)

The inpatient housing stalls have high ceilings, ample light and ventilation (mechanical and artificial), and open fronts. The open fronts give caretakers immediate visual access to the patient's entire body so that caretakers can take action to remedy any issues which could otherwise be hidden by standard, solid stall doors. The materials throughout this area are durable and easy to clean. Flooring material is textured, improving grip and lessening the chance of slipping for both horses and humans (J. Martinolich, personal communication, October 6, 2014).

The front entry desk shows care taken in making the building inviting and professional-looking for visitors and prospective clients. The finishes in this area are pleasing to the eye, but they are also low-maintenance and durable. At the corner of the picture is the entrance to staff areas, including offices, a changing/shower room, and a small sleeping area (J. Martinolich, personal communication, October 6, 2014).

Figure 5.22 - Carolina Equine Reception Desk (JMM Architecture, n.d.)

Figure 5.21 - Carolina Equine Pharmacy and Restocking Area (JMM Architecture, n.d.)

The pharmacy is open and large. Plenty of easy-to-clean working surfaces ensure that users will be able to collect the items they need quickly and efficiently. Open shelving provides good visual access to medical items, while closed cabinets can keep larger objects and supplies out of the way. Finally, the lighting level is high enough for detailed work.

CASE STUDY: UW CANCER CENTER

Type: Human Cancer Clinic

Architect: OWP/P

Location: Johnson Creek, Wisconsin

Size: 14,300 square feet

Cost: $3.28 million (OWP/P, 2006)

Completed: October 2005 (Hudson, 2008)

Figure 5.23 - UW Cancer Center Northwest Perspective (Steinkamp, n.d.)

Project Features:

Contemporary look
Ample lighting and views
Easy for patients to navigate
Clear definition between patient areas and staff areas
Strong connection to site
Building form responds to interior space needs
Patients choose aspects of treatment environment in some areas (Hudson, 2008)

Project Details:

Split-face concrete masonry units, steel, and brick exteriors
Split-face concrete masonry units, cedar, and maple interiors
Outdoor patio on south side for patient use and treatment
Semi-rural location (Hudson, 2008)

The UW Cancer Center is a human cancer treatment clinic located in Johnson Creek, Wisconsin. The building is an example of excellent architecture instead of being one of the "… bland modular buildings that competently provide the basics at low cost…" (Hudson, 2008, p. 124). The center strives to provide a safe, healthy environment for patients who are going through stressful times. The building merges function and form, taking advantage of necessary interior spaces as well as existing exterior conditions to inform the building's overall shape.

The UW Cancer Center is situated on a small, wooded site. The building strives to connect to the surroundings and to bring patients into the natural world rather than shutting them away in a cold, uninviting space ("UW Cancer Center," 2006). Patients at the UW Cancer Center have been treated on the building's patio, and they will occasionally see wildlife through the building's many windows (UW Cancer Center, n.d.).

Despite catering to a specialty of human medicine rather than equine patients, the UW Cancer Center shows many similarities to both the Carolina Equine Hospital and the U of M Equine Center. All three buildings are arranged in similar ways, with main circulation corridors which have support spaces along them. In addition, all of the facilities acknowledge a break between patient care areas and more staff-oriented areas. The UW Cancer Center focuses particularly on light and views, and this is something that the Carolina Equine Hospital was also designed to do. Both Carolina Equine and the Cancer Center use ample expanses of glass to provide light and views to patients, caretakers, and staff.

Figure 5.24 - UW Cancer Center Interior Steinkamp, n.d.)

Size notwithstanding, the buildings are also different in many ways. Both of the equine hospitals are constructed of durable, easy-to-clean materials in the patient care areas and save their more expensive finish material for client areas. The UW Cancer Center, because of its focus on human patients and their comfort in times of need, uses natural or naturalesque materials throughout the building. In addition, the Cancer Center makes an effort to integrate interior and exterior spaces, merging them into useful, beautiful places for patients and other visitors to utilize. While both equine hospitals do demonstrate an awareness of their connections to their sites and exterior spaces, they are more focused on the circulation potential of outdoor areas than the beauty of them. While the UW Cancer Center caters to an entirely different clientele than either the U of M Equine Center or the Carolina Equine Hospital, the three cases function and are organized in a remarkably similar manner.

The UW Cancer Center is a beautiful, functional, small clinic which caters to cancer patients in their times of need. It uses light, views, and natural materials to provide a comfortable atmosphere for its users. It maximizes its available square footage by taking advantage of both interior and exterior spaces to provide comfortable areas for patients to be treated or to wait for appointments. The building, though small, fulfills its purpose admirably, showing a merger of function and form – the hallmark of good design.

Figure 5.25 - UW Cancer Center South Elevation Photo (Fort HealthCare, 2014)

Diagrammatic Analysis:

Images by Author, Based on Architectural Record Diagrams

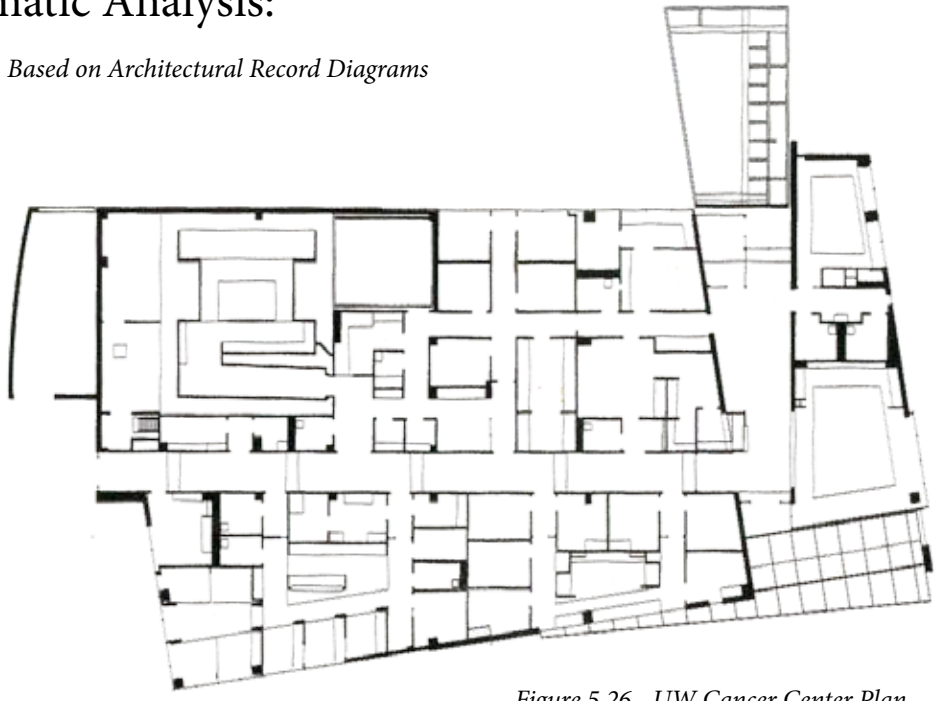


Figure 5.26 - UW Cancer Center Plan

Figure 5.27 - UW Cancer Center Section

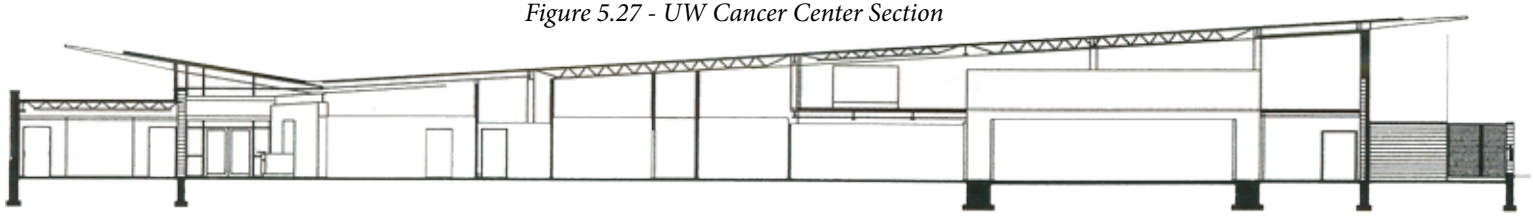
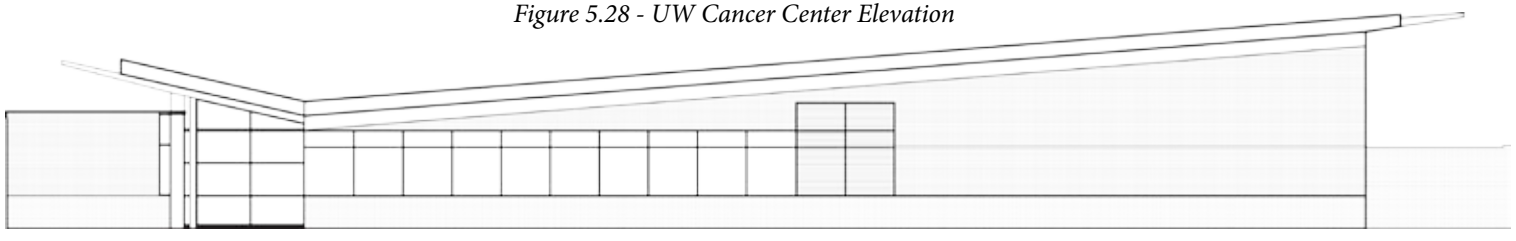


Figure 5.28 - UW Cancer Center Elevation



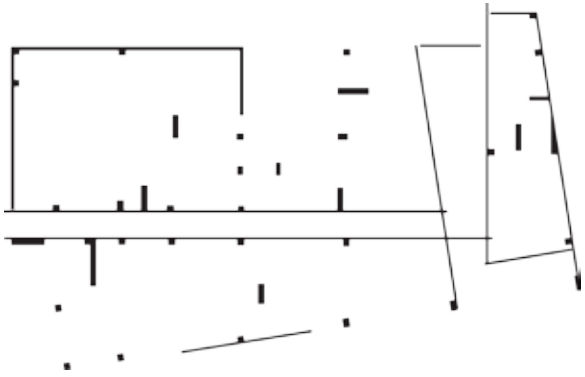


Figure 5.29 - UW Cancer Center Structure

Figure 5.30 - UW Cancer Center Natural Light

Figure 5.31 - UW Cancer Center Hierarchy

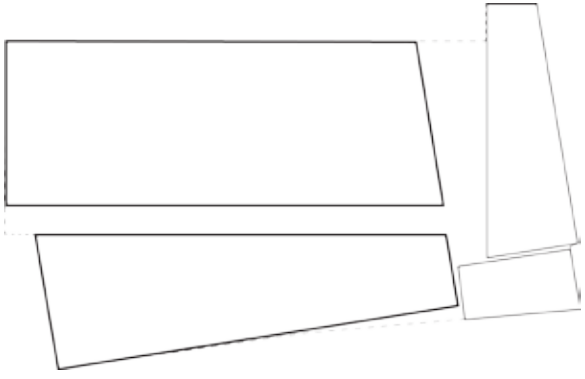


Figure 5.32 - UW Cancer Center Massing

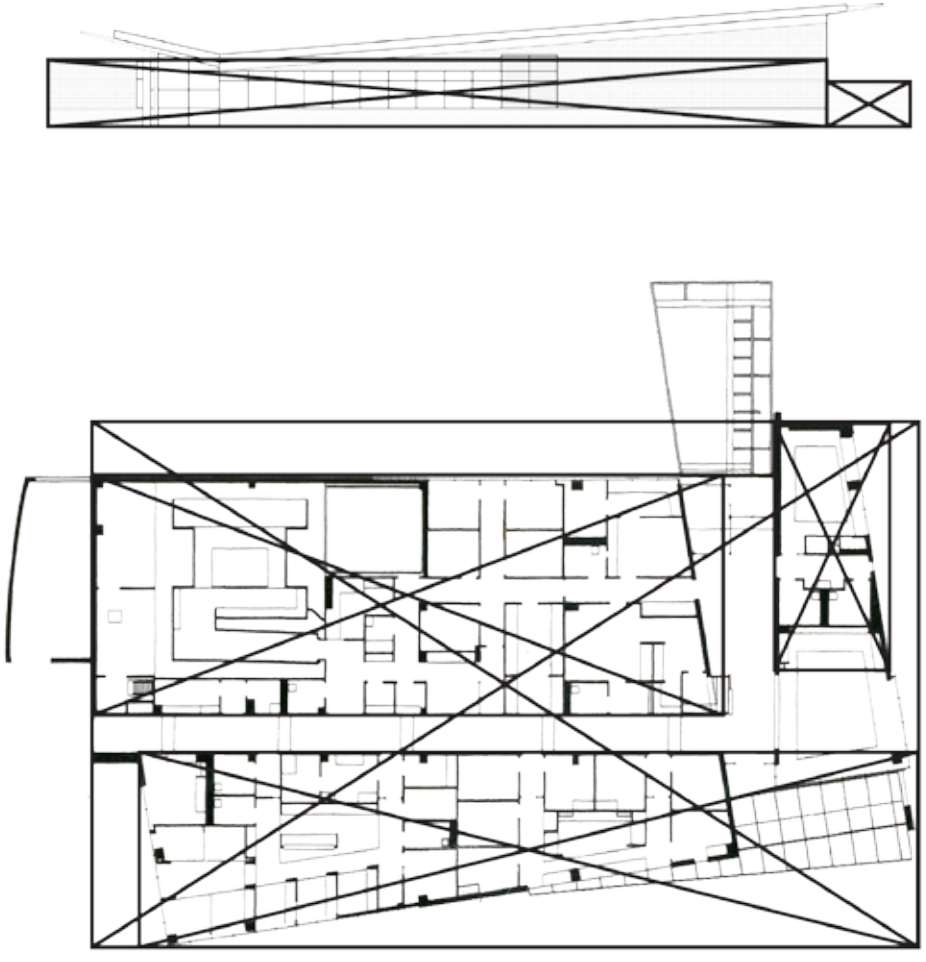


Figure 5.33 - UW Cancer Center Geometry

Figure 5.34 - UW Cancer Center Circulation to Space

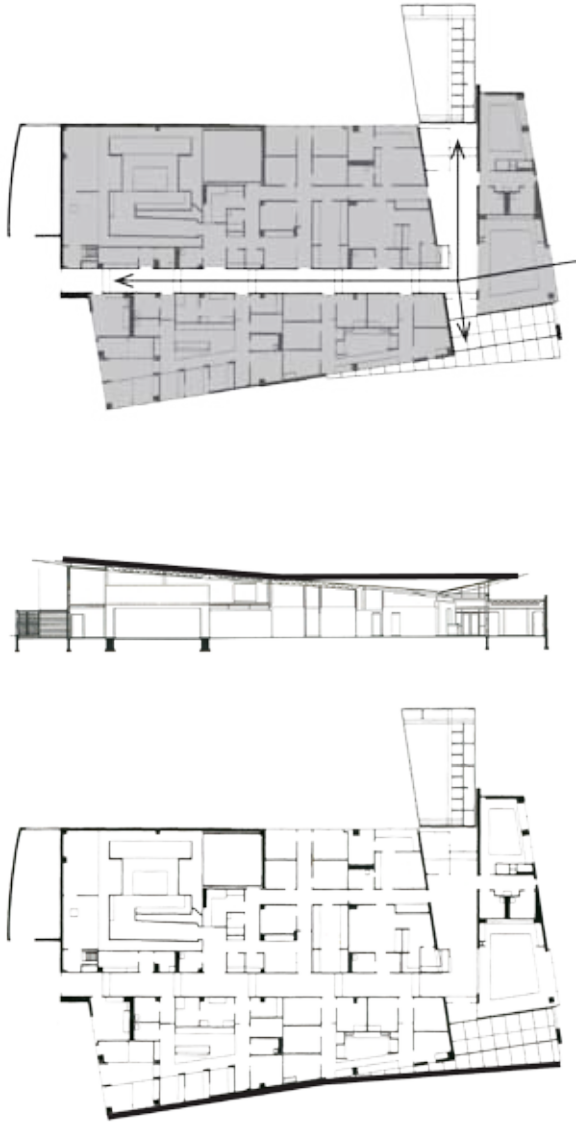


Figure 5.35 - UW Cancer Center Plan to Section

CASE STUDY SUMMARY

While each case serves a different specific use, they all fall under the category of healthcare design, and each shows elements of design which can be applied to future projects – both for human and animal healthcare. The greatest overlap in design between the three is their organization; each building is a made of groups of spaces organized around a central circulation spine. These spaces are separated into public, private, and staff-only areas. Each space is clearly marked and easy to navigate to and from.

Circulation, according to both *The Equine Hospital Manual* and *Horseman's Architect*, is paramount to good equine facility design. A good circulation pattern is one which is easily navigable, clear, and efficient. This sets a standard for the hospital, presenting a welcoming, professional face before the client even enters the building. Circulation is also important for safety. Tim Greet (2008) in *The Equine Hospital Manual* advises designers to "… think carefully about the flow of people (staff and visitors) as well as horses and their handlers" (p. 148). In addition, Joe Martinolich, designer of the Carolina Equine Hospital, counsels designers to plan for the worst case scenario so that the design will work even in the most unfavorable situations (J. Martinolich, personal communication, October 6, 2014).

Two of the three cases – Carolina Equine and the UW Cancer Center – also show an awareness of light in the design. Each of those projects places emphasis on light, especially in client areas, and on views. The UW Cancer Center in particular uses its form to capture extra light via a clerestory. While Carolina Equine does not utilize skylights, the project does make use of large expanses of glass and multiple openings on both sides of its long, linear plan. The U of M Equine Center utilizes skylights and windows in housing and activity areas – mainly the indoor riding arena and the primary stall wing – in order to make the spaces more livable for its users.

An added benefit of natural light is a lowered need for electric lighting. While none of the studied cases specifically target sustainability as a design goal, this is an admirable objective to aim for. Sustainable design strategies can be applied to any project, and may even be more applicable to an equine hospital than other typologies. Site interventions for sustainable design – retention ponds and compost pits, for example – could be particularly useful.

The UW Cancer Center and the U of M Equine Center are both in a climate zone which is comparable to the Fargo, North Dakota area. They utilize strategies to protect the north sides of their buildings and any entries necessary on those elevations. The UW Cancer Center in particular has done an excellent job minimizing fenestration on the building's north face. In fact, a mechanical room acts as a buffer along that face of the building and helps to trap heat in the more commonly occupied spaces. Strategies such as these will need to be implemented in order to provide a comfortable, efficient environment.

Despite differences in usage, location, and details, each of the three cases provides valuable insight into best practices for medical facility design. The two equine facilities are useful for studying adjacencies and spatial arrangement, while the human facility gives a human perspective while highlighting both similarities and differences between the typologies.

Case Study Comparison								
	Location	*Typology*	*Specific Use*	*Size*	*Organization*	*Form*	*Materials*	*Design Emphasis*
U of M Equine Center	St. Paul, Minnesota	Equine Hospital and Research Center	Veterinary School and Research	60,000 square feet	Spaces Along Corridors	Rectilinear with Gable Roofs and Coupolas	Concrete Masonry Unit, Structural Steel, Fiber Cement Siding, Seamed Metal Roofing	Efficiency, Low-Maintenance, Specialized Spaces
Carolina Equine Hospital	Browns Summit, North Carolina	Equine Hospital and Base for Ambulatory Care	Small-Scale Surgery and Care Facility	8,000 square feet	Spaces Along Corridors	Rectilinear with Hip Roofs and Coupolas	Concrete Masonry Unit, Steel Studs, Brick Veneer, Asphalt Shingles	Efficiency, Light, Views, and Ventilation
UW Cancer Center	Johnson Creek, Wisconsin	Human Cancer Clinic	Treatment Clinic	14,300 square feet	Spaces Along Corridors	Butterfly Roof and Rectilinear Form, Single Angled Wing	Split Face Concrete Masonry Units, Finish Wood, Structural Steel	Public/Private Separation, Light, and Views

Figure 5.36 - Case Study Comparison Matrix

6 - MAJOR PROJECT ELEMENTS

PUBLIC

Parking Lot
- Spaces for clients, staff, and horse trailers

Waiting Area/Reception
- Administrative assistant's desk & medical records; client waiting area

Riding Arena & Training Areas
- For exercising patients & checking soundness

STAFF ONLY

Offices
- Staff offices

Surgical Suite
- Includes anaesthesia & recovery stalls, surgeon's scrub-up area, storage, and lab

Pharmacy
- Drug storage & dispensary

Isolation Stabling
- Stabling for patients with highly infectious diseases

Staff Rooms
- Includes a small living space with sleeping and shower facilities for staff on overnight duty & a staff break room

Storage
- Storage will be dispersed throughout the facility as required

Mechanical/Generators
- Backup power will be supplied by generators

Muck Pit
- Equine waste disposal

SEMI-PRIVATE

Exam Rooms
- Clients will help hold their horses if necessary during examinations

Stabling
- Stalls will be available for patients who require long-term care

Euthanasia
- An area will be designated for euthanasia

Meeting Room
- A place for classes to take place and for staff to meet

Seminar Rooms
-Classrooms for student and professional use

Equine Library
-A library of equine books and equipment

Surgery Observation
-Student and public observation of surgery

Gallery
-A gallery of equine history

7 - USER/CLIENT DESCRIPTION

The project will be designed to meet the needs of a hypothetical partnership of several veterinarians who own a growing equine practice. In order to better serve the Fargo/Moorhead area, the partnership has elected to build a haul-in clinic which will supplement their current ambulatory care practice. In addition, the practice hopes to further pre-veterinary and veterinary technician student education.

Primary users include:

Hospital Staff -

This will include veterinarians, veterinary technicians, administrative assistants, janitorial staff, and student interns. The majority of staff will be available on weekdays, while certain members will be present at the facility as needed on weekends and overnight.

Special accommodations include an on-call staff living area

Horse Owners -

Owners will be transitory users of the building. They will be present as needed during procedures involving their horses.

Special accommodations include trailer parking and convenient, well-marked circulation.

Equine Patients -

Patients will be present at the clinic primarily for surgeries and long-term care. Special accommodations are varied and will depend on each particular case, but as a general rule, horses will require durable surfaces all around and non-slip flooring materials.

8 - SITE

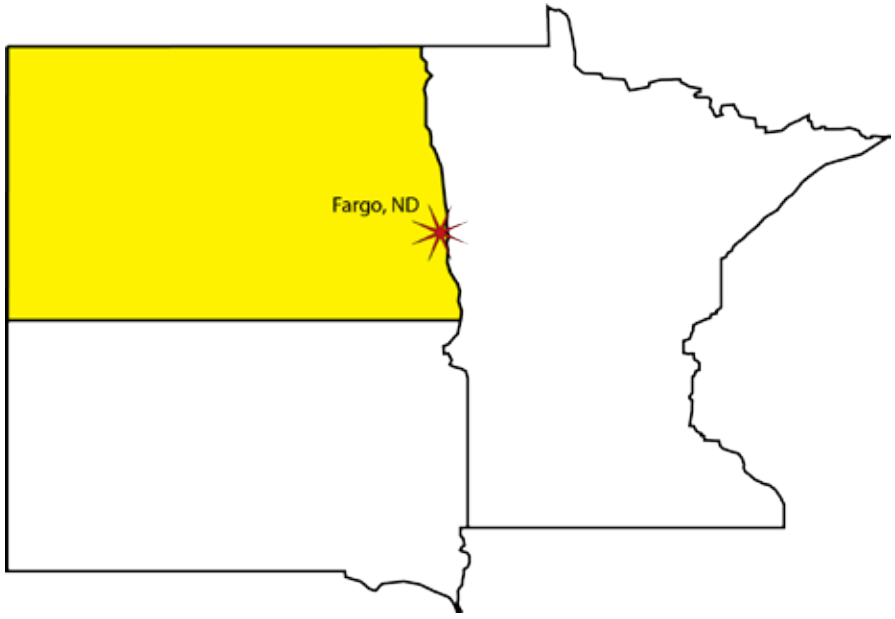


Figure 8.1 - Site Regional Context

The proposed project site is on the northwestern edge of North Dakota State University property. It is close to the NDSU equine center and the North Dakota Horse Park. The site's proximity to NDSU, the Horse Park and the equine center will allow partnerships to easily form between these venues, including professionals, enthusiasts, students, and faculty.

Figure 8.2 - Site City Context

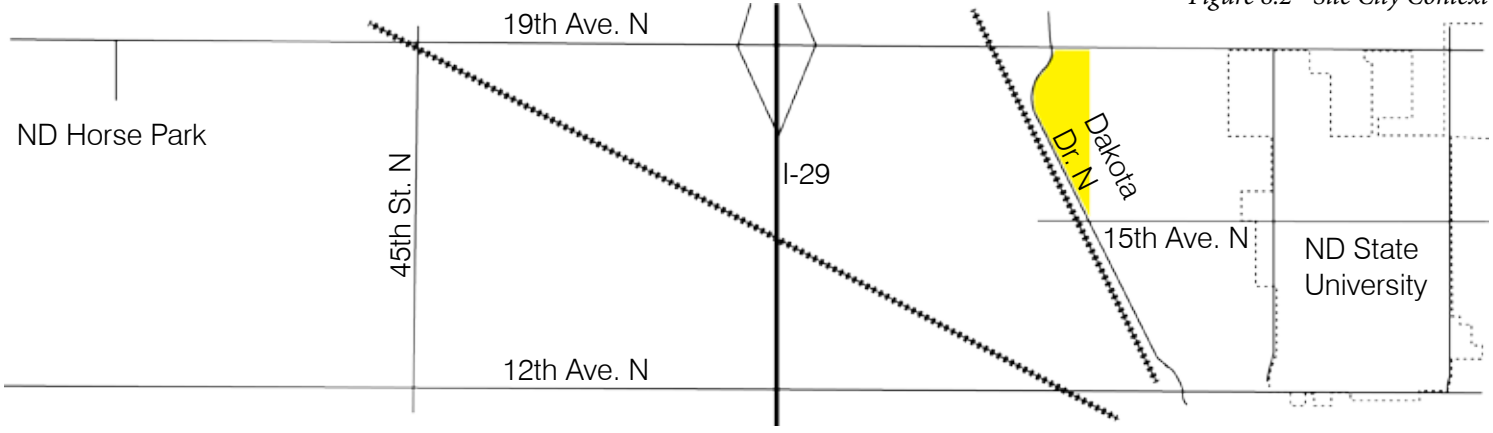


Figure 8.3 - Site Close Context (Google Maps)

The site is a long, 27.8 acre parcel zoned for public and institutional use. It is currently vacant except for a small tilled area in use by the NDSU soils department. The property is bordered by a drainage ditch to the east, Dakota Drive to the south and west, and 19th Avenue North to the north. Views from the property are expansive due to its lack of significant topographical changes and vegetation.

Figure 8.4 - View of Site from Dakota Drive Looking Southeast (Photo by Author)

Figure 8.5 - View of Site from 19th Avenue North Looking South (Photo by Author)

9 - PROJECT EMPHASIS

This project places emphasis on the design of a functional, efficient equine hospital which caters to the health and comfort of both equine patients and human handlers. In addition, it will strive to illustrate the connection between humans and horses.

10 - GOALS OF THESIS PROJECT

My academic goals for the project include the completion of a comprehensive, well thought-out design which meets the needs of the building type. A project is far more than just a pretty façade – it must function well. Correct function includes adequate sizing and efficient arrangement of spaces. In addition to these basic components, the building must be structurally sound, adequately climate-controlled, and efficiently constructed. When a building meets all these requirements and is also beautifully designed it qualifies as a good design.

It is my goal to design my thesis project to these standards. I hope to learn how to design a building which comprehensively addresses all of these areas without sacrificing quality in any of them. My past studio projects have all touched on aspects of each of these elements, but none have included all of them to a high level of completion. I hope to use my past experiences along with newly-learned concepts to design a building which meets all of my criteria for good design.

Finally, I hope that my programming research will provide a beginning knowledge base for any future students who are interested in the topic of equine healthcare. While the project typology is not well-documented, it is far from obscure. I hope that my thesis research can be used as a starting point for equine facility design.

Professionally, I want my project to exhibit my last five years of schooling. The skills I develop and demonstrate while completing this project will be useful in future architectural practice, and it is my intention to create a design which will display my ability for possible employers.

Personally, I want this design to be something which I am proud of and enjoy doing. I have completed studio projects in the past which I was not satisfied with, and I intend for this project to be something which I am happy to talk about, present, and work on. For some time I was leery of choosing such an odd topic for my thesis project, but this is a building type which combines two of my most resilient interests: architecture and horses. I am something of a Jack-of-all-trades and I have taken part in more activities and hobbies than I can count, but both architecture and horses have stayed with me over the years. I hope to learn more about each of them through this project.

11 - PLAN FOR PROCEEDING

Definition of Research Direction:

In order to better understand the problem at hand – how to design a facility for animal patients and human handlers – research will be undertaken in a variety of areas. Research subjects supporting the main design question include: horse and human needs for a comfortable, safe environment; equine physiology and behavior; and medical techniques applied to large animals. It is unwise to design this sort of facility without background knowledge in the typology, so various similar cases will also be studied to gain understanding of programmatic and spatial requirements. History plays a role in healthcare today for both humans and animals, so knowledge of the horse's place in history will be important and must be researched. Finally, a thorough site analysis will provide a beginning for my design process.

Design Methodology:

By using both quantitative and qualitative data I will be able to see the design problem from many different angles and will fill in gaps in my preexisting knowledge. My approach will employ a mixed method including study of existing architectural cases, research in various published material, and interviews with professionals. Each research method will serve to answer different questions about the design problem, and will raise more questions. I will pursue as many of these questions as possible in order to optimally position myself to design an effective building.

Process Documentation:

The architectural design process is long and involves many different parts. I intend to preserve that process through digital and physical copies of various media including written notes, artistic and architectural drawings, photography, digital modeling and rendering, and physical modeling. These items will be documented at the end of every week. At the completion of the project an oral presentation, a process book, and a set of final presentation boards will serve as documentation for individuals who are immediately available. In addition, the final products will be digitized and made available on the North Dakota State University Institutional Repository.

Project Schedule:

Successful projects have a detailed schedule to keep them moving forward smoothly. I intend to keep to a strict project schedule which will help me to manage my time effectively, and will also keep the project on track for completion on time. The schedule will allow time for design, but will also keep the final product in mind, allowing ample time for final production.

SPECIFIC PROJECT SCHEDULE

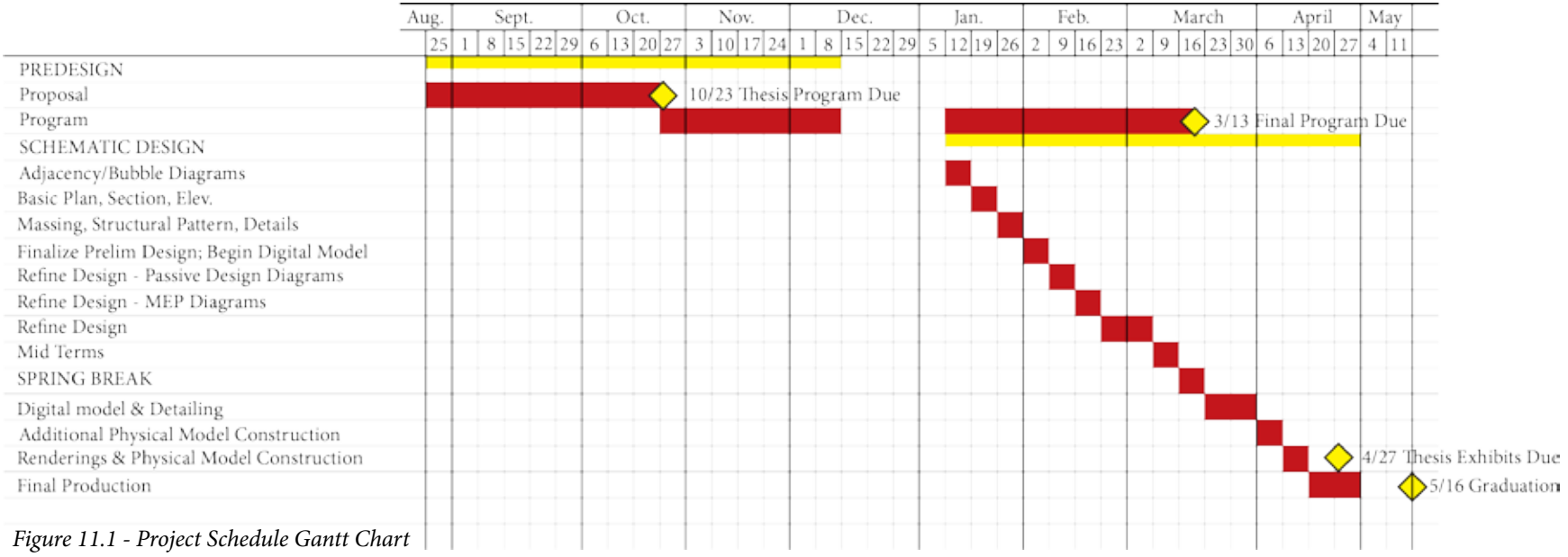


Figure 11.1 - Project Schedule Gantt Chart

12 - PROJECT JUSTIFICATION

This project is important to society because the horse represents a part of our history. Throughout the ages, the horse has been a constant companion to man. Equines have been used for transportation, food, companionship, and recreation, and they have helped to shape the landscape of society across the world. While horses no longer hold either the symbolic or practical status that they once did, they are still a part of the fabric of society. By designing an equine hospital, I will showcase a subset of society that has fallen into relative obscurity. Because the horse is no longer man's primary form of transportation, horse-related activities have become recreational rather than necessary. Even though equines no longer qualify as prime movers, they still have a place in society, one which can be supported by the design of an equine hospital.

An equine hospital project is also important because it demonstrates a variety of architectural skills. First, it is specific in nature and requires detailed research and background knowledge. Second, it requires the designer to think in terms of clients who span different species, adding to the specificity of the design. Third, it is a small enough project that a high level of technical detail is possible.

13 - HISTORICAL CONTEXT

The year was 1871 and the Northern Pacific Railroad was planning to develop rail lines across the Red River. Opportunistic settlers built up a city around the place where the rails crossed the Red, and the city of Fargo was born. It was a small place, just shacks and tents to begin with, but it soon gained traction and grew to a population of 8,000 in 1892. The makeshift buildings of the early days had disappeared and sturdy, wood-frame buildings stood in their place (City of Fargo, 2014).

There is little record of the information, but it is likely that many of the pioneers who settled the Fargo area owned horses and used them as transportation and power – horsepower in the truest sense of the word. In 1870, the year before Fargo was founded, the US Census Bureau recorded just under 10 million horses and mules in the United States. By 1900 that number had more than doubled, and over 25 million horses and mules lived – and likely worked – in the country (Greene, 2008).

Horses would have been used in the loading and unloading of goods and materials from both the steamboats which plied the Red River and from trains. They were a common form of transportation in city and country, and a source of power for industry – especially in farming. North Dakota is known for its agriculture today, but it was also agriculturally productive in the past. Farms were common across the countryside, and large-scale operations (known as bonanza farms) would employ many horses in their work. A photo of the Dalrymple bonanza farm, the first in the Red River Valley, from 1877 shows over 48 horses in use on a single operation (Clawson, 2012).

Today, horses play a much less prominent role in the Fargo area. They are no longer the primary means of transportation or a prominent worker, but they are still present. North Dakota State University has courses and degree programs in equine science, while the North Dakota Horse Park holds live racing on several weekends every summer. Members of the community participate in horse-related activities as well, including recreational riding and various horse associations and clubs. The horse's role has moved from work animal to companion, and horseback riding is no longer a valued skill but is simply recreation.

While there are many interest groups and proponents of equine activities, there is little support from nearby veterinary clinics. The closest equine veterinary hospital with the capacity for specialized surgery is in Cassleton, North Dakota. The Fargo area, as the largest city in North Dakota, should have a specialized veterinary hospital.

Figure 13.1 - Work on a North Dakota Farm (NDSU Archives, n.d.)

Horses in Art

Throughout history, horses have held symbolic meaning for humans. This is often demonstrated through the art that was created. The cave paintings at Lascaux, France are perhaps one of the most well-known instances of prehistoric art. In these paintings, ancient people inscribed images of both food animals and predators on walls deep inside the caves. The paintings were traced over many times, indicating that the act was probably a ritual or ceremony of some sort rather than a strictly artistic endeavor (Tedesco, 2000). Whatever the purpose, these paintings have survived throughout the centuries and continue to intrigue researchers and viewers alike.

Later civilizations also placed special emphasis on the image of the horse. Some of the most impressive and lifelike of these artworks are statues of Greek and Roman origin. Images that depict horses in use for war, sport, or ceremony are most common, but other tasks have also been represented (Johns, 2006). Overall, the artistic record shows an impressive intertwining of horse and man over the ages. As Catherine Johns (2006), a former curator at the British Museum, says,

> The role they [horses] have played in human societies since they were domesticated… has been so crucial that it is no exaggeration to say that the development of nations and cultures would have been quite different had they not existed. (p. 9)

Figure 13.2 - Lascaux Cave Painting (Wikimedia Commons, n.d.)

Figure 13.3 - Lascaux Cave Painting (Popular Archaeology, 2011)

Horses in Myth

Horses have also played a leading role in mythology. Arguably the most recognizable of the mythological horses is Pegasus, the winged horse famed as the companion of the Greek hero Bellerophon. The image of the winged horse was not strictly a Greek invention, though, as this character also played a part in artwork from the ancient Near East before the Greeks promoted him to a place just below their gods (Johns, 2006).

Horses appeared in other mythologies as well. Odin, the chief god of Norse mythology, rode a horse named Sleipnir. The animal was unique in that he had eight legs and could travel between the worlds of men and immortals (Johns, 2006). Unicorns, popular in medieval times but stemming from earlier myths, also take their place in the popular image of horse-like creatures (Johns, 2006).

History contains stories of horse-human or horse-other animal hybrids, including the centaur. Half human and half horse, the centaur is theorized to have been a response to the first sight of men on horseback. Centaurs are featured in Greek mythology, but they are accompanied by horses said to be fathered by the wind, an allusion to the animals' speed (Johns, 2006). Myth and stories, along with art, provide convincing evidence for the horse's important relationship with man throughout the ages. This relationship has varied from the horse as a noble creature to the view of the horse as a machine. Now, people's view of horses is balanced somewhere between these two extremes.

Figure 13.4 - Pegasus Drawing (Baileymcdoogle, 2014)

Figure 13.5 - Centaur on Greek Amphora (Theoi.com, 2011)

Horses at War & Work

Throughout history horses have been used as animals of war. Before 500 BC it is likely that most equine-assisted warfare involved chariots (Pickeral, 2003). A chariot would be less agile than a mounted soldier, but much more accurate. Mounted soldiers would have to control their horse and fight, while a charioteer could conceivably rely on a driver to take care of navigation. Some of the first soldiers on horseback were Greeks mounted archers (Pickeral, 2003). Later, after the saddle (which came first) and stirrup came into common use, mounted warriors – cavalry – began to play a more important role in warfare (Johns, 2006). An iconic image of the mounted warrior is the knight of the Middle Ages. The knight's armor weighed several hundred pounds, and often the horse would be armored as well (Johns, 2006; Pickeral, 2003). The great weight of armor required large, strong horses which, while not the size of modern-day draft (heavy) horses, were still able to carry the burden without tiring too quickly (Pickeral, 2003). Cavalry continued to grow and evolve throughout the years, and it was not until after the First World War that cavalry were substantially replaced by machinery (Johns, 2006; Pickeral, 2003).

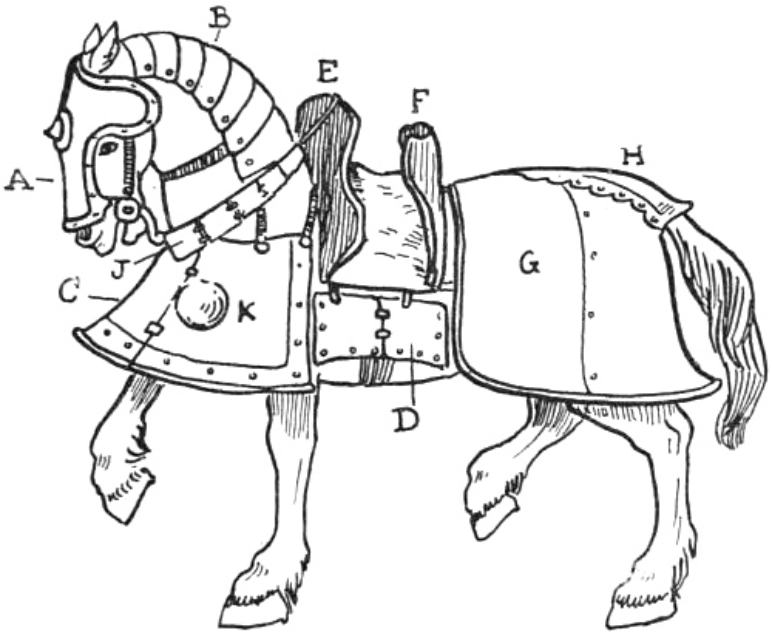


Figure 13.6 - Horse Armor (Ffoulkes, 1909)

Horses were not only used for war; they were also valuable work animals in times of peace. Catherine Johns (2006) says:

> … the idea of using a docile and biddable equine to carry or pull a load would have been fairly obvious [in prehistoric times], and the contours of a horse's back, unlike that of an ox, positively invite the idea that a person might be able to sit securely astride it. (p. 14)

It is unclear when horses were first used for riding and driving, and it is not known which came first. While evidence shows that horses were used for transportation as early as 2500 BC, good roads were a limiting factor to efficient use. Good roads are imperative to efficient use of horse power (Greene, 2008). The Romans maintained good roads, but they fell out of repair after the fall of the empire, and it was not until the 1600s that roads began to be improved once more (Johns, 2003). Horses continued to be used until the mid-1900s, but as machines improved, equine populations for transportation dwindled (Johns, 2003).

Industrial America is often thought to be the least horse-powered of environments. Steam power and industrialization have been perceived as the working horse's doom, but Ann Norton Greene makes an argument for a different idea: that, in some ways, railroads and industrialization created more tasks for horses. She says that "technologies never exist in isolation, but are always part of a network of usage" (p. 5). In her book, *Horses at Work: Harnessing Power in Industrial America,* Greene shows that horse use in the 1800s actually increased along with the use of steam power and rail lines.

While railroads decreased horse' work for long distance hauling, the same technology also increased the need for horses for short transport. The railroad may have overtaken horses for some tasks, but trains ran on rails while horses moved about freely. The only way to get to the railroad station – and sometimes between stations within a town – was by horse power. Until the adoption of the automobile, horses dominated short distance transportation (Green, 2008). Green (2008) says this about the importance of horse power in industrial America:

Figure 13.7 - Horse and Car (Nantucket Historical Association, n.d.)

> The resilience of horse power can be measured by the fact that it took three kinds of power to replace horses as prime movers. Steam engines replaced long-distance hauling, but with the consequence of dramatically increasing the number of horses used for short distance haulage. Electric power replaced the use of horses in mass transit. Only the third one, automotive transport, came close to replicating the horse as a prime mover …. (p. 8)

While America has adopted the automobile and has not looked back, horses are still at work in the country and the world today (Johns, 2003). Certain communities such as the Amish continue to use horse power as a way of life, but other farmers have returned to – or rediscovered – the art of working with horses (Leslie, 2013). While horse power may not be the best way to work large-scale farming operations, some small-scale farmers have made it (or a hybrid machine/horse system) work well for their farms. Other operations such as ranches still employ horses for daily work as well (Kilby, 2007).

Today, a small portion of the equine population remains in the working field or are considered competition or racing animals, but the majority of horses in America are used for recreational purposes (Kilby, 2007). These animals have no purpose other than to bring joy to their owners. Horses have fulfilled many roles throughout history – from food to friend – and now they hold a special place in society. Not quite pets and not quite livestock, they are both an iconic symbol and the most prosaic of technologies, and they will continue to leave hoof prints in history.

14 - SUPPORTING RESEARCH

According to Emily Kilby (2007), there were 9,222,847 horses in the United States in 2005. She continues, saying "the United States unquestionably has the most variegated collection of equidae on earth" (Kilby, 2007, p. 180). This equine diversity and the human interest in the animals contributes to a $39 billion impact on the United States' economy (American Horse Council, 2005). According to Kilby (2007), a large part of the horse's popularity is the broad set of options for activities. She states that there is "… something for everyone" (p. 194). Earlier in her text, Kilby (2007) gave a probable reason for this variety. She says:

> … the idea of using a docile and biddable equine to carry or pull a load would have been fairly obvious [in prehistoric times], and the contours of a horse's back, unlike that of an ox, positively invite the idea that a person might be able to sit securely astride it. (p. 14)

The horse is a part of American history and culture, from the romance of mustangs in the west to the drama of horse racing's Triple Crown, to the simple companionship of keeping a "backyard horse" for recreation. In fact, the largest portion of the equine population in the United States is kept for pleasure. According to Kilby (2007), in 2003, 42% of horses were kept for recreational purposes, followed by 29% for competition, and 9% for racing. A final category was 19% specified as "other" use. While recreational horse ownership is the primary category that horse owners fall into, many of them also compete. Kilby (2007) states that:

> … equestrian sports… that are physically and mentally challenging and based on a long working relationship with one horse appeal to many in the recreational world. The past twenty years have seen large increases in most equestrian activities, but sports that test brains – training, skill, and strategy – not just beauty have seen some of the steepest rises. (p. 196)

Figure 14.1 - Horse Racing (Slooby, 2007)

This partnership between human and animal and the need for both physical and mental acuity is a major reason for horse owners to try competition. There is an inherent pleasure in riding through the countryside on a willing horse, but many riders also wish to further improve their skills and to test those skills against competitors. But, with all of these horses moving about the country for both recreational and competition purposes, there must be someone to take care of them all. After all, as Kilby (2007) says "… soundness and mobility [are] the most essential ingredients in equine well-being."

In the United States there are 27 university veterinary clinics and many more private hospitals and individual veterinarians (Kilby, 2007). There is no shortage of people to care for horses, but the location of all of these horse doctors is sporadic. The closest university veterinary hospital to Fargo, North Dakota is at the University of Minnesota, over 200 miles away. The closest equine veterinary services to Fargo are in Casselton, North Dakota, just under 30 miles away. While this by no means indicates a severe shortage of veterinary care, it does indicate that the Fargo, ND area is underserved by equine veterinarians, and that another clinic – more specialized than those surrounding – could be in order.

Figure 14.2 - Recreational Riding (National Park Service, n.d.)

Figure 14.3 - University of MN Veterinary Hospital (Photo by Author)

According to Tim Greet (2008), veterinary hospitals are "highly efficient from the veterinary point of view…" because they improve the quality of veterinary procedures (p. 147). The majority of veterinary practice is undertaken through farm calls where the vet travels to the client's farm to work on their animal. This arrangement allows the most mobile of the participants – the veterinarian – to travel to the least mobile participant – the patient. While this method is very effective for small, routine procedures such as vaccinations and minor suturing, it prohibits major surgical intervention and often reduces the quality of long-term care. A standard veterinary farm call alleviates immediate symptoms and improves health, but post-procedure care throughout the recovery process is often left up to the patient's owner.

Figure 14.4 - Stall with Sling for Support (Photo by Author)

In the case of major surgery, a haul-in clinic or veterinary hospital is the ideal location for these procedures. The building provides a sanitary, secure location where the veterinarian has access to all necessary equipment. In addition, the surgeon will have skilled help available on site. In the instance of home visits, a veterinarian has only the patient's owner as an additional hand.

Veterinary hospitals and haul-in clinics do not all need to be designed for the same level of care (Greet, 2008). For instance, a small clinic such as the Carolina Equine Hospital profiled earlier is set up to do simple surgery and procedures, but not a great deal of major medical procedures. A larger, more specialized facility (such as the University of Minnesota Equine Veterinary Center which was previously described) would serve as a referral clinic for surrounding small clinics. As Greet (2008) says, "… the structure of the building and available facilities should be designed to satisfy its use" (p. 147). Thus, it is important to know the facility's specialty or purpose before beginning to design. Still, even without a specific program in mind, there are certain factors, namely the physiology of the patients, which all facilities will need to take into account.

Figure 14.5 - Stall with Stocks for Control (Photo by Author)

Stabling is not a natural living situation for horses (Vogel, 1995), but it is often crucial for recovery after surgery or sickness. There are two primary types of stalls: box stalls and tie stalls. Box stalls (sometimes called loose boxes) are similar to a small room and are designed for a horse to stand up, lie down, and move around freely. Box stalls are recommended to be between 10'x10' and 10'x14' depending on the size of the horse to be housed (Pickeral, 2003). Tie (or straight) stalls are narrow and are not designed for horses to turn around (Vogel, 1995). In a tie stall, the horse is tied at the front of the stall and the back is open. Horses are backed out of the stall when they need to leave. This option is not designed for long-term stabling and would likely not be necessary in a veterinary hospital.

In the wild, horses spend the majority of their time grazing (Vogel, 1995). This requires that the horse is constantly moving. In addition, horses have small stomachs (Vogel, 1995) which are relatively sensitive (in comparison to ruminants such as cows). In a natural state, horses would eat for nearly the entire day, ingesting small quantities of roughage over a long period of time. In a stable, horses are fed several meals (or a single meal, depending on management practices) of concentrated, high-calorie feeds per day. While larger feedings are often necessary due to the handler's schedule, this style of feeding is not a natural one, and, if managed improperly, stabled horses can develop illnesses due to domestication. According to Colin Vogel (1995), a veterinary surgeon who practices in England, "many common ailments are linked to domestication" (p. 118). While the horse has adapted well to stabling, it may not be the best choice for long term housing. Horses are made to travel and move throughout the day (Vogel, 1995). Unfortunately, horses who are recovering from illnesses often need to be stabled for their own safety, yet the very stabling that is helping them to recover is also contrary to the healthiest way for their bodies to function.

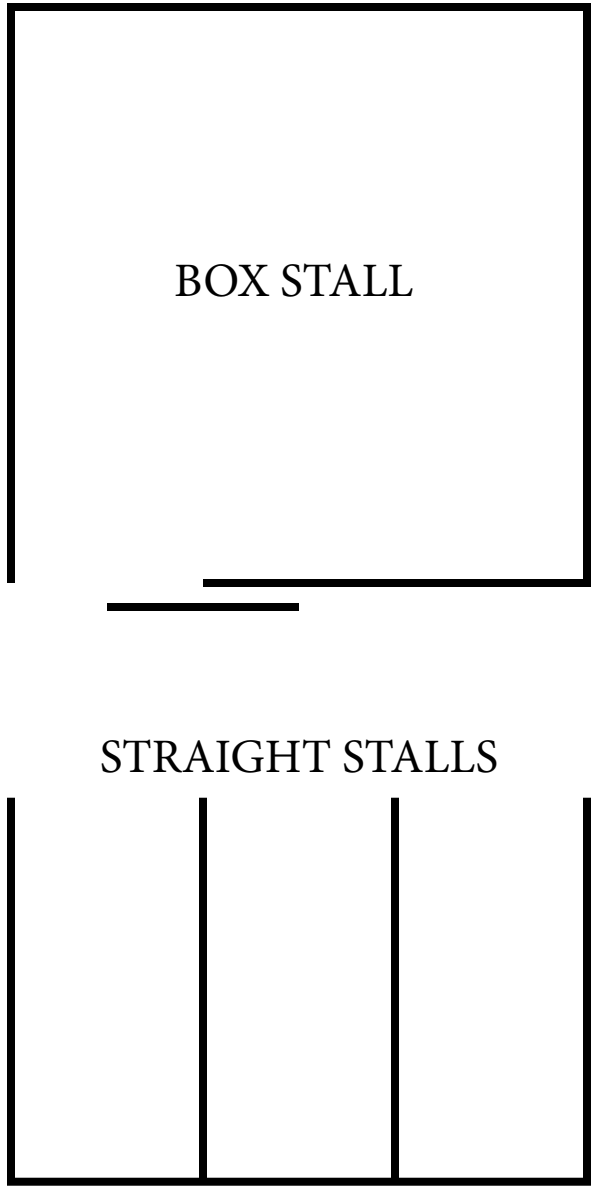


Figure 14.6 - Stall Type Diagrams (Image by Author)

The equine respiratory system is one that is most noticeably affected by stabling, and the stable environment must be conducive to respiratory health. Researchers in Sweden studied the effects of seasonal air quality on equine respiratory systems. The barn used for the test was unheated and had no mechanical ventilation systems, and housed 18 horses. In addition, the stable management schedule kept horses out on pasture for a minimum of four hours per day and up to twelve hours per day depending on the season and the weather (Riihimäki, Raine, Elfman, & Pringle, 2008). In a veterinary hospital, horses are more likely to be indoors for a greater amount of time, therefore exacerbating any respiratory symptoms related to stable conditions. According to the article on the study, "… there is a clear connection between exposure to highly dusty stable environments and increased airway inflammation in horses" (Riihimäki, Raine, Elfman, & Pringle, 2008, p. 433).

A horse which is stabled constantly for recovery is at risk for developing respiratory problems. Not all of the air quality issues are architectural, though. According to the article, "… studies have shown that type and hygienic quality of feed and bedding material have a great influence on dust concentration in stable air" (Riihimäki, Raine, Elfman, & Pringle, 2008, p. 437). This indicates that, while architectural interventions are helpful, much of the responsibility for proper air quality management lies on the caretakers. Another study focused on the effect which installing a mechanical ventilation system had on a stable. Wålinder et al. (2010) state that in the study, "…the installation of mechanical ventilation was effective in improving the air quality in the stable" (p.270). This architectural intervention is a critical one to consider for veterinary hospital design because the spaces where horses are housed will also be work areas, so they need to be climate controlled. This is an aspect of design that caters both to human and animal comfort, but is also important for respiratory health.

Attention must also be paid to human respiratory health. Elfman, Riihimäki, Pringle, and Wålinder (2009) state that "in humans it is well known that exposure to organic dust, microorganisms and endotoxins from different farm animal stabling systems can cause pulmonary disease" (n.p.). The stable which was studied did not have a mechanical ventilation system, and it was found that in the summer, when natural ventilation due to clement weather was much more prevalent, air quality was greatly improved (Elfman, Riihimäki, Pringle, & Wålinder, 2009). The authors state that "… stables are often closed in winter times … this can markedly affect indoor air quality." So, while horse stables can be inflammatory environments (for both humans and horses) a key to mitigating the problem of low air quality is good ventilation.

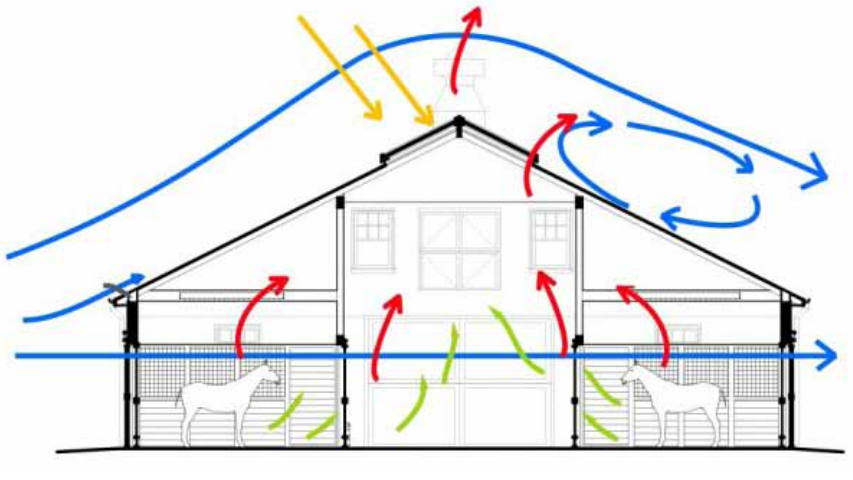


Figure 14.7 - Horse Barn Ventilation Diagram (Equestrian Quarterly, 2013)

Horses are prey animals. In the wild, they live in herds for protection and companionship (Vogel, 1995). Herds have a definite hierarchy as well, often called a pecking order, which helps to determine access to prime food and resting places. Overall, the horse is a very social creature which thrives when in contact with other horses. This can be a both a stumbling block and a stepping stone to human interaction with horses. It is a stumbling block because horses will, at times, become agitated and more difficult to handle if separated from their herd-mates. Herd mentality is also one of humanity's greatest tools for working with horses, though, because the majority of horses are most comfortable following a confident leader. The domestic horse can learn to see humans as both companions and herd leaders, giving humans an advantage in the relationship that makes up for their lack of size. As mentioned previously, horses are built to move and can often become bored and under socialized in stables. Stable vices are repetitive motions that horses develop because they are bored (Vogel, 1995). Thus, it is important to provide both mental stimulation (in the form of food or stall toys) and social interaction (if possible) to stabled equines.

As prey animals, equine senses are highly developed in order to avoid being killed and eaten (Vogel, 1995). The horse's field of vision extends almost entirely around its body, with blind spots directly behind it and directly in front of its nose (Pickeral 2003). A horse's eyes are placed on the sides of its head and used independently (Vogel, 1995). This allows their wide range of vision, but also gives them the ability to eat and watch for danger at the same time (Pickeral, 2003).

A horse's sense of smell is also very strong. The sense of smell complements eyesight and adds to the knowledge that visual perception accrues. Horses use smell to detect other animals nearby, but also to find food or water, or to decide if a food is good to eat (Pickeral, 2003; Vogel, 1995). Equine skin also very sensitive. Horses can detect even small touches – especially insects – and remove them (Vogel, 1995).

Equine ears serve dual purposes; they are both excellent for capturing sound and for communication. Each ear is long and shaped to funnel sound, and they each move independently in order to better capture sounds (Vogel, 1995). This independent movement also facilitates communication. One of the best indicators of equine mood is the ears. Though a horse is capable of a variety of vocalizations, body language is the most prevalent form of equine communication (Pickeral, 2003). Humans have, through observation, learned to read equine body language in order to better understand behavior.

Horses have been a fixture in human culture for thousands of years. Though their role has changed, they have stayed with us and continue to impact our society. The previous research findings demonstrate the horse's meaning in society, its place today, and its economic impact in the United States. In addition, research on equine behavior and physiology helps to pave the way for a better understanding of how to make architecture for equine and human use.

The horse industry has a sizeable impact on the United States' economy. This, as well as demographic information about the horse population in the country, helps to define the need and location of an equine hospital. In locations with large populations of both horses and people, equine care is prevalent. In other locations, such as the Fargo area, equine care can be in short supply. Knowledge of the context of horse use and existing hospital locations is beneficial for understanding the feasibility of architectural interventions.

While veterinary hospitals as a typology are not uncommon, they are not a standard architectural education focus. Despite similarities to human-centered healthcare design, equine design is most definitely a niche market. Thus, it is important to read recommendations from experts as to how design is best carried out.

An understanding, even at a basic level, of equine physiology and behavior is necessary for holistic design of equine facilities. While architects can rely on some level of "instinct" or "experiential knowledge" in the design of human-centered facilities, equine-centered facilities are a whole new animal. The architect needs to cater to the needs of both humans and equines, keeping both as safe as possible in the process. It is no easy task to think like a horse and design in a way which benefits them, but it is much more achievable if the proper research is gathered before embarking on design.

The design of any healthcare facility is a monumental task that requires specialized knowledge and plenty of experience. Unfortunately, the equine medical facility is a typology that most architects will never encounter, or, if they do, will only undertake once. No amount of research will ever provide total understanding of the design problem at hand, but proper preparation – including research – can only help an architect to do a more comprehensive job. The previous research is only a small snippet of what could be learned, but it is a place to start.

15 - SITE INFORMATION & ANALYSIS

All Diagrams by the Author

The site is located at the southeast corner of the junction of 19th Avenue North and Dakota Drive North. It is a 27.8 acre section of land zoned for public and institutional use and is currently in use by the NDSU soils department. The views from the site are minimal. To the north is 19th Avenue and the fence separating Hector International Airport from the road. To the east lie NDSU agricultural plots, and beyond those the research park, FargoDome, and NDSU agriculture buildings are visible. South of the site, thin shelterbelts and the 12th Avenue North bridge dominate the view. Finally, to the west are train tracks, NDSU agricultural buildings, and fields.

Figure 15.1 - View Photo Locations

Figure 15.2 - Site Looking South (Photo by Author)

Figure 15.3 - Site Looking East (Photo by Author)

Figure 15.4 - Site Looking North (Photo by Author)

Figure 15.5 - Site Looking West (Photo by Author)

There are no built features on the site; it is undeveloped. The light quality varies with the time of day, but the area is open and light is not interrupted. Vegetation consists of mostly grasses. Cattails, milkweed, and small trees grow in the drainage ditch that borders the east side of the site, and a set of spruce trees takes up the northwest corner. The only water on the site is to the east, in a small drainage ditch. The water in the ditch runs, but the availability of water and the speed of movement depends upon the season. Garbage collects in the ditch, and the water appears to be muddy.

Wind is a near-constant presence on the site due to its openness. No built features obstruct the flow of wind, though the spruce trees in the northwest corner slow it some. The only human intervention on the site is a small portion of tilled land overturned by the NDSU soils department. The land appears to be well-maintained, though garbage tends to collect along the roadside and in the ditch.

Figure 15.6 - Vegetation Photo Locations

Figure 15.7 - Tilled Land (Photo by Author)

Figure 15.8 - Milkweed (Photo by Author)

Figure 15.9 - Cattails & Water (Photo by Author)

Figure 15.10 - Spruce Trees (Photo by Author)

The site's soil is classified in the category of Fargo-Ryan silty clays, with a soil order of vertisols and a suborder of aquerts. The water table for these soils is typically at three feet below the surface in the summer, and one to two feet below during the winter. According to the FEMA flood information which takes effect in January 2015, the site has a .2% annual chance of flooding. While a portion of the south and east of the site are in a 500 year flood plain, the remainder of the land is safe from flooding.

Utilities currently available on the site include water, and (presumably) electricity. The area surrounding the site includes a variety of buildings, so connection to the electrical grid would not be difficult. Vehicular traffic along 19th Avenue is fairly regular, and peaks during events and prime driving hours, while Dakota Drive only directs a small portion of traffic. Both roads are classified as arterial streets. A few runners and walkers use Dakota Drive, but there are no sidewalks or amenities near the site, so few pedestrians visit it.

The site has very little topography, the most significant being the slope to the drainage ditch. In fact, there is no topographic change to be seen around the site. Fargo is not known for its variation in terrain. There is little plant cover on the site, only grasses and a few trees as previously described.

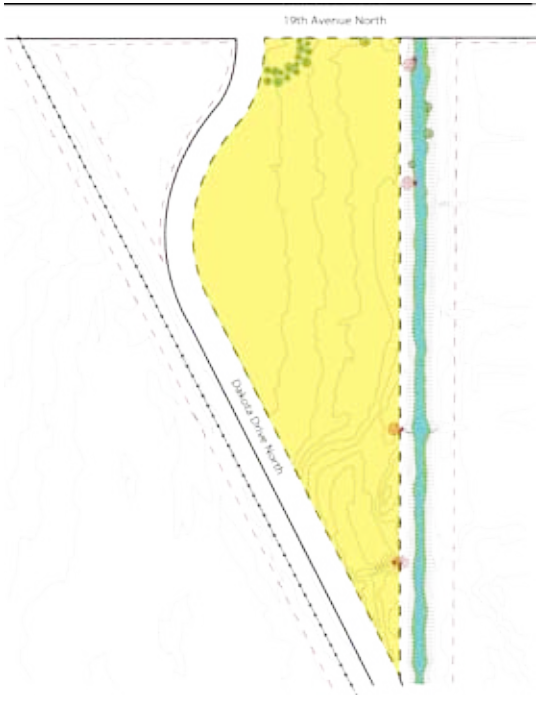


Figure 15.11 - Drainage Photo Locations

(Photos by Author)

Figure 15.12 - Culvert (North)

Figure 15.13 - Drain Tile Pipe

Figure 15.14 - Dome Drain

Figure 15.15 - Dead Cattails

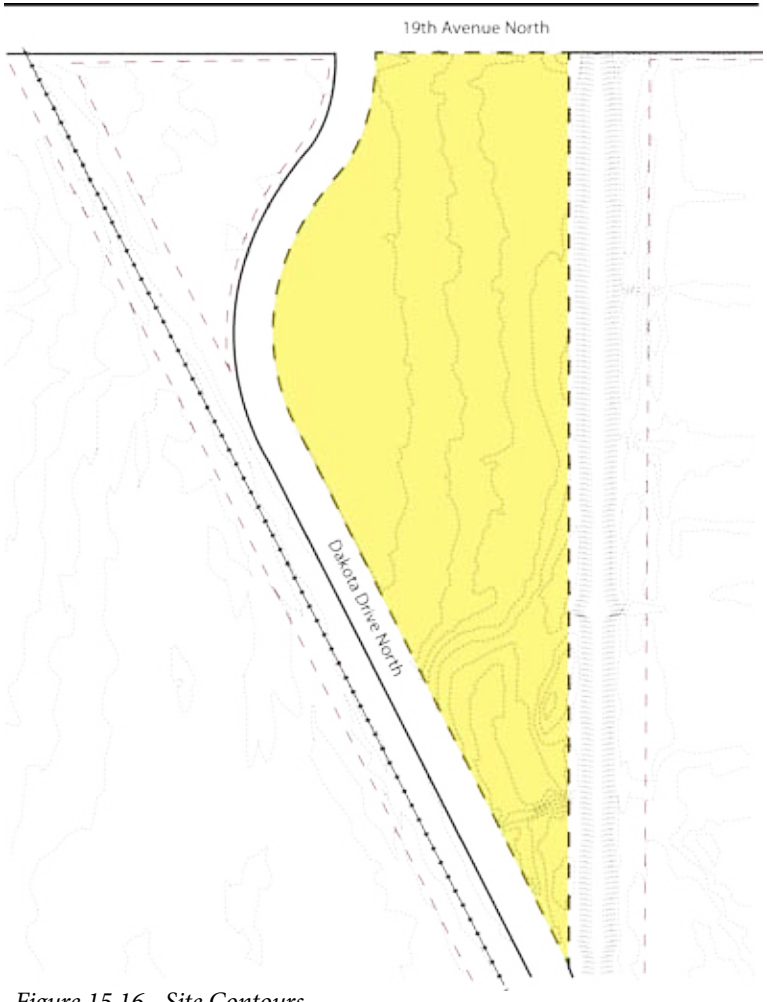


Figure 15.16 - Site Contours

The site shows little major topographical change, but the overall slope is towards the east and the drainage ditch.

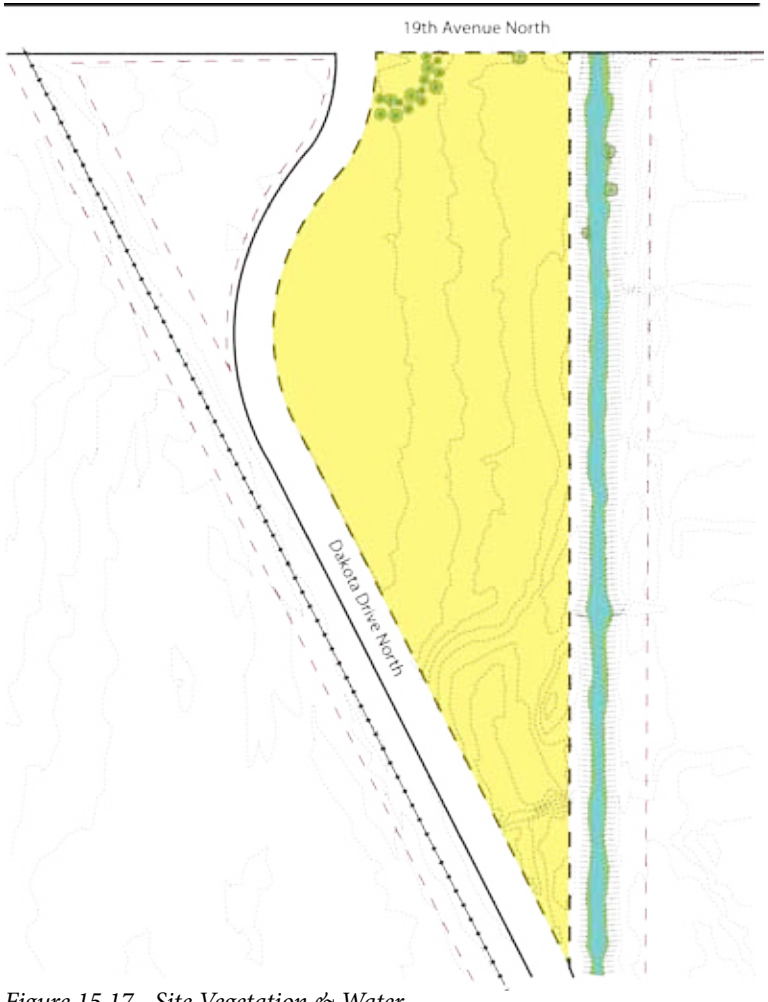


Figure 15.17 - Site Vegetation & Water

Vegetation on site is minimal, but includes cattails and a few small trees in the ditch to the east, and a small stand of spruce trees in the northwest corner.

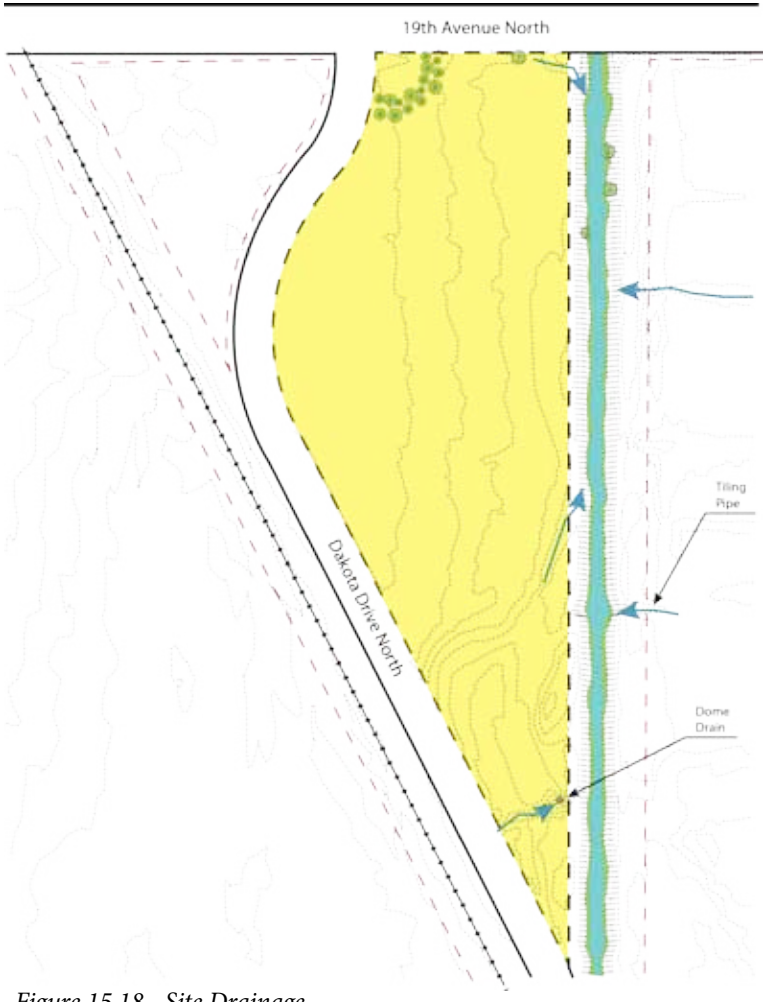


Figure 15.18 - Site Drainage

The site appears to be well-drained. A dome drain with a swale from a culvert under the road, as well as tiling pipes from the eastern fields and an overall slope to the ditch helps to assure that excess water is handled appropriately.

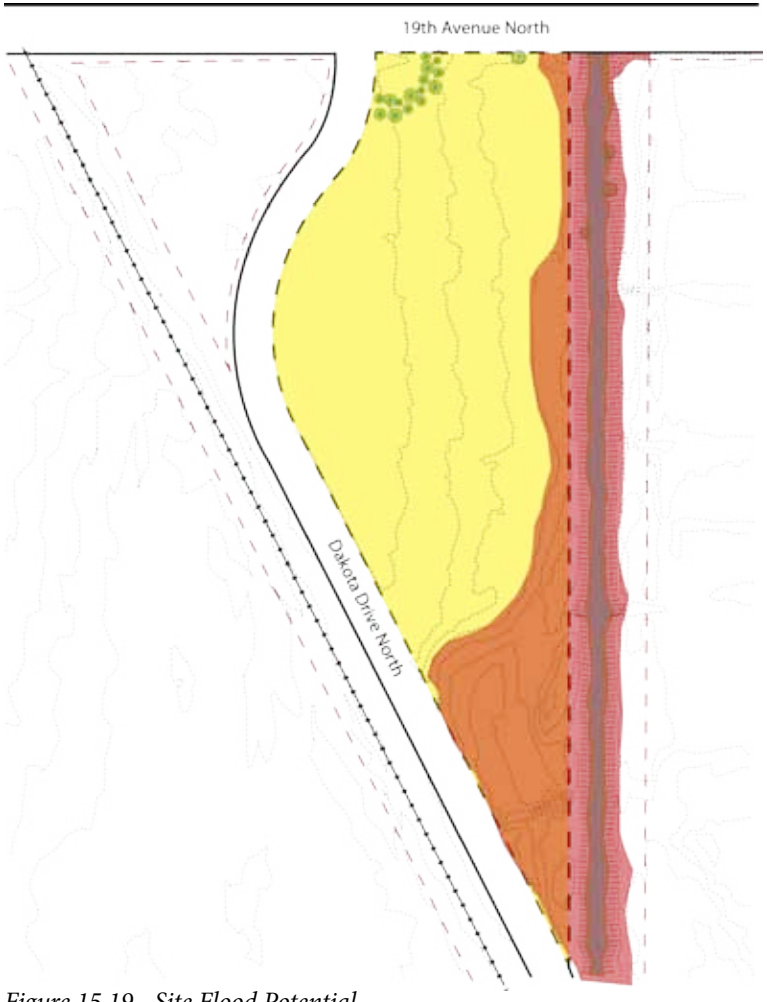


Figure 15.19 - Site Flood Potential

The 500 year flood plane (shown in red) affects the southern and far-eastern sides of the site, but not the northwestern and western parts. These appear to be the optimal places to build.

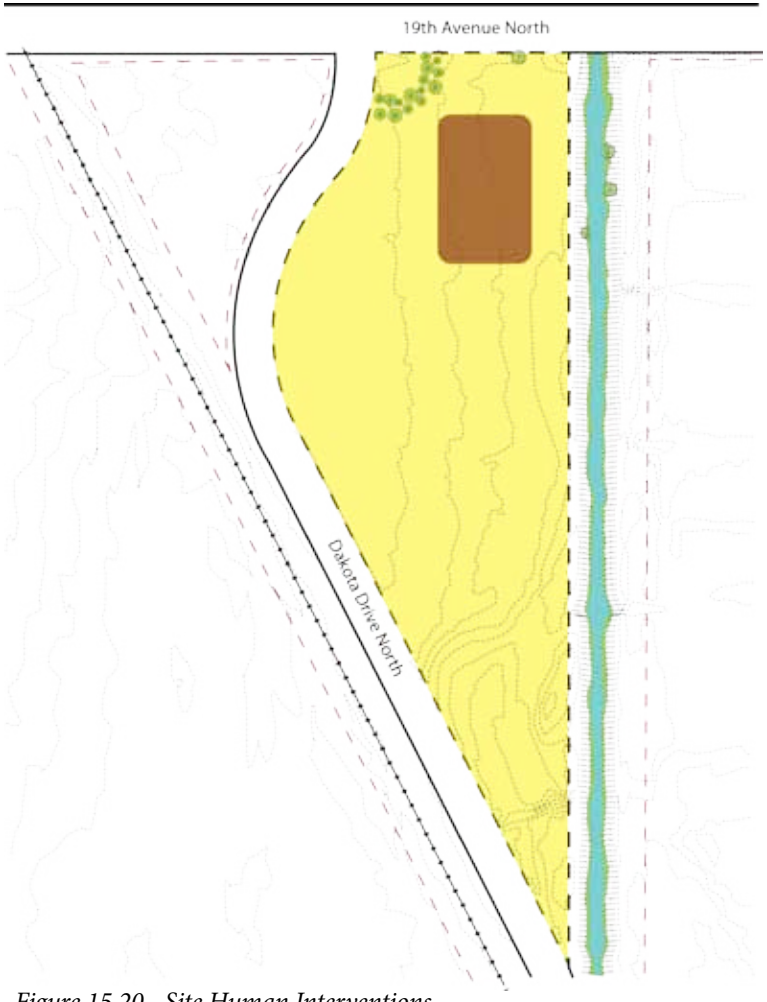


Figure 15.20 - Site Human Interventions

Human interventions on the site are minimal. There is a small tilled area (shown in brown) in use by the NDSU soils department, and garbage collects in the drainage ditch.

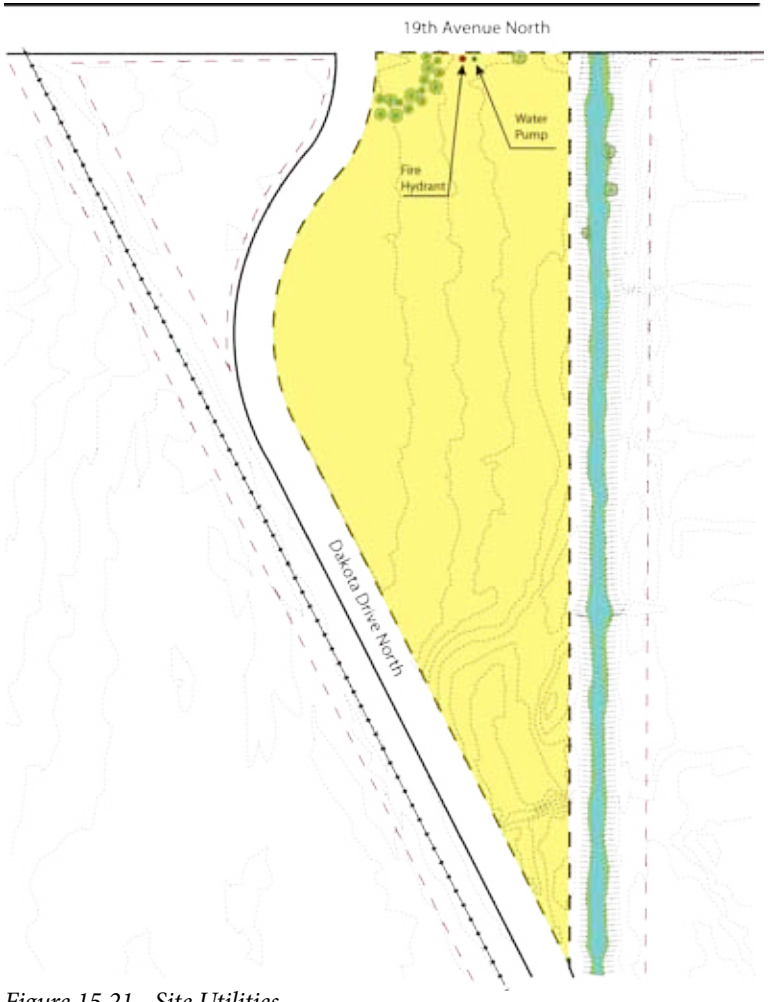


Figure 15.21 - Site Utilities

Utilities specifically on site only include water, but the presence of buildings on the parcels surrounding the road, and the streetlights, suggest that it would not be difficult to connect into existing utilities.

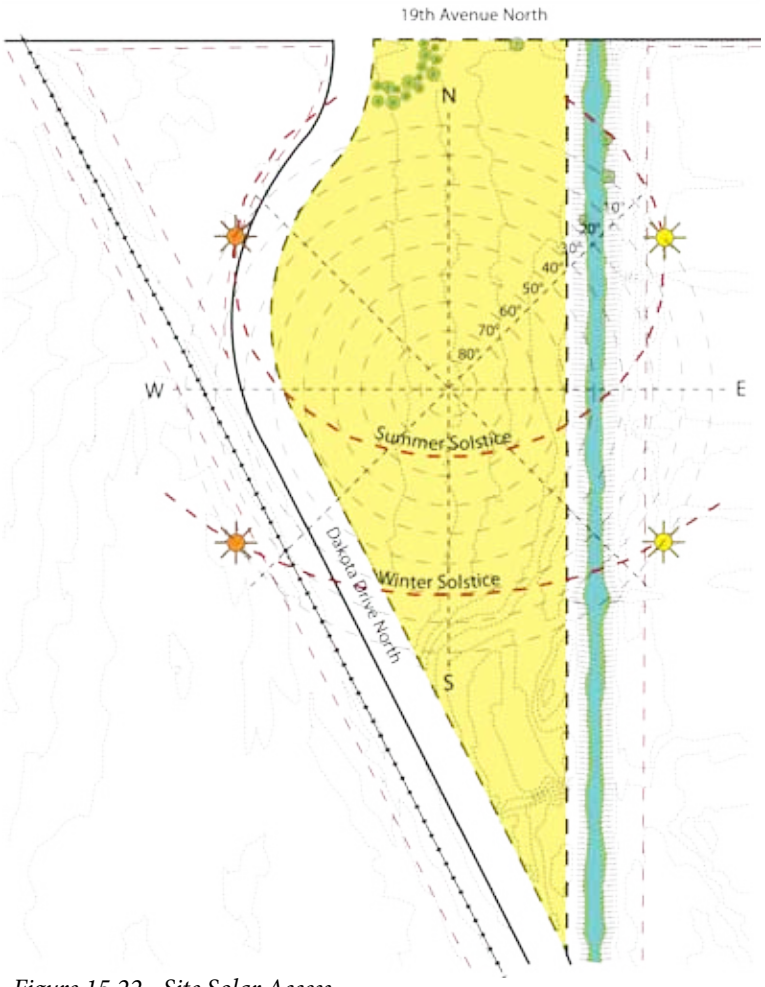


Figure 15.22 - Site Solar Access

The site receives a great deal of summer sunlight on the south, east, and west sides, but the majority of the winter sunlight will be from the south alone.

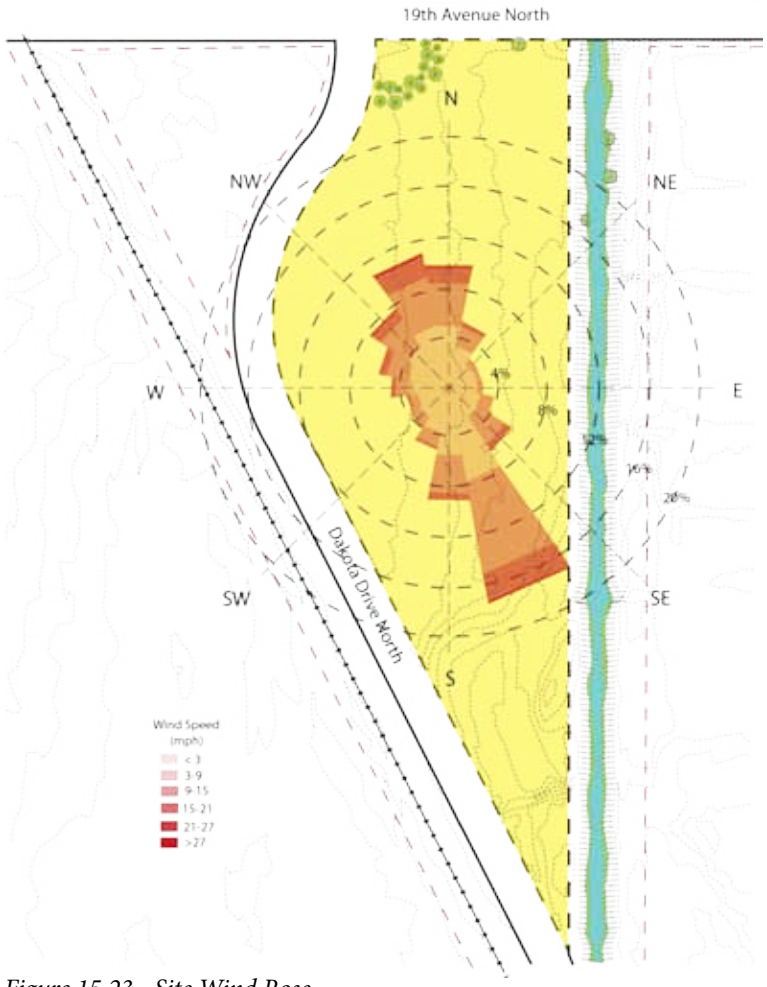


Figure 15.23 - Site Wind Rose

Wind on the site comes predominantly from the southeast and northwest with speeds of between 15 and 21 miles per hour.

FARGO CLIMATE DATA

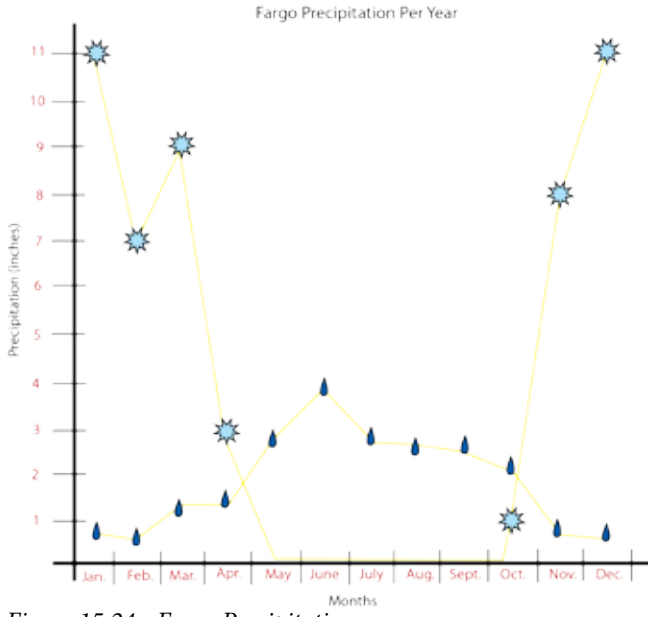


Figure 15.24 - Fargo Precipitation

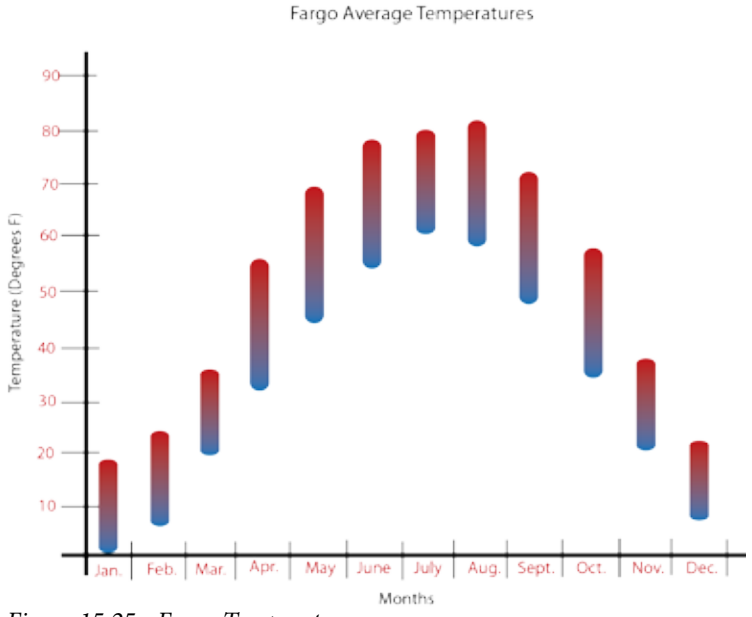


Figure 15.25 - Fargo Temperatures

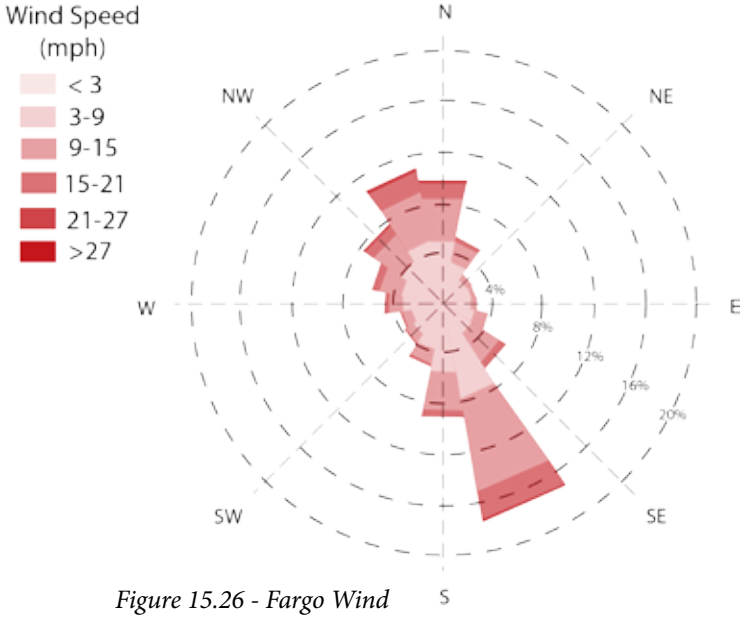


Figure 15.26 - Fargo Wind

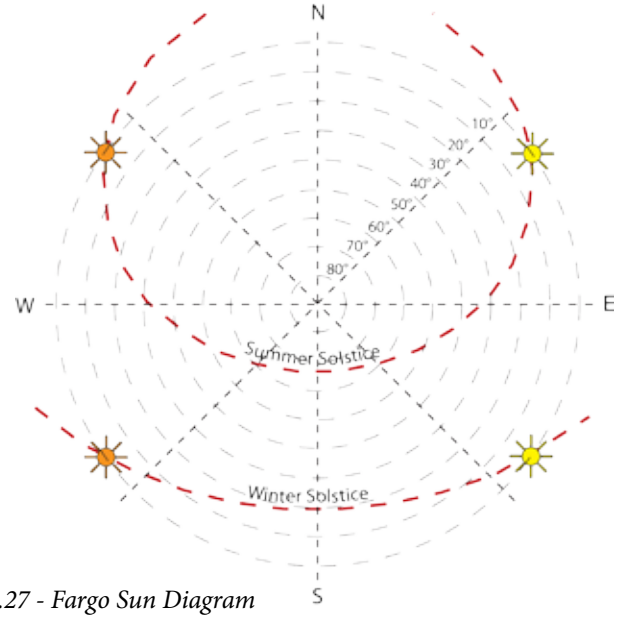


Figure 15.27 - Fargo Sun Diagram

16 - BUILDING PROGRAM SPACES

PUBLIC

Reception
225 sf
Public WC
130 sf

SEMI-PRIVATE

Exam Rooms
1900 sf
Stabling
1300 sf
Meeting Room
330 sf
Seminar Rooms
1400 sf
Offices
250 sf

STAFF ONLY

Surgical Suite
1500 sf
Pharmacy/Lab
600 sf
Isolation Stabling
500 sf
Break Room
170 sf
On-Call Living
300 sf
Staff WC
80 sf

TOTAL SF:
8685 sf

Storage - 12%
1042 sf
Mechanical - 8%
695 sf
Circulation - 20%
1737sf

ADJUSTED TOTAL SF:
12159 sf

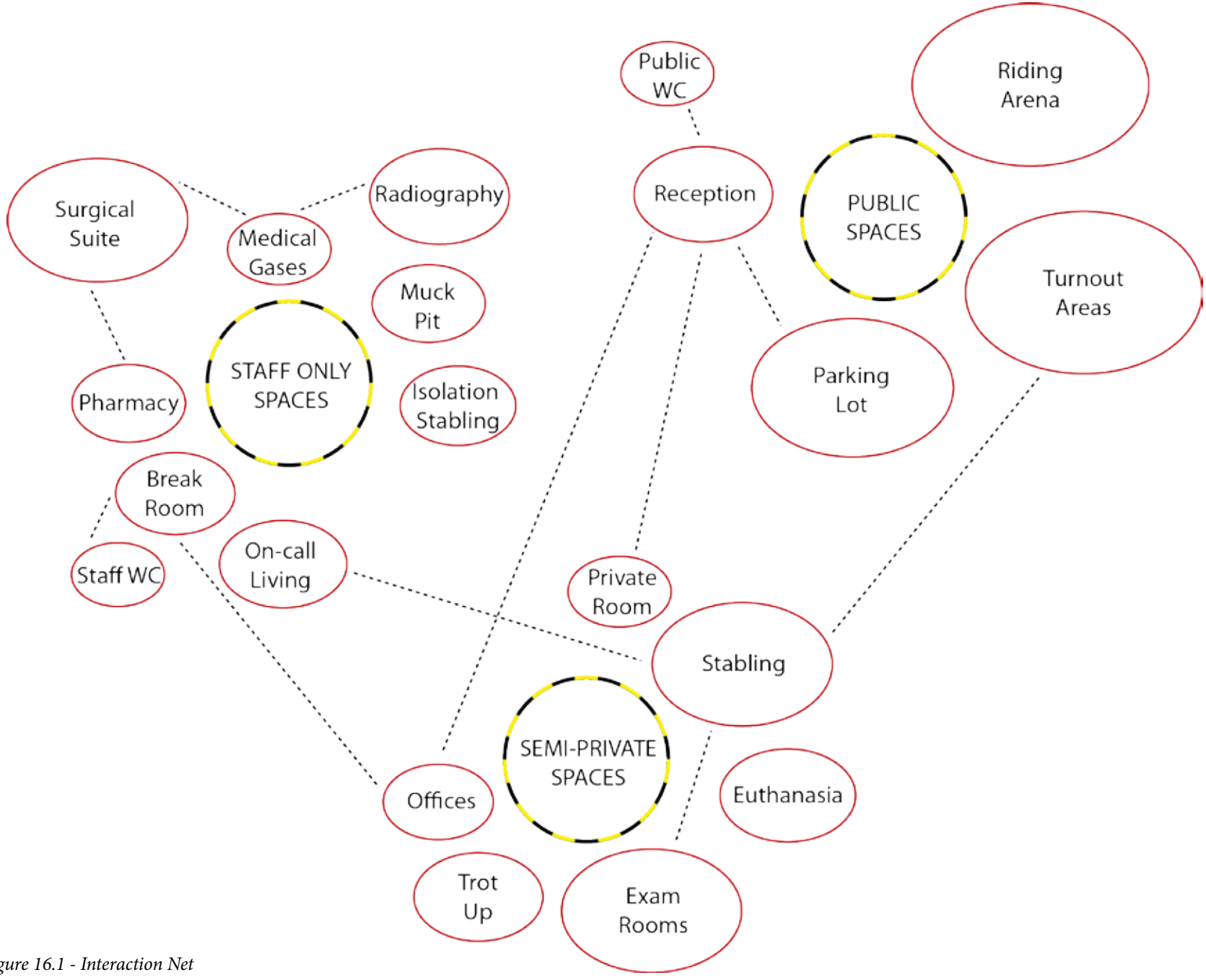
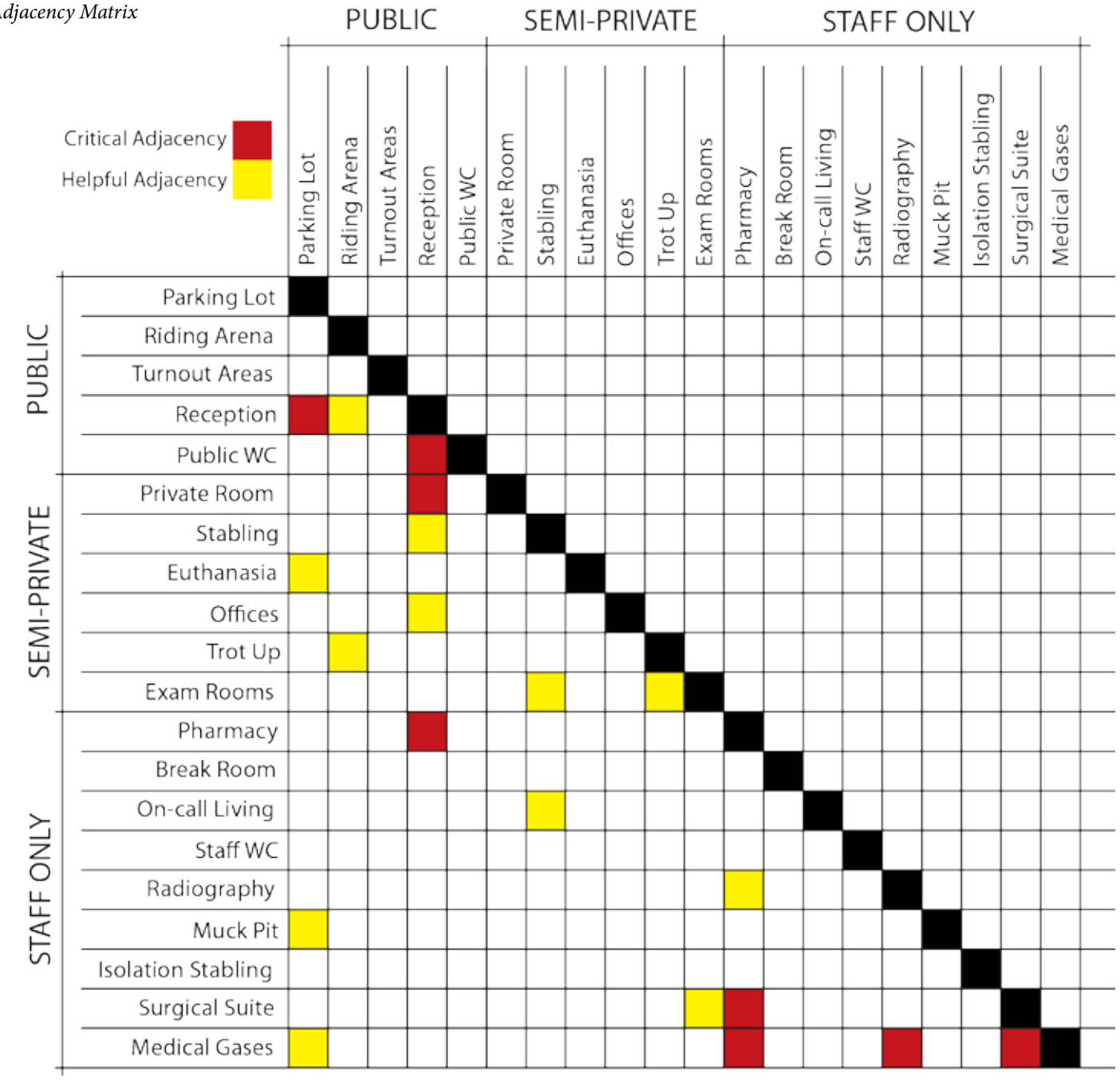


Figure 16.1 - Interaction Net

Figure 16.2 - Adjacency Matrix



17 - THESIS PROCESS DOCUMENTATION

My design process began with an artifact. It is meant to embody the movement of a horse in a unique way. My artifact moves unpredictably – like a living thing – yet can be controlled. It is like a horse in its sound, its movement, and the way it is manipulated with the hands. It takes up a great deal of space, yet can also be small. It looks light and elegant, yet is deceptively heavy. The overall effect, while created by the collection of parts, is allowed by the joints between pieces. It is these joints which work as the pivot points and direct all of the object's movement.

Figure 17.1 - The Artifact

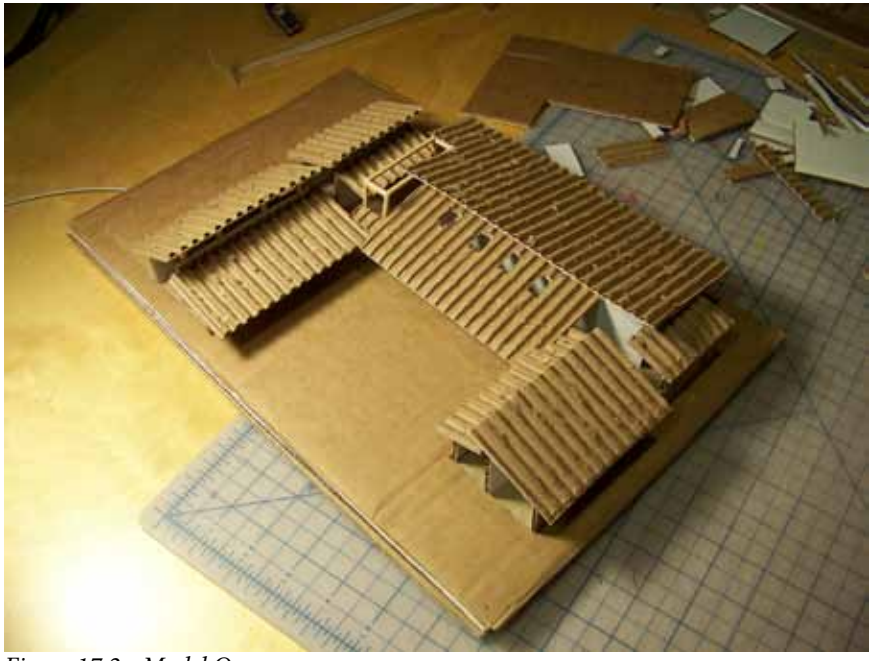


Figure 17.2 - Model One

Following the design of the artifact, I moved into exploring possibilities with models. The picture on the top left of this page shows my first attempt at a design. The building was oriented to catch summer wind (for ventilation) and block winter winds (for energy conservation).

The lower two photos are of my second model. It was designed with a separation between the "human" and "horse" spaces. This was also the first model to include a piece of the "human" upper level which stretched out over the land.

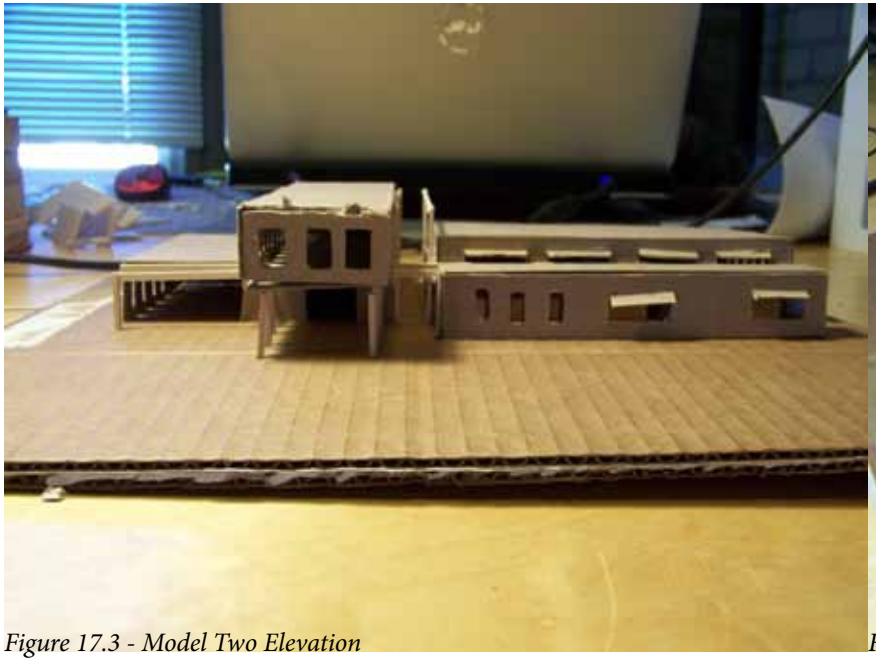


Figure 17.3 - Model Two Elevation

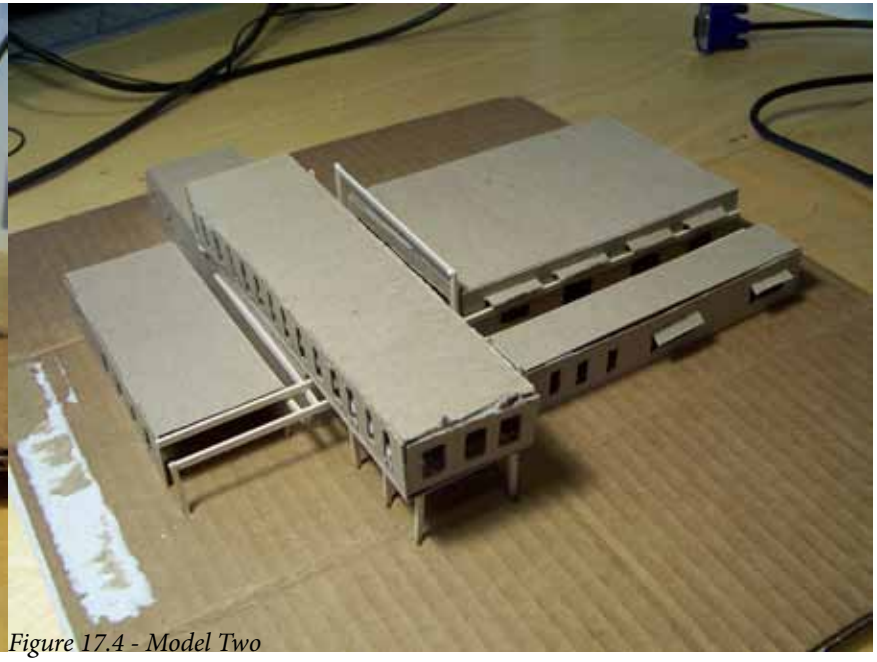


Figure 17.4 - Model Two

Figure 17.5 - Model Three Plan

My third model utilized several different materials, but stayed with essentially the same design. The model included shed roofs which sloped up towards the slightly-cantilevered upper level. The fenestration was also different, using a repetitive pattern to call to mind the pattern of horses' hoofbeats.

Figure 17.6 - Model Three Elevation

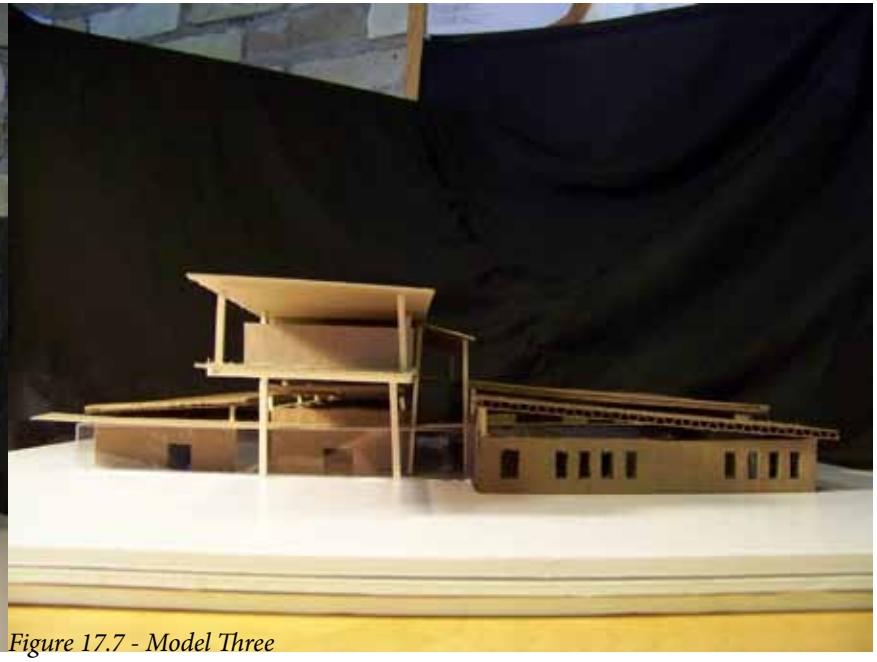


Figure 17.7 - Model Three

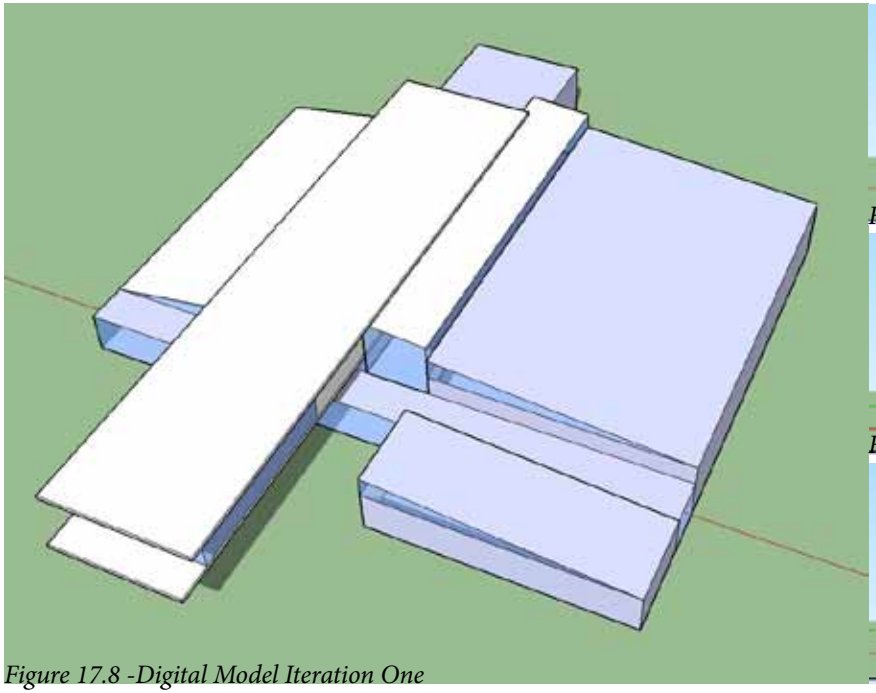


Figure 17.8 -Digital Model Iteration One

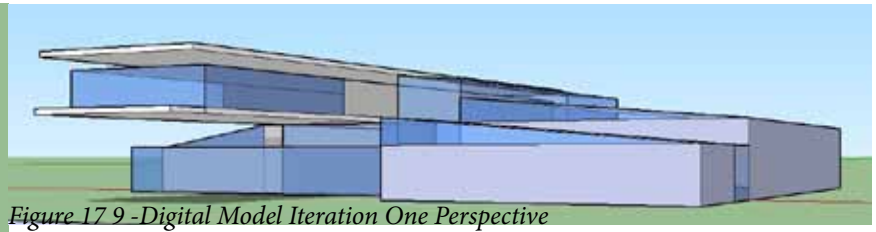


Figure 17 9 -Digital Model Iteration One Perspective

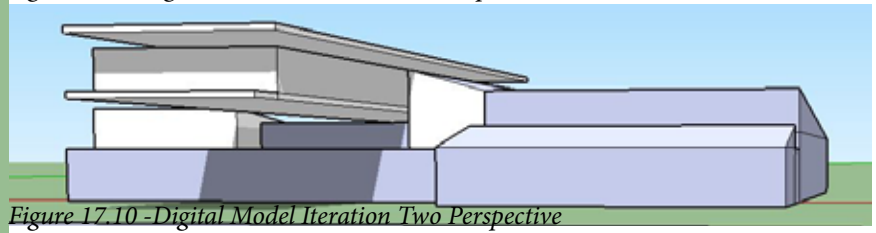


Figure 17.10 -Digital Model Iteration Two Perspective

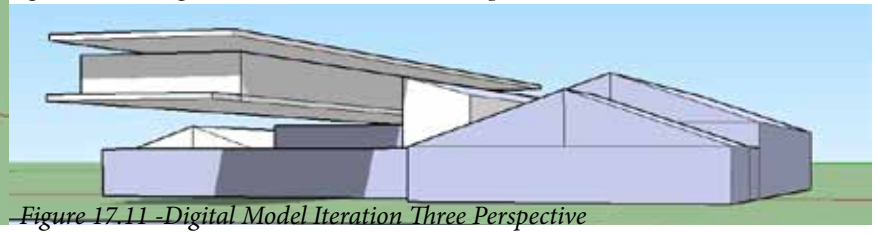


Figure 17.11 -Digital Model Iteration Three Perspective

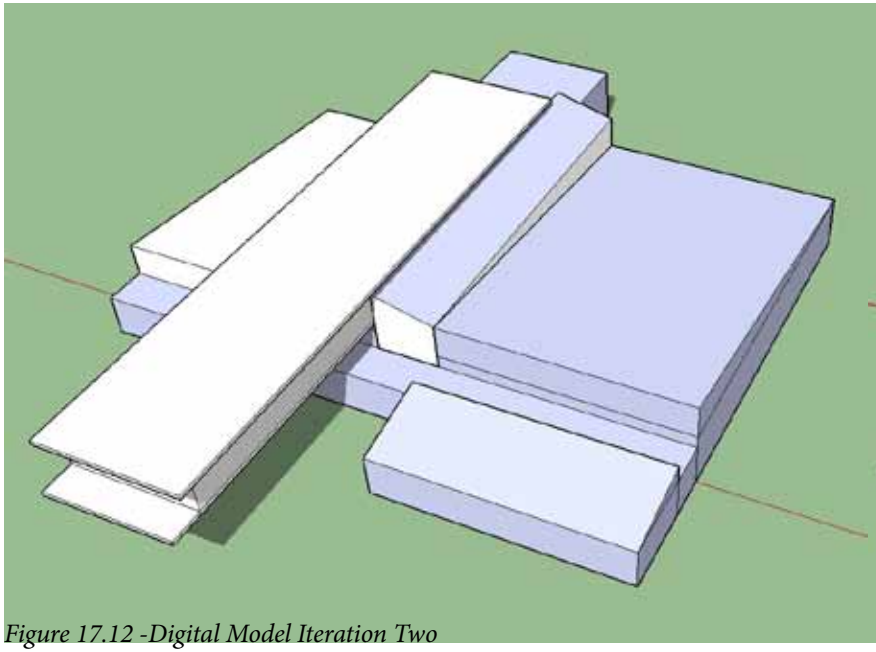


Figure 17.12 -Digital Model Iteration Two

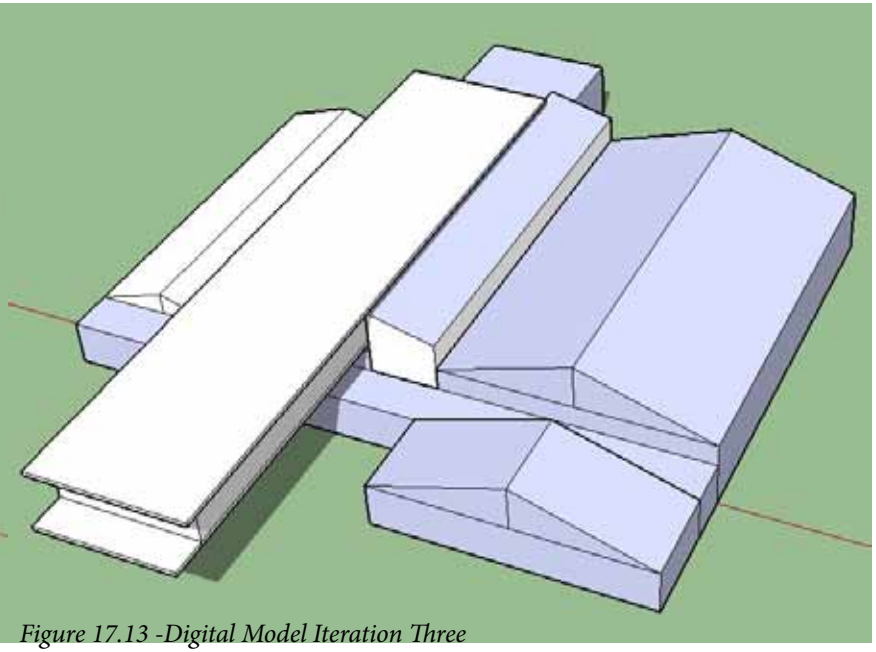


Figure 17.13 -Digital Model Iteration Three

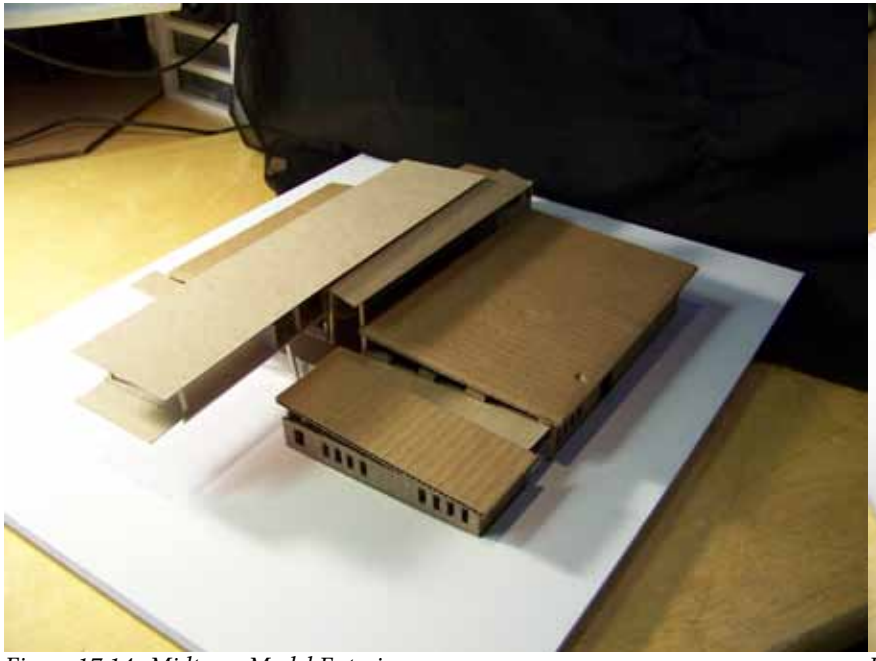


Figure 17.14 -Midterm Model Exterior

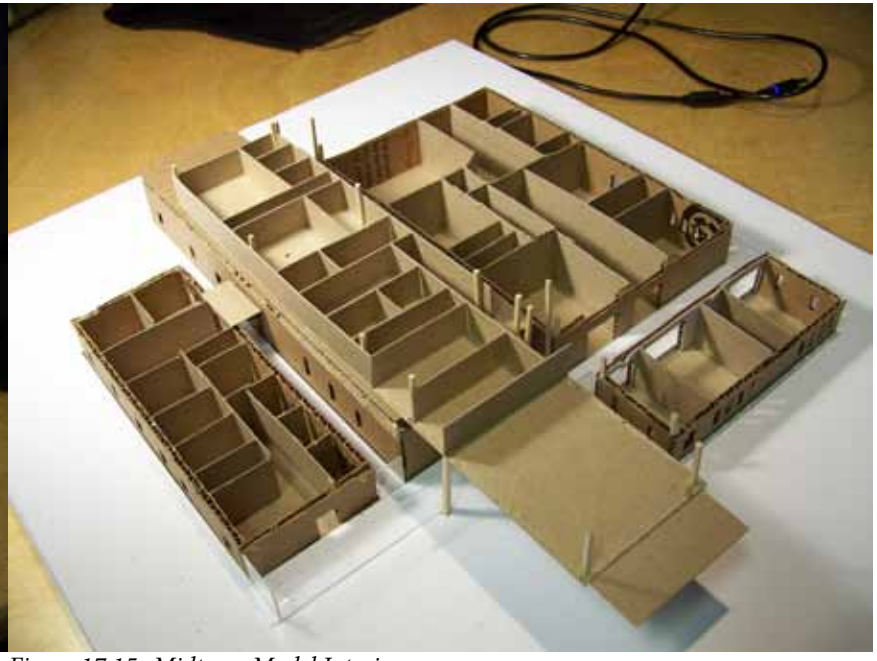


Figure 17.15 -Midterm Model Interior

The fourth model was larger, to scale, and included interior spaces. The upper level cantilever was emphasized and the building incorporated a "viewing" aspect that is similar to the final design. People could look down at the lower level and the horses from the upper level. The model was used for midterm reviews. On the previous page, different digital models show a variety of roof iterations.

The midterm model's floor plans showed a similar arrangement of spaces as the final model. The clinical spaces, though, were far more numerous and spread throughout the lower level of the building.

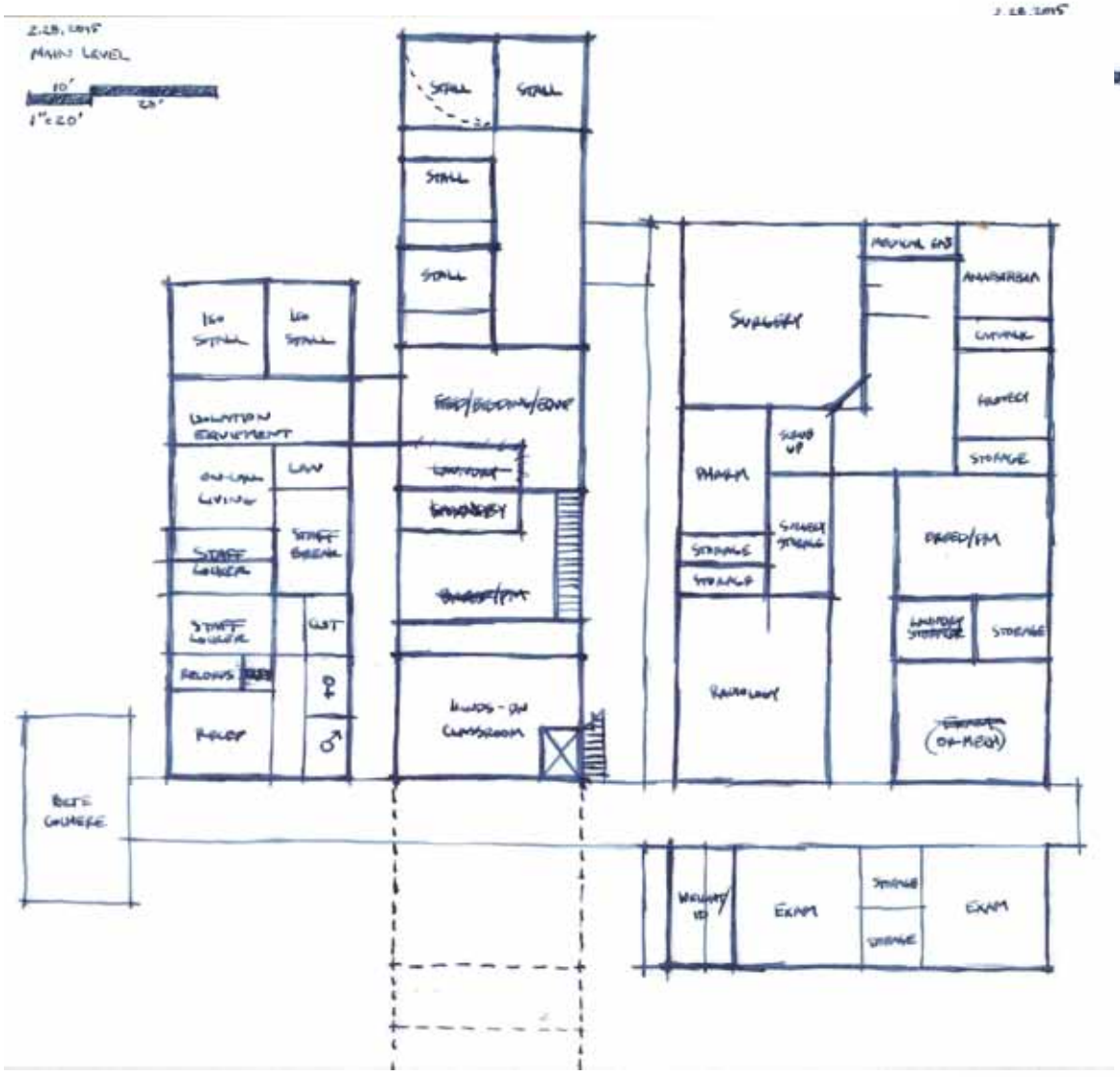


Figure 17.16 -Midterm Model Lower Plan

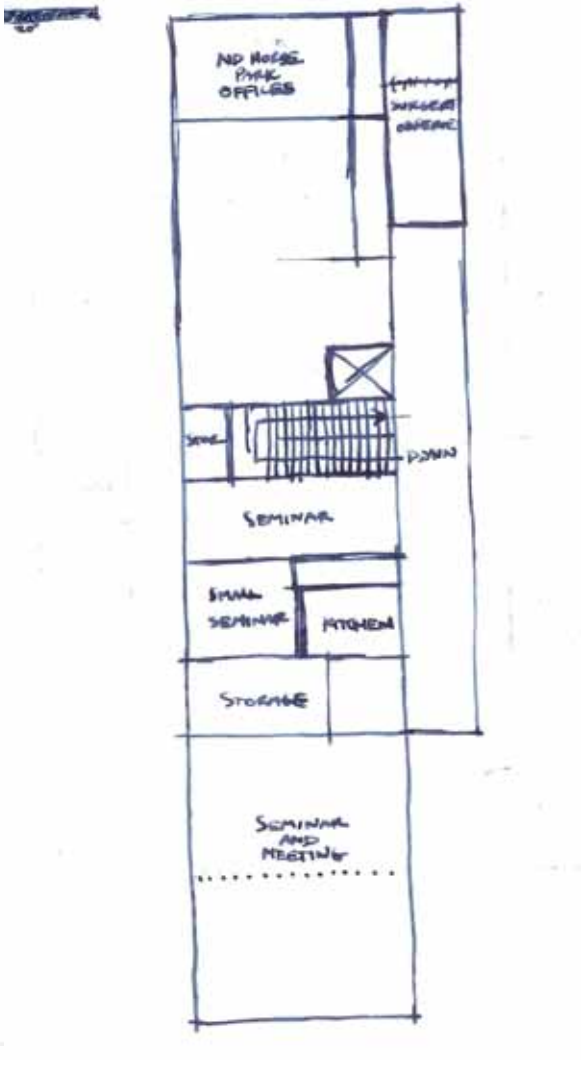


Figure 17.17 -Midterm Model Upper Plan

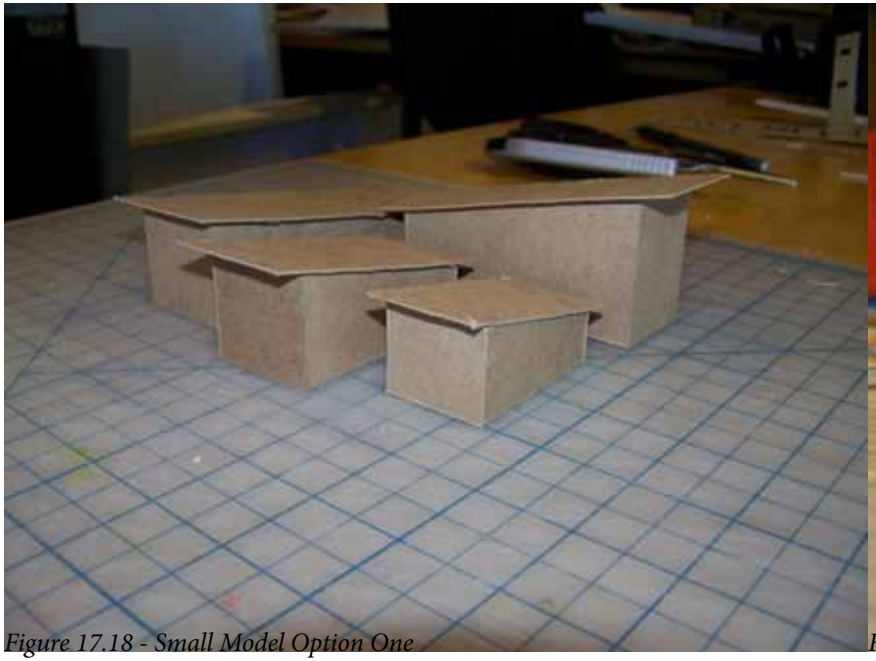


Figure 17.18 - Small Model Option One

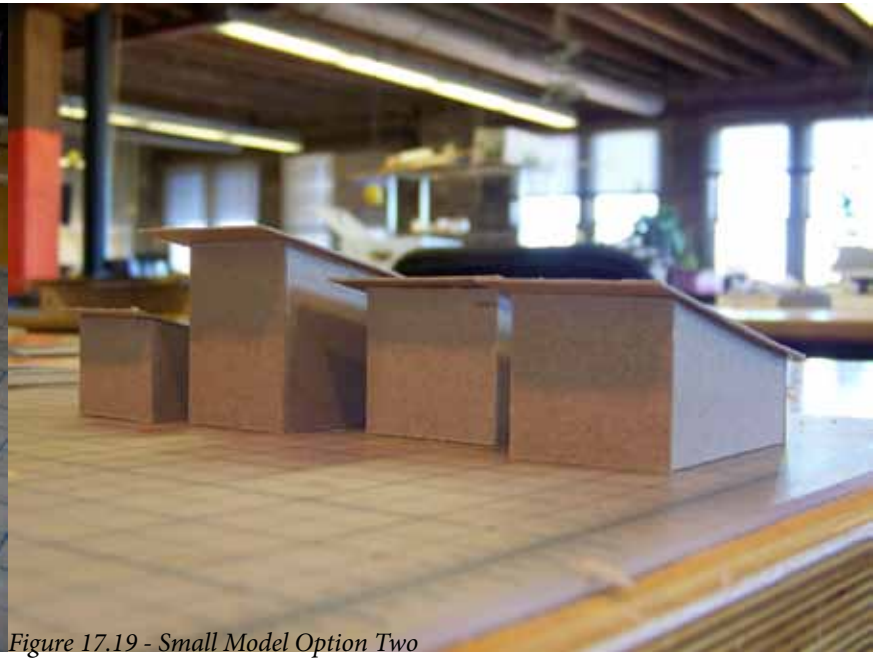


Figure 17.19 - Small Model Option Two

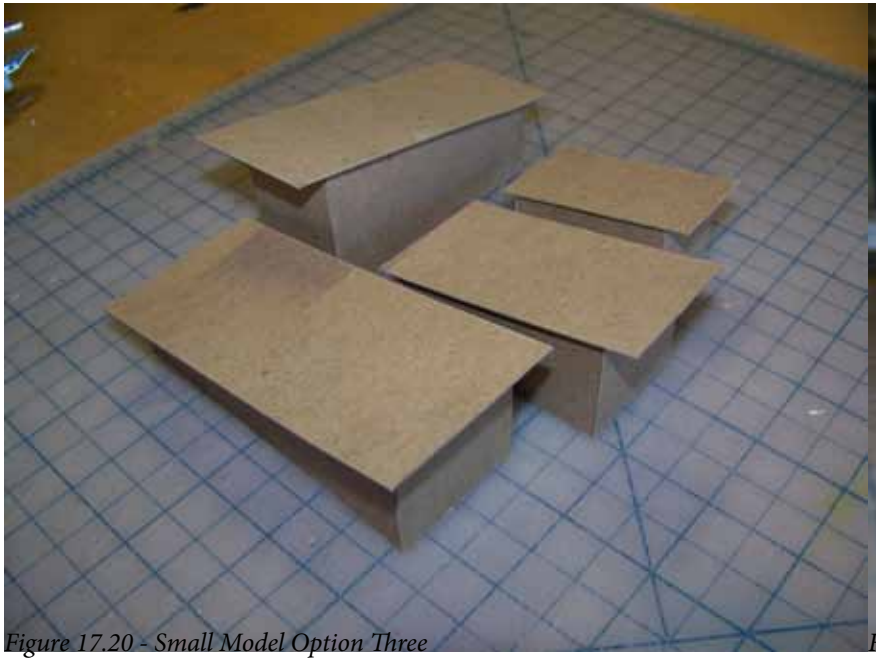


Figure 17.20 - Small Model Option Three

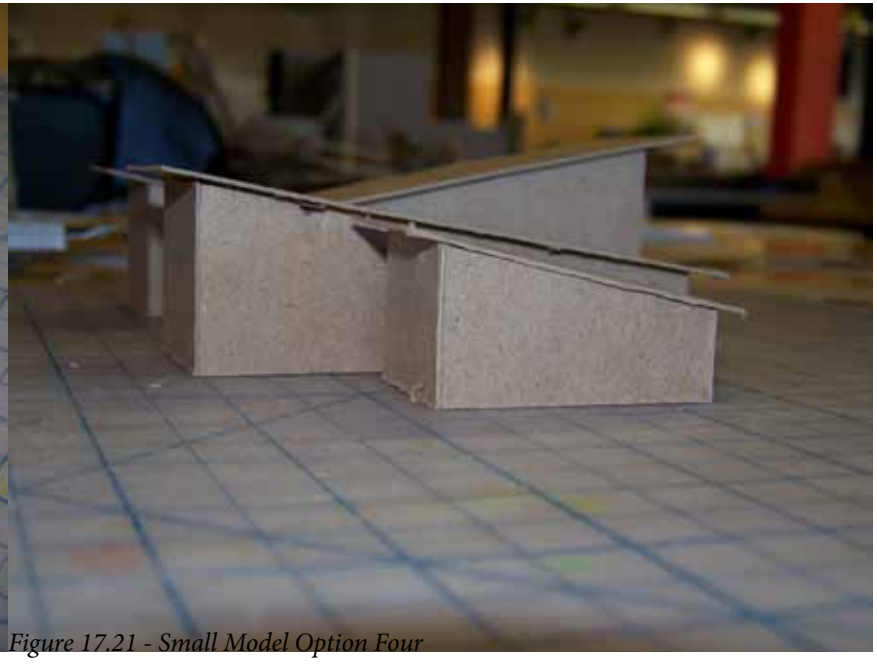


Figure 17.21 - Small Model Option Four

After midterm critiques my design direction shifted some, but did not drastically change. There were still both human and horse spaces, viewing areas, and glass on the building's southern exposure.

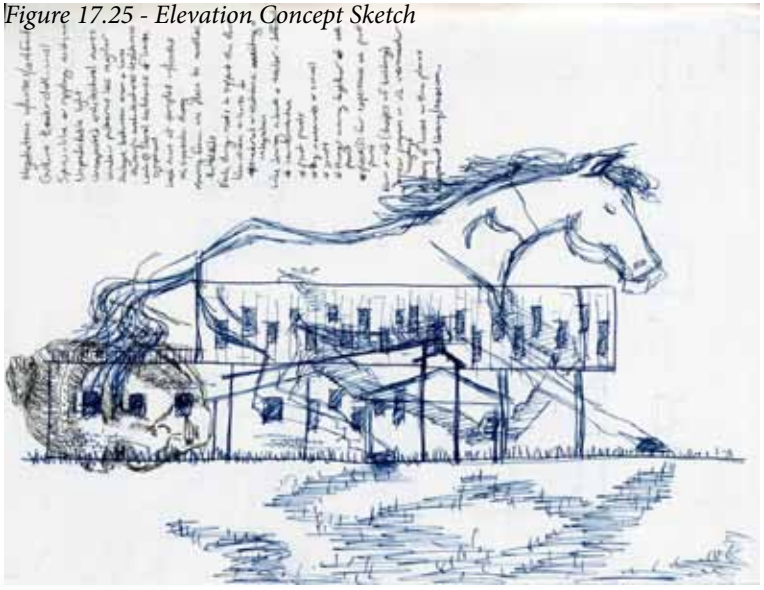


Figure 17.25 - Elevation Concept Sketch

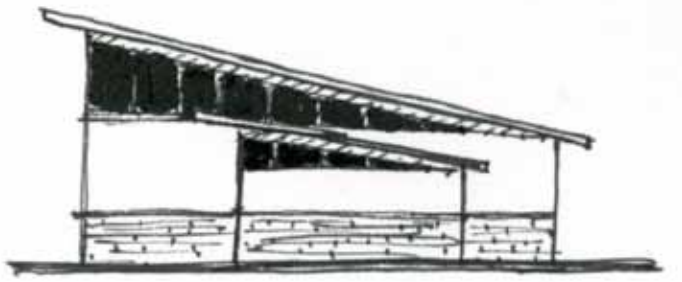


Figure 17.22 - Elevation Sketch One

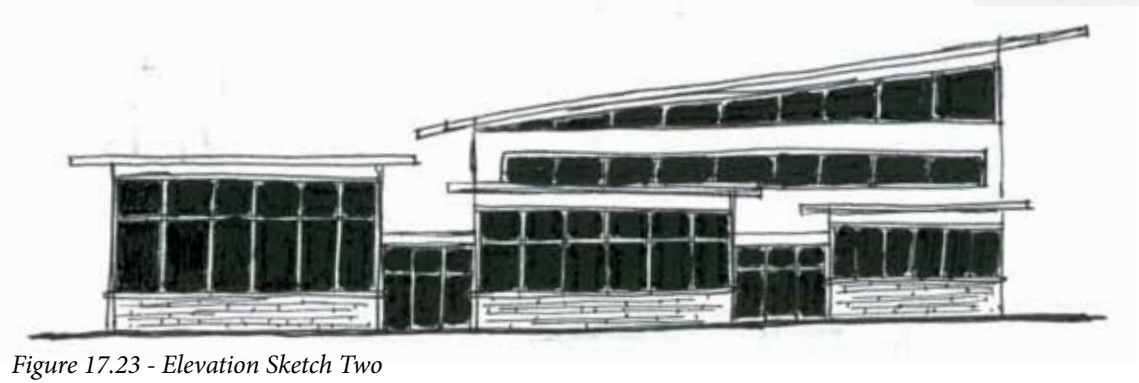


Figure 17.23 - Elevation Sketch Two

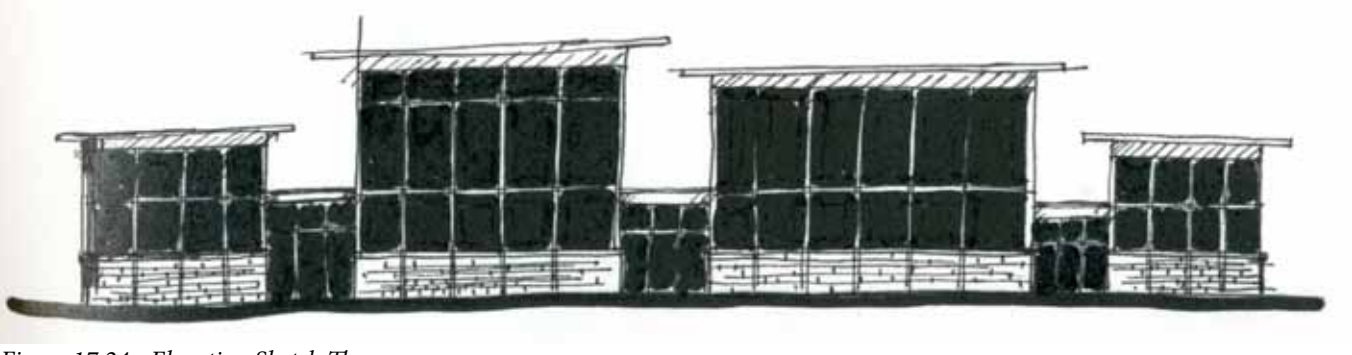


Figure 17.24 - Elevation Sketch Three

Figure 17.26 - Space Planning Notes & Sketches One

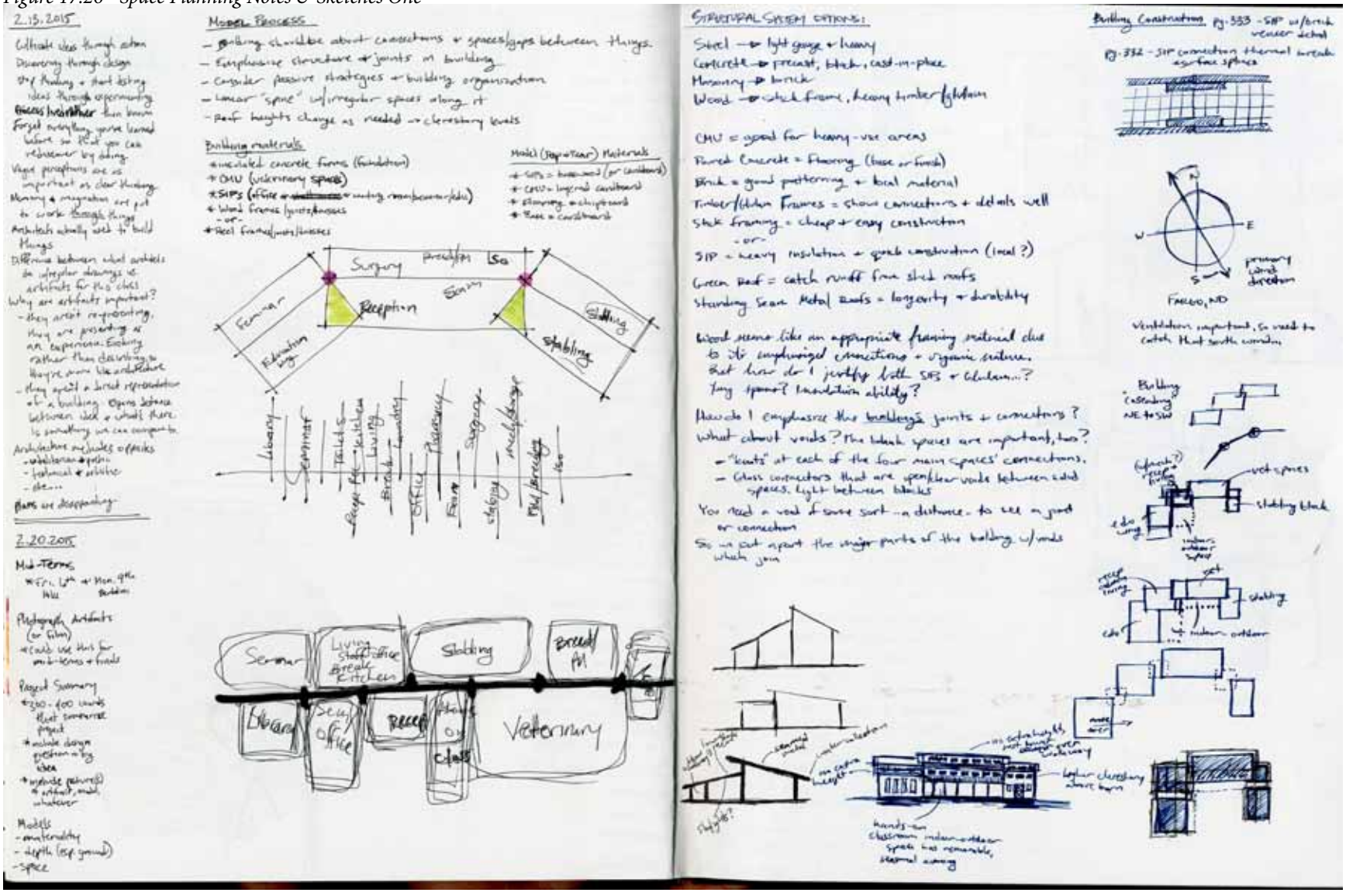
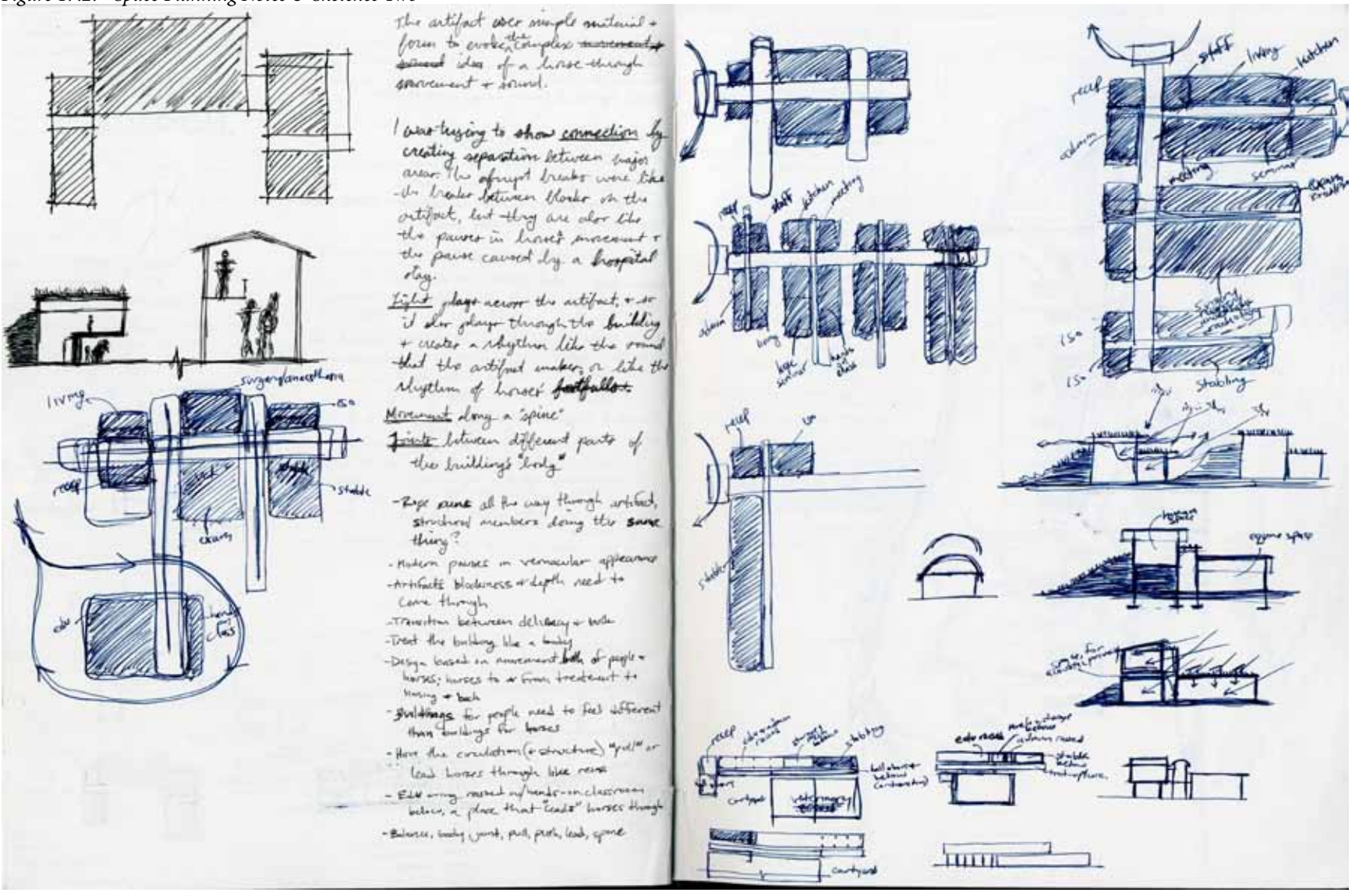


Figure 17.27- Space Planning Notes & Sketches Two



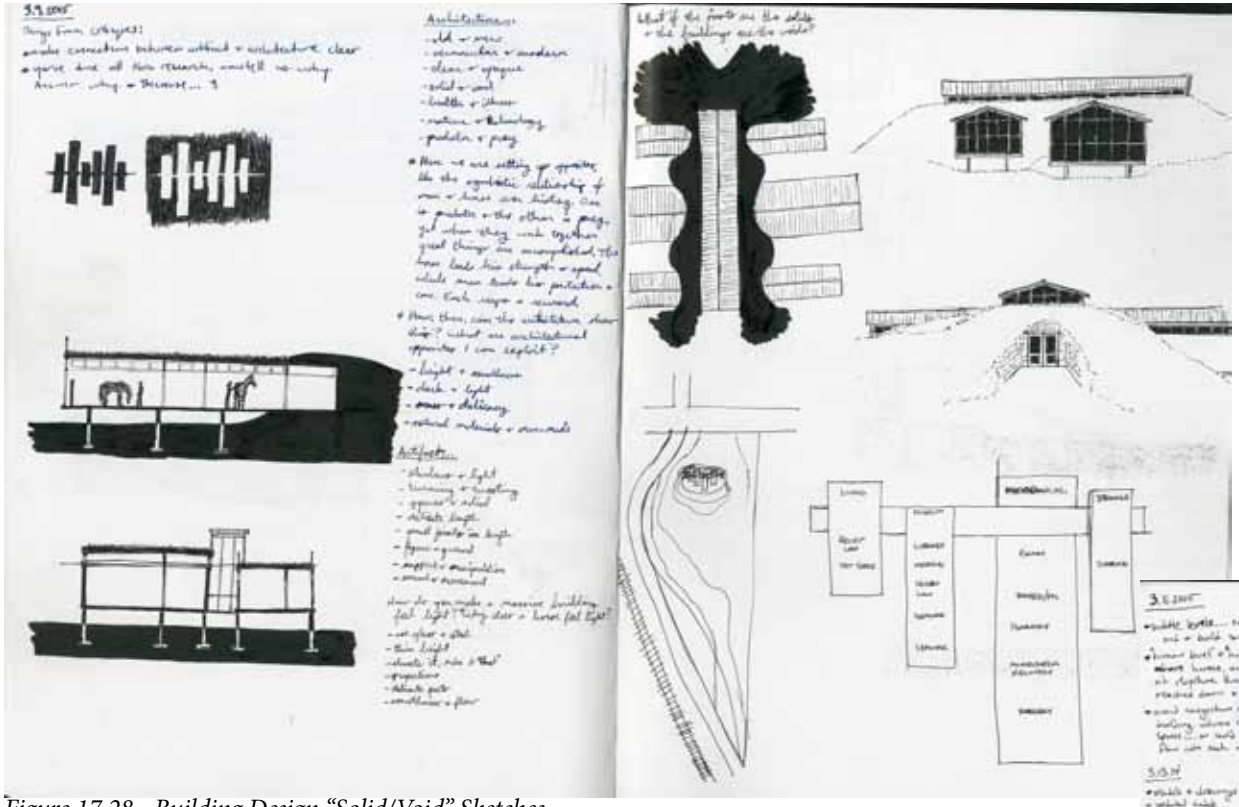


Figure 17.28 - Building Design "Solid/Void" Sketches

While trying to break "designer's block" I made a series of sketches exploring solid, void, and the building's relationship to the artifact. I began to think of the building as a series of blocks held together by unifying elements. In some of the drawings I saw the building as the solid and the area around it as the void, but in other drawings (where the building is integrated into the land) I saw the building as the void and the land as the solid. The models on the following pages are the result of that line of thought.

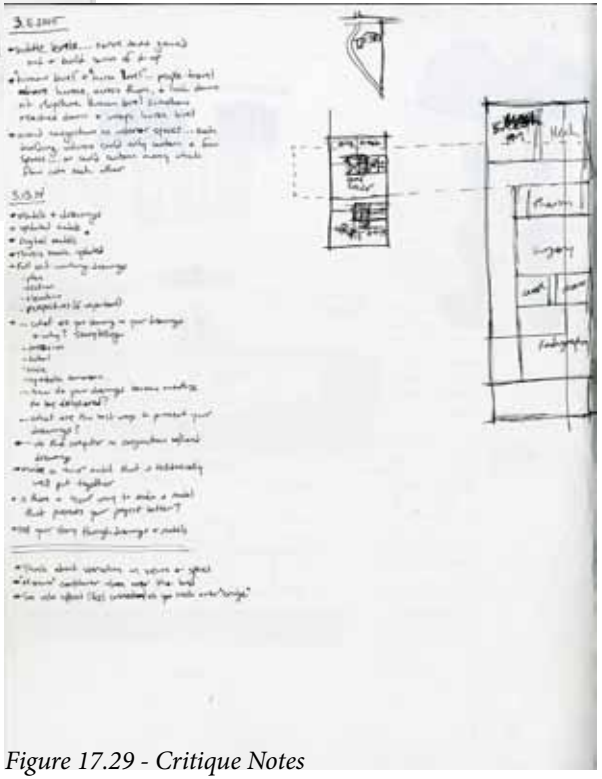


Figure 17.29 - Critique Notes

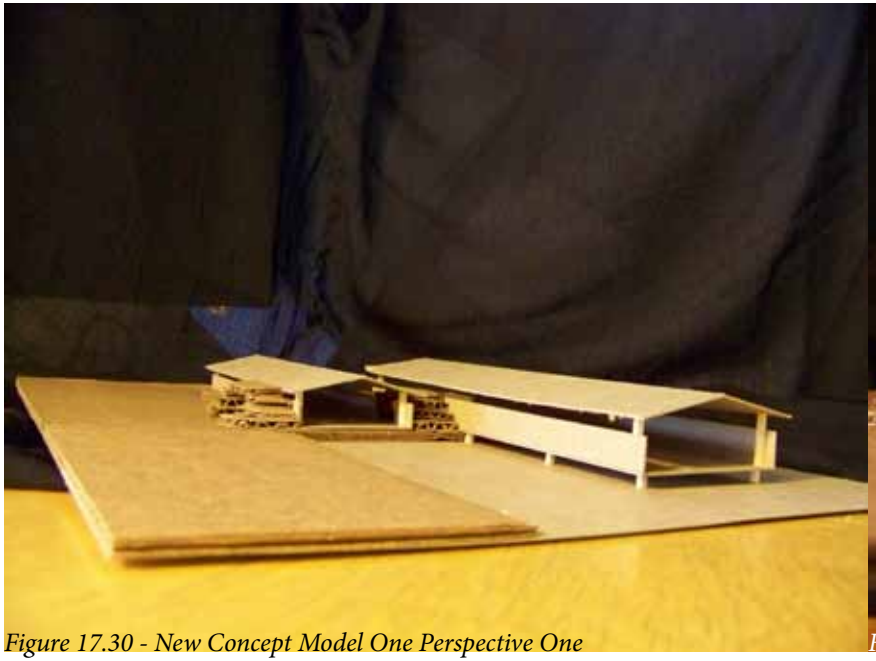


Figure 17.30 - New Concept Model One Perspective One

Figure 17.31 - New Concept Model One Perspective Two

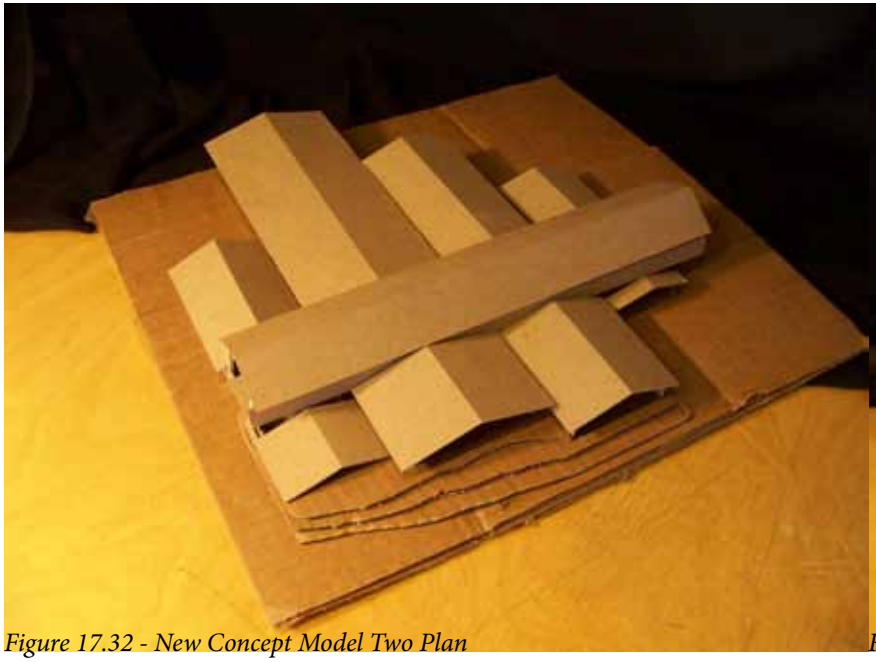


Figure 17.32 - New Concept Model Two Plan

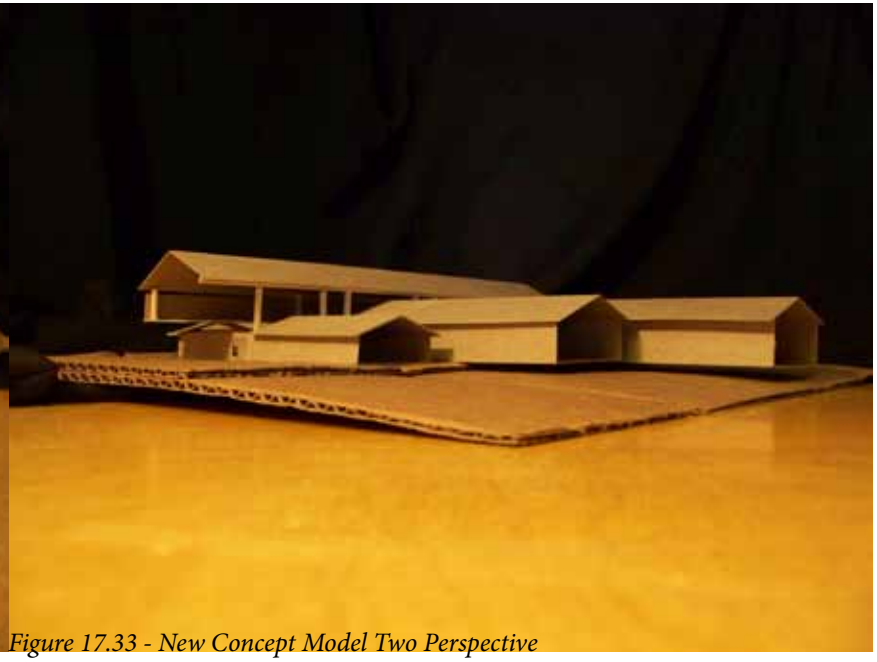


Figure 17.33 - New Concept Model Two Perspective

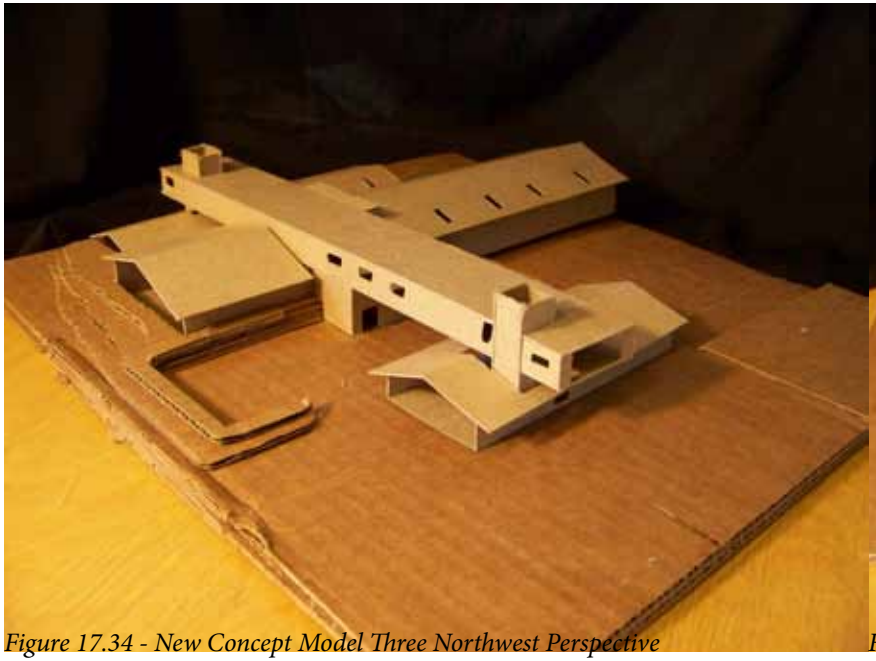


Figure 17.34 - New Concept Model Three Northwest Perspective

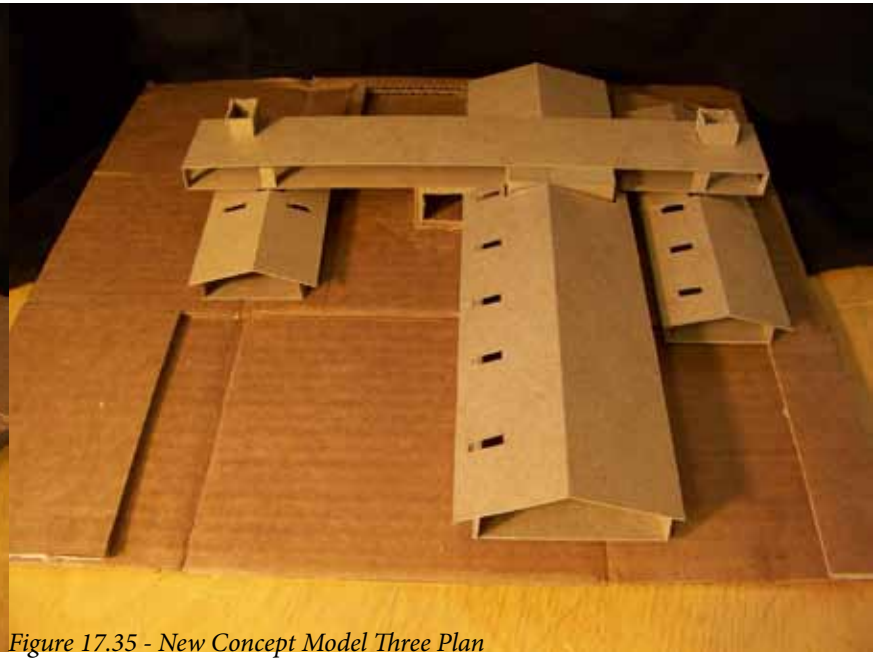


Figure 17.35 - New Concept Model Three Plan

Figure 17.36 - New Concept Model Three Southwest Perspective

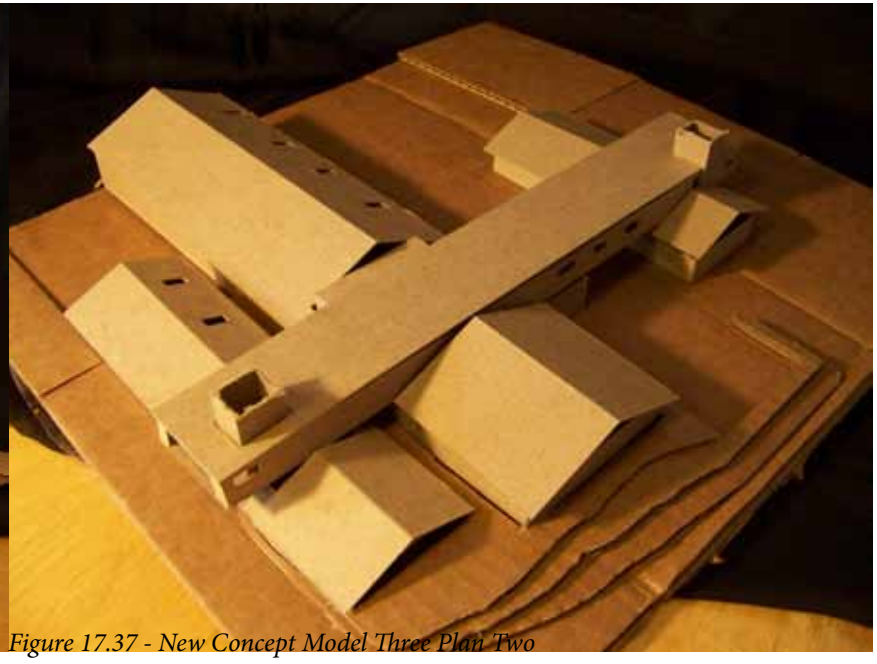


Figure 17.37 - New Concept Model Three Plan Two

After finalizing the major building layout and form, I began to think about how it would relate to the site, and about my final board layout. In addition, I did some brainstorming about materials for the final model.

Figure 17.38 - Critique, Site Plan, & Other Notes

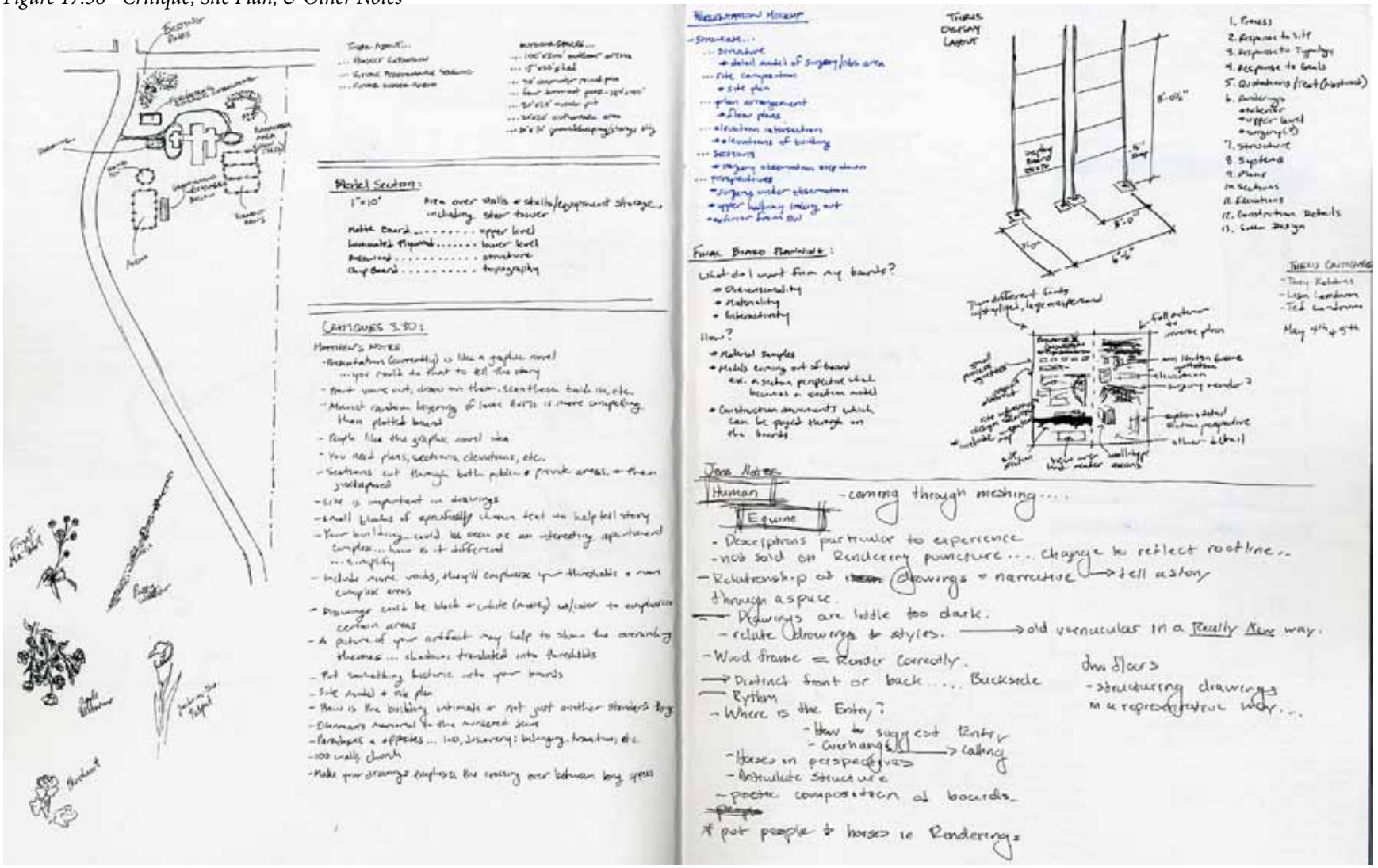


Figure 17.39 - Structure Section Model View One

A structural section model helped to define how the spaces interacted with each other around a very prominent, solid structural system.

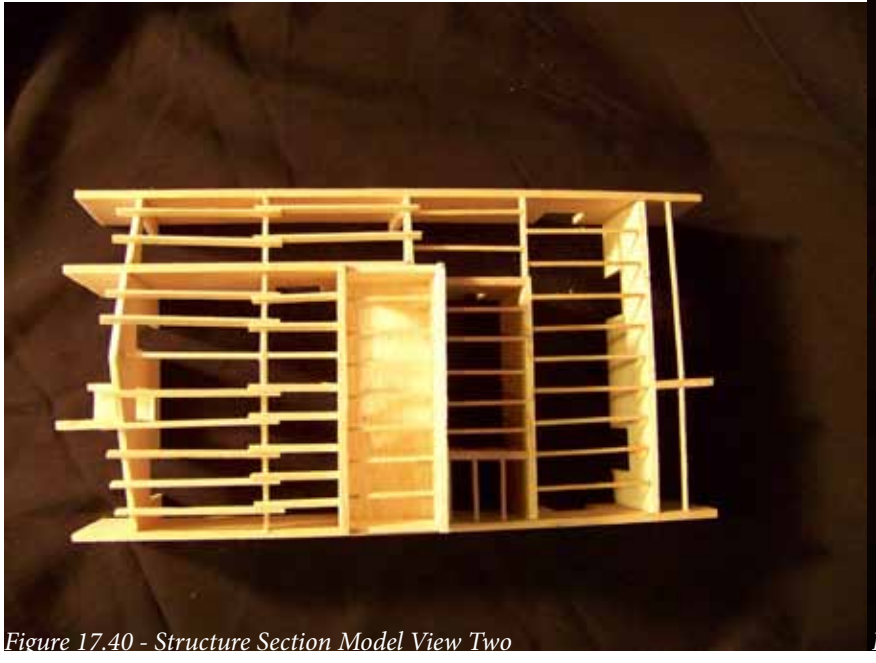


Figure 17.40 - Structure Section Model View Two

Figure 17.41 - Structure Section Model View Three

Figure 17.42 - Material Section Model View One

A small section model using a variety of materials helped inform final material choices and the way the various building sections interacted with each other.

Final model materials included both basswood and laminated plywood. The layered cardboard was later replaced with MDF.

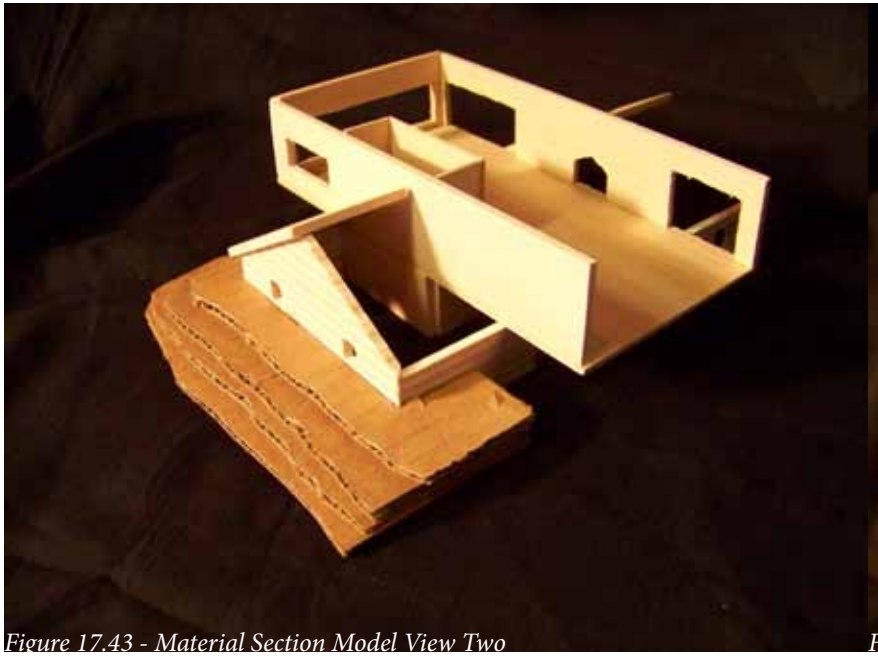
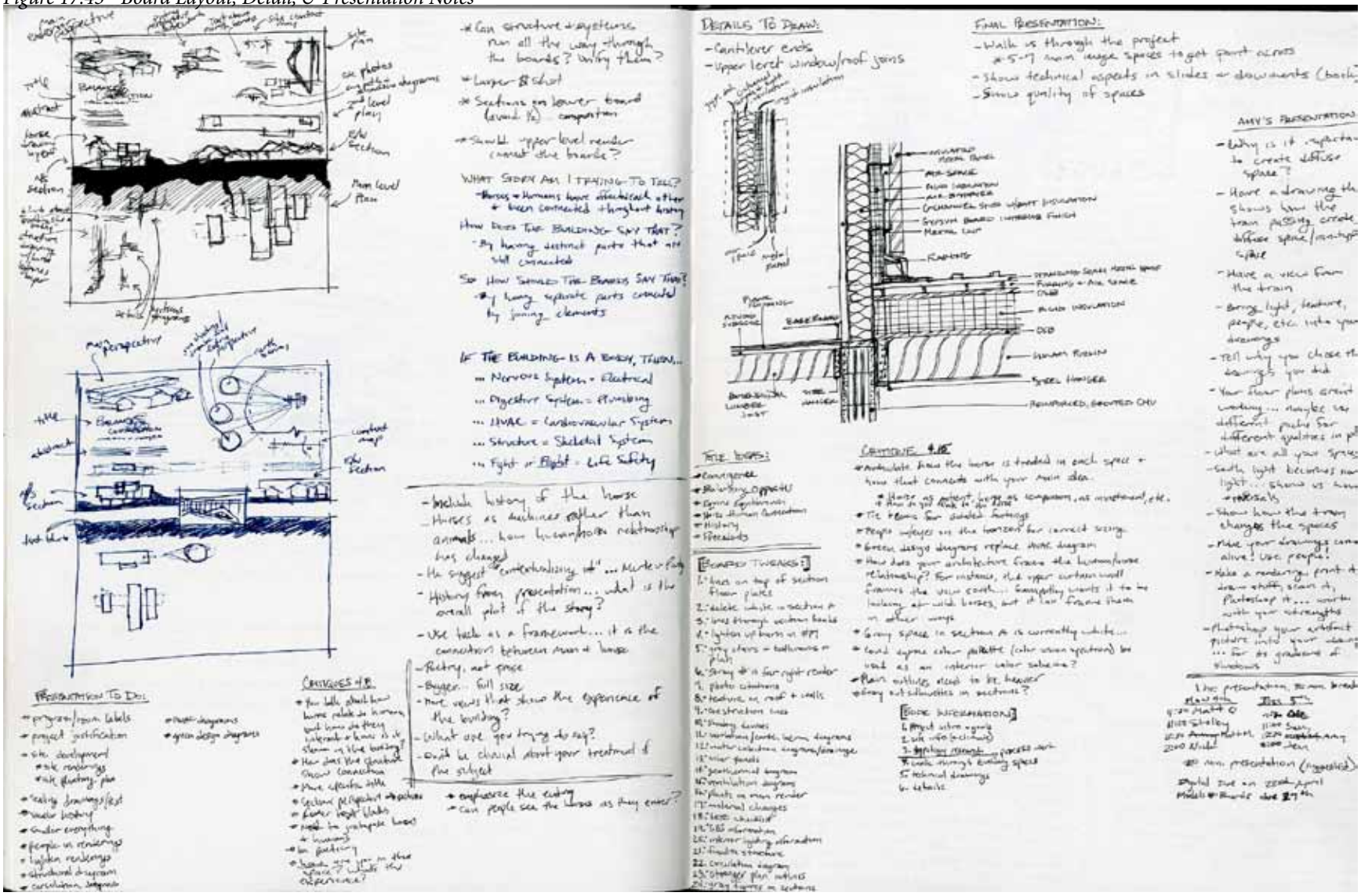


Figure 17.43 - Material Section Model View Two

Figure 17.44 - Material Section Model View Three

One of my other areas of exploration was the building's detailing. An area that required particular attention was the connection between the peaked roofs and the upper level wall. The connecting portion was thin and would require supplementary structure, while the roof needed to be well sealed to avoid leakage where it met the wall.

Figure 17.45 - Board Layout, Detail, & Presentation Notes



18 -THESIS EXHIBITION MATERIALS

The final model was made out of 3/32" basswood and laminated plywood of a similar thickness, all mounted onto an MDF base. The building was made to be taken apart in order to better show structure and interiors.

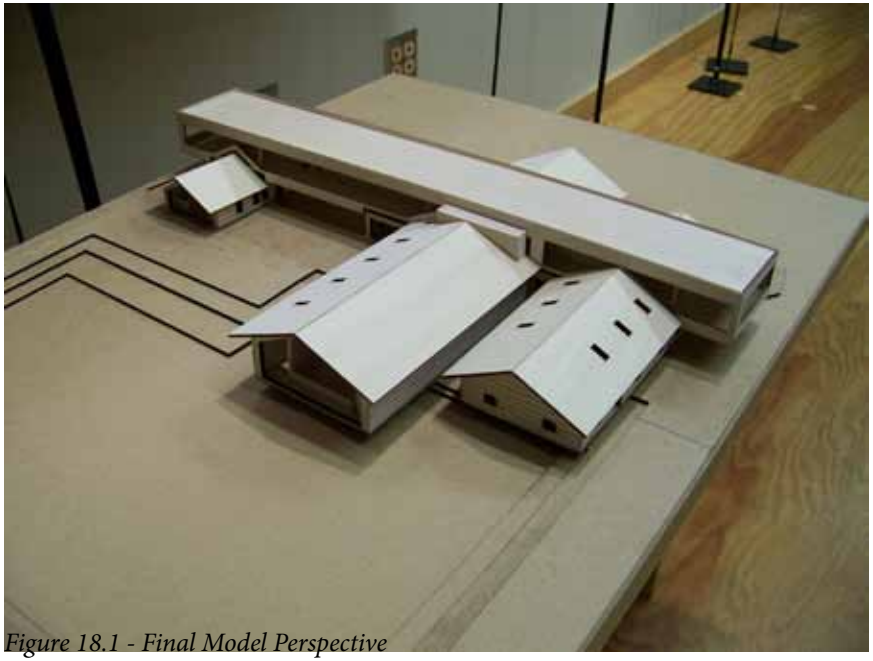


Figure 18.1 - Final Model Perspective

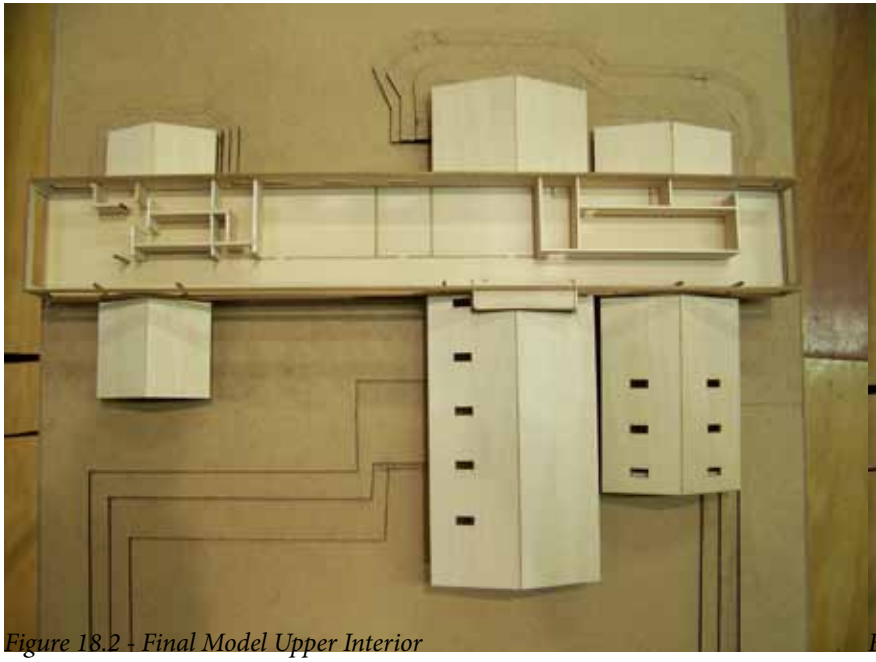


Figure 18.2 - Final Model Upper Interior

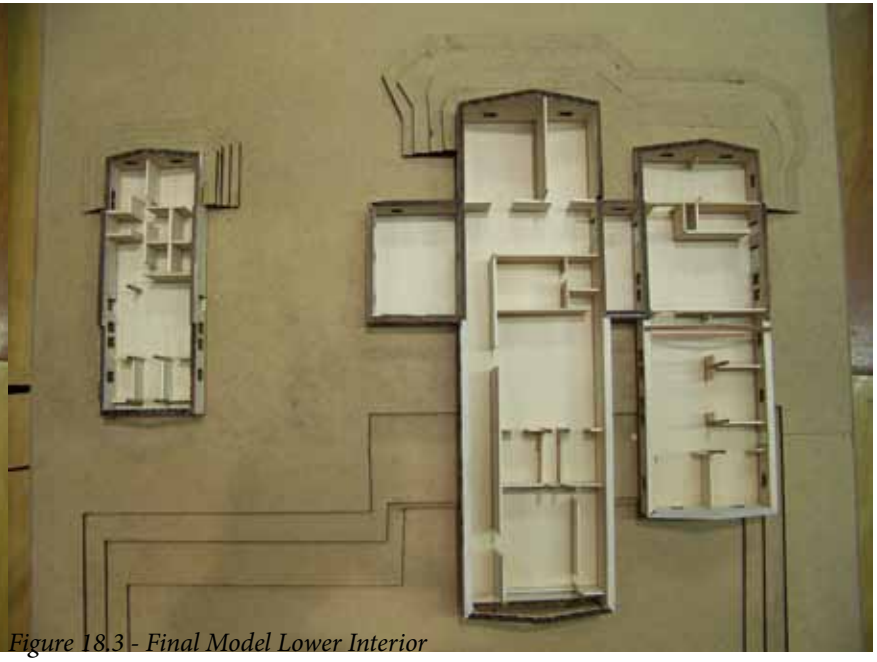


Figure 18.3 - Final Model Lower Interior

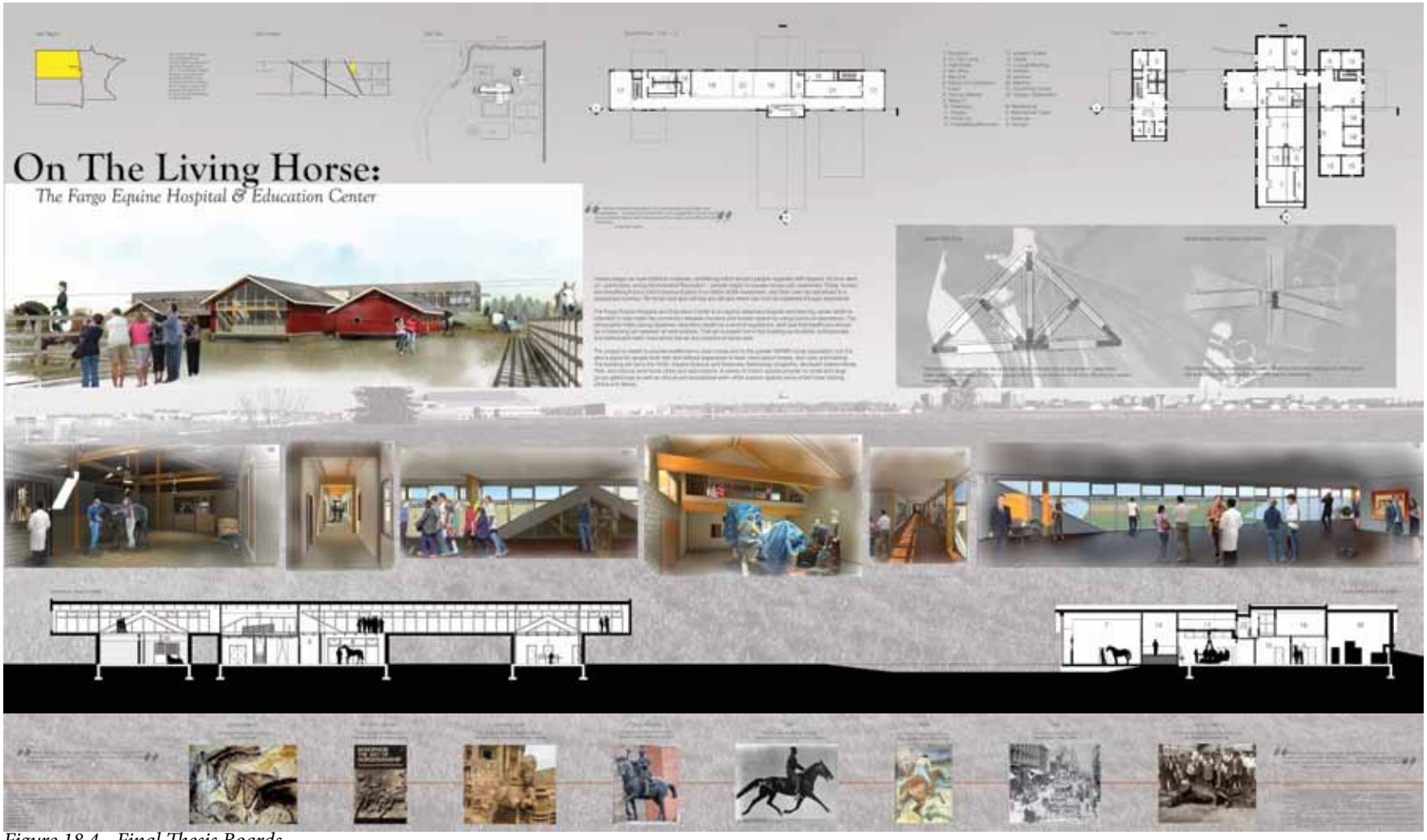


Figure 18.4 - Final Thesis Boards

Figure 18.5 - Exterior Rendering from the Southeast

Figure 18.6 - Upper Level Interior Rendering Showing a View into the Stable

Figure 18.7 - Upper Level Interior Rendering Showing the Large Gathering Space

Figure 18.8 - Upper Level Interior Rendering Showing the Upper Gallery Hall

Figure 18.9 - Lower Level Interior Rendering Showing the Trot-Up Hall

Figure 18.10 - Lower Level Interior Rendering Showing Surgery

Figure 18.11 - Lower Level Interior Rendering Showing Reception

Figure 18.12 - Site Plan

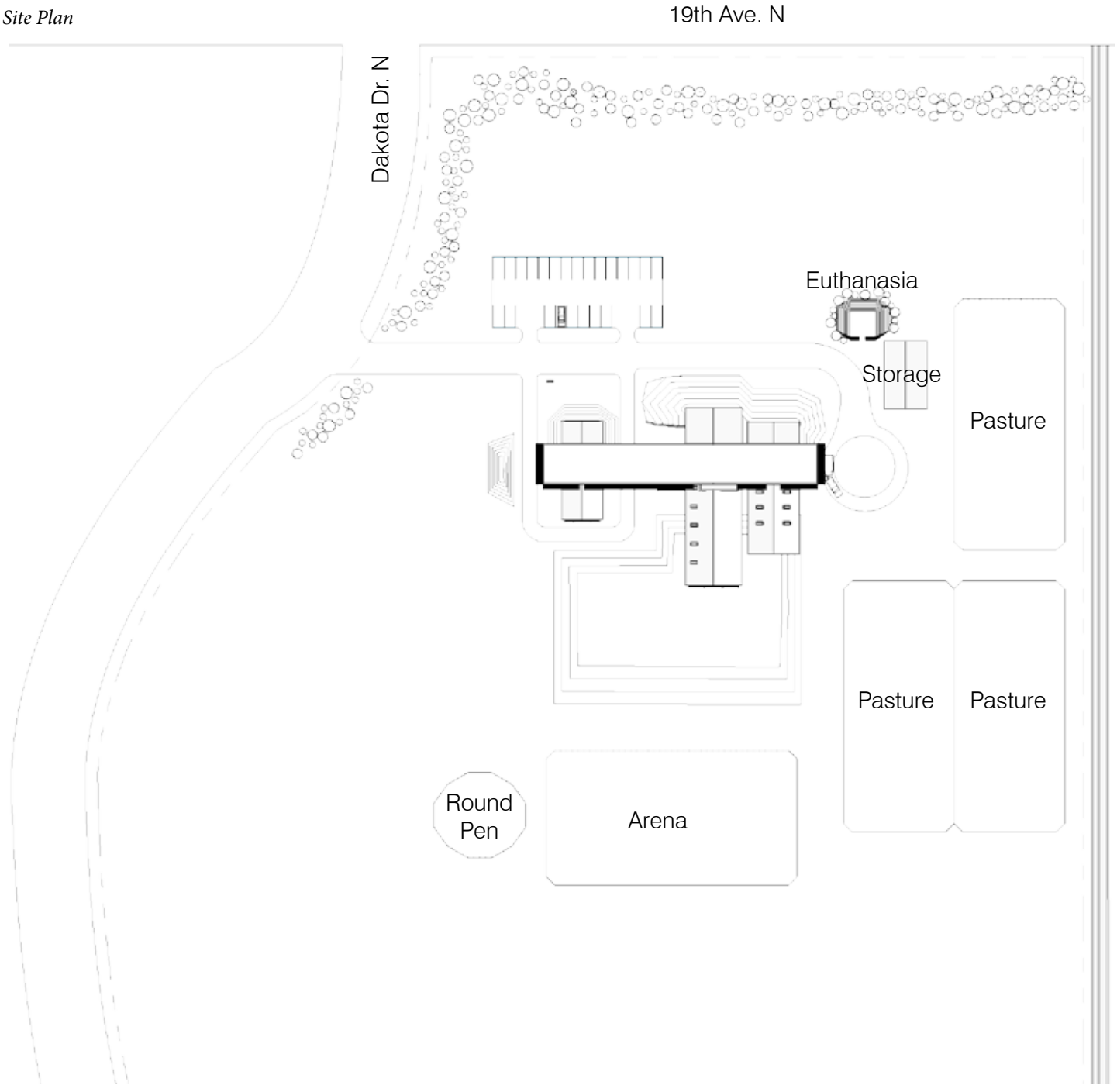
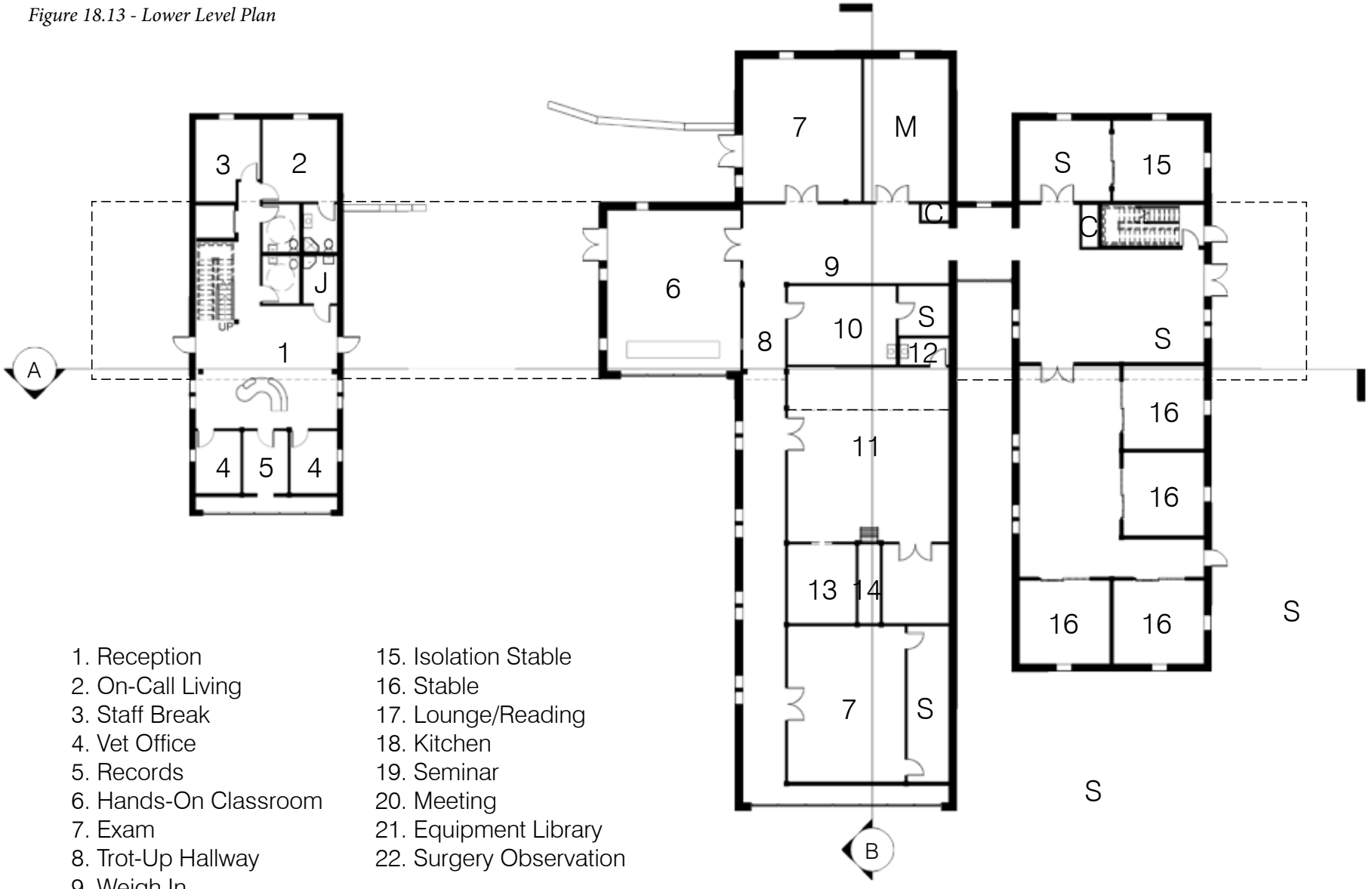


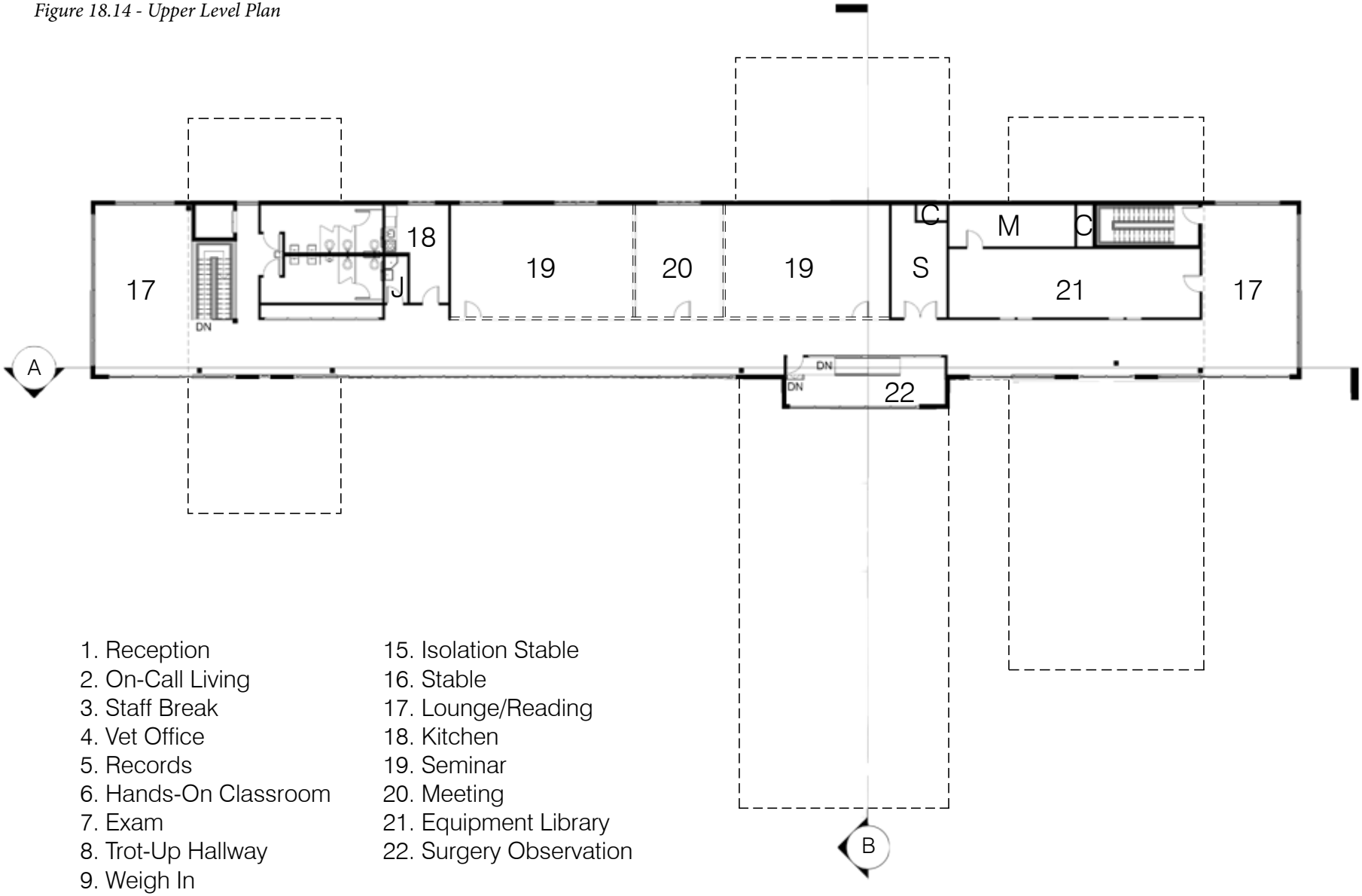
Figure 18.13 - Lower Level Plan



1. Reception
2. On-Call Living
3. Staff Break
4. Vet Office
5. Records
6. Hands-On Classroom
7. Exam
8. Trot-Up Hallway
9. Weigh In
10. Pharmacy
11. Surgery
12. Scrub-Up
13. Anaesthesia/Recovery
15. Isolation Stable
16. Stable
17. Lounge/Reading
18. Kitchen
19. Seminar
20. Meeting
21. Equipment Library
22. Surgery Observation

M. Mechanical
C. Mechanical Chase
J. Janitorial
S. Storage

Figure 18.14 - Upper Level Plan



1. Reception
2. On-Call Living
3. Staff Break
4. Vet Office
5. Records
6. Hands-On Classroom
7. Exam
8. Trot-Up Hallway
9. Weigh In
10. Pharmacy
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17. Lounge/Reading
18. Kitchen
19. Seminar
20. Meeting
21. Equipment Library
22. Surgery Observation

M. Mechanical
C. Mechanical Chase
J. Janitorial
S. Storage

Figure 18.15 - N/S Section Through Clinical Wing

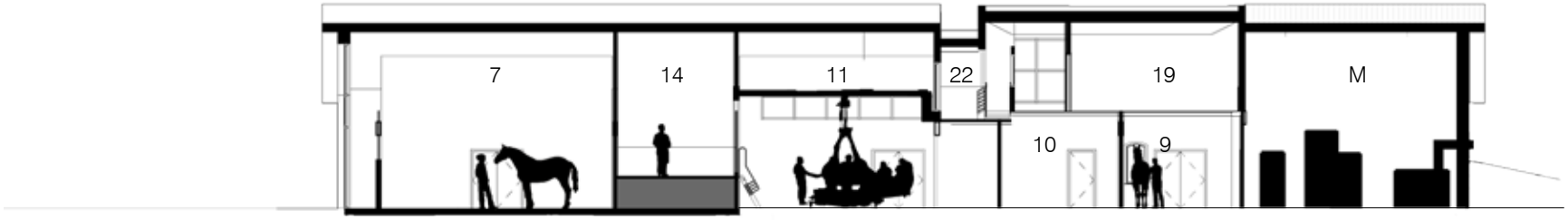


Figure 18.16 - E/W Section

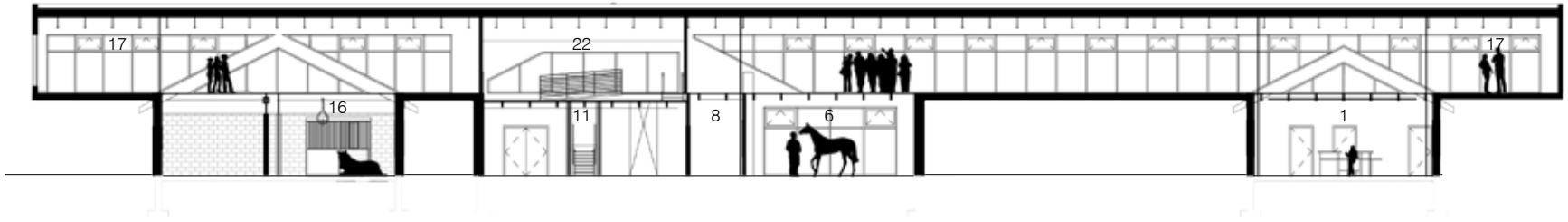


Figure 18.17 - Structural System

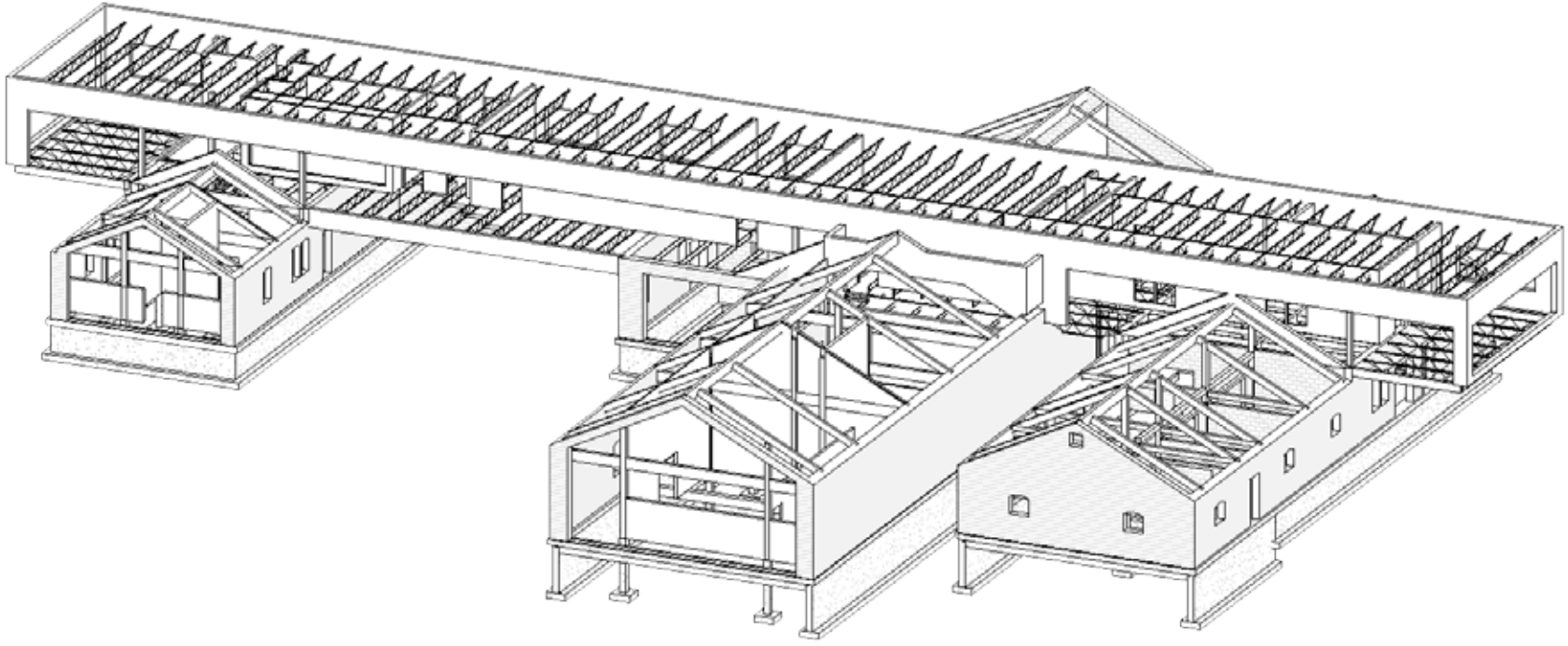


Figure 18.18 - Roof-Wall Detail

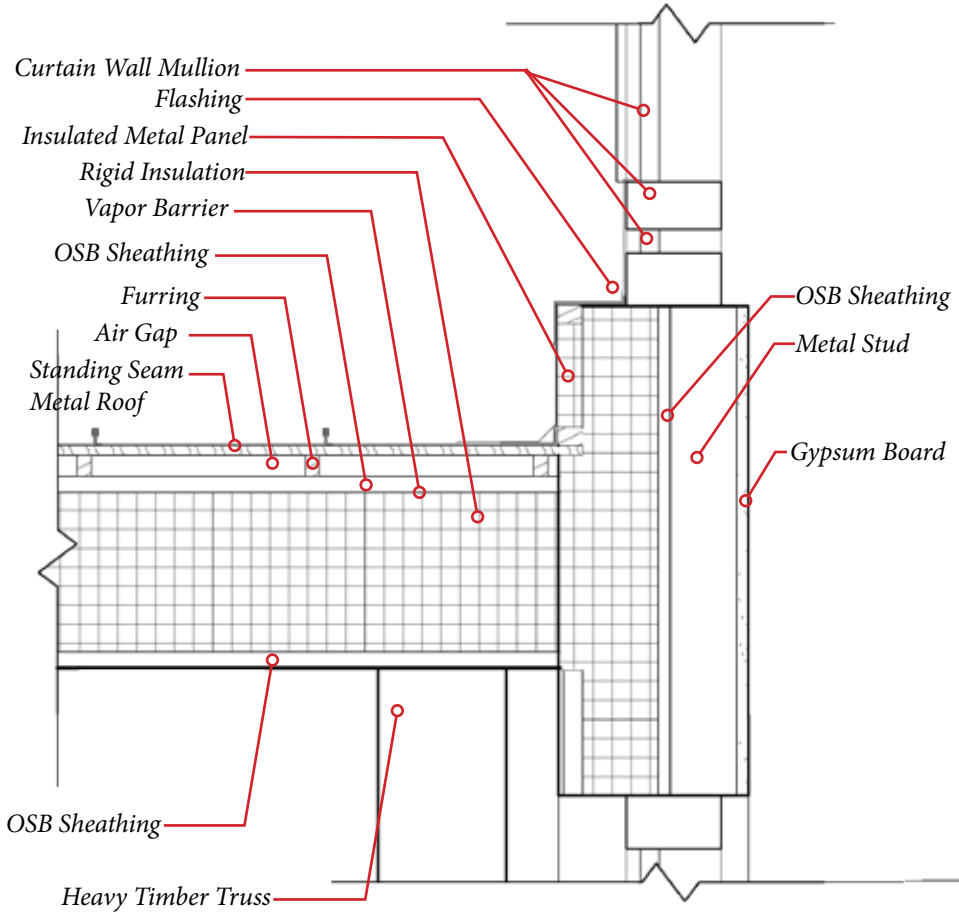


Figure 18.19 - Parapet Detail

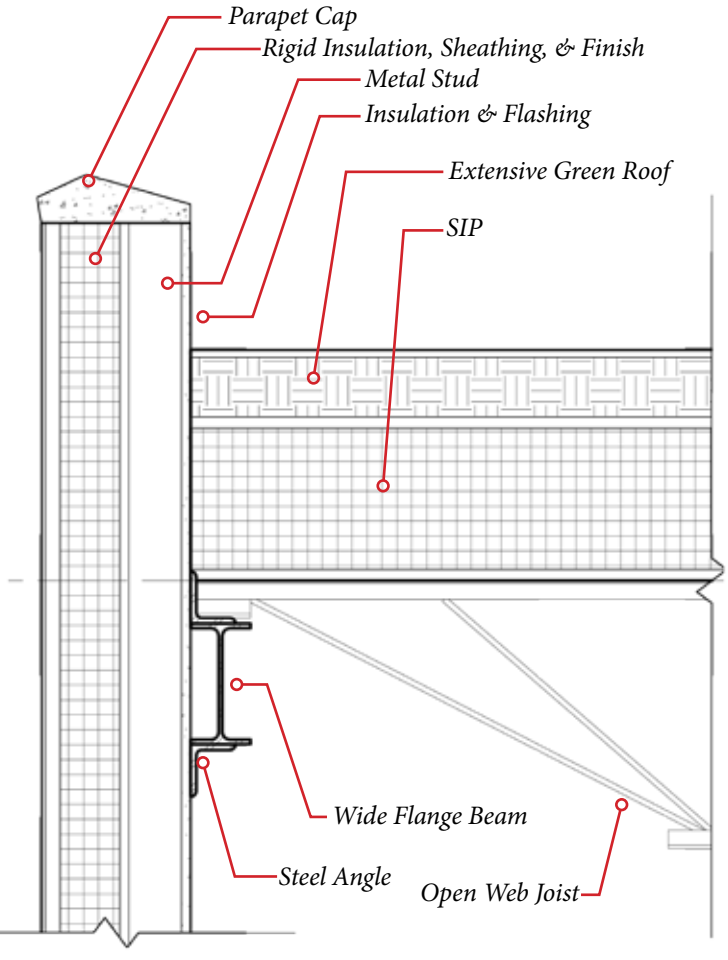


Figure 18.20 - Ground Source Heat Pump Diagram

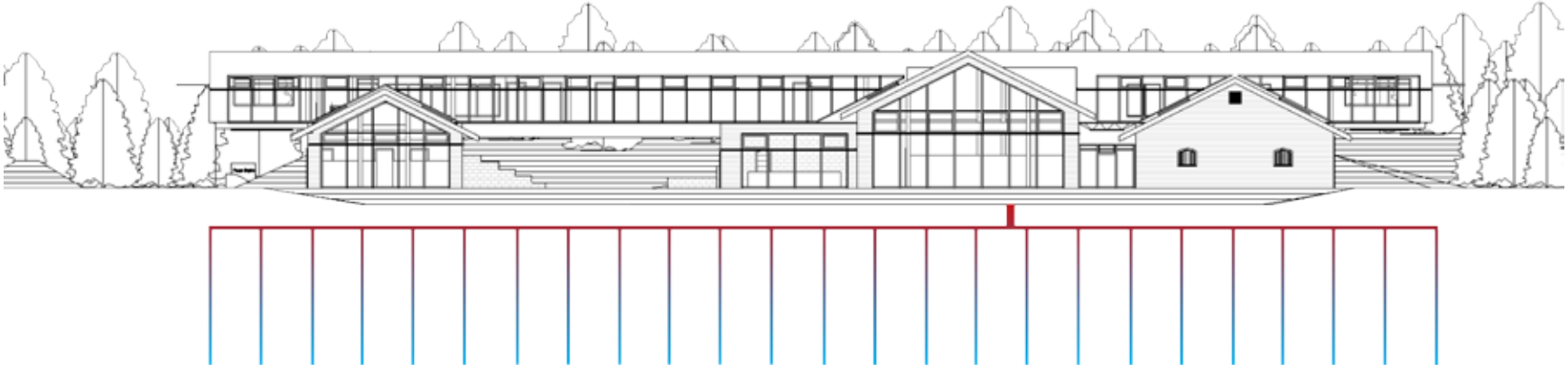


Figure 18.21 - Ventilation & Daylighting Diagram

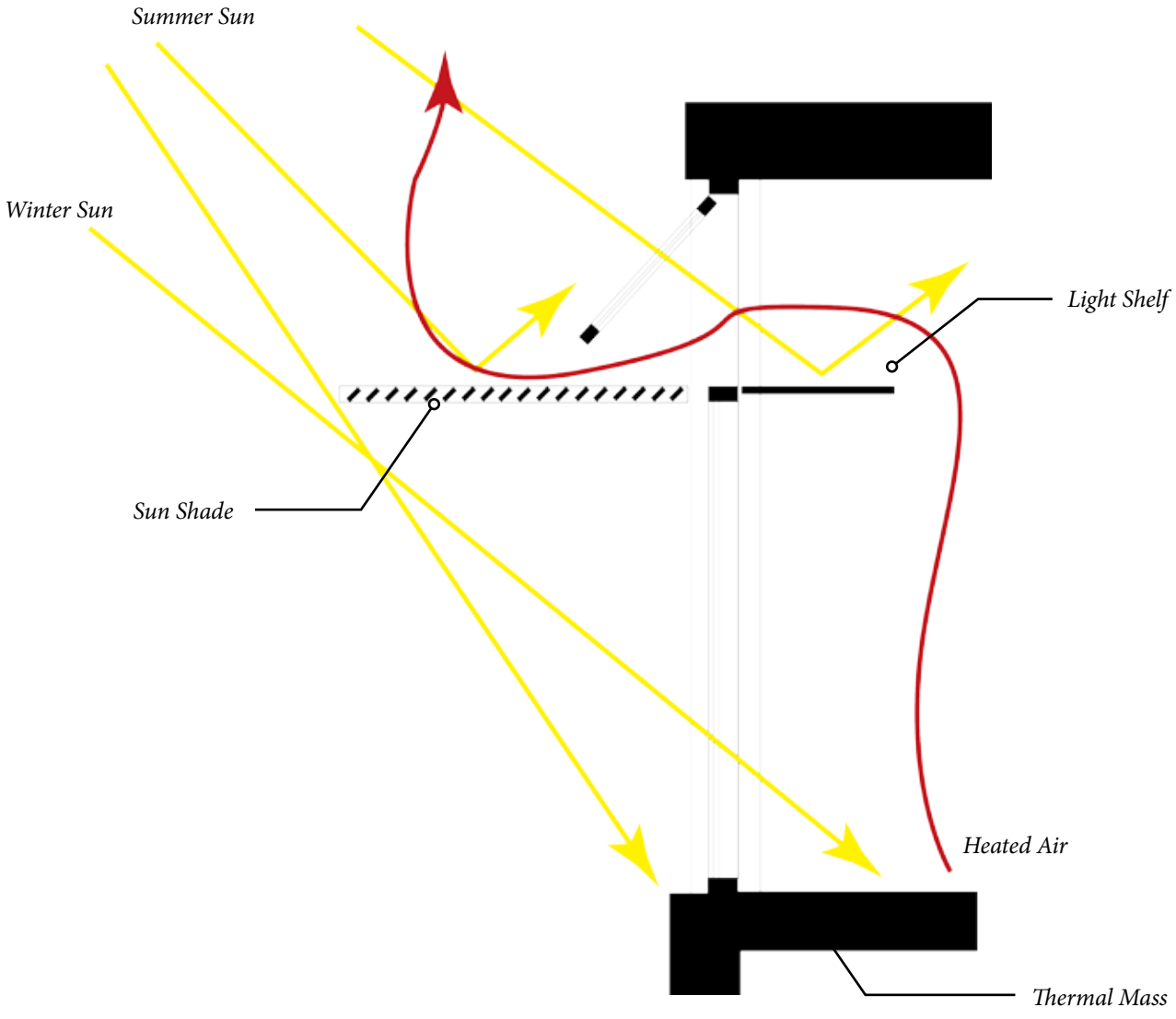
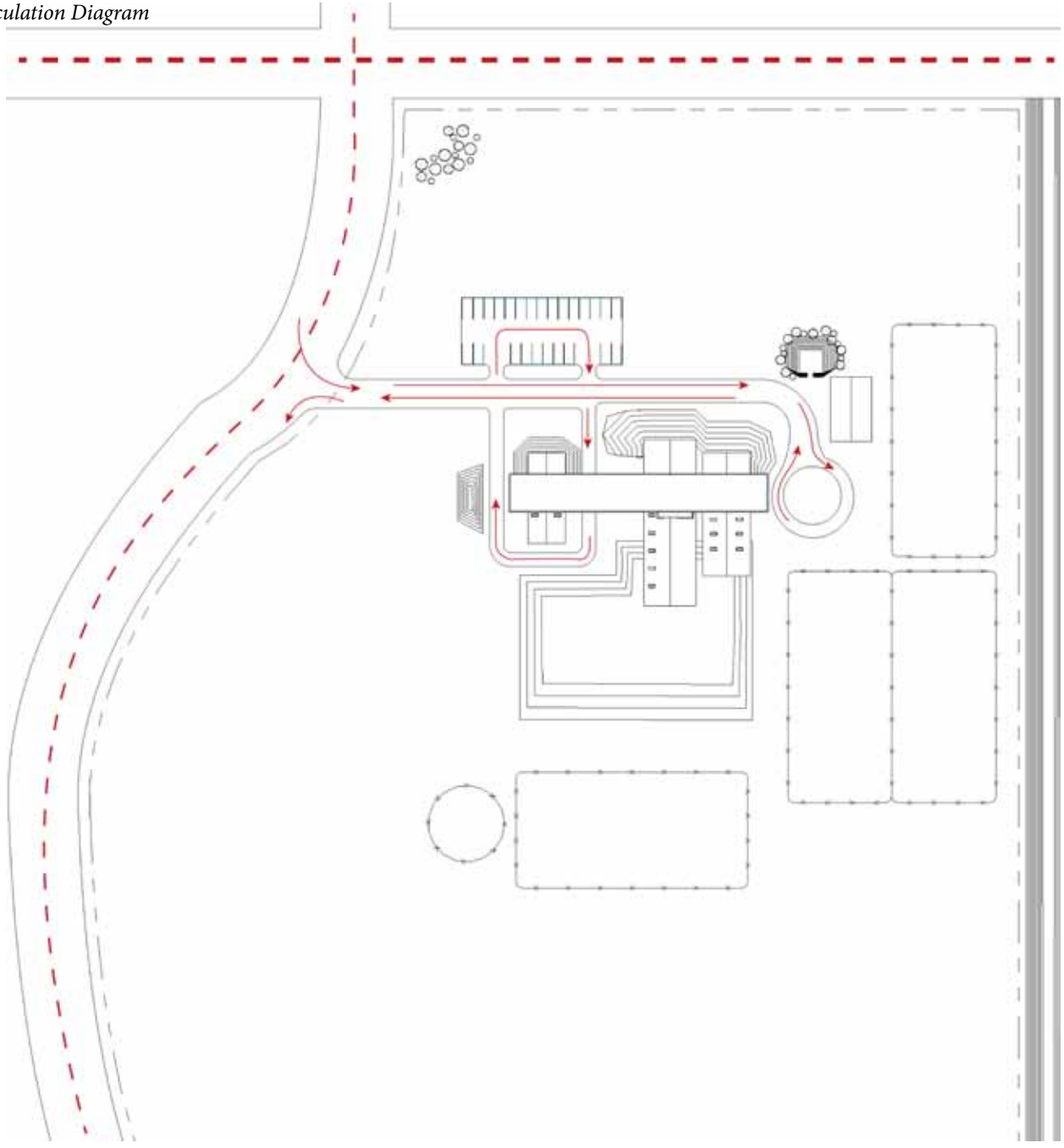


Figure 18.22 - Site Circulation Diagram



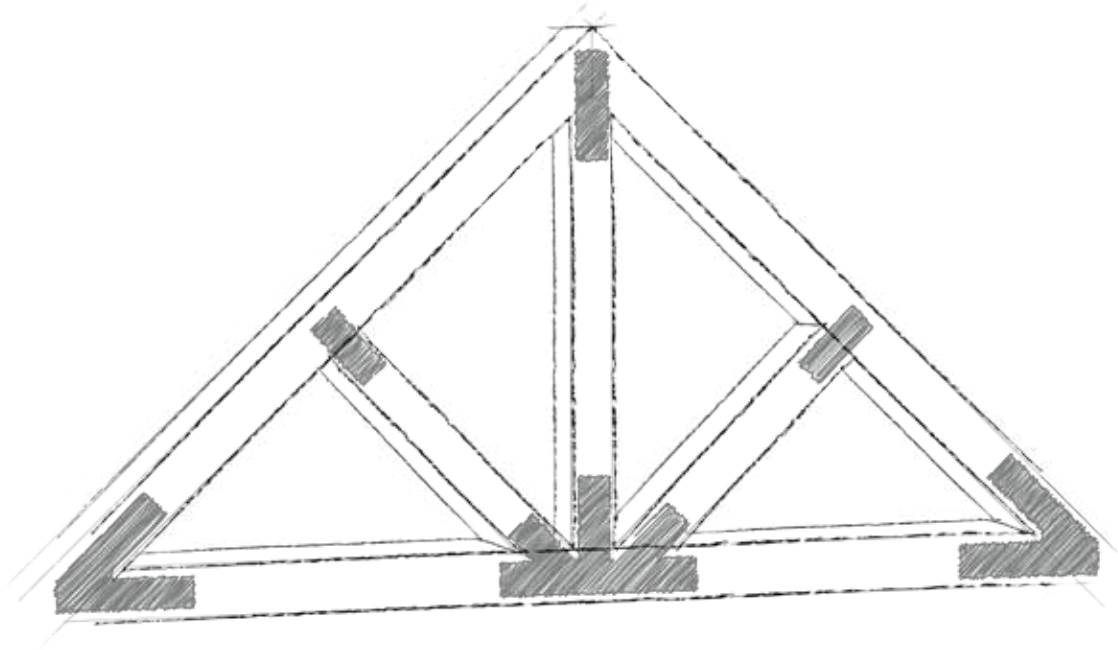


Figure 18.23 - Truss Detail

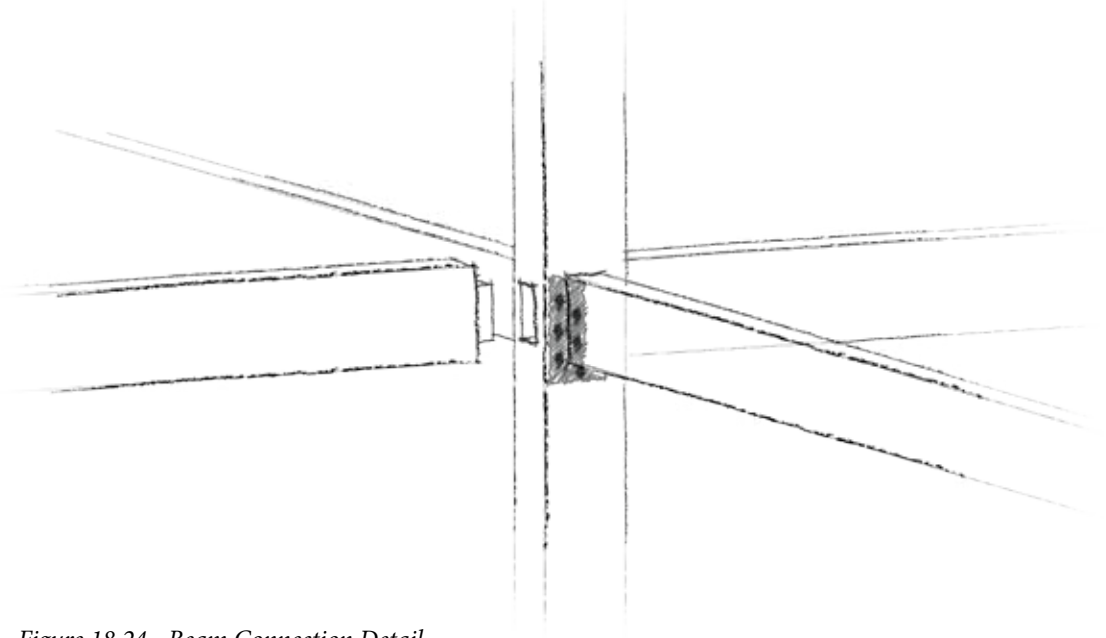


Figure 18.24 - Beam Connection Detail

Figure 18.25 - Utilities Diagram

19 - RESPONSE TO SITE

My project's site is large and semi-rural, and because of that it fulfilled typological requirements for the project. Because of its location in eastern North Dakota, the land is also predominantly flat. A drainage ditch borders the eastern edge of the site, but that is the only topography of consequence. A small cluster of trees in the northwest corner of the site at the intersection of Dakota Drive and 19th Avenue is the only large vegetation on the site.

My building responds to these site conditions in a variety of ways which take into account both typological and poetic requirements. Because the building was meant to be "like a horse" in some ways, it needed to hover over the ground. Rather than standing the entire building on stilts and using space-consuming ramps (which would also become slick in the correct weather conditions), I chose to cut away some of the land on the southern half of the building where there were no exits that required ground-level entry. This cut also fulfilled a secondary purpose: drainage. Despite the location of a drainage ditch to the east of the site, I chose to reroute water from my building to the far end of the lowered area, away from foundations and building elements. This new drainage area would be landscaped with plants that would use and purify the water before it returned to aquifers. Equine hospitals require a great deal of water daily, and also end up with waste water and runoff which need to be handled. The lowered area of the site fulfills this requirement.

The soil cut from the southern side of the building was piled into berms on the northern sides of the building. This helps the building to be integrated with the land - something which can be difficult on such a barren site - but also protects the structure from harsh winter winds. The added insulation and protection provided by the berms is augmented by a shelterbelt planted around the northern and northwestern edges of the site.

Prevailing winds on the site blow from the north, north-northeast, and south-southwest. Ventilation is another important aspect of hospital and stable design, so operable windows are provided on all sides of the building. In addition, the building's shape allows for doors to be opened on each end of the building and winds to blow through.

Finally, the southern exposure of the building is designed for thermal gain in the winter months and shoulder seasons. During the overheated time of the year sun shades cover the windows, but when the sun dips below a certain altitude, the light shines into the building, heating the thermally-massive floor and walls. Light shelves on the interior of the southern windows redirect light that shines into the unshaded upper windows, bouncing the light deeper into the building and reducing the need for artificial lighting.

20 - RESPONSE TO TYPOLOGICAL RESEARCH

Veterinary hospitals are unique, and they have typological requirements that are unique to their situations as well. During my research on this building typology, several factors were apparent as being particularly important to the success of the project. They were location, ventilation, spatial arrangement, and material. My design strove to accommodate each of these items.

First, my building was located in an easy-to-access area which is not far off of a major interstate or too far from the city, but which is also open and uncrowded. The project is located between two major equine hubs, the North Dakota Horse Park and North Dakota State University, with the peripheral location of the FargoDome, where rodeos take place.

Second, my building was designed with natural ventilation in mind, but also allows adequate space for active mechanical systems for ventilation. The prevailing winds on the site blow from the north-northwest and the south-southeast. Operable windows - particularly high venting windows on the south side - allow for hot air to rise and exit, pulling cool air in below. Ceiling fans are used where appropriate to move air around, and the building's long shapes allow for air to be drawn across the length of the building from one side to the other.

The third factor, spatial arrangement, was dealt with by grouping various activities in "wings" of the building. All of the clinical spaces (as well as the supporting mechanical space) were compiled into the central wing. Stabling was separate enough to keep horses away from excess distraction and activity, but close enough that they were accessible to caretakers. The stabling wing is also split into two to keep infectious diseases contained, since biological security is also a factor that needs to be taken into account.

The final major factor of equine hospital design, material, was managed in a variety of ways. Buildings constructed to house large animals need to be solid, durable, and easily cleanable. Concrete masonry units were a natural choice for much of the structure, but in order to fulfill my personal requirement of energy-efficiency, I chose to add an extra-heavy layer of insulation to the exterior before applying the finish siding. Glass, which is prominent in many of the equine spaces, also needed to be protected to avoid mishaps in the event of a panicking horse. This is accomplished by thermally-massive half-walls and fixed cabinetry which protects the glass, gives observers a safe space to stand behind, and also provides much-needed storage.

My building program was originally much larger, but due to a variety of circumstances I made the decision to cut out some of the spaces entirely and to cut down the size of others. This allowed for well-connected areas which were also adequately sized, all without crowding the building's interior.

21 - RESPONSE TO GOALS & EMPHASIS

My original project goal was to design a comprehensive project which is well-detailed in every area. The project emphasis was on function and efficiency. Each of these goals was met, but the goal of comprehensive design was less developed than I would have liked. A secondary goal I had for my project was to create a body of research which future students could use for their own work. I believe that I have succeeded in that respect. My thesis document was well-researched and written. The bibliography alone should provide an excellent resource to anyone interested in equine design.

22 - THESIS PRESENTATION - PAPER

In the past, horses were civilization's main sources of movement and power. Today, horses are no longer our primary means of transportation or a prominent worker, but they are still present. Because the horse's role has moved from work animal to companion, riding has become a skill that seems inaccessible to many people, but that was not always true. The horse has had a long relationship with mankind and has helped to shape the trajectory of human history. By understand this relationship, I hope to design a better facility for the care and healing of horses.

In Before Philosophy: The Intellectual Adventure of Man, Henri Frankfort discusses primitive man's perception of the world. According to Frankfort, ancient humans saw the world as entirely animate. He says that:

> Primitive man has only one mode of thought, one mode of expression, one part of speech – the personal. … Primitive man simply does not know an inanimate world.

A possible example of this mode of thought can be seen in France. The Lascaux cave paintings are the earliest examples of art known to man, and among the animals painted across the cave walls there are horses. The paintings are superimposed over each other, showing evidence that they were renewed regularly. This leads researchers to believe that the act of painting these animals was somehow connected to how the painters lived and what they believed about the world.

Frankfort describes this as an "it vs. thou" approach to the world. To primitive people like the Lascaux cave painters, the world and everything in it was a "thou" – an animate being. Today, the world is an "it" – a thing to be explored and explained. This mindset has also been reflected in regards to the horse throughout history.

The ancient Greeks told stories of an immortal winged horse named Pegasus, showing us that they thought of the horse as more than a draft animal. It is interesting that an animal which was originally hunted for meat and which has been used for the most humble of work – from mining to plowing – was the inspiration for such a fantastic creature. Pegasus demonstrates that, for the Greeks, the horse was something both common and uncommon – an animal for use but also one to be respected.

In several different mythologies, the sun and other celestial bodies were said to be pulled across the sky in horse-drawn chariots, showing that the horse was respected across cultures. For instance, the Konarak sun temple in India is built to honor the Hindu sun god, Surya. It is made in the form of seven horses – one for each day of the week – pulling a colossal chariot. The building faces east so that the first rays of the morning sun travel along the path leading to the main door. The sunlight moving past the chariot horses parallels the sun's travel across the sky and adds a dimension of movement to the entire building. The twelve pairs of chariot wheels are carefully carved, and each pair represents a single month of the year.

In Hindu mythology wheels represent time, so this massive chariot is meant to show time and its movement, and the primary symbol of these themes is the horse.

While horses were common representations of speed, they have also been a sign of power and strength. The statue of Gattamelata by Donatello is one such illustration. While the statue does not depict any particular instance, it does relay a sense of strength and command – nobility, even. Humans perceive the horse as something more than a beast of burden, and this is obvious in Donatello's treatment of the subject.

Donatello's work in the sculpture of Gattamelata shows careful attention to detail and a great knowledge of the equine form. This knowledge could have been gained by first-hand experience or through study of contemporary works on horses. The earliest known text on the horse selection, care, and training is Xenophon's The Art of Horsemanship. Xenophon was an Athenian who lived from the late fifth century B.C. to the early fourth century B.C. Throughout his treatise Xenophon does not advocate for harshness or abuse, indicating what Frankfort would call a "thou" sort of mindset. Counter to what could be expected, Xenophon shows a remarkable respect for the animal. He suggests trying to understand the horse and working with it to achieve the desired result. To Xenophon, the horse is a worker and a tool, but it is also a companion.

Horses were a common part of life up until the Industrial Revolution. This time period illustrated an idea which was not previously emphasized: the horse as technology.

Before the late 1870s, equine locomotion – their main method of usefulness to people – was something of a mystery, and this helped preserve the horse's elevated status in human perception. Catherine Johns, in Horses: History, Myth, Art says that "Roman chariot-racing scenes always show the animals in a leaping movement, both forelegs well off the ground, to represent swift movement." Works of art from before the late 1800s also show this pose, and it well-represents the feeling of speed and lightness. Toulouse-Latrec's "The Jockey" is an excellent example of the precedent. In 1878, though, Eadweard Muybridge published a series of photos which showed horses in motion at various gaits, clearing up any mystery and setting a new standard for the collection of equine knowledge. In Horses at Work: Harnessing Power in Industrial America, Ann Norton Greene says that Muybridge and other researchers' work changed how people saw horses. Work with horses was no longer a hands-on apprenticeship, but was rather the same as working with any other machine.

The horse's greatest influence on history was as a method of transportation. But as technology advanced, people's expectations of horses changed. Some people began to expect the horse to function in the same way as an engine: constantly and without tiring – an "it" sort of mindset, in Frankfort's terms. In the past, the horse was a noble creature, but in industrial America it was a machine to be studied, as is demonstrated by Muybridge's photographs and the interest in them.

Today, human perception of the animal has struck a balance somewhere between these two extremes. On the one hand is the cutting-edge world of equine sports medicine and high-level equestrian competition, on the other is a child's backyard pony. Currently, the horse is a recreational animal, similar to a machine in that it needs maintenance and takes us places, but different because it shows personality and still captures our imaginations.

While our view of the horse has shifted, not all of the well-established respect for the animal has disappeared. Despite its age, Xenophon's guiding principle of working with and understanding the horse has stood the test of time, and contemporary writers of equine training literature still reference his work. Xenophon's empathetic connection between man and horse is well illustrated by the Spanish Riding School in Vienna, Austria. The Spanish Riding School is the oldest school of horsemanship in the world and has been performing for centuries.

In an age where quick methods and easy learning are in high demand, horse care and training are skills which can only be gained with time and experience, something which many people do not have access to. That does not mean that equine education must stay inaccessible. A large part of the relationship between horse and man involves the human's daily care for the horse's health and wellbeing. Horse care is not just for the emergencies, it is the details of every day.

This type of horse care – the precedent for which was set over two thousand years ago and has been kept alive through years of tradition – is imperative for equine health today. The knowledge to heal is only a single aspect of patient care, whether human or animal. In The Enigma of Health, Hans-Georg Gadamer describes health as a balancing act between illness and wellness, and he discusses the physician's role in healing. He says:

> … if the balancing act were to go wrong, it would not be because physical force or power was lacking or too little was exerted, but rather because there was actually too much force in play. But when the act works, suddenly everything seems to happen spontaneously, lightly and effortlessly.

Gadamer says that physicians should practice medicine as both an art and a science. An art, because doctors must balance their interventions against the patient's natural health, or "equilibrium," and a science because they must know what remedies to apply to return the patient to health. Gadamer's description of health as a balancing act is analogous to the balancing act performed by the Spanish Riding School. The riders must know both the "science" of how to ask their horses to move, but also the "art" of not asking too much, so that, as Gadamer says, "…when the act works, suddenly everything seems to happen spontaneously, lightly and effortlessly."

Architecture, like horsemanship, can also be both an art and a science, and moving from historical information to solid buildings can be a challenge. One way to mediate between history and architecture is through the use of an artifact which is made to embody an idea. My artifact moves unpredictably – like a living thing – yet can be controlled. It is like a horse in its sound, its movement, and the way it is manipulated with the hands. It takes up a great deal of space, yet can also be small. It looks light and elegant, yet is deceptively heavy.

The overall effect, while created by the collection of parts, is allowed by the joints between pieces. It is these joints which work as the pivot points and direct all of the object's movement.

The architecture follows this same pattern. The building is separated into pieces arranged on a long axis. The lower, barn-like structures are the "horse spaces," while the more modern upper level includes the "human spaces." The building is quite large, but does not appear to take up as much space as it does because it, like a horse, stands over so much ground. The building is both a part of the land and above it. On the south side, the lower wings stretch over the land in the same way that a horse does – almost hovering above it because of slender connections. On the north side, the lower wings burrow into the land as earth excavated from the south is piled into berms. These berms help protect and insulate the building from harsh north winds, while the excavated southern area serves as a drainage location.

The building is located at the intersection of 19th Avenue North and Dakota Drive North in Fargo, between North Dakota State University and the North Dakota Horse Park. The facility is meant to accommodate students from NDSU's veterinary technology and equine science programs as well as area horse professionals and enthusiasts. Because of its wide clientele, the building can be separated into several "wings:" the reception wing, the clinical wing, the stable wing, and the upper level.

Throughout the building the structure is exposed. Reclaimed heavy timbers hold up the vernacular lower buildings, while those same timber columns pierce through the floor of the upper level from below, drawing the sections of the building together. Insulated concrete masonry unit walls provide shear strength and durability to the lower wings and help to reinforce the heavier, horse-like feel of the vernacular structure. Above, insulated metal panels clad the upper level, providing a lighter, more modern material palette for the human spaces. The building's structure frames the activities inside. Similarly, horse equipment – called tack – helps riders teach horses to move in a good frame – the posture which is most effective for horses carrying a rider. The structure draws parts of the building together and holds them up in the same way that tack is the connection between humans and horses. This detail shows a small brace stabilizing two larger members. The brace can be compared to a bit. A bit is a small piece of equipment, but it is a pivotal connection between horse and rider. The structure is also comparable to the artifact. In the artifact, long, thin cord both ties the pieces together and separates them. In the same way, the structure ties the building together and separates its spaces.

This connection can first be seen as visitors enter the building from the northwest, through the reception wing, where clients can check patients in or groups can gather before events or classes. The reception wing also houses veterinarian offices, records keeping, a staff break room, and living quarters for on-call staff. From the reception wing, visitors can either move across to the clinical wing, or up to the upper level.

The clinical wing is reached by walking across an open area below the upper level "bridge." This exterior space can be used for outdoor learning during warm months, but also serves as a covered area for clients to unload horses being brought for treatment. Inside the clinical wing patients move to one of the three multi-purpose exam rooms. The long hallway leading to the surgery is an axis counter to

the upper level, and it is meant to draw people through the clinical wing. It serves as circulation, but it is also a place for veterinarians to diagnose hoof injuries in patients. Off of this main hallway are the pharmacy, an exam room, and the surgery, which is the heart of the building. Inside the surgery, veterinarians deal with the most difficult of cases, while above, in the observation room, visitors can become part of the process.

The easternmost portion of the hospital is the stabling wing. This area provides housing for horses both waiting for procedures and recovering from them. In addition, an isolation stabling area is separated from the main barn so that infectious diseases can be contained. The barn has space for short-term equipment and feed storage as well.

If visitors are not at the hospital for its clinical purpose, they will be directed towards the upper level. The upper level serves as a connecting "bridge" over the landscape and the hospital buildings below. It is a human space because of both its use and its position; it ties the three lower buildings together, similar to how humans have molded and affected equines. The connection does not only go one way, however; the lower buildings also affect the upper level, blocking and reshaping views. The upper level's main axis leads visitors through gallery display spaces and views south over open land, putting them between the past and the present. The gallery space displays historic images and items of man's relationship with horses. It is open to the public and is intended to draw new viewers into an otherwise exclusive space. Two classrooms and a smaller meeting room can be used for educational purposes, but their walls can be pulled back to create a single large gathering space. The upper level also houses a library of equine books and equipment as well as the surgery observation room. The observation room hovers over the surgery like the building hovers over the land. It allows laypersons to take part in the specialist's work below. Views along the upper level alternate between historic displays, the lower buildings, and the land beyond. At each point where the lower buildings meet the upper level, visitors can see into the equine spaces. There are views into the reception area, the surgery, and the stabling wing. These views, as well as cantilevered lounge and reading rooms on the east and west ends of the upper level, allow visitors to look out over the vernacular shape of the lower wings as well as the land itself. This juxtaposes human intervention – the hospital itself – with the open land, the horse's natural habitat.

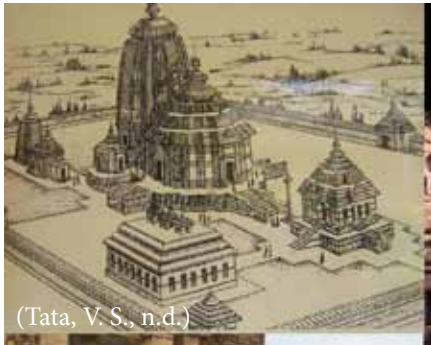
The project is meant to encourage visitors to see the horse as an integral part of mankind's history, and the building's form and layout of spaces attempts to capture the connection between man and horse. The Fargo Equine Hospital and Education Center is designed to serve everyone from professionals with years of horse experience to laypersons whose closest encounter with horses is seeing them from a distance, all while encouraging a new view of the animal.

22- THESIS PRESENTATION - SLIDES

On the Living Horse: The Fargo Equine Hospital & Education Center

(Popular Archaeology, 2011)

(Marsyas, 2005)



(Tata, V. S., n.d.)

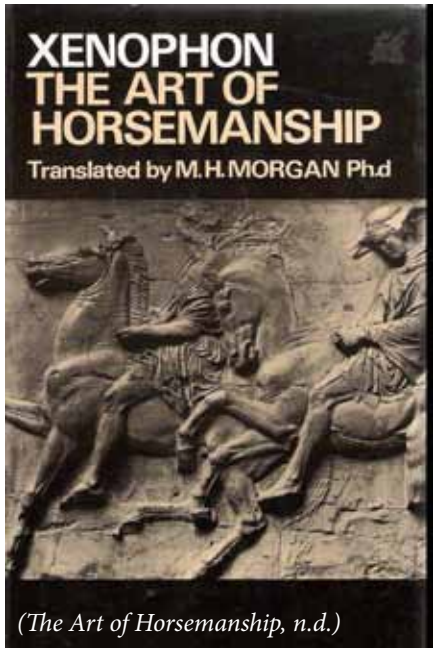
(Kundu, n.d.)

(A., M., 2008)

(Studyblue.com, n.d.)

"Nature is on the inside."
-Cézanne

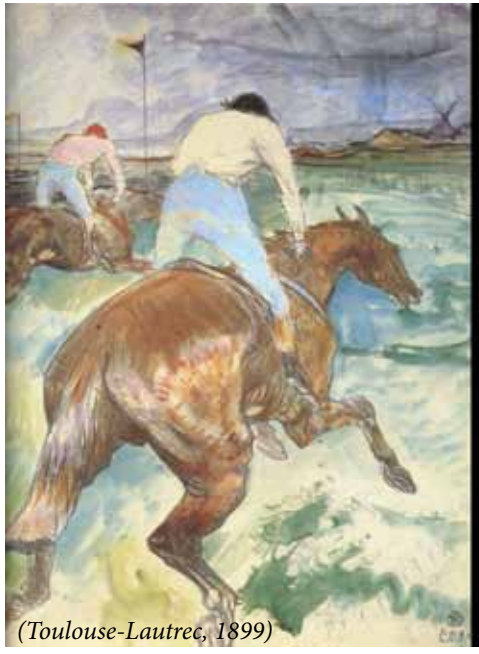
The nature of the horse is not in Donatello's stunning detail, or the strength and power evident in the horse's form. These are a part of the picture, but the horse's nature is also completed by our own perception of it.



(The Art of Horsemanship, n.d.)

"Consequently, when your horse shies at an object and is unwilling to go up to it, he should be shown that there is nothing fearful in it, least of all to a courageous horse like him; but if this fails, touch the object yourself that seems so dreadful to him, and lead him up to it with gentleness. Compulsion and blows inspire only the more fear; for when horses are at all hurt at such a time, they think that what they shied at is the cause of the hurt."
-Xenophon

(Park, 1902)

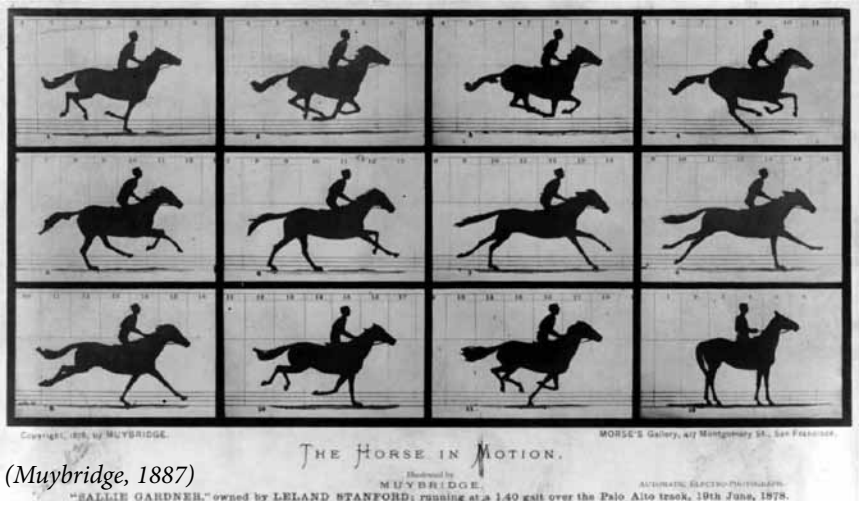


(Toulouse-Lautrec, 1899)

"Roman chariot-racing scenes always show the animals in a leaping movement, both forelegs well off the ground, to represent swift movement."
-Catherine Johns

Toulouse-Latrec's "The Jockey" is an excellent example of this precedent.

"... their [Muybridge and other researchers] work also reflected a significant change in the approach to horse technology as a form of knowledge. Traditionally, knowledge about horses had been gained through personal, immediate experience and was often transmitted orally. Learning about horses was a kind of apprenticeship. Muybridge's photographs ... produced a new kind of knowledge. It not only required the mediation of technical apparatus, but it was entirely independent of physical contact with actual horses."
-Ann Norton Greene



(Muybridge, 1887)

(Horse Overcome by Heat, n.d.)

(University of Pennsylvania, n.d.)

(Dashing Tails Photography, 2010)

(Van Bakel, R., n.d.b.)

(Van Bakel, R., n.d.a.)

(ScienceVision, n.d.)

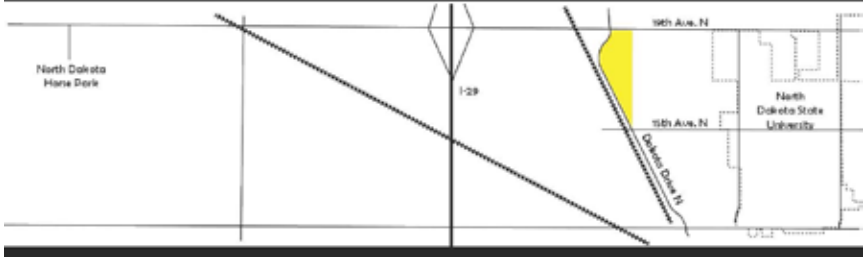
Health - and Horse Care - as a Balancing Act

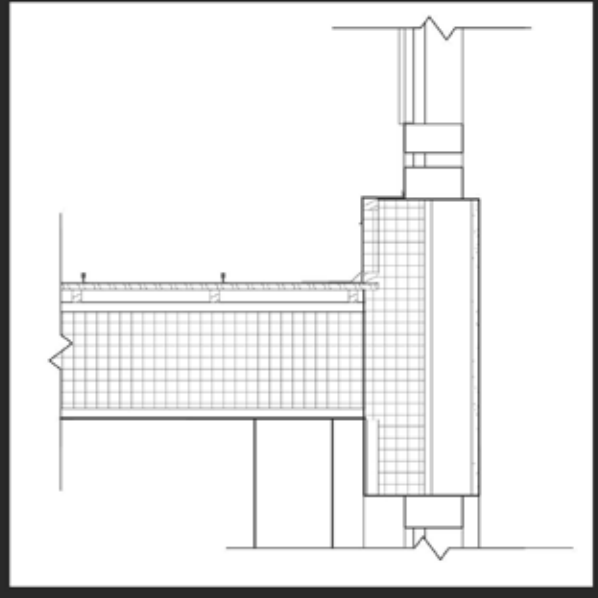
"... if the balancing act were to go wrong, it would not be because physical force or power was lacking or too little was exerted, but rather because there was actually too much force in play. But when the act works, suddenly everything seems to happen spontaneously, lightly and effortlessly."

-Hans-Georg Gadamer

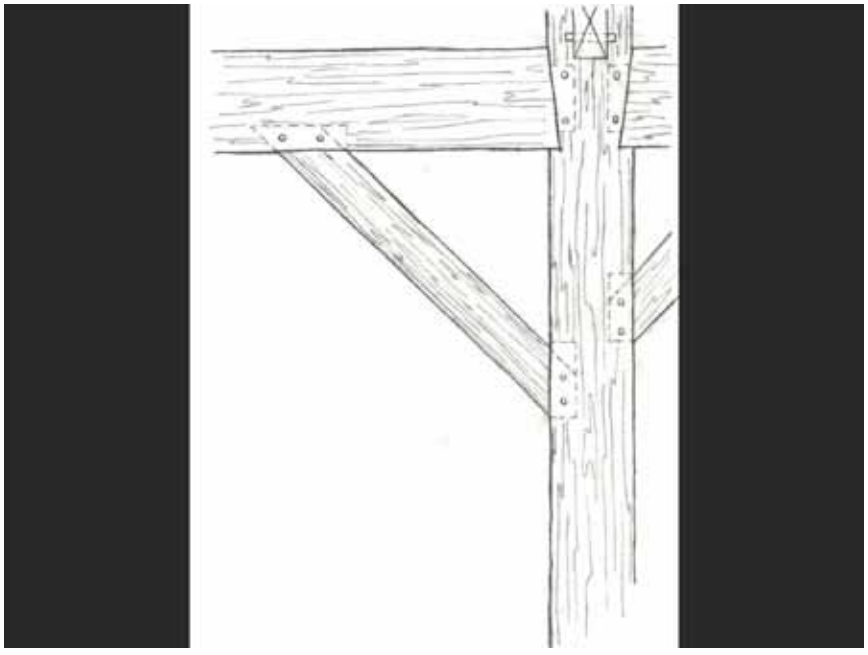
Site:

Fargo, ND
19th Ave. N & Dakota Dr. N



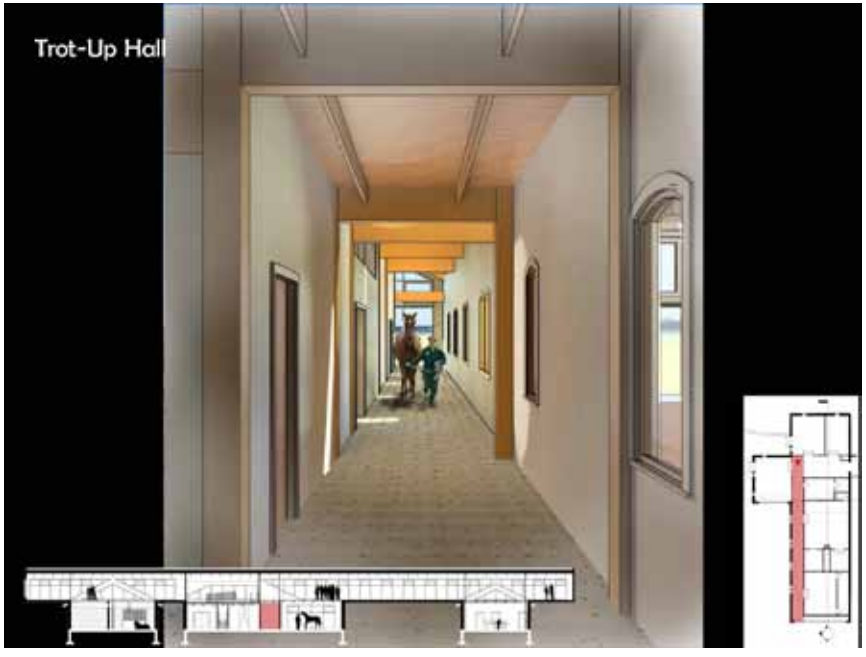



Riding Frame
(Grimmett, 2014)




Reception Wing

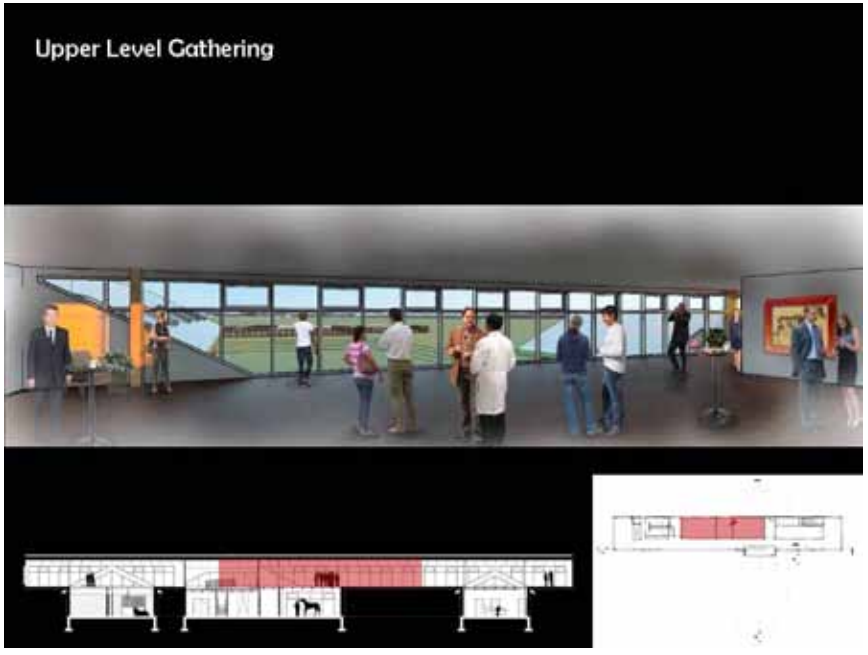

Outdoor Classroom

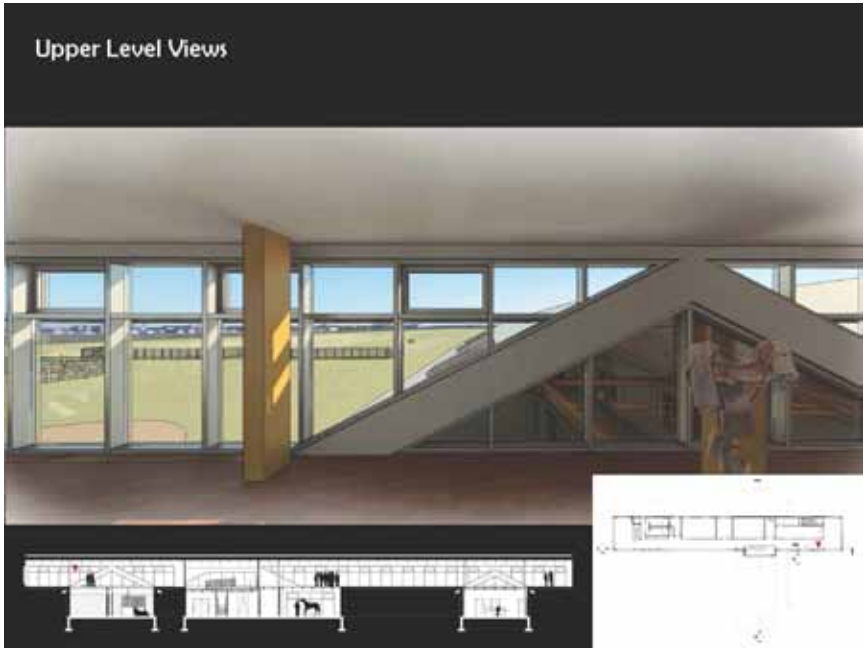

Trot-Up Hall


Surgical Suite


Inpatient Housing


Upper Level Hall


Upper Level Gathering


Upper Level Views

PROJECT INSTALLATION

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The statue of Gattamelata depicts an Italian war captain mounted on a horse. The work is important to my project because it gives an example of an instance where the horse is used to depict nobility, strength, and command.

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This webpage gives an overview of the Greek myth of Pegasus. It affects my project because Pegasus is the Greek idea of the perfect horse, and it shows the respect that the Greeks had for the animal.

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Frankfort and the other authors discuss their view of the mindset of ancient man, and how they perceived to world. The work connects to the Lascaux cave paintings, some of which depict horse. Thus the work helps to show a possible mode of thought behind the paintings, and to primitive man's connection to the horse.

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Gadamer describes healing as a balancing act, and as both an art and a science. This relates to my work because working with horses – and healing them – is also art, science, and balancing act.

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Ann Norton Green discusses the horse's place in the Industrial Revolution and how people's perception of horses changed due to advances in technology and the current thought of the age. It ties into my work because it describes an important time in history and the horse's place in it.

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Catherine Johns catalogues various pieces of art depicting horses and discusses their significance. Her work is valuable to my research because the artwork shows the evolution of human thought about horses.

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The Konarak Sun Temple is an example of horses used as a part of architecture to depict the themes of movement and time. It is helpful to my paper as a further example of the horse as it has been used by people throughout history.

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B - PREVIOUS STUDIO EXPERIENCE

Second Year

Fall 2011: Joan Vorderbruggen - Tea House; Rowing Club Boathouse

Spring 2012: Stephen Wischer - House for Twins; Center for Music

Figure B.1 - Twin House Model

Third Year

Fall 2012: Steve Martens - Camp Cormorant Lodge; Mortuary Chapel

Spring 2013: Milton Yergens - Wind Energy Interpretive Center; Studio & Living/Learning Space

Figure B.2 - Approach to Mortuary Chapel

Fourth Year

Fall 2013: Don Faulkner - San Francisco Mixed Use High Rise

Spring 2014: Steve Martens - St. Mark's Lutheran Church Adaptive Reuse

Figure B.3 - Adaptive Reuse Addition Interior

Fifth Year

Fall 2014: Michael Christenson - Oil Patch Housing

Spring 2015: Stephen Wischer- Thesis Design

Figure B.4 - Oilpatch Housing Elevation Study

C - PERSONAL IDENTIFICATION

Figure C.1 - Photo of the Author

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