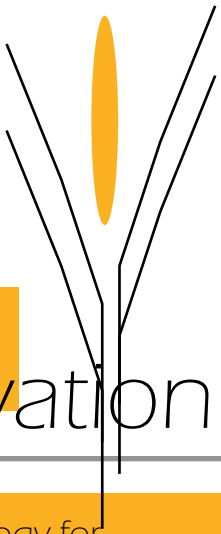

gAstronomic Innovation

A New Methodology for Nutrition Education

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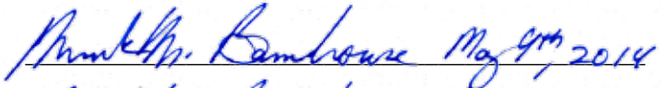
North Dakota State University / Spring 2013

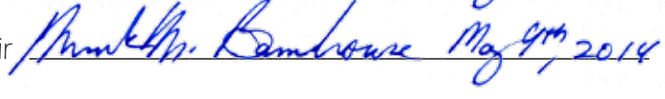
Gastronomic Innovation

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

By
Joshua D. Muckenhirn

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

Primary Thesis Advisor 

Thesis Committee Chair 

May 2014
Fargo, North Dakota

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Abstract

The title of the thesis is *gAstronomic Innovation: A New Methodology for Nutrition Education*. The question being investigated is, *how can architecture be used as a tool to ultimately improve society's overall health and well-being*? The typology for this thesis investigation is a culinary education center for young people. The facility will be nearly 90,000 square feet. The Theoretical Premise/ Unifying Idea guiding the thesis is *"a youth oriented culinary education center can contribute to improving the health of future generations by empowering youth before they become trapped in the cycle of "fast" and processed foods that has been branded into them by today's society"*. The Justification for the investigation is the growing trend of consuming fast and processed foods that has led to a plethora of health related issues. The site for the thesis will be in Delano, MN.

Keywords

Nutrition education
Gastronomy
Health and Well-being
Culinary education
Home cooking
Nutrition

Problem Statement

How can architecture be used as a tool to ultimately improve society's overall health and well-being?

Statement of Intent

Unifying Idea

TYPOLOGY

Culinary education center; school cafeteria

CLAIM

By offering a revised methodology for teaching Nutrition, society's general understanding of it will improve, and with it, their health and well-being.

PREMISES

Children attend school to prepare them for their future endeavors, and their parents are placing an increasing reliance on the school systems to teach their children more and more. As it currently stands, Nutritional education is seriously lacking, leaving children unprepared to make informed decisions regarding their food consumption.

ACTOR

SITE

The site chosen to investigate the thesis is Delano, MN.

ACTION

Nutrition, as it is currently taught, is inadequate and incomplete. "Generally, lessons are limited to nutritional tables and videos about what is "good" and "bad" for you...The didactic materials used are usually inadequate as well as boring..." (Petrini, 2007). This system fails to stimulate interest, thus causing children to place very little importance on the subject.

OBJECT

"Gastronomic knowledge was passed down almost automatically from generation to generation. Nowadays, that umbilical cord no longer exists...It is this lack of knowledge that leads many of us to eat, unthinkingly, in fast-food restaurants" (Petrini, 2007). This growing trend has lead to increased health issues including heart disease, obesity, high blood pressure, diabetes, etc.

UNIFYING IDEA:

A youth oriented culinary education center can contribute to improving the health of future generations by empowering youth to make informed Gastronomic decisions before they become trapped in the cycle of "fast" and processed foods that has been branded into them by today's society.

Project Justification

It is common knowledge that today's society is living an increasingly fast and chaotic way of life. Because of this, many families and individuals have come to believe they do not have the time, energy, or motivation to cook for themselves; they opt for microwaved dinners, fast-food, and highly processed foods. This trend has led to increased health-care costs, decreased qualities of life, shorter life spans, and countless other health related issues. These health related problems are due merely to a misperception caused by what has been branded into us over time. We are told we do not have time to cook for ourselves and eat responsibly, so we accept our "only" option - fast and processed foods. People simply have forgotten or have never been taught how easy, rewarding, and empowering preparing a meal from scratch can be. By teaching today's youth how easy it actually is to prepare a meal for themselves, how fun and rewarding it can be, and where the food they eat actually comes from, we can decrease the desire for fast and processed foods. In order to accomplish this, we must stop the problem before it begins, and we can start by teaching young people while they are still in school. By redefining what a school cafeteria is and provides, we can take the first step towards...

Figure 1 - Vegetables Image: http://uhaweb.hartford.edu/MNUNEZ/Vegetables.html

bringing back Nutrition.

Proposal

Narrative

Every day, we are hounded by various doctors, trainers, and other health professionals that the world is slowly eating itself to death. The media's answer to a majority of these health problems are temporary fad diets promising to magically shed twenty pounds. Naturally, eating a miniscule amount of food is going to cause your body to lose weight, but proper health and Nutrition are *more than a reflection in the mirror*. People blindly follow "guidelines" set forth for our benefit because they do not have the necessary background knowledge to make informed decisions for themselves. It is time to rethink the way we eat from the very beginning – starting with our children.

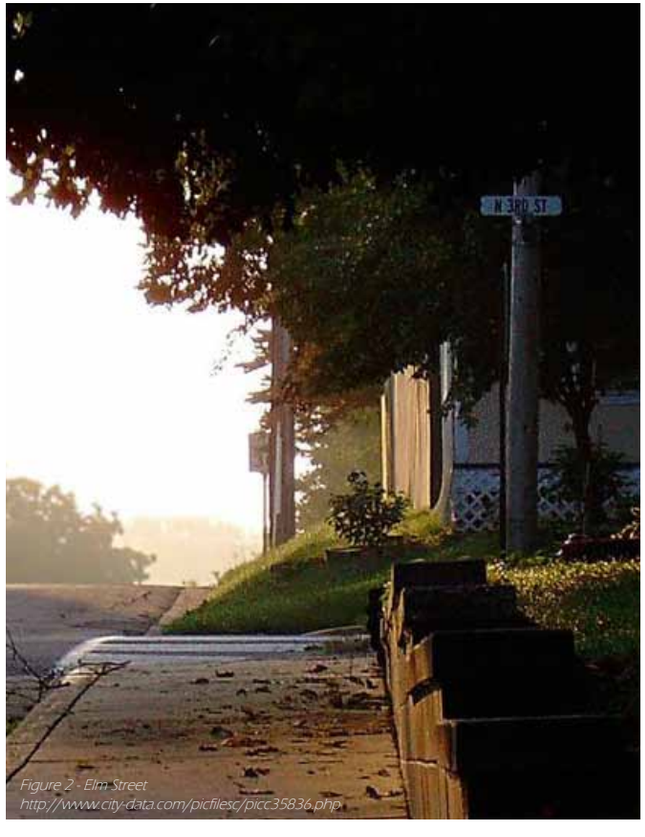


Figure 2 - Elm Street
http://www.city-data.com/picfilesc/picc35836.php

...more than a reflection in the mirror...

...easy, quick, and rewarding...

Unfortunately over the past few decades, home cooking has been dwindling – becoming something of a lost art. We have forgotten how to cook and eat properly because we have been *told* that our lives are too chaotic and hectic, and we simply do not have time to do it. We are made to believe we have two options – 1.) Eat out, or 2.) Nuke it. It is my belief, along with many others, that our lack of cooking knowledge and gastronomic respect are directly tied to this way of thinking. People no longer know where their food actually comes from or how it is prepared, and so, they simply do not think about it. Because food is prepared for us behind the scenes, we do not realize how many extra carbohydrates, fats, sugars, and other artificial ingredients are added to a simple meal. When one physically prepares a meal for themselves, we must make the conscious decision to add more butter to the pan. This in and of itself aids in controlling what we consume. We need to lift the veil cast by fast food, and see what real food is. People simply have forgotten, or have never been taught, how *easy, quick, and rewarding cooking a proper meal really is*. Because parents are no longer teaching their children proper eating habits at home, schools are the perfect alternative venue.

One of the major factors lacking in today's Nutrition education is taste. In order to provide a wholistic Nutrition program, we must show children that eating properly can also taste good – it is not limited to items loaded with sugar, fats, and salt.

"This educational model, based on tasting and on a direct relationship with the material, must not be the only one; it must not replace the nutritionist and health-oriented approaches. But it is the missing link that is needed to train children's perception of the world about them from an early age" (Petrini, Slow Food Nation, p. 154).

We can increase children's tendency to consume healthier options by showing them how to properly prepare a meal to extract the maximum amount of taste and flavor. Enlightening society on these methods will inevitably lead to an increased tendency to consume cuisine that is more Nutritionally responsible. Unfortunately, eating Nutritionally has acquired a somewhat negative connotation because it is often associated with expensive, organic produce.

The point of this thesis is not to advocate the consumption of "organic" or the most expensive foods. "Organic" has transformed into yet another marketing scheme attempting to capture our dollar. Organic foods may be as harmful as processed and fast foods **depending on what is put into them**; they can still be loaded with fats, sugars, and salts.

"And many of the dishes glorified by the wholesome-food movement are, in any case, as caloric and obesogenic as anything served in a Burger King" (Freedman, How Junk Food Can End Obesity, 2013)

Unfortunately, there is too large an economic gap for everybody to be able to afford purchasing and preparing one-hundred percent natural and whole foods. However, one can eat responsibly by making informed decisions while shopping at a big-box food store. It is my hope to demonstrate to children and their families how to eat responsibly - **even on a tight budget**.

One of the major factors lacking...is taste...

...educating children, teachers, and community...

Because families no longer cook together as they once did, children are not introduced and taught how to prepare a meal for themselves. This has led many families opting to purchase a pre-packaged, highly processed meal, or stopping in at the nearest fast food restaurant to pick up a quick meal. Our Nutrition education has done little to prevent this way of thinking, and has caused us to blindly follow the advice of health professionals. Nutrition has become the vernacular of only an elite few, leading to many health related issues. If Nutrition education in the schools was not limited to spewing static pyramids, tables, and facts to children, but also incorporated dynamic and hands on growing, preparing, and cooking techniques, children would attain a much more reliable Nutrition education. Practicing proper Nutrition does not require purchasing organic or one-hundred percent natural foods – there are low-budget options available in today's supermarkets. By educating children beyond tables and pyramids, we can **empower** them to make informed decisions regarding all types of foods – organic or processed. They will have the ability to see through the marketing blindfolds that have impaired our vision. By rethinking how we educate youth, teachers, and the community, we can take the first steps towards...

...bringing back Nutrition.

User / Client

Learn

School Youth: 5-12
The main users of the facilities will be students of the school in the grades 5 through 12. Delano Public Schools currently enrolls approximately 1500 students 5-12. They will utilize the building during school hours - 8 am until 3 pm.

Community Members
The facility will also offer nutrition and cooking classes to the community after school hours. There will also be community gardens on the premises.

Teach

School Teachers
They will teach solely the school students during class time. Some may get involved in the after school club.

Facility Managers
FM's will ensure the maintenance and upkeep of the building.

Community Members
It is intended for some community members to become volunteer instructors for after school activities/club.

Local Farmers
As part of the education curriculum, local farmers will come in during class time and work with the youth.

Maintain

Facility Managers
FM's will ensure the maintenance and upkeep of the building through janitorial, safety, hygiene, security, and so on.

Major Project Elements

Grow
- Exterior Growspace
- Germination Rooms
- Indoor Greenhouses
- Outdoor Grow Space
- Packaging / Preparation

Learn
- Advanced Kitchen
- Classrooms
- Cold Storage
- Computer Lab
- Demonstration Stations
- Food Preparation
- Non-refridgerated Storage
- Student Kitchen

Private
- Facility Kitchen
- Loading Area
- Mechanical / Janitorial
- Staff Breakroom
- Staff Restroom

Public
- Circulation
- Market Space
- Multi-purpose Event Space
- Outdoor Market
- Restrooms

Site: Macro

Region: Upper Midwest

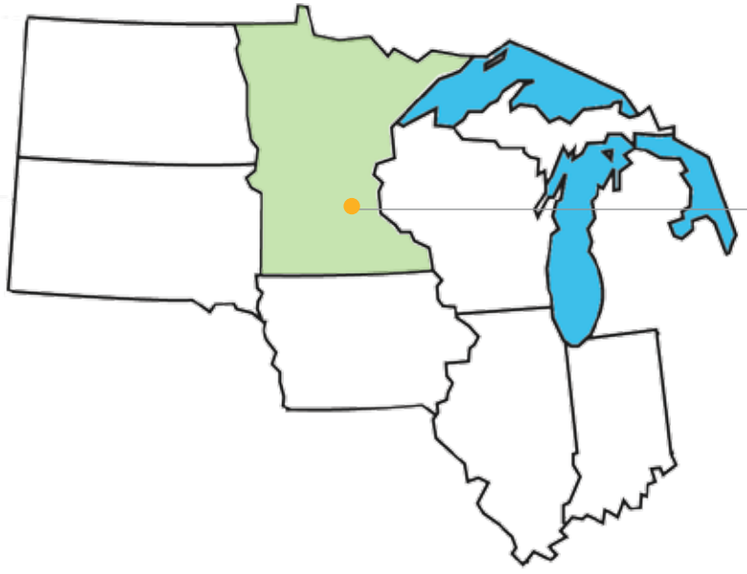


Figure 3 - Upper Midwest
http://www.wsfcs.k12.nc.us/Page/9873

Plant Hardiness Zones

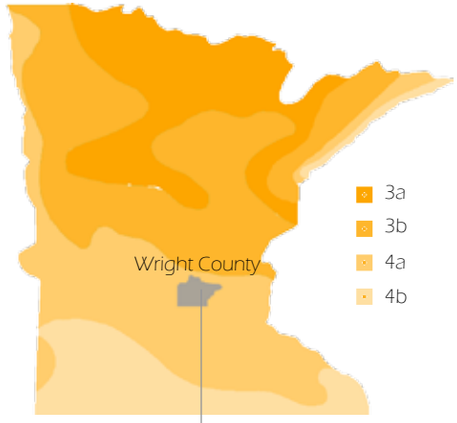


Figure 4 (Above) - MN Plant Hardiness Zones
http://www.extension.umn.edu/yardandgarden/MG/USDAZonemap.html

Minnesota is located in the upper midwest of the United States. Delano, Minnesota lies within Wright County. According to the United States Department of Agriculture (USDA), Delano, MN is within zone 4b of the Plant Hardiness Zoning Maps. This zone reports an average annual minimum extreme temperature of -30 to -25 degree Fahrenheit. Because of this, the thesis project will require extensive and possibly experimental indoor farming practices to maintain a viable growing environment throughout the year.

Delano lies directly on Highway 12 which is a main transportation route into Minneapolis. Because of this, there are literally hundreds of thousands of people within 30 minutes of Delano who could benefit from the facility.

Figure 5 - Delano Context Map
Google Maps

Site: Micro

Landmarks

Delano Municipal Stadium is located within City Park making it easily accessible by locals and visitors alike. The stadium has hosted Delano's amateur baseball team, the Delano Athletics, since 1896. Delano was fortunate enough to host the Minnesota Class B and C Amateur State Tournament this past summer which drew close to 20,000 fans in four weekends.

a

Figure 6.1 - Delano Municipal Stadium
Josh Muckenhirn [2013]

Downtown Delano is one of the most historic locations in the entire city. Many of the buildings are over 100 years old, and have been repurposed dozens of times. Today, Downtown Delano has numerous restaurants, a local bar, a butchery and meat market, two photography studios, a karate studio, and ice cream shop, and a coffee shop which hosts live musicians on a daily basis.

b

Figure 6.2 - Downtown Delano
Josh Muckenhirn [2013]

Peppermint Twist is located directly off Highway 12 and is a favorite summertime treat for the community. They retain an old fashioned drive in atmosphere with outdoor seating and a full size juke box. It has even been honored on the Food Network Channel for its "famous" Strawberry and Raspberry shakes which feature locally picked berries.

c

Figure 6.3 - Peppermint Twist
http://www.panoramio.com/photo/41760645

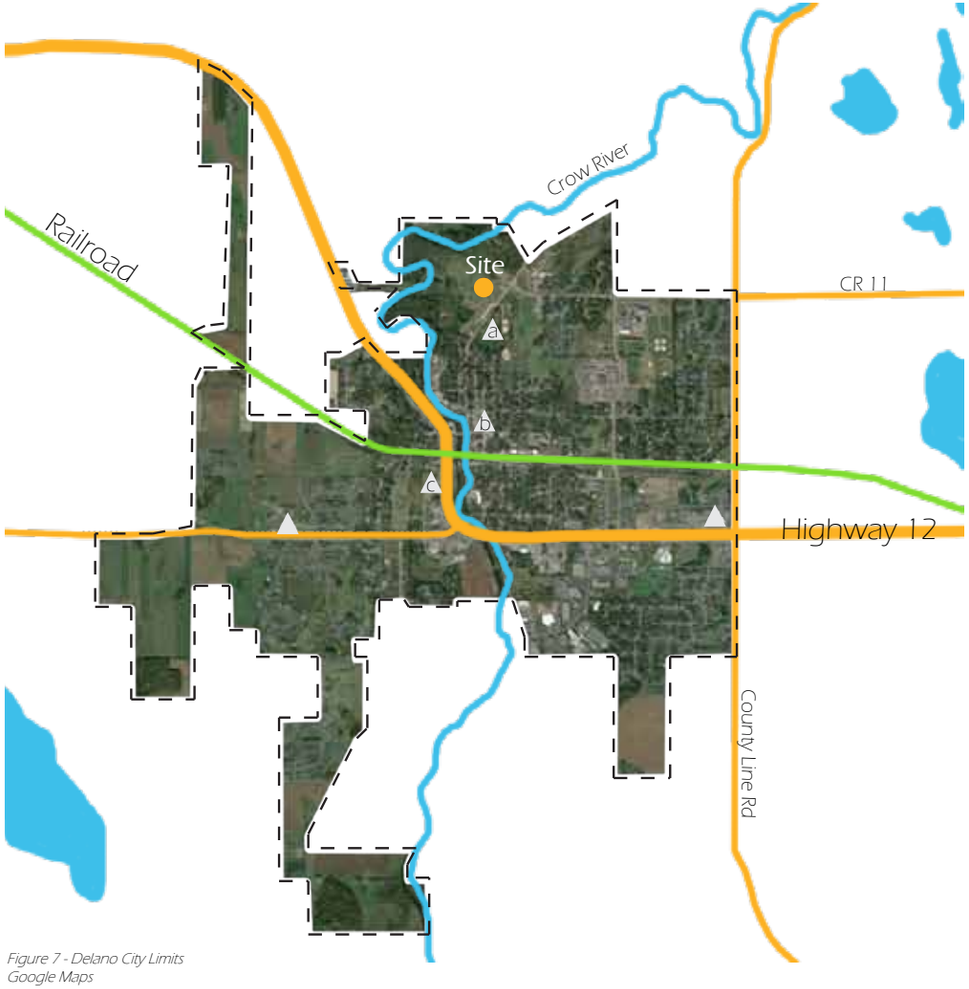


Figure 7 - Delano City Limits
Google Maps

Proposed Site

The school itself currently has nearly 2300 students enrolled K-12 with 1500 of those being in grades 5 and up. Because the site is located near the City Park, it will be easily found by visitors who wish to participate in evening classes and utilize the facility's offerings.

The proposed site is located just west of the City Park - making the facility easily found by visitors. The city park contributes immensely to the character and spirit of Delano because various city events are held on the grounds throughout the year. Events include a Carnival and Fourth of July parade, Relay for Life event, baseball and softball tournaments, and various recreational activities. Because of this, the proposed site will offer the facility a plethora of visitors. The facility will have the opportunity to become deeply rooted in the heart of the city.

Figure 8.1 - Autumn Tree
Josh Muckenhirn [2013]

a

Figure 8.2 - Site Image 1
Josh Muckenhirn [2013]

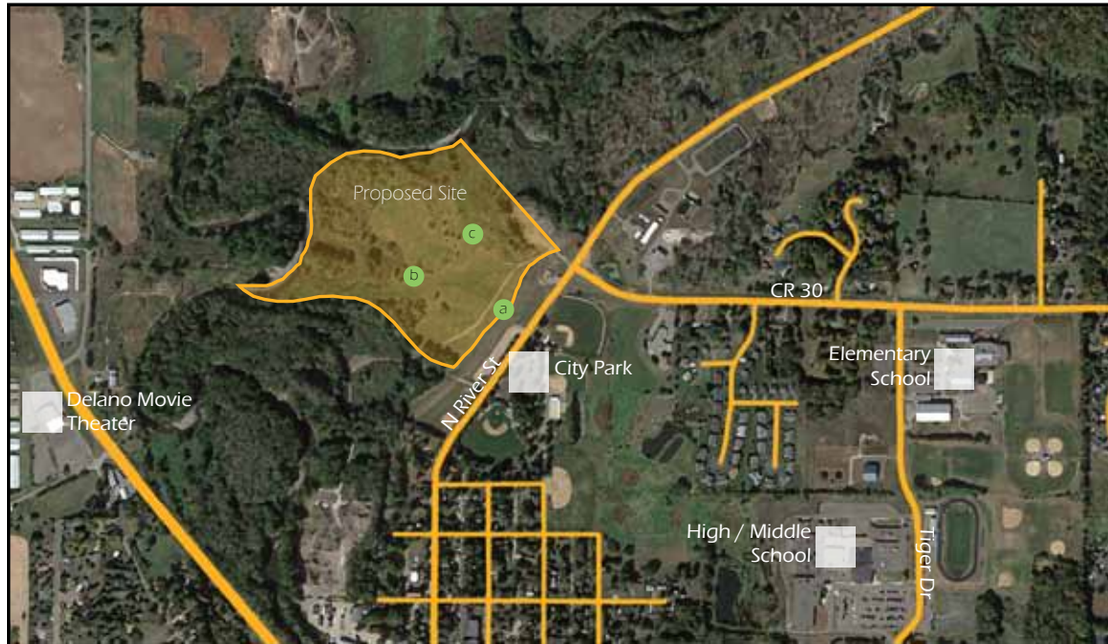
b

Figure 8.3 - Site Image 2
Josh Muckenhirn [2013]

c

Figure 8.4 - Site Image 3
Josh Muckenhirn [2013]

Figure 8.5 - Proposed Site
Google Maps



Project Emphasis

This thesis investigation will explore how design can contribute to and support new methodologies for nutrition education by providing spaces specifically created to emphasize a more hands-on, experience based curriculum. In order to accomplish this, research must be conducted in a few areas:

I. Psychology

This will include the psychology of eating and nutrition. Within this subject, the investigation will explore Psychology in behaviors, and how physical spaces and our senses affect the way we eat.

II. History

This will include the history of cooking and Nutrition to gain insight into how and why the methods of cooking have been all but lost in today's society.

III. Indoor Farming

It is the intention of the facility to offer year-round farming practices by providing indoor space designed for growing produce.

IV. Economics

Economics will play an integral role in this thesis investigation. In regards to the education system, funding always seems to be an issue. On the personal level, the food people choose to purchase is swayed heavily by their income and food prices.

V. Nutrition Education

As of today, the Nutrition Education system is inadequate. The underlying shortcomings will be examined and new methodologies will be advised.

Plan for Proceeding

Research will be conducted to attain a greater understanding of the Theoretical Premise/Unifying Idea, Project Typology, HIstorical Context, Site Analysis, and Programmatic Requirements of the thesis project.

I. Project Typology

Case studies will be extensively documented and examined to help gain a deeper understanding for the Project Typology. Floor plans, sections, materials, technology, among other areas of interest will be examined through the case studies.

II. Historical Context

Research will be conducted in areas such as the history of cooking, processed foods, and the evolution of eating habits, among others.

III. Site Analysis

Numerous site visitations will be conducted and documented to responsibly design for the site, not on top of it. This will aid in the development of the layout of the facility along with the growing areas.

IV. Programmatic Requirements

Extensive research will be conducted on passive and active environmental control systems because they will be vital to the success of year-round farming. An example methodology for implementing the new education curriculum will be provided to illustrate the feasibility of the program itself.

Design Methodology

The mixed methodology for researching the thesis will be conducted using a Concurrent Transformative Strategy. The direction and emphasis of the research will ultimately be guided by the Theoretical Premise/Unifying Idea and will occur throughout the duration of the project. Collecting, analyzing, and reporting of the information will occur throughout the thesis investigation, and will be integrated at various stages within the process. The information gathered will include both quantitative and qualitative emphasis.

Methodologies

The design methodologies utilized in the thesis investigation will be as follows:

I. Mixed Method Quantitative/Qualitative Analysis

II. Graphic Analysis

III. Digital Analysis

IV. Interviews with Farm-to-School Teachers and Administrators, Registered Dieticians (RD), and students.

V. Statistical data

Quantitative Research

I. Statistical Data
II. Scientific Data

Qualitative Research

I. Interviews and Surveys
II. Archival Search
III. Observation

Documentation

Documentation

Documentation of the research progress will be conducted throughout the entire investigation on a weekly basis. The documentation will help show the evolution of the research as it comes to fruition. Documentation will be maintained through various mediums including: sketching, journals, photographs, diagrams, physical and digital modeling, video, and audio recordings. The research will be backed-up and preserved on a weekly basis using a laptop hard-drive, external hard-drive, cloud storage, photographs, and digital scanning to insure that no progress is lost.

Submission

The final product for the thesis investigation will be made available in both a digital and physical copy for review. It will be made available for future scholars and interested parties on the North Dakota State University Libraries Digital Collection in the Architecture Thesis Institutional Repository.

Presentation

The final presentation of the thesis investigation will involve an oral presentation supplemented with a digital presentation. Physical models will be created to offer a tactile representation of the project. Physical boards and images will be created to clarify and illustrate important or interesting aspects of the thesis project.

Schedule

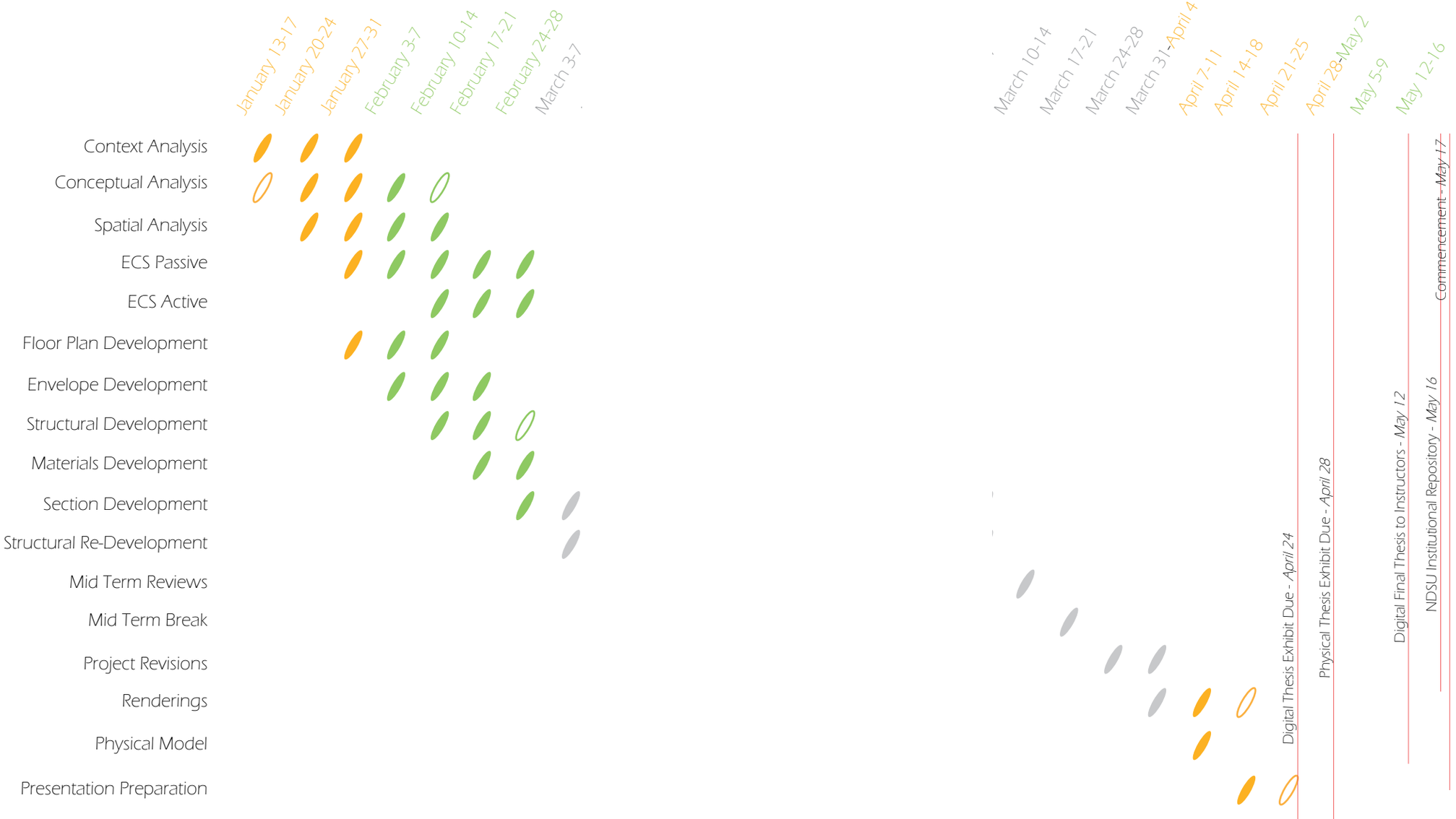


Figure 9 - Thesis Schedule
Josh Muckenhirn

Previous Work

ARCH 271 - Vorderbruggen

Fall 2010

Teahouse
Boathouse

ARCH 272 - Urness

Spring 2011

Montessori School
Birdhouse
Dwelling

ARCH 371 - Schwaen

Fall 2011

Zombie Safe House Competition
Snow Symposium
Artist in Residence

ARCH 372 - Christenson

Spring 2012

NDSU STEM Building Proposal

ARCH 471 - Aly Ahmed

Fall 2012

High Rise Competition
*Received First Place
DLR Competition

ARCH 472 - Faulkner

Spring 2013

Hope's Journey Educational Campus
Marvin Windows Competition

ARCH 771 - Dr. Ganapathy

Fall 2013

Graduate Research Assistant
*In conjunction with RL Engebretson Architects

Previous Work

Figure 10.1 - Birdhouse
Josh Muckenhirn

Figure 10.2 - High Rise Rendering
Josh Muckenhirn & Jakob Lawman

Figure 10.3 - High Rise Model
Josh Muckenhirn & Jakob Lawman

The Program

Research Results

A youth oriented culinary education center can contribute to improving the health of future generations by empowering youth to make informed Gastronomic decisions before they become trapped in the cycle of "fast" and processed foods that has been branded into them by today's society.

...engage the children...

There is no doubt the meaning and value placed on nutrition has changed in the last century. Recently, sickness and physical ailments associated with poor nutrition and eating habits have been on the rise. Nutrition-related diseases and conditions cost the nation a colossal $1.18 Trillion (with a "T") annually in health care costs (Hoggle, 2012). Many people tend to seek help after the fact – which is exactly what increases the health care costs. In order to fight this epidemic, we must start at the beginning – by educating the youth. Today, much of the nutrition education is provided by schools, but this education is severely lacking. As it stands, the nutrition education offered by many schools simply spews lackluster facts and tables at children who have a hard enough time as it is sitting at a desk for hours on end. In order for the information to stay with the children in a meaningful way, it needs to engage the children and make them actively participate. Students will not fall asleep and daydream because they will be actively involved – keeping their mind and body active. This leads to increased information retention.

> *"Knowledge alone has proven ineffective in altering eating behavior, but the offering of hands-on cooking and tasting demonstrations appears to be far more encouraging" (Horodynski, Hoerr, & Coleman, 2004).*

...realize there is a difference...

On average, student attention spans in lectures are about 15 minutes long. In classes that last over an hour, students are not retaining necessary information simply because they cannot focus for that amount of time. By breaking up the monotony of lectures and engaging students actively in the education, the students will be much more likely to retain the information (Prince, 2004). Richard Hake, a professor at Indiana University, conducted a study of 6,000 college students to understand the effect active learning has on information retention. According to the study, "test scores measuring conceptual understanding were roughly twice as high in classes promoting engagement than in traditional [lecture-based] courses." By incorporating hands-on culinary education with the fact-based nutrition education program, children will gain a more holistic understanding of healthy eating habits.

Today, a majority of foods purchased and consumed are highly altered and processed – often times greatly reducing their nutrition. It must be clarified that not all "processed" foods are inherently unhealthy. Technically speaking, every time food is cut, sliced, cooked, et cetera, it is being processed. Minimally processed foods – such as bagged spinach or chopped vegetables – retain a majority of their nutrition (Denny – Md, 2013). The highly processed foods are the ones to avoid. Educating youth to distinguish between the two (and to simply realize there is a difference) can make a major impact on their eating habits and preferences.

Cooking - The Lost Art

Over the past century, cooking habits and techniques have drastically changed to fit a completely different generation – and not necessarily for the better. In 2010, Neal Barnand, MD, published a detailed analysis in the American Journal of Clinical Nutrition regarding how eating habits have changed since 1909. In the past 100 years, we have increased our meat consumption by seventy-five pounds annually, cheese consumption by twenty-five pounds annually, and oil consumption by fifty pounds annually. These dietary changes have led to increasingly unhealthy lifestyles – causing many dietary illnesses and ailments. A majority of these dietary changes have been related to industrialization and the invention of food-processing. The fast food industry began in 1921 when White Castle first opened its doors. Since then, fast food has grown exponentially to an unprecedented level. One of the greatest impacts industrialization had on the food industry was the creation of pre-packaged, ready to eat meals that simply had to be slapped into the microwave and nuked. The convenience factor associated with these meals was enticing to mothers at the time who had to cook for an entire family by themselves. Less time in the kitchen meant more time for themselves. This led many families to adopt pre-packaged, processed foods in lieu of home cooked meals which utilized more natural ingredients.

...increasingly unhealthy lifestyles...

Mothers, who traditionally did most of the cooking, are no longer making meals as they did in the past. Because of this, culinary and cooking knowledge is no longer being passed down from generation to generation – causing the knowledge to be all but lost. What has resulted is a society completely oblivious towards preparing a meal for oneself, causing cooking to be seen as intimidating to many. The media and marketing have also contributed heavily towards creating a sense of unfamiliarity in the kitchen.

This highlights one of the major barriers to home cooking, and one that can be easily overcome with experience. Individuals do not have confidence in their cooking skills which causes many to opt for pre-packaged meals or going out to eat. Deb Perelman – renowned food bloggist of the Smitten Kitchen – released an online questionnaire asking individuals why they were "afraid" to cook. From this survey, Deb created a list of the top recurring cooking phobias:

1. Our mother/mother-in-law cooks it better.

People opt not to cook for themselves – especially at family gatherings – because they are afraid their dish will not live up to the "standard". The lack of cooking confidence leads many to believe that they cannot cook, even before they try.

2. The food police scared us.

We are constantly bombarded with food safety precautions warning us to properly cook our meals. If individuals are never taught how to properly cook safely, the warnings and precautions will instill a fear in their minds, causing them to avoid cooking altogether.

3. The dish did not turn out very well the last time.

Individuals who are not experienced at cooking may be discouraged after one "failed" attempt. Practice makes perfect. Although perfection is rarely achieved in any aspect of life, practicing a skill will inevitably improve it.

"The packaged foods industry did more than just create a sense of inadequacy among home cooks. In research we conducted we found that people's uncertainty didn't just stem from the fact that home cooking seemed too difficult and inconvenient but from a lack of trust...People no longer believe in themselves." *(Shapiro, 2010)*

Figure 11 - Swanson TV Dinner
http://www.yibei.com/book/4f21340f7e021e33400a3b77

It's hard to get our head around the steps. 4.

If one is not versed in cooking techniques and vocabulary, it is easy to see how cooking can be seen as an untamable beast. By introducing simple cooking techniques and vocabulary into the education program, following recipes will seem much more manageable.

We're afraid of wasting an expensive ingredient. 5.

There is no doubt that certain ingredients can be quite costly. If individuals are not fully comfortable working with a recipe, they may not want to risk spending money to concoct an unpalatable dish.

Our skills aren't where we wished they were. 6.

People tend to avoid cooking simply because they are not happy with their cooking abilities. If individuals were more educated and experienced in cooking techniques, they would be more likely to cook for themselves.

By educating children at an early age, we can help eliminate many of the leading cooking phobias preventing people from preparing a meal for themselves. Children will not only know the factual, objective knowledge of food and nutrition, but how to apply that knowledge in their daily lives. The Edible Schoolyard, located in Berkeley, California, is attempting to lead the way. It involves an organic garden which the students take care of, a kitchen classroom which teaches students how to prepare everyday meals using the ingredients harvested from the garden, and community programs meant to get the parents involved by offering evening and weekend cooking classes. This not only teaches children a necessary life skill, but it also makes cooking a family experience.

The Subconscious Appetite

Psychology plays an integral role in individuals' eating behaviors and habits, and can offer insights into why people eat and act the way they do. In order to fully understand how to alter society's eating habits and overall view of nutrition, we must study the underlying reasons for these habits and views. By understanding why we eat the way we do, we can use that knowledge to realize what needs to change. Individuals will be able to see past the subconscious influences that affect what and how much they eat, and take complete control of their nutrition.

...take control of their Nutrition...

Color has a much larger effect on our eating behaviors than one might initially realize. Every color influences us in a different way, and understanding these differences can help to understand our tendencies – allowing us to take control of them. Red, for example, tends to increase blood pressure, heart rate, and energy. This equates to an increased appetite and rate at which we eat. Yellow has a stimulating effect by increasing energy and attracting our attention. This also leads to an increased appetite and rate of consumption. Because of this, many fast food restaurants tend to use bright reds and yellows within their building and on their packaging in an attempt to influence our behaviors. In contrast, the cool colors – blue and green – tend to have a calming and relaxing effect on us, causing us to slow down (Singh, 2006). Simply realizing the different effects colors can have on our tendencies and behaviors, we can reduce the influence colors have over us. One application of this knowledge would be to paint home kitchens and eating areas with cool colors as opposed to warm colors. The cool colors will create a more relaxing environment which will cause the individuals to eat at a steadier pace.

By slowing down, we tend to eat less because it often takes on average twenty minutes for our bodies to realize that we are full (Miller, 2011). Unfortunately, most Americans do not give themselves ample time to realize this sensation. According to Brian Wansink – author of *Mindless Eating: Why We Eat More Than We Think* – if we eat alone, Americans tend to spend on average eleven minutes in a fast food restaurant, thirteen minutes in a work-place cafeteria, and twenty-eight minutes in a moderately priced restaurant. If we compare these measly durations to that of the average European mealtime, we immediately see a stark difference. Europeans often have up to two full hours for their lunch "hour", which gives them the necessary time to eat at a comfortable pace and actually feel when they are satisfied (Patenaude, 2013).

...we do not listen to our bodies...

Because we do not listen to our bodies, we [Americans] are much more susceptible to external cues. Brian Wansink conducted a survey to determine when people – both from America and Europe – decided to stop eating.

> *"Parisians reported that they usually stopped eating when they no longer felt hungry. Not our Chicagoans. They stopped eating when they ran out of a beverage, or when their plate was empty, or when the television show they were watching was over. Yet the heavier a person was – American or French – the more they relied on external cues to tell them when to stop eating and the less they relied on whether they felt full." (Wansink, 2007)*

Because we are influenced by external cues (in general), perceived portion sizes have a significant effect on the amount we eat. This effect is increased while eating in a distracting environment such as a fast food restaurant, in front of the television, or at a movie.

...increased Nutrition and overall health...

A distracting environment can reduce a person's ability to accurately monitor how much they eat, and it may lead them to over-rely on visual cues (such as the fill level in a bowl) to determine when to stop eating. An overreliance on such visual cues could lead them to overeat because they are inattentive to food intake and satiety. For instance, if a person intends to eat one-half of a bowl of soup, the amount of the soup remaining in the bowl provides a visual cue that indicates whether he or she should continue eating or should stop (Wansink, 2007).

Yet another study conducted by Wansink and his graduate students at the University of Illinois tested the amount of popcorn consumed at a movie theater when the viewers were given a large versus a medium size portion. At the end of the movie, the average movie-goer consumed 53% more popcorn if eating from the large bag compared to those who ate from the medium. Using this information, one can see the subconscious empty calories that can be consumed by not fully understanding the effects of perception. We can take this information, learn from it, and know how to see past the marketing ploys in order to gain a greater connection with ourselves. This will ultimately lead to increased nutrition and overall health.

Indoor Farming

Many foods are processed to prolong shelf life and ensure "freshness" as they are transported across vast distances. One solution which has been provided for this problem is indoor and vertical farming. Indoor farming has the potential to offer fresh vegetables and produce year-round – even in inhospitable environments such as is seen in Minnesota. The long and cold winters translate to a decreased growing season for most vegetables, which forces grocers to purchase foods produced hundreds, even thousands, of miles away (Keener, 2003). This creates the need for certain processing techniques to ensure the foods do not spoil during transportation. By growing food locally, foods can be served fresh without the need for major processing.

...without the need for major processing...

> *"Vertical Harvest is situated on a site that is 1/10 of an acre. Due to the efficiency of hydroponics and our innovative growing carousels, the greenhouse's production will be equivalent to that of 5 acres of traditional agriculture."* (Vertical Harvest, 2013)

This equates to a 5000% increase in potential capacity compared to the required land! Because of the vast potential indoor and vertical farming offer, research into the subject has increased dramatically over the recent years. One of the cities leading the way is Chicago, Illinois. Chicago is home to the nation's largest indoor vertical farm project – FarmedHere. The facility is packed with grow beds that are stacked 5 to 6 high! FarmedHere is taking indoor farming to a whole new level, and proving that its potentials are not limited to small-scale production.

It is growing enough produce to supply local groceries, restaurants, and even individuals. The process is drastically decreasing transportation costs – including monetary and environmental – and feeding the local community. The facility plans on expanding the available grow space, and they are anticipating having 150,000 square feet of grow space by next year. (

For those who are skeptical of the economics of indoor farming, FarmedHere retorts that they will eventually be producing nearly all of the energy needs of the facility by harvesting methane released from the growing process. This will be used as energy to heat and cool the facility along with creating electricity to run the lighting systems. FarmedHere plans on harvesting up to 1 million pounds of produce annually when their final stage of development is complete early next year.

Energy efficiency of various lighting systems used in indoor farming has increased dramatically in the past few years. Research has produced results that are more than promising. Recently, a ground breaking discovery has been uncovered that may reduce lighting costs to a fraction of its current price. LED lighting has been on the rise for a couple reasons. LED lights run much cooler than traditional lighting – even compared to fluorescent – so they can be placed directly against the plant itself without damaging the plants.

> *"Recently, Mitchell [Purdue University] and his graduate student designed a 9-foot-tall tower of lights and grew tomato plants right up against it."* (Michaeleen Doucleff, 2013)

This greatly reduces space needs by compacting the entire system while saving cost by cutting the cooling load. LED lights also give the ability to control the wavelength and color of the light being emitted. This allows for optimal growth conditions because research has shown that a majority of the light plants use is in the form of red and blue light. The other wavelengths (O,Y,G,V) are often rejected by plants during photosynthesis, so that portion of the light is essentially wasted in the process. By honing in on the specific wavelengths plants use during their various stages of development, growth rates can be increased and energy saved.

> *"Plant's photosynthesis machinery is tuned to absorb red and blue light most efficiently. They have a handful of other pigments in their leaves that catch other wavelengths, but the red and blue wavelengths are the big ones, supplying the majority of the light needed to grow. So why LEDs? They're super energy efficient in general, but unlike traditional greenhouse lamps, they can be tuned to specific wavelengths."* (Michaeleen Doucleff, 2013)

Indoor farms could essentially have a 24 hour grow period compared to the normal 8 to 12 hour period from sunup to sundown. The lighting would be turned off during the day as natural daylight would provide a majority of the lighting needs, but as the sun went down, the magenta colored LEDs would be turned on to allow for continuous growth.

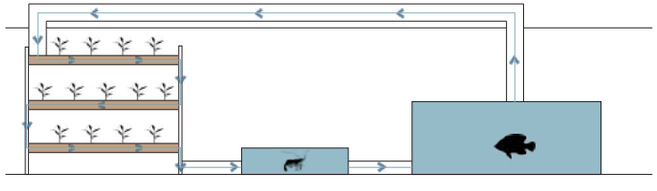


Figure 12.1 - Indoor Farming Diagram
Josh Muckenhirn

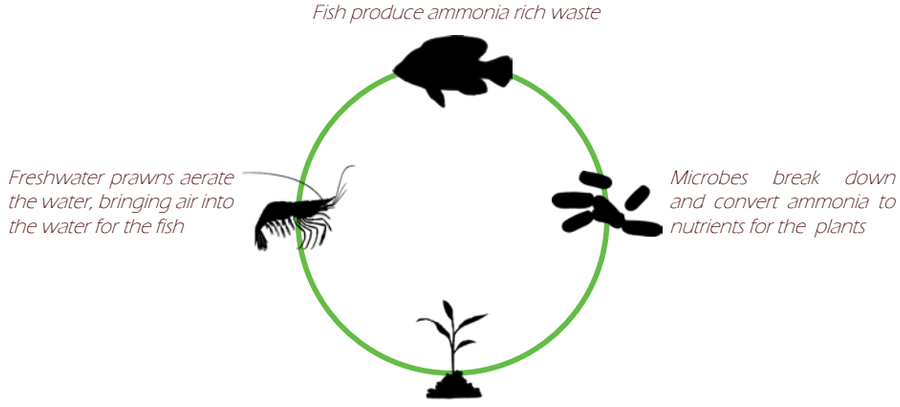


Figure 12.2 - Indoor Farming Processes
Josh Muckenhirn

To supplement the advanced lighting of the facility, an aquaponics systems could be utilized to save even more energy by offering a closed-loop system requiring virtually no outside resources apart from the start-up cost. Aquaponics have recently begun to catch steam because of their potential impact on the indoor farming industry. The system is a closed-loop system, meaning it will essentially require no outside resources to function – it will maintain itself. The system usually contains the plants being grown, tilapia, and occasionally freshwater prawns. Figure 13.1 illustrates the basic principles behind an aquaponics system and how all the pieces supplement each other.

> *"Here's how it works: Plants are grown in beds stacked as much as six high by using a mineral-rich water solution which is derived from tanks of hormone-free tilapia offering up nutrients to the plants in a controlled environment that ensures optimal growing."* (Huffington Post, 2013)

Basically the only input required would be fish feed. Otherwise, system maintenance is required once in a while to harvest the fish, plants, and clean the tanks. Aquaponics offers an extremely potent addition to the facility because it will cut down on operations costs and inputs while offering fresh fish to sell and use in the kitchens.

Economics of Cooking

Of course, one of the most notorious barriers to practicing nutritious lifestyles is the perceived cost. It is believed that eating healthfully comes with an increased price-tag – but this viewpoint is largely flawed. *"In general, there is not a strong relationship between nutrient intake and income level" (Senauer, 1986).* This is because although certain foods do cost more, every major nutrient can be obtained from a variety of sources – many of which are easy on the wallet. By educating individuals in regards to these alternative food options, we will ultimately increase their likelihood of adopting healthier lifestyles.

...there are alternatives to acquiring...nutrients.

When people are told to eat healthy, they are immediately skeptical because of the perceived price tag associated with it. It is true, many healthier, more natural foods do tend to be more expensive than other foods, but there are always alternatives to acquiring necessary nutrients. Today, interest in these alternative foods and methods of cooking are gaining popularity as more and more television shows are being put on the air targeting the economically conscious. *Ten Dollar Meals* with Melissa d'Arabian is one of those series. Her show is centered on preparing a meal for four or more people while spending less than $10 to purchase all the necessary ingredients. Her show exemplifies the possibility of cooking a Nutritious meal at home without breaking the budget. There are organizations dedicated to eradicating the notion that eating healthfully is expensive and a luxury enjoyed by an elite few. The *Share Our Strength Foundation* has created a program called Cooking Matters that strives to expose people to budget friendly recipes that are also quick to make.

A study conducted by Jane Dornbusch of the Boston Globe tested to see how much more eating at home really costs. Jane first went to an Outback Steakhouse restaurant and ordered a full steak dinner with an upgraded side of asparagus. The price for two: $47.68, not including tip. She then went home and prepared the meal herself, replicating every detail as close as possible. When all was said and done, her grocery bill came to $45.86 – but there is more to this than meets the eye.

> *"The cost per meal at home wasn't $22.93 (half of the grocery bill), not even close. I made only a small quantity of soup, and it was still the equivalent in volume of about four restaurant servings. Cost per serving of soup: 70 cents. And so it was for the rest of the menu. Yes, I had to buy a whole head of romaine and a whole head of iceberg for the salad, but that gave me enough lettuce for a week's worth of salad, not just one meal. Cost per serving of salad: $1.66. All told, the at-home meal prepared for two came to $11.84 per person. The meal per person at the Outback: $23.84. Eating at home: the winner." (Dornbusch, 2013)*

So, when considering the true cost of cooking at home, one must remember that recipes rarely use up the entire portion of purchased food – there will be leftovers that can be prepared into different meals. This significantly reduces the cost per meal when cooking at home. That study did have a flaw however. When people are looking for a cheap meal to save some money, they are not going to go to an Outback Steakhouse and enjoy a meal fit for a king. They will most likely run through the drive-thru at the closest fast food restaurant. How can home cooks compete with a $3 meal found at many fast food chains? *The answer may surprise you.*

"Don't eat fast food because you believe it to be "cheap." The only real advantage of fast food is convenience – in the end, it has almost nothing to do with money. In fact, if you choose anything but the absolute best value on the menu – which the McDonald's double cheeseburger might be – it's going to be far more expensive to eat fast food than eat at home." (Hamm, 2007)

...equates to...$100 in savings per month...

From personal experience, I can say that cooking at home saves an immense amount of money. I have kept a personal budget for the past 3 years, and I have recorded every single time I buy food at the grocery store and eat out. Over the past three years, I have budgeted (and stuck to) roughly $175 per month on groceries. It must be noted that I eat more than the average person; on a daily basis, I eat three main meals, and three smaller "snacks". Of course, there are months where the bill exceeds the $175 goal, but there are also months that fall below the $175 – it all balances out. When comparing this to an average meal at a fast food restaurant of $3-$5 (with a main course and drink), the monthly costs begin to rack up. $3 per meal would cost roughly $10 per day including tax. That comes to $70 per week, and about $280 per month (considering an average of four weeks per month). This *equates to an average of $100 in savings per month* by cooking at home! The gap in savings only widens when cooking for numerous people at once because one can take advantage of economies of "scale".

The second cost consideration for cooking at home is the time it takes to prepare the meal. Many individuals opt for fast food because they believe cooking at home will always take more time than swinging through a drive-thru.

Although it may be quicker to purchase a pre-made meal, cooking can become a family event. Who would argue that spending quality time with their family is a negative when our lives are becoming more and more crammed? There is also a plethora of resources on the internet that offer recipes requiring less than 30 minutes to prepare. It must also be noted that cooking for one person will take roughly the same amount of time that it takes to cook for a family of four – yet again benefiting from economies of scale.

FT Bletsas, a food expert, TV show host, and culinary writer from Greece has compiled some *"Rules for Cooking Economically"*.

1. Plan your meals and organize your nutrition budget

By planning ahead, immense amounts of time and money can be saved. If meals are planned ahead, time can be saved by purchasing all necessary ingredients in one trip. Organizing a food budget is a must as it will physically show people how much they spend on their meals. This will cause people to make more budget-conscious buying decisions rather than being caught up in one of the many marketing ploys meant to capture your attention.

2. Learn how to cook, eat at home and increase your Food IQ

By learning how to cook, people will inevitably be introduced to new foods and ingredients which they previously did not have knowledge of. The more ingredients one knows, the more recipes that are possible.

3. Cook economically and base your meals in cheap, nutritious foods

Cooking nutritiously does not require breaking the budget. Frozen chicken breasts, noodles, rice, and frozen vegetables are examples of nutritious foods that can be bought for pennies on the dollar.

4. Eat less and seek quality over quantity.

Portion control is one of America's greatest criticisms when it comes to our eating habits. By controlling the amount we eat, we can save money while shedding the pounds.

Shop smartly and always buy local, seasonal food 5.

Prices of food items fluctuate seasonally. When an item is in season, the prices drop significantly because transportation costs will inevitably be reduced as the food is purchased at a closer location. Out of season foods require increased transportation because the food must be acquired from a distant location where the food is still in season. Berries, fruits, and vegetables are all very seasonally sensitive.

Conserve and preserve foods, use leftovers and never waste food 6.

Do not throw away leftovers! This is a chance to get creative and transform those leftovers into another meal. By saving leftovers, money can be saved by stretching the meal into something completely new.

Carry your own snacks and avoid processed foods or ready meals. 7.

Purchasing individual snacks on the go are often over-priced because they bring in the convenience factor. Money can be saved by always keeping a snack on hand for when you really need it.

Dine out selectively and never lose an opportunity to eat for free. 8.

Eating out has been misconceived as being cheaper than cooking at home. Money can be saved simply by eating out less often and opting to cook at home. (Bletsas, 2012)

A Culinary Education

"A young boy came up to tell us that there was a bone in his piece of chicken. He felt that there was truly something wrong – that the piece of chicken was defective in some way" (Diller, n.d.). This rather innocent story from a Farm to School program in Orono, MN highlights a major problem. Many young people are accustomed to eating foods that are so highly processed the foods lack any resemblance towards their original form. Children often do not know what foods are made of, or where they come from. *"Two generations have grown up in the shadow of industrial products and are no longer able to discriminate among foodstuffs..." (Petrinin, Slow Food Nation, p. 156).*By reconnecting children with food origins, young people will gain a greater understanding of the world around them, and provide them with the knowledge to make informed decisions on what and how to eat.

Today, much of the Nutrition education is provided by schools, but this education is severely lacking. As it stands, the Nutrition education offered by many schools simply spews lackluster facts and tables at children who have a hard enough time as it is sitting at a desk for hours on end. In order for the information to stay with the children in a meaningful way, it needs to engage the children and make them actively participate.

"Knowledge alone has proven ineffective in altering eating behavior, but the offering of hands-on cooking and tasting demonstrations appears to be far more encouraging" (Horodynski, Hoerr, & Coleman, 2004).

Students will not be able to fall asleep and daydream because they will be actively involved – keeping their mind and body active. This leads to increased information retention. On average, student attention spans in lectures are about 15 minutes long. In classes that last over an hour, students are not retaining necessary information simply because they cannot focus for that amount of time. By breaking up the monotony of lectures and engaging students actively in the education, the students will be much more likely to retain the information (Prince, 2004).

Richard Hake, a professor at Indiana University, conducted a study of 6,000 college students to understand the effect active learning has on information retention. According to the study, *"test scores measuring conceptual understanding were roughly twice as high in classes promoting engagement than in traditional [lecture-based] courses"*. By incorporating hands on culinary education with the fact-based Nutrition education program, children will gain a more holistic understanding of healthy eating habits.

Children enjoy getting their hands dirty and learning by doing – not sitting at a desk and reading from a textbook. Their minds are young and yearn for activity to stimulate their capabilities. One challenge to improving children's overall health is simply convincing them to eat more vegetables and to try new food items. Research has been conducted however that concludes children tend to eat vegetables that they had a hand in planting, harvesting, and preparing *(Morris et al., 2001)*.

...gain a more holistic understanding...

This phenomenon is in part due to a feeling of ownership and pride. When the children personally care for the plant, watch it grow, and harvest it, they feel a sense of pride and gain a certain familiarity with the plant. They have a better understanding of what it is and where it comes from, so they are more inclined to eat it when given the opportunity. Instructors at the Edible Schoolyard in Berkeley, CA have noted that students often times tend to simply pick a vegetable right out of the ground or off the plant and take a bite of it while walking through the school gardens. Their curiosity is peeked, and there seems to be something special about being able to eat a vegetable directly from the earth – an almost sacred act. An obvious objection many children have (along with many grown adults) is that vegetables simply do not taste good. There are a few ways to combat this restrictive train of thought. One method would be to simply introduce vegetables into children's diets at a younger age because it has been found that the more times children are exposed to new foods, they will be more willing to try them (Izumi, 2013). Another would be to simply educate society on methods of preparing vegetables to enhance their taste and palatability.

"Nevertheless, taste remains the most important factor in food choice. Therefore, we cannot expect consumers to change to more healthful food choices unless they also believe that those food choices taste good." (Guthrie et al., 1999)

In order to teach children that vegetables can taste good – depending on their preparation methods – children will begin to consume more vegetables without being forced to do so. Incorporating culinary education classes within the Nutrition education program will offer the missing link (according to Carlos Petrini): the *Pleasure Principle*. He argues that the Pleasure Principle is non-existent in the current school nutrition program, and this has a major impact on children's tendency to trying unfamiliar foods.

"The pleasure principle is deliberately ignored – not even considered. While rules of nutrition are correct and need to be explained, they are not enough on their own." (Petrini, Slow Food Nation, p. 154)

...not limited to young people...

According to Petrini, the Pleasure Principle is essential in order to acquire a holistic knowledge base for Nutrition. People can read all the Nutrition tables, textbooks, and labels in the world, but without actually experiencing how a food item tastes, the information will not be used to its full potential.

Although a culinary-based Nutrition education program must be taught in the school, that education does not have to be limited to young people. In order for the overall health of society to be improved, parents, individuals, young adults, and even today's teachers need to have a culinary background so they are able to pass the knowledge onto future generations while providing responsible Nutrition for today's generation. *"The new educational methods must therefore be taught to teachers, too. And it must be taught to parents, both young and not so young, the first children of that food-and-drink industrial revolution which has left us devoid of taste" (Petrini, Slow Food Nation, p. 156)*. Educating the educators will insure a quality education is passed onto the youth so the young people will have a solid culinary and Nutrition background which they will be able to continue into the future.

Theoretical Research Summary

As of today, the nutrition education offered by a majority of school systems is severely lacking in its scope. Static charts, tables, and textbooks are not enough to truly teach how to responsibly maintain proper nutrition while actually practicing it. By incorporating a hands-on culinary and farming program, children will become more engaged and retain greater amounts of information. By making Nutrition FUN, children will be prone to practice it in their daily lives on their own. For the most part, people have a basic understanding of what is good and bad for them, but they often times override this knowledge and opt for what is viewed as the "quick fix". Schools need to include another dimension to Nutrition by giving students a culinary experience by incorporating cooking lessons into the program. One of the greatest barriers to home cooking is the intimidation factor: people simply do not know how to cook. Because many people are unfamiliar with proper cooking techniques, they simply opt for an easier way out. Educating young people on cooking techniques that employ principles of proper Nutrition will ultimately increase the overall health and wellbeing of society. By actually showing people how to prepare and cook using wholesome ingredients, many of the fears associated with cooking will be alleviated altogether.

It is common knowledge that society's overall health and wellbeing are diminishing as Nutrition-related diseases continue to rise. This problem is not one that sprung up overnight – it has been a few centuries in the making. We must adjust our daily practices and behaviors in order to regain control of our Nutrition.

First and foremost, the inadequacies inherent in today's Nutrition education program must be realized and confronted. Once this acknowledgement occurs, we can begin to rebuild the foundations of society's health and wellbeing. Acquiring a sound knowledge base pertaining to the principles of Nutrition will help guide young people, but do little to actually motivate behavioral change. There must be another dimension added to the equation – firsthand experience. By examining underlying causalities concerning society's Nutritional state, we can understand methods for ultimately improving it.

Many of today's school systems are under equipped to offer such an educational experience. Architecture is created for a purpose – to provide spaces necessary to perform certain activities. Because the hands-on culinary education method is yet in its infancy, there simply are not facilities equipped to house such a system. In order for Nutrition education to transform into a lifelong process, a new type of architecture must be envisioned. A Gastronomic Architecture must be created.

Typological Research

Introduction

In order to combat the lacking nutrition education system, a whole new typology must be conceived to fully address the issue. Such a facility will require fairly unique spaces that are rarely found together under one roof. Because of this, three case studies have been chosen and examined to gain a more complete understanding of the theoretical premise, and to discover methodologies of addressing the problem statement. The projects being explored include PS 62 Richmond in New York, Shan Shui Grape Garden in Beijing, and Vertical Harvest in Jackson Hole. Individually, each case study emphasizes unique design solutions, but as a whole, the three projects offer a more holistic understanding of the thesis typology.

Figure 13 - Case Study Locations
http://www.oberlin.edu/external/EOG/OYTT/ch1.html

PS 62 Richmond

Project Type
K-5 Public School

Location
Staten Island, New York

Design Team
Skidmore, Owings, & Merrill

Size
Site : 3.5 acres
Building : 68,068 square feet

Program Elements
Classrooms
Offices/Administration
Cafeteria
Kitchen
Circulation
Mechanical
Greenhouse
Vegetable Garden
Library
Gymnasium/Event Space

Figure 14 - PS 62 Aerial
Karissa Rosenfield - Archdaily.com

Notable Characteristics
- 100-percent self-sustaining
- Extreme use of sustainable design solutions, both mechanical and vernacular
- Provides indoor and outdoor vegetable gardens for the purpose of supplementing the students' education
- Designed to serve 450 K-5 students

Research Findings

...net zero school...

PS 62 Richmond seamlessly blends education and crop production into a single project whose affect extends beyond its walls. Not only does the school educate the students who attend it, but the surrounding community also benefits from its construction. As do the other two case studies, the SOM project implements vegetative growth. The difference here is the vegetable gardens will educate young children by having them care for and harvest the vegetables produced. All three case studies acknowledge the importance of sustainable design principles, and showcase different methods of achieving such a feat.

SOM's answer to sustainable design is one that completely sustains itself – the building is designed to harvest and produce as much energy as it uses on an annual basis. The southern wall and roof will be nearly completely covered with photovoltaic panels to maximize the sunlight collected by the facility, and on its northern façade, the school will be capped with a green roof that is accessible to students, faculty, and staff. The school employs vernacular design principles by including a central courtyard which is surrounded by the enclosed, inhabited spaces. This takes full advantage of natural ventilation principles which decreases the reliance on mechanical systems.

Some of the other unique features of the building include:

> *"...an ultra-tight high-performance building envelope, daylit offset corridors, energy-efficient lighting fixtures, low-energy kitchen equipment, a greenhouse and vegetable garden, a geo-exchange system, energy recovery ventilators and demand-control ventilation, and a solar thermal system for hot water"* (Rosenfield, 2012).

Relation to and acknowledgement of the chosen site played an integral role in the overall design and success of the project. The site is located in a developed rural community at the intersection of Crabtree Avenue and Bloomingdale Road on Staten Island, NY. The building is situated on the site in such a manner that will maximize the amount of energy collected from natural sunlight. There is also an existing bus stop located less than one-quarter mile from the school entrance – allowing easy access to transportation to and from the facility for the surrounding community. Because PS 62 will be located within a residential neighborhood, the school will stand above surrounding buildings and act as a beacon for the surrounding community.

SOM's P 62 Richmond school project serves as an ideal case study for the thesis proposal as it offers insight into extreme sustainability practices. Because the thesis project will be a culinary school, many spaces PS 62 Richmond has will be similar to the thesis facility including a cafeteria, kitchen, kitchen storage, vegetable gardens, and classroom spaces. The project emphasizes the importance vernacular decisions – such as building form – have on the overall success of such a facility.

...one hundred percent self-sustaining...

PS 62 Richmond

Conclusion

Skidmore, Owings, and Merrill's P62 Richmond is a prime example of the possibilities of sustainable design. Although their solution to a prevalent issue in the built environment effectively eliminates all reliance on unsustainably produced energy, this method of design does not fit every design situation. Because Delano is a rather small city, the funds available will not be sufficient to construct such a technologically advanced structure. The design principles employed by SOM can however be used to learn from and improve the built environment. Although PS 62 in not complete yet, its inclusion of a student tended vegetable garden shows the possibilities of and interest in such a space.

Figure 15.1 - PS 62 North Facade
Skidmore, Owing, & Merrill

Figure 15.2 - PS 62 South Facade
Skidmore, Owings, & Merrill

Figure 15.3 - PS 62 Section

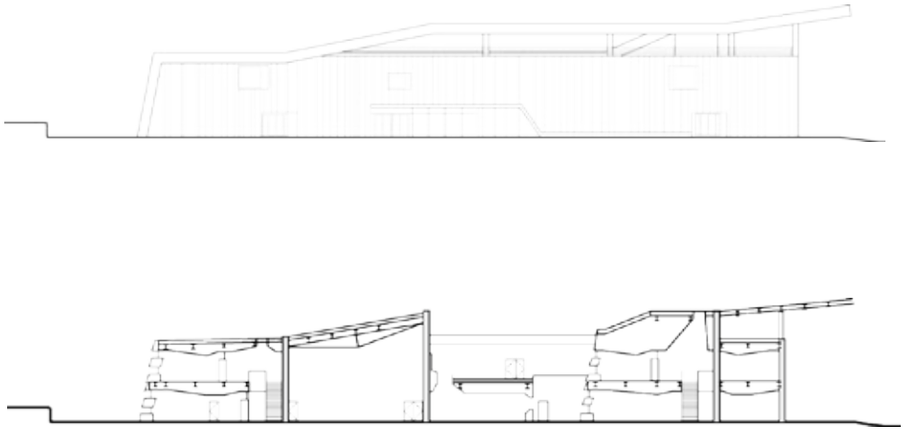


Figure 16.1 - PS 62 Plan - Section - Elevation

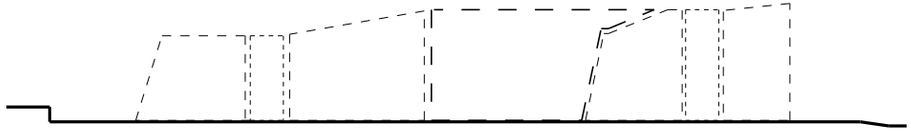


Figure 16.2 - PS 62 Hierarchy

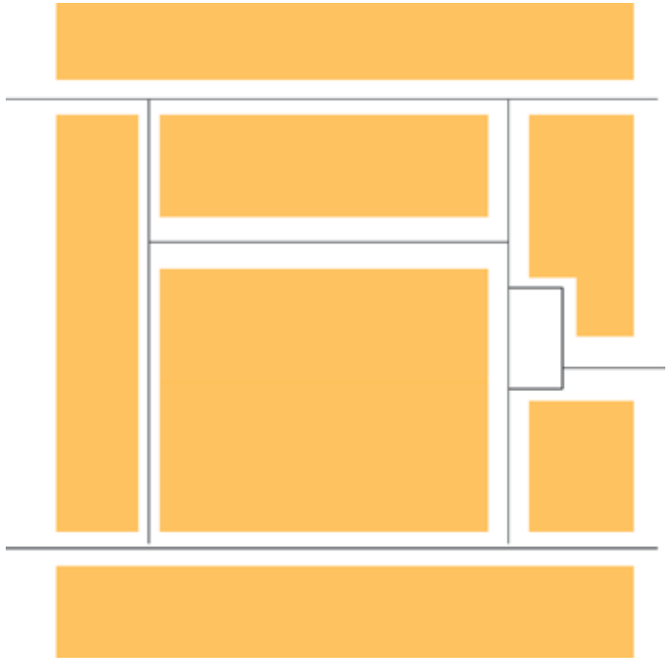


Figure 16.3 - PS 62 Circulation and Use

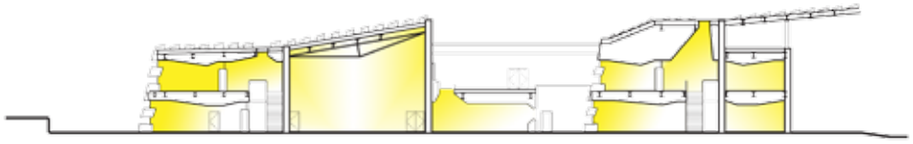


Figure 16.4 - PS 62 Structure and Daylighting

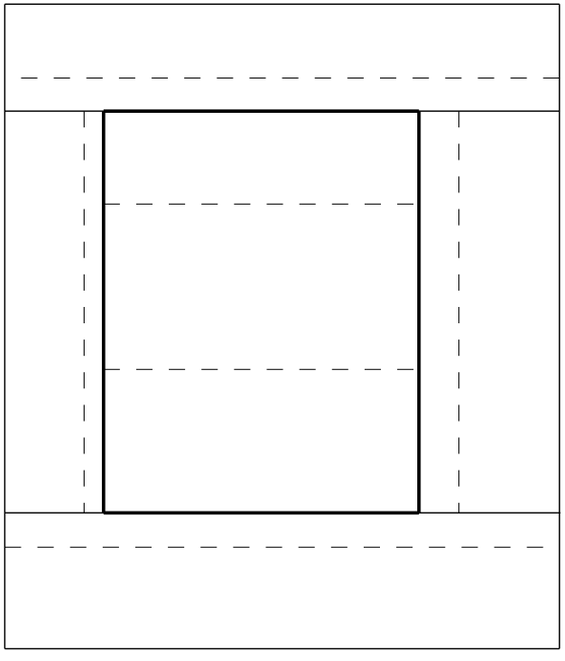


Figure 16.5 - PS 62 Geometry

Figure 16.6 - PS 62 Massing

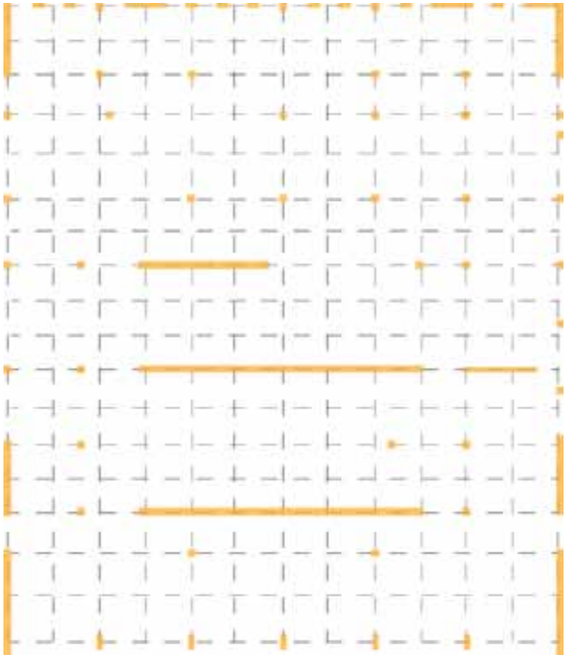


Figure 16.7 - PS 62 Structure

Shan Shui Grape Garden

Project Type
Greenhouse and Winery

Location
Beijing, China

Design Team
LocalDesign Studio

Size
Site : 3.8 square kilometer
Greenhouse : 14,000 square meter
Hotel and Restaurant : 5,000 square meter

Program Elements
Outdoor Park and Walking Paths
Greenhouse Facilities
Hotel / Restaurant
Information Center
Offices
Cafeteria
Bike Rental
Book Shop
Gathering Spaces
Vineyards
Mechanical Storage

Figure 17 - Shan Shui Perspective
Alison Furuto

Notable Characteristics
- Numerous large greenhouse spaces
- Expansive outdoor park and crop production
- Unique structural system
- Outdoor multi-purpose event space
- Involves the surrounding community by allowing local farmers to tend "traditional" greenhouses located near the facility

Research Findings

The Shan Shui Grape Garden takes a community based farm project to a whole new level. The facility offers both large scale indoor and outdoor farming which makes its program highly relevant and related to the intended thesis facility. Shan Shui fluently incorporates both indoor vegetable production with outdoor farming practices to create a facility which offers an example of how design can serve a community. Although Shan Shui's crop production is mostly limited to grapes for wine, the principles implemented to realize the facility can be transmitted to my thesis proposal. All three case studies are influenced by an underlying theme: education. Whether it be the students at PS 62 who tend for a vegetable garden, the community that purchases crops produced at Vertical Harvest, or visitors of the Grape Garden that gain first-hand experience of wine production, education remains a core goal. In this aspect, all three cases are related.

By examining Shan Shui Grape Garden and Vertical Harvest at Jackson Hole, it seems steel may be the material of choice for the structure of my thesis proposal. Steel allows for a light structure that has the ability to create unique spaces with the ability to span vast horizontal distances.

Both Shan Shui and Vertical Harvest take advantage of the unique qualities of steel as a structural material, but Shan Shui attempts to push the material properties to the next level. Shan Shui specifically highlights the possibilities of how the structure of a facility can simultaneously create unique and interesting spaces while fitting the specific needs of the typology.

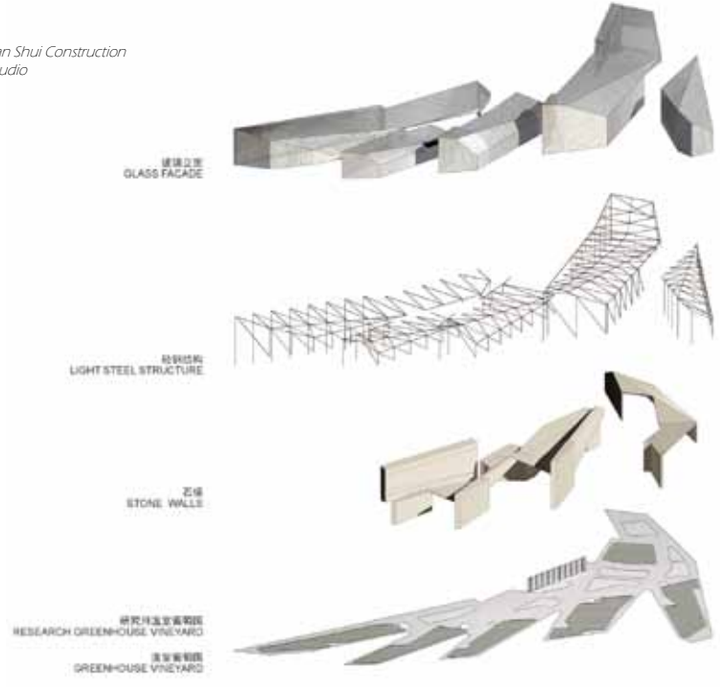
The Shan Shui Grape Garden has been deliberately placed on the site in a very particular manner. "The Green House develops along five sections corresponding to the five continents from which grapes are coming" (Furuto, 2012). The site not only informs the overall design – it dictates it. The project includes a vast park composed of numerous micro-environments meant to "promote a deeper understanding of the territory, local products and farming/production processes" (Furuto, 2012).

Conclusion

Shan Shui Grape Garden was studied as an example of indoor farming on a grand scale. The greenhouses located at Shan Shui are much larger than the other two case studies, and this brought a new perspective to the typology. The complex as a whole showcases how indoor and outdoor farming can be implemented to create a synergy unmatched by either alone. The facility does not include any classrooms, but what it lacks in necessary program requirements, it makes up for in its unique use of structural systems to create long-span spaces. The Shan Shui Grape Garden proves that greenhouses are not limited to uninspiring horizontal sheds, but can become something unique and beautiful to complement the landscape.

Figure 18 - Shan Shui Masterplan
LocalDesign Studio

Figure 19 - Shan Shui Construction
LocalDesign Studio



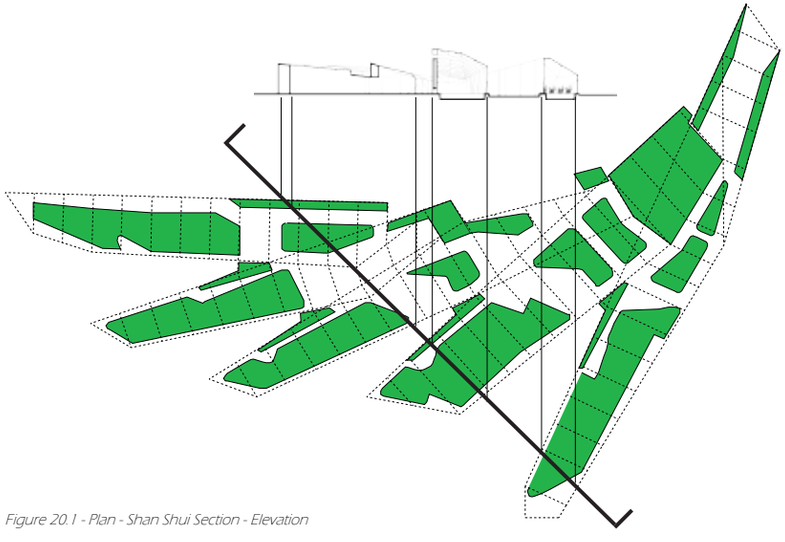


Figure 20.1 - Plan - Shan Shui Section - Elevation

Shan Shui Grape Garden

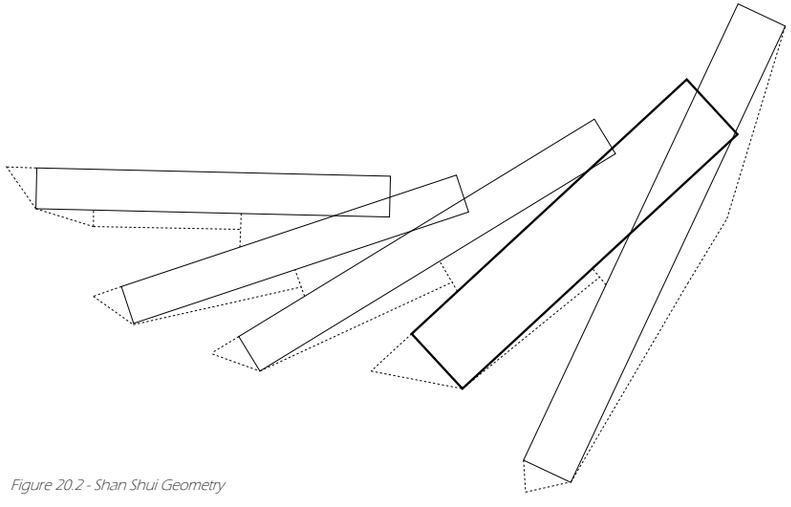


Figure 20.2 - Shan Shui Geometry

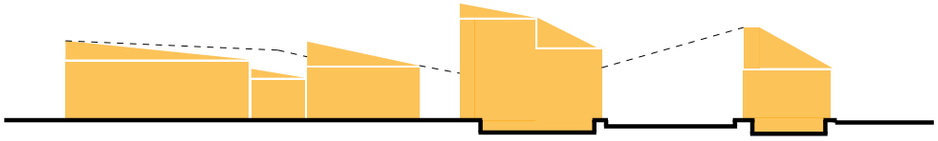


Figure 20.3 - Shan Shui Massing

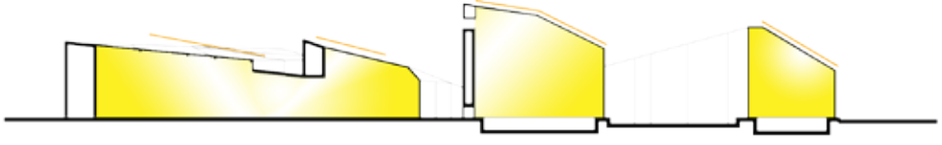


Figure 20.4 - Shan Shui Structure and Daylighting

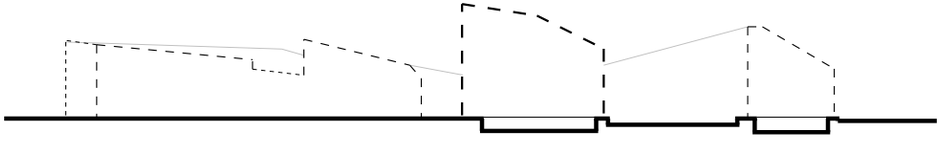


Figure 20.5 - Shan Shui Hierarchy

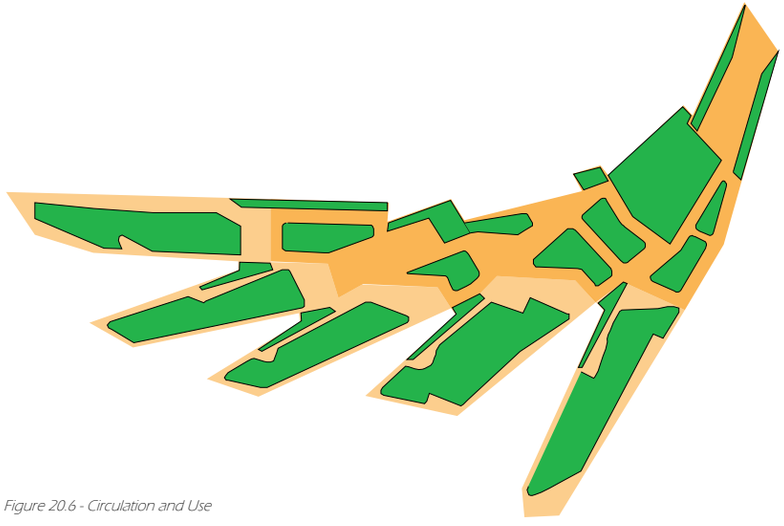


Figure 20.6 - Circulation and Use

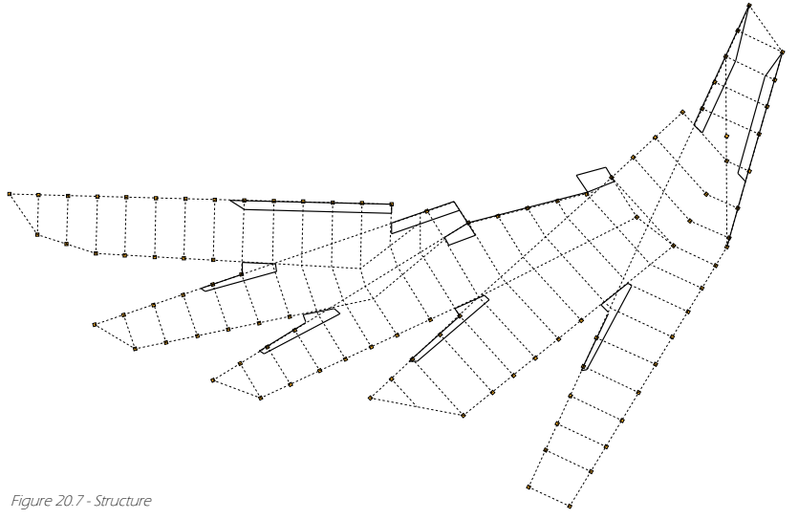


Figure 20.7 - Structure

Vertical Harvest

Project Type
Indoor Vertical Garden

Location
Jackson Hole, Wyoming

Design Team
E/Ye Design

Location
Site : 1/10th acre
Building : 12,995 square feet

Program Elements
Retail
Office
Preparation
Mechanical/ Irrigation
Restroom
Grow Space
Germination Room
Storage

Figure 21 - Vertical Harvest Perspective
E/Ye Design

Notable Characteristics

- Maximizes crop production by utilizing vertical farming
- Provides the community with fresh produce year round
- Sells produce to local groceries, restaurants, and markets
- Provides observation spaces so visitors can personally see the crop production and learn about its processes

Research Findings

The most unique characteristic of the Vertical Harvest project is its use of indoor hydroponic farming to grow vegetables all year long. This is an impressive feet considering Jackson Hole is a ski-town with a climate normally considered inhospitable to annual farming. The project actually began as a Kickstarter project - it successfully surpassed its goal of $30,000 and actually rose $36,000 for initial funding of the project. The facility has three main floors – all of which grow some variety of vegetable. The main crop will be tomatoes which will grow on the top floor. Vertical Harvest plans on selling the produce to the local community by supplying restaurants and local grocery stores. The estimated annual produce will include 44,000 pounds of tomatoes, 20,000 pounds of lettuce, 4,400 pounds of herbs, 10,000 pounds of microgreens, 7,500 pounds of baby specialty greens, and 4,725 pounds of strawberries.

Both Vertical Harvest and PS 62 take advantage of stacked grow spaces by incorporating vertical gardening. Vertical Harvest will utilize three levels of grow space where PS 62 has placed grow spaces on two floors. This technique is still in its infancy, and so, the expedition will be partly experimental. The grow spaces in Vertical Harvest as well as Shan Shui will be virtually completely unobstructed and glazed, allowing for maximum sun exposure which will inevitably decrease reliance on artificial lighting. This may potentially cut down on mechanical costs.

Vertical Harvest has been examined exclusively for its innovative use of limited space while maximizing grow area within an ordinarily inhospitable climate. The facility has been "attached" to an existing parking garage, proving such a project could potentially be placed virtually anywhere in a variety of environments. This is very promising considering Delano has a relatively restricted growing season compared to warmer climates.

A unique characteristic to the Vertical Harvest project is the idea of vertical farming. Although all three case studies include vegetable growing, Vertical Harvest is the only one that offers numerous stories of grow space.

The chosen site for the Vertical Harvest project is situated on a vacant parcel of land on the south side of a parking garage in Jackson Hole. The lot is currently owned by the city of Jackson Hole, and Vertical Harvest will rent the land for a measly $ 1 per year. Because of this, the facility will experience increased profitability compared to similar projects because the land acquisition costs and upkeep will be next to nothing. Unfortunately startup costs associated with such a facility can run rampant, so Vertical Harvest was fortunate to strike such an enticing deal with the city. In order to improve feasibility, decreasing land acquisition costs would be quite beneficial. Because the project is situated on the south side of the parking garage, its access to the natural sunlight will be uninterrupted and nearly direct. This will provide ample sunlight for the crops throughout the year.

The Vertical Harvest project is an ideal case study for the thesis proposal because it offers insight into how to successfully implement indoor vertical farming with restricted spatial allowances. Because the facility is on a smaller, more personal scale, it offers a greater understanding of grow spaces required, and the potential productivity per square foot of the space.

Conclusion

E/Ye Design has done something truly remarkable in creating the Vertical Harvest at Jackson Hole. The facility showcases how responsible design can lead to unimaginable results. The design makes use of an extremely limited space by utilizing vertical gardening alongside an existing parking garage. The grow space has been thoroughly thought out and designed to maximize vegetable production in an otherwise inhospitable environment not suitable for year round growing.

Figure 22.1 - Vertical Harvest Growspace
E/Ye Design

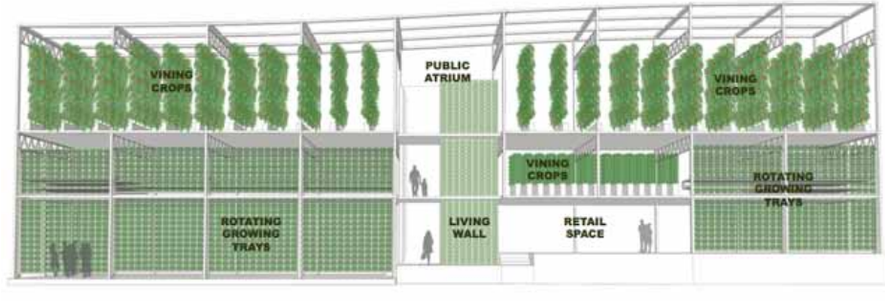


Figure 22.2 - Vertical Harvest Section
E/Ye Design

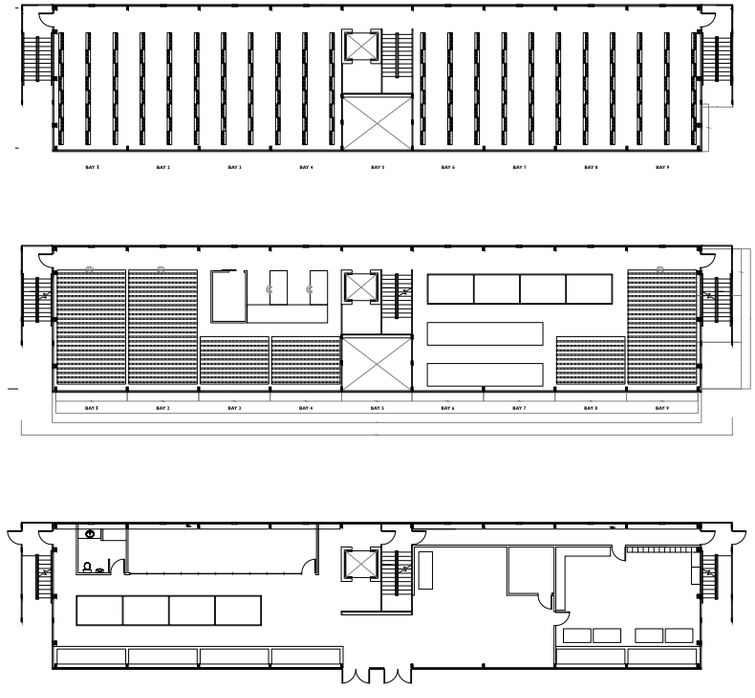


Figure 23.1 - Floorplans

Vertical Harvest at Jackson Hole

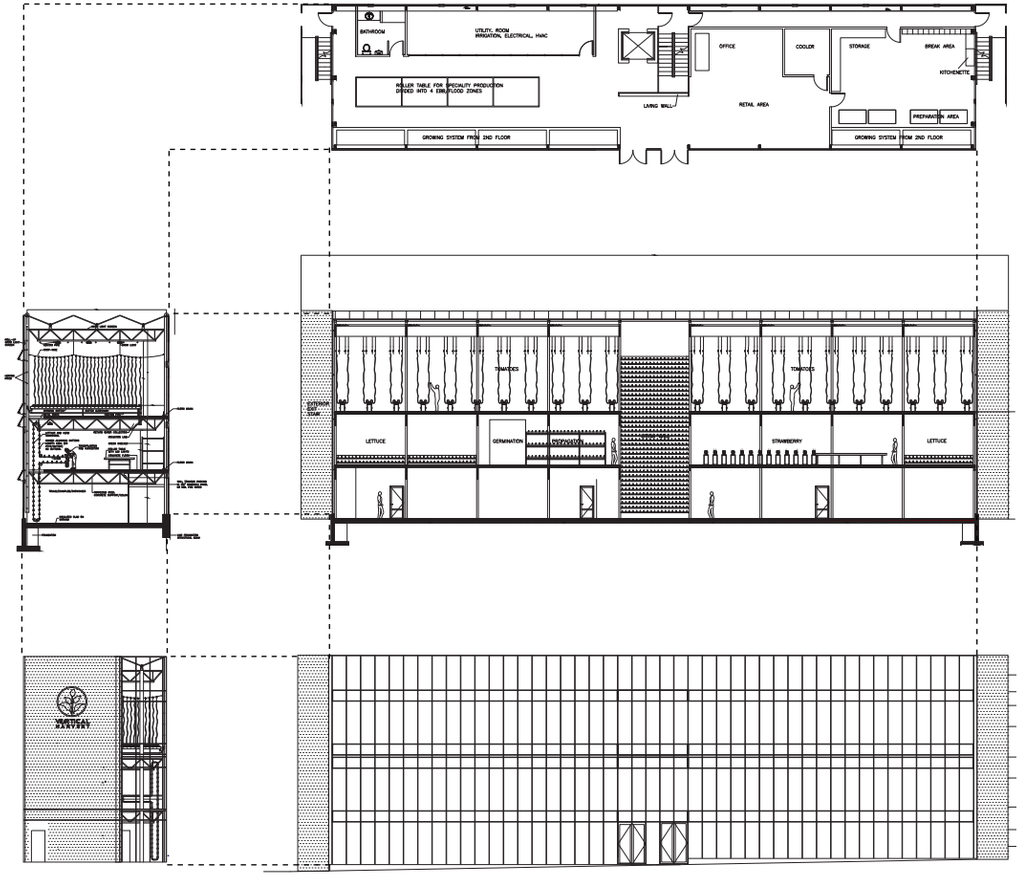


Figure 23.2 - Plan - Section - Elevation

Figure 23.3 - Floor Plan Structure

Figure 23.4 - Massing

Vertical Harvest at Jackson Hole

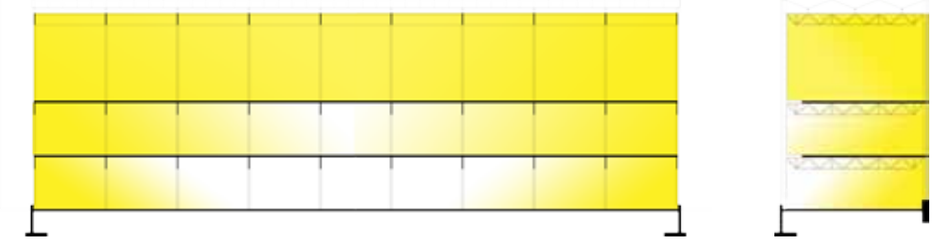


Figure 23.5 - Structure and Daylight

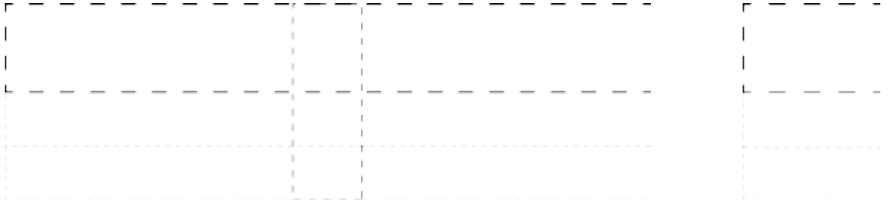


Figure 23.6 - Hierarchy

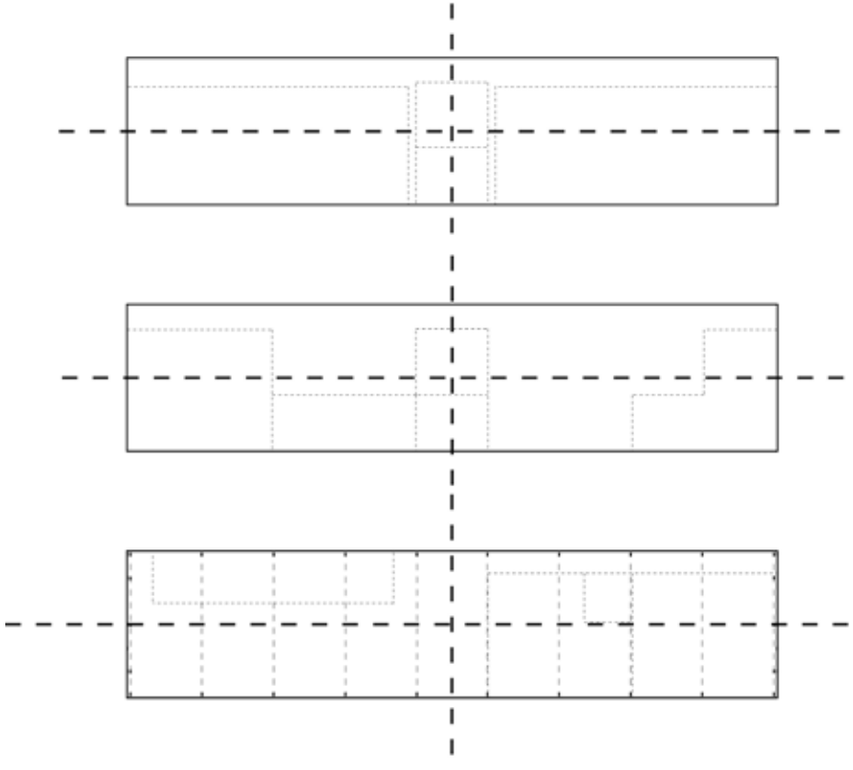


Figure 23.7 - Geometry

Vertical Harvest at Jackson Hole

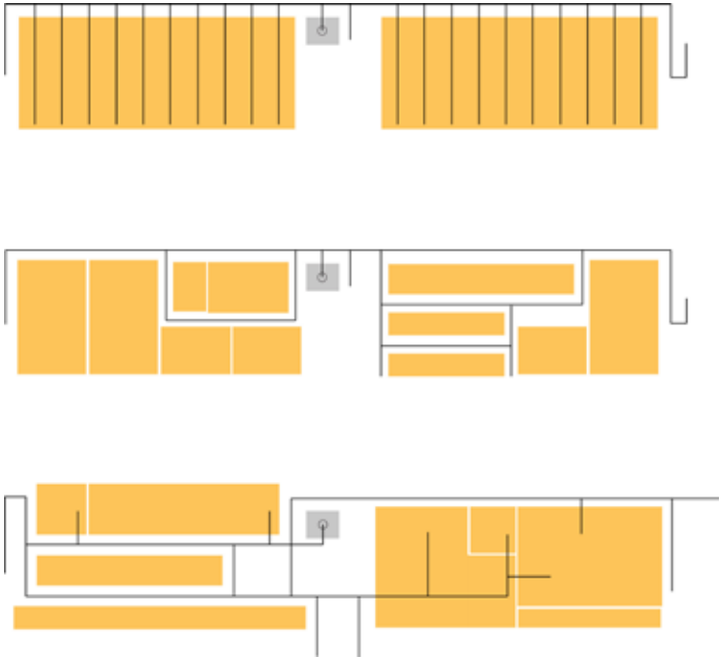


Figure 23.8 - Circulation and Use

Typological Summary

Three case studies were examined in length to acquire knowledge which will be used to inform the layout, spatial requirements, and theoretical underpinnings of my thesis proposal. These included PS 62 Richmond by SOM, Shan Shui Grape Garden by LocalDesign Studio, and Vertical Harvest by E/Ye Design. Although each individual study offered unique insight towards understanding the unifying idea, the three case studies taken together compose an invaluable asset to the holistic understanding of the issue at large. In addition to the three case studies listed above, there were a few additional projects which were examined including several culinary education facilities, restaurants, and NDSU's experimental indoor greenhouse facilities. (a personal tour of NDSU's facilities was graciously given to me by Julie Hochhalter who provided numerous resources proving to be of value) By examining the three cases and considering all outside information acquired, it can be reasonably concluded that a project such as my thesis is plausible, and can be successfully operated assuming some prerequisites are met. Responsible location of the facility, acquiring sufficient funds for the project, and an enthusiastic community and school district will ensure a successful outcome.

Because steel has the capability of creating intriguing forms and spanning vast distances while maintaining its structural integrity, its use as the main material in the structure of the facility will be highly considered. Compared to other materials such as concrete or masonry, steel weighs considerably less which may also benefit the facility. Indoor farming is not only plausible, but entirely possible, and vertical farming may be the best option for use on the chosen site because available space will not be in abundance. There will be little opportunity for future expansion as the site is partly restricted on three sides by the Crow River and North River Street on its southern border. This will increase the emphasis on intelligent spatial arrangement in order to achieve maximum productivity from the available square footage.

The three case studies are located in completely different environments around the world. Although there is definitely an ideal site and climate to improve productivity, the case studies illustrate how such a facility can be successful in a variety of environments. Northern climates undoubtedly have a greater need for year round, indoor farming due to their decreased growing season. This, climactically, is why Delano serves as an ideal location to test the project typology.

The examination of all the case studies illustrates the importance of human interaction with the architecture to ensure the greatest benefits of the typology are extracted. This ensures the relevance of architecture for generations to come. Vertical Harvest offered visitors the opportunity to experience how indoor farming actually occurs by including a viewing platform on each floor of the facility. This serves to generate interest in the building and processes taking part inside its transparent walls. The Shan Shui Grape Garden created meandering gardens visitors wandered through on their way to the indoor grape gardens. An outdoor gathering space was included in the project to offer an area to be utilized for events and social gatherings meant to draw visitors to the facility. SOM's PS 62 school on Staten Island was designed specifically to provide a space to teach the children attending the school, and at the same time, educate the surrounding community of the possibilities of sustainable design. Along with these, the cases offered a unique solution to sustainably growing vegetables year round whether it be indoor, outdoor, stacked, or consolidated to a single level.

Whether it be for young children, a very specific population of grape aficionados, or a small-town community simply interested in locally produced vegetables, at their core, all three case studies focused on education. At the end of the day, the thesis proposal revolves around education – an overarching education to reach all aspects of society in hopes of bettering our health and bringing back Nutrition.

Historical Context

Evolution of Cooking

What makes us human? This is perhaps one of the most profound questions of our time, and one that has occupied the minds of many. The answer may not be as difficult as some might think. Preparing and cooking a meal for oneself is a trait unique to Homo Sapiens – no other species takes the time and effort to do so. Is this perhaps what sets us apart from all other species, and did this act as the catalyst for our remarkable evolution?

Archaeologists recently discovered a cave in South Africa that may have the earliest evidence of cooking with fire – dating 1 million years ago.

> *"No one knows why, just 500,000 years later, a radically more advanced species — Homo erectus — emerged. Its brain was up to twice the size of its predecessor's, its teeth were much smaller, and its body was quite similar to ours. Wrangham credits the transformation to the harnessing of fire. Cooking food, he argues, allowed for easier chewing and digestion, making extra calories available to fuel energy-hungry brains." (Miller, 2013)*

Not only did it allow for easier digestion of certain foods, but it made other more unpalatable foods edible. The cooking process kills bacteria that may prove dangerous for consumption. By cooking food through, it cut down on illness that previously caused death. These dietary changes led to improved Nutrition which inevitably led to improved overall health – increasing the opportunity for an accelerated evolution.

> *"When you eat cooked food, you have access to many more calories than if you eat the same food raw…The combination of more calories and less complicated intestines means more energy can be devote to cogitating—hence H. erectus' relatively big brains, which suck up a lot of calories" (Anderson, 2012).*

Cooking not only improved our diets, but cooking around a fire inevitably led to prolonged socialization. Humans have always been a social species, and cooking only built upon this trait. As human society transformed from strictly hunter-gather into one of agriculture, their lifestyles became more sedentary. This allowed for more time to cook, advancing our culinary expertise. Cooking slowly became an ingrained part of everyday life.

As time went on, cooking practices were refined and flavors and seasonings added to increase palatability. The earliest known recorded recipes date back to the second millennium BC in Mesopotamia. These recipes were quite crude, often only including ingredients, not measurements or cooking times (Oliver, 2000). Recording recipes allowed individuals to "build upon" and "improve" the recipes by trial and error. In 1765, the first restaurant was opened by a Parisian named Boulanger, and as the story goes, he wrote "Boulanger sells restoratives fit for the gods" on the sign to his store. People soon discovered one could make a living selling their cooking techniques to the masses. From there, the restaurant business exploded to become what it is today – a necessity by many peoples' standards.

Food Processing: A Suburban Affair

The food processing industry can tie its roots back to suburbs of major cities, such as Delano, rather than the cities themselves. It was here that industrial plants were constructed due to relatively cheap land costs for the large square footages needed for the processing and packaging. The largest food processing company in Minnesota – and one of the largest in the world – was first conceived in 1866 on the banks of the Mississippi River when Cadwallader C. Washburn built two flour mills in St. Anthony Falls, MN. He grew his empire until 1928 when he decided to purchase several surrounding flour mills to become the largest flour milling company in the world – General Mills Co. Since then, General Mills has revolutionized the processed foods industry, creating and acquiring iconic household brands such as Betty Crocker, Green Giant, and Pillsbury Dough (General Mills Co., 2003).

The lure of the processed foods industry took off in the aftermath of WWII when American households were thriving and began purchasing televisions which would become the industry's largest method of advertisement. The packaged foods were brought to households around the country, and families began to view the convenience as being the epitome of American success. Everybody had to have them. Since then, an epidemic has swept the world resulting in people no longer cooking wholesome meals for themselves, but opting to purchase premade, highly processed foods with no regards to what the food actually consists of. All connections with our food were severed. This has undoubtedly led to increased nutrition related issues resulting in elevated health care costs and decreased well-being.

Figure 24 - Food Processing
http://schoolworkhelper.net/food-preservation-history-methods-types/

Today, home cooking is beginning to make a comeback as young families are realizing the negative effects of constantly consuming processed foods, and are making a conscious decision to eat more responsibly not only for themselves, but for their children. Unfortunately, much of the knowledge of cooking has been lost by today's generation, and has prevented many from adopting a more responsible diet. We must offer a method of educating tomorrow's generation by introducing knowledge of the origins of food as well as cooking techniques, and this must occur at an early age. Schools are a perfect place to start.

> *"It is the school which is seen as a vehicle for social and economic betterment. Its authority and the respect it enjoys in the community make it the logical place to disseminate recognition of the importance of nutrition in health and well-being and to teach the fundamental concepts of applied nutrition."*

The location must provide a few necessities to insure the survivability of such a program, and to prove that a facility such as this is viable. Once its use has shown to be effective, similar facilities may begin to appear as more school districts begin to realize the potential of such a facility. In order for the initial facility to be successful, the site must first lie within a community that is open to rather radical and cutting-edge education systems. The community must support the school system, as the people residing within the district play a vital role in acquiring funding for school programs. Delano has been known for its community involvement in the school system, with many parents playing active roles on the school board, and the school itself holds values which compliment such a radical change in the nutrition education system. These values have been held throughout the history of Delano's existence.

Delano: A History

The city of Delano has a rich and enticing history. Its humble beginnings were sparked in the late 1800s when the city of Minneapolis was booming and railroads were being constructed to connect surrounding townships to the great Twin Cities. Construction on the Great Northern Railway began in 1857 when the Minnesota and Pacific Railroad was chartered to connect St. Cloud and St. Paul via rail-line. Unfortunately, the MPR defaulted and a James J. Hill acquired the charter in 1881 who then took over the operation and expansion of the railroad. Today, the Great Northern stretches from Seattle, WA all the way to St. Paul, MN and is classified as a Class I Railroad signifying it is among the largest and most profitable rail-lines in the country. The Great Northern encouraged settlement along its rail-lines by German and Scandinavian immigrants because it operated agencies in those countries that promoted it, and offered to transport settlers to America for low cost if they were willing to farm along its rail-line.

Figure 25 - Historic Downtown Delano
http://www.delanomn.com/history

Figure 26 - Historic North River Street
http://www.delanomn.com/history

By 1868, steel rails reached what is now Delano – stemming from Minneapolis. This brought an influx of settlers, causing the village of Delano to swell. The village was initially named Crow River, and a local post office – the Crow River Station – was established. The villagers did not like this name however, and so, a name was agreed upon which would be in honor of a Francis Roach Delano of Massachusetts who was an enterprising superintendent of the railroad.

Many of Wright County's new settlers were of Scandinavian descent, but Delano became home to a majority of German and Polish peoples. The large trees of the area served as evidence of fertile soils, and many settlers saw a promising opportunity. With the increasing population, businessmen from larger cities began to enter Delano as its future looked bright.

Figure 27 - Historic Railroad
http://www.delanomn.com/history

As the presence of the railroad grew and more visitors passed through Delano on their way to various destinations, the hospitality industry in the city flourished. The city's first hotel was constructed in 1868 to accommodate the increasing number of visitors and was known as the Great Northern. After an addition was added to the structure, a Col. James D. Young purchased the building and made it become one of the finest hotels on the rail line. It became known for its renowned food and accommodations, causing Delano to become a popular resting point for travelers.

The late 1880's brought yet another boom in business for the city, but unfortunately, the town itself began to acquire a persona of "all work and no play". To combat this image, city officials decided to give back to the community by constructing a 4,000 square foot roller skating pavilion which became known as one of the finest outside a large city. Since then, the city of Delano has considered the community a priority, and has continued to supply numerous entertainment venues. City officials decided to increase funding for the annual Fourth of July celebration which first began in 1857. Since then, Delano's Fourth of July celebration has become the largest in all of Minnesota, beginning with a four day carnival at City Park, and culminating with a parade and extravagant fireworks display on the Fourth. Thousands travel through Delano specifically for the celebration, creating a major opportunity for the thesis proposal as it is located just north of City Park.

Delano has been seen as a "commuter community" because it lies directly on Highway 12 – connecting it directly to Minneapolis. The commute is a measly twenty five to thirty minutes (depending on the traffic) from Delano to Minneapolis, making Delano an ideal location for individuals who wish to remain near the cities, but desire a more rural community. In the early 1990s, the Minnesota Department of Transportation (MnDoT) threatened to reroute Highway 12 around Delano because the road was unfit to handle the amount of traffic traveling on it. Fortunately for the city, a massive reconstruction project was agreed upon and begun in 2007 with its completion ending in 2009. Due to the reconstruction efforts, the highway was widened and travel through Delano was streamlined. This directly led to increased commercial and residential growth in Delano because young families realized the benefits Delano had to offer, both professionally and personally. The past decade has brought the largest growth in population seen throughout Delano's history; the city's population boomed an astounding 42% and continues to grow. Because the city of Delano is thriving, is not overcrowded, and lies directly on a major route through the Twin Cities, it serves as a prime location for the thesis proposal.

Figure 28 - 1890 Delano Millers
http://www.delanoathletics.org/history.html

Goals of the Thesis

Professional

It is still unclear to me as to where exactly I would like to end up in the professional environment. For this reason, it is my goal that my thesis project will exemplify the full spectrum of my capabilities – from beginning research to final design skills. As of now, I do not see myself specifically being a lead Design Architect. That is not to say I will not design at all – I would simply prefer to become a Project Manager or deal with business transactions. Those roles seem to fit my strengths and interests more than purely designing. Because the issue being examined by my thesis is relatively unexplored, there are limited resources available for future studies. The world is dynamic and constantly changing – Architecture included. One of the most beautiful aspects of Architecture and the built environment is that is can be constructed and manipulated to fit a plethora of uses. As new issues are raised, such as rethinking Nutrition education, Architecture will have to adapt to fit the need. Due to the rather limited resources regarding facilities designed to provide spaces necessary for a reinterpretation of Nutrition education, it is a goal of my thesis to successfully provide one method for resolving this issue.

It is still not entirely clear to me whether I would like to work within the traditional Architecture profession or use my education to stem out into a related field. I am extremely interested in architecture, technology, health, nutrition, and cooking and so, hope to find a career that incorporates aspects of all these topics.

Academic

I have spent the last five years of not only my academic career but more importantly, my life, striving for an end goal that will ultimately culminate as a Masters of Architecture degree from North Dakota State University. I have spent countless hours away from home in an attempt to succeed in my endeavors. Because of this, my overlying goal would be to simply graduate and earn my Masters of Architecture degree and begin my professional career. It is my hope that my academic endeavors will lead to a fulfilling career which I am excited to get out of bed for. Keeping this in mind, I am determined to apply my best effort to create a project that I – along with others who view it – will find insightful and impressive. I will design the thesis with the intent of aiding future students and researchers studying a similar project typology because my thesis addresses a rather novel issue which currently has very limited applied research. Thus, it is my hope that my thesis will provide a unique and insightful perspective into a farm-to-school culinary education program and facility.

Personal

Learning is a lifelong process – it is not complete with the acquisition of a certificate. I have lived my life with the perspective that one cannot learn enough. Ultimately, I hope to extend my knowledge in the topics explored while producing a piece of work which I am proud of. I will put my entire effort into the thesis project until its culmination in the spring of 2014.

It is my desire that this thesis project not only educates readers on its content, but stimulates interest producing supplementary exploration. There is a profound skill which is being lost in our lack of cooking – one which I believe should be a second language to us. Cooking is what makes us human.

Climate Data

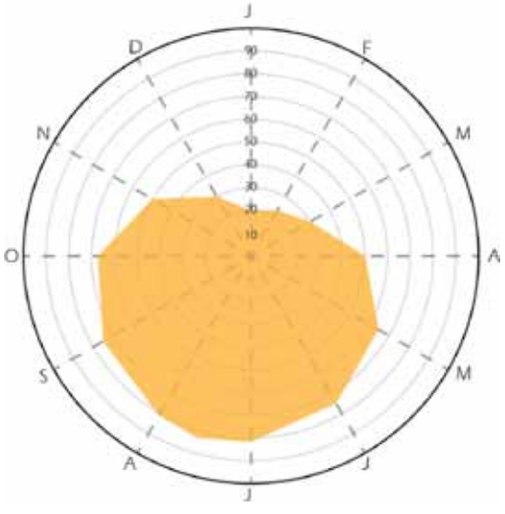


Figure 29.1 - Temperature (degrees Fahrenheit)

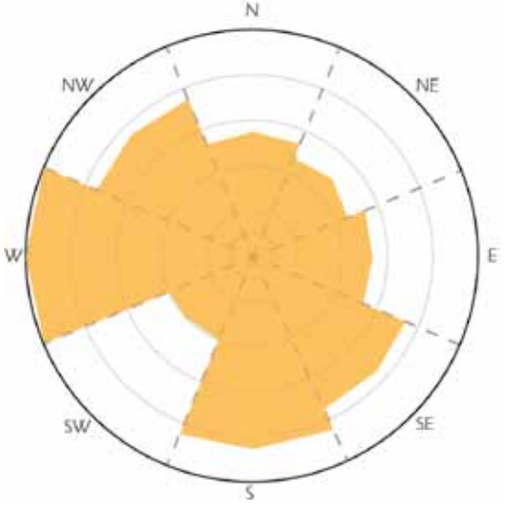


Figure 29.2 - Wind Direction

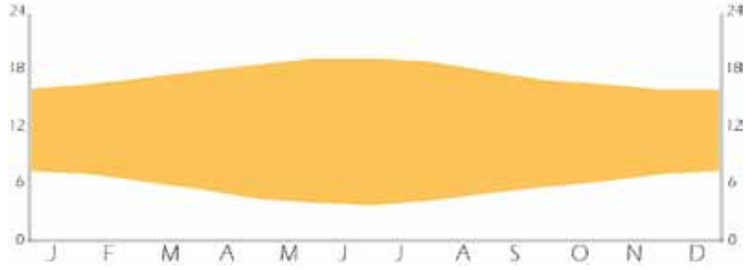


Figure 29.3 - Hours of Sunlight

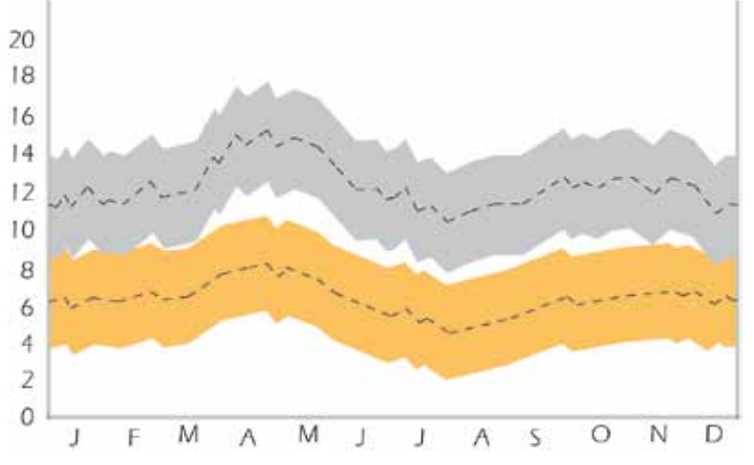


Figure 29.4 - Wind Speed (MPH)

Daily Max

Daily Mean

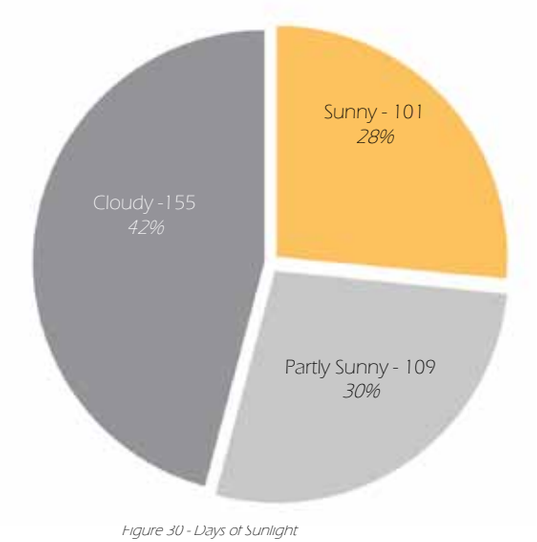


Figure 30 - Days of Sunlight

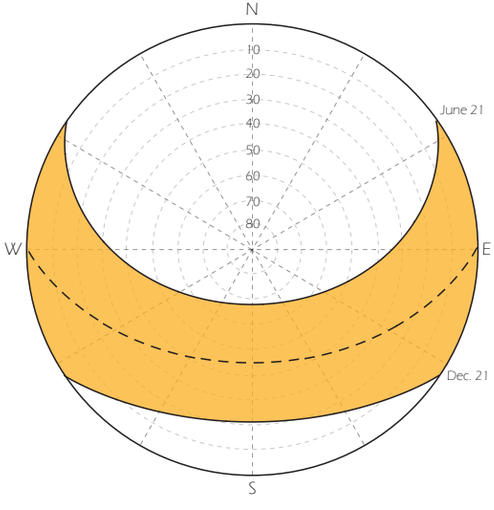


Figure 31 - Sun Path

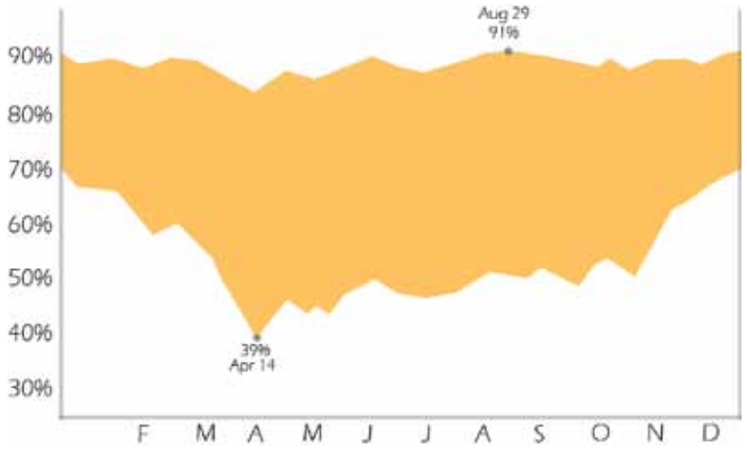


Figure 32.1 - Humidity

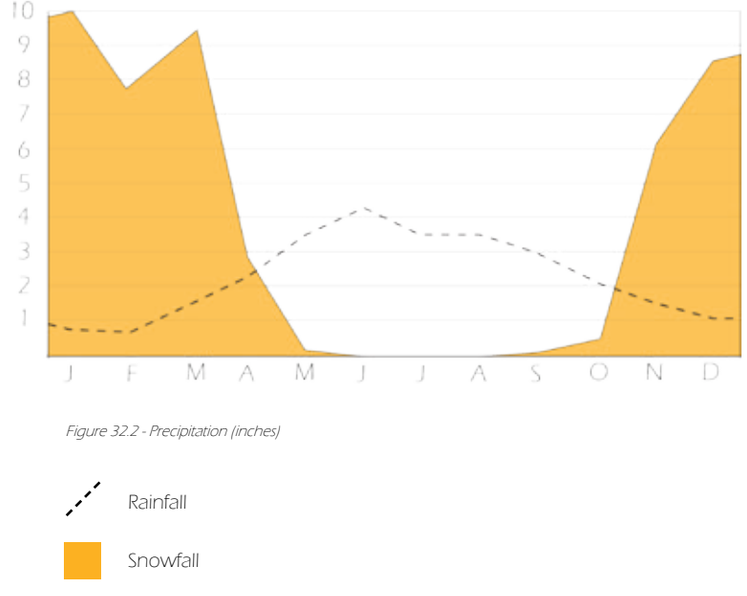


Figure 32.2 - Precipitation (inches)

Qualitative Aspects

Growing up in Delano, I naturally have developed an innate connection and respect for the community. It has provided unforgettable experiences, a firm educational background, lasting relationships, and so much more. To show my gratitude, I find it fitting that I work with the community of Delano, and base my thesis investigation where it all began.

Delano lies right on Highway 12 – one of the major arteries feeding the Twin Cities. Highway 12 acts as a funnel and "fast-track" for a majority of commuters west of the Twin Cities because it becomes 394 and directly connects to Minneapolis. This means that visitors who want to utilize the cooking and educational offerings of the facility will have easy access to it from many surrounding cities. Delano is a mere 25 minute drive to Minneapolis and 15 minutes from Minnetonka, one of the major suburbs of Minneapolis.

The chosen site is within walking distance of the elementary school, middle school, and high school which comprises grades K through 12. The school system serves just over 2200 students. However, my thesis will be focused on mainly grades 5 through 12 which make up about 1500 students. The students come from numerous surrounding cities and providences, meaning the thesis project will indirectly affect many communities beyond the limits of Delano.

Traveling to the site brings visitors right into the heart of Delano – City Park. As of now, the only parking available nearby lies just south of the site. This particular parking lot provides access to City Park and all its amenities including the park itself, numerous softball fields, Delano Municipal Stadium, a pickle ball court, and playgrounds which are under near constant use by children. City Park is used throughout the year to host various events including Minneosta's oldest and largest Fourth of July Celebration, Relay for Life events, baseball tournaments, and personal gatherings. Traveling north from the parking lot, visitors initially traverse over a small hill that creates the southern boundary for the site itself.

Built Features

The site itself is void of all human intervention regarding built structures, the only alteration being a small service road which cuts through the southern edge. To the south of the site, across North River Street, City Park resides, and is composed of numerous baseball and softball fields, including Delano Municipal Stadium which the Delano Athletics amateur baseball team calls home. On the southeastern boundary of the site lies a compost pile where various biodegradable objects find refuge. Walking northwest through the site, visitors will run into an unobstructed view connecting the site to Delano's Harley Davidson showroom located on Highway 12 and across from the city's movie theater. Although the built structure of the thesis will alter the surrounding environment, all measures will be taken to ensure the thesis proposal will be built within the existing environment – not on top of it.

Light Quality

Light will be a major factor in deciding whether or not the thesis project is a success or failure. Because one of the main purposes of the facility is to produce vegetables both indoor and outdoor, the amount of shadows cast upon the grow space must be minimized to ensure maximum production. Fortunately, the site itself is rather open and flat, creating vast open spaces with limited existing shadows cast upon it. The few shadows that are found on the site are relatively small because they are cast by young trees dispersed intermittently throughout the site. During the second visit to the site, at the end of November, the sun was exceptionally intense during the evening hours just before sundown. The unobstructed and flat site will be ideal for crop production because the lack of shadows will allow for an increased number of quality daylight reaching the crops.

Site Distress

Overall the site seems quite healthy and thriving. There is little evidence of extreme distress on the site. Erosion is minimal with it being most prevalent on the river's edge, but kept hidden by a small tree line surrounding the site. All vegetation seemed to be alive, with no signs of disease or death.

Figure 33.1 - River View

Figure 33.2 - Access Road

Figure 33.3 - Site Vegetation

Water

There is no water that is directly visible on the site itself, but the Crow River flows around the north and west edges of the site. A short trek through a few prairie grasses and shallow wood line brings visitors to beautiful views of the Crow River as it meanders silently through the city on its way south. Because the soil found on the site has such a high capacity for water drainage, ponding and standing bodies of water are rarely if ever seen at all.

Wind Patterns

The wind behaviors were quite similar on the two visits to the site. A majority of the wind behaviors were dictated by the existing vegetation found on the site. During the initial visit – in the middle of September - the wind flowed quite gently from the south as it was channeled through the natural paths created by the surrounding woodlands. The northern portion of the site received stronger breezes than the southern half due to the paths created by the vegetation. A couple months later – at the end of November – the wind patterns were quite similar except for their intensity. Breezes were stronger and created a crisp and chilling environment which would benefit from a few strategically placed wind breaks. Placing a building on the site will inevitably alter the wind patterns, but if done properly may actually benefit the site.

Human Characteristics

The site has been minimally altered by human intervention with the exception of a single service road which is a simple dirt road placed on top of the existing ground. Just outside the site's boundaries lie a few built structures including a compost pile to the northeast and baseball and softball fields to the south – near City Park.

Quantitative Aspects

Figure 34.1 - Grasses and Treeline
Josh Muckenhirn [2013]

Figure 34.2 - Trees
Josh Muckenhirn [2013]

Figure 34.3 - River
Josh Muckenhirn [2013]

There are five main soil classifications found on the proposed site. The different soils range in fertility from "highly productive" to "not at all". A majority of the site lies on what is known as Hanlon Fine Sandy Loam. It is mostly flat, with slopes ranging from zero to two percent on average. The area is occasionally flooded with a moderate to high drainage capacity eliminating the possibility of ponding. The site has a high water capacity of 10.2 inches. The site's soil characteristics lead it to being classified as "prime farmland".

	Crop Productivity Index
106D2: Lester Loam - 12 to 18 percent slopes	67
603: Hanlon Fine Sandy Loam - 0 to 2 percent slopes	82
1030: Pits - gravel Udipsamments complex	0
1163: Suckercreek Loam - 0 to 2 percent slopes	20
1197: Suckercreek Fine Sandy Loam - 0 to 2 percent slopes	64

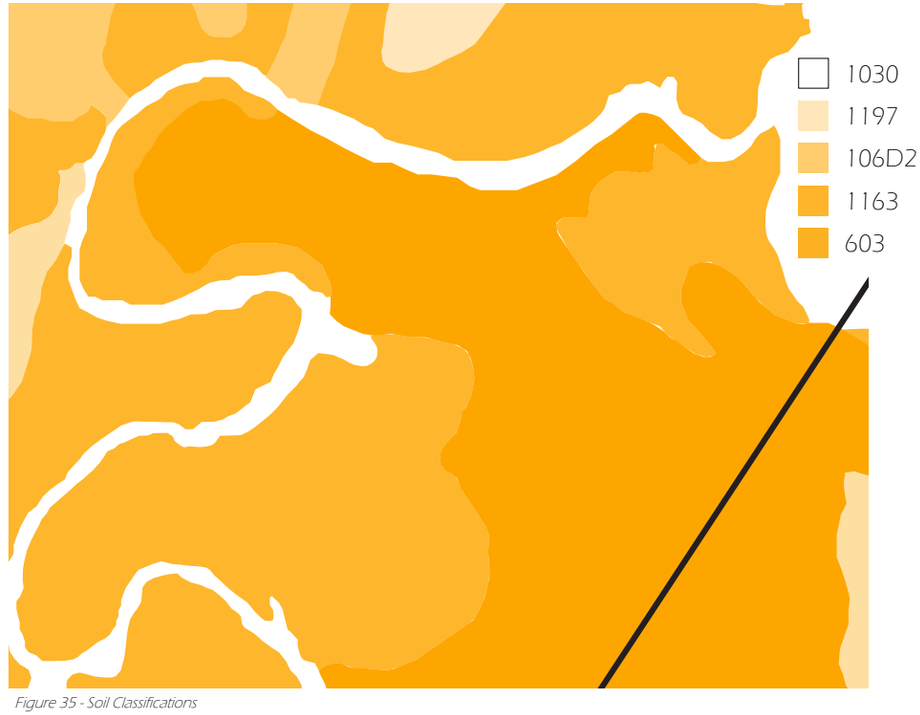


Figure 35 - Soil Classifications

Noise

The largest source of continuous noise on the site originates from North River Street which lies just southeast of the site.

On average, there is very traffic - automobile and foot - on and around the site. The speed limit on North River Street is 25 MPH, which helps keep the noise levels down. There are a few annual events that take place at the city park which can significantly raise the noise levels penetrating the site.

A majority of the site is surrounded by a fairly dense layer of trees and vegetation, which lends to the negligible noise levels. A slight rumble from trains that run through Delano can rarely be heard over the air. Overall, the site is very quiet and noise free, creating a rather serene environment.

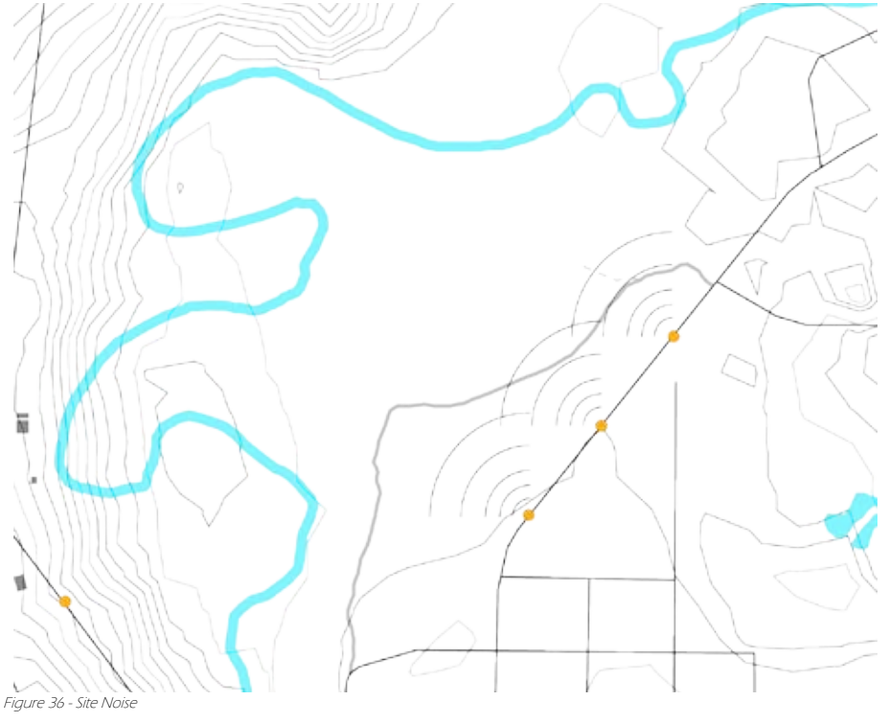


Figure 36 - Site Noise

Wind & Vegetation

The site is surrounded by a dense layer of trees and vegetation. These range from fully grown maple trees, tall prairie grasses, and short grasses. The site itself lies on rather fertile soil which allows for a variety of plant species to flourish.

The site is rather protected from major winds by the surrounding vegetation. The winds that do penetrate the site prevail from the south and northwest - entering through an opening in the vegetative barrier.

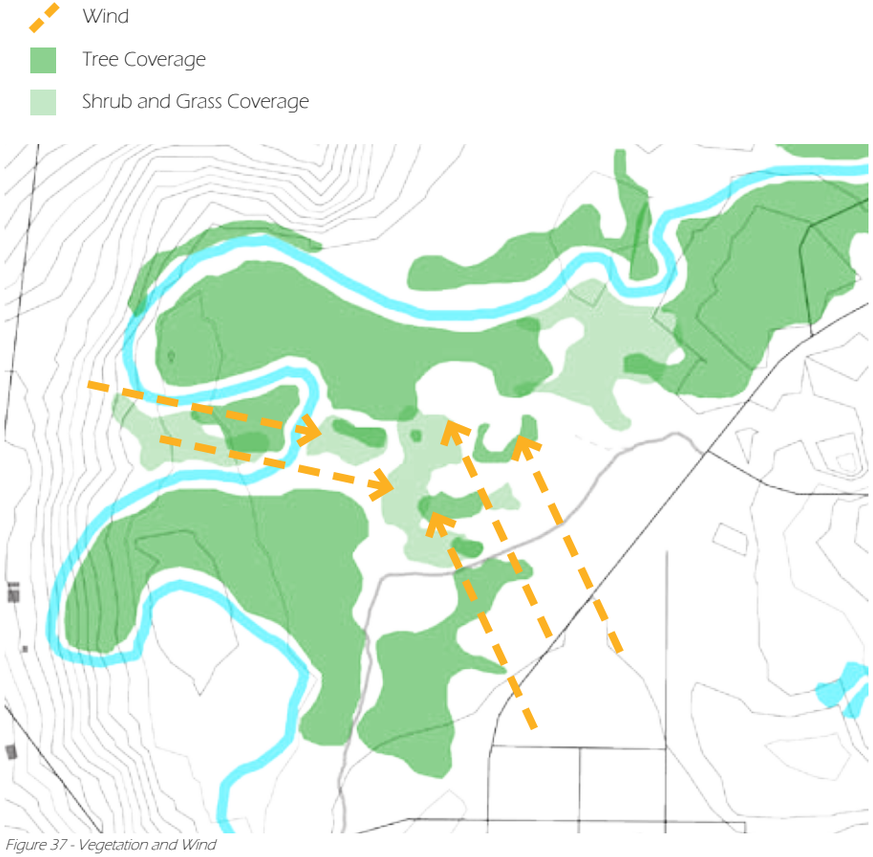


Figure 37 - Vegetation and Wind

Site Reconnaissance

- Plumbing
- Light Pole
- Electrical Box
- Vehicular Traffic
- Pedestrian Traffic
- Service Access

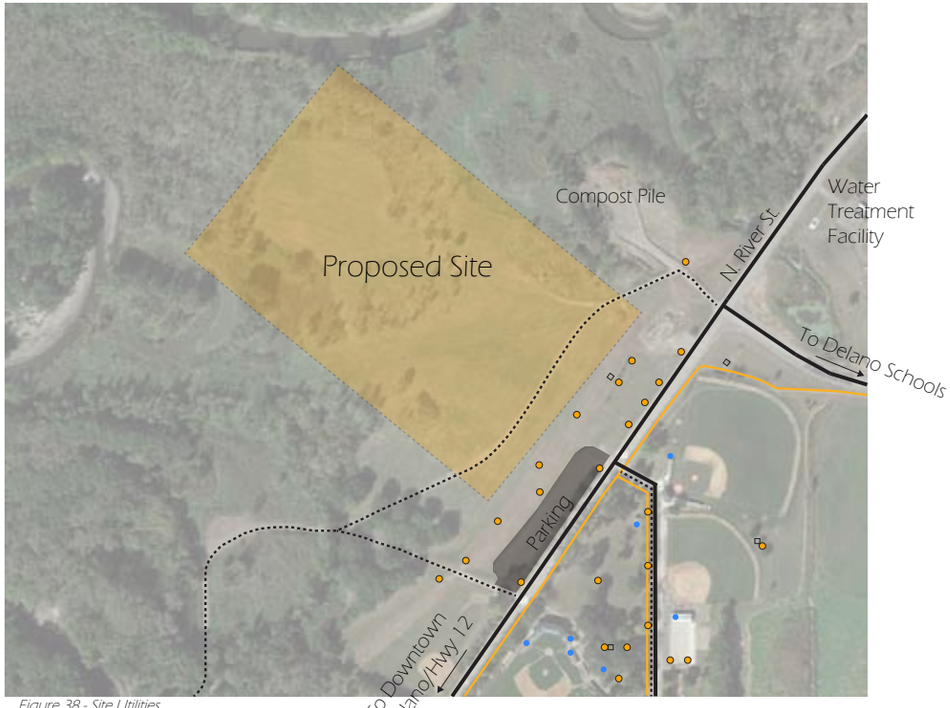


Figure 38 - Site Utilities
Google Maps

Utilities

There are no major utilities that lie on the site itself, but rather, on the surrounding vicinity. To the northeast of the site lies Delano's water treatment facility. On the northeast corner of the site resides the city's compost pile which may benefit the facility by providing fertile compost to be used in the gardens. The parking lot just south of the site has streetlights that keep it lit during events. Because of this, there is also a small electrical box between the site and the parking lot. The city park which is southeast of the site is equipped with electrical and plumbing utilities to serve the numerous events which are hosted on it.

Vehicular Traffic

On average, there is little to moderate vehicular traffic which passes by the site. North River Street serves as one of two paths allowing access across the Crow River. The road acts as an alternate route around the city – one used mostly by individuals familiar with the area. Because the site lies adjacent to the city park, vehicular traffic can get quite heavy during annual events. There is an access road which has been laid out on the site which gives utility vehicles access across the site occasionally.

Pedestrian Traffic

There are numerous walking paths in the area which lead to seasonal foot traffic. Many residents use the paths for walking, jogging, roller blading, and bicycling. During warmer months, pedestrian traffic becomes commonplace as it is used as a method of transportation between surrounding neighborhoods, the school, and the city park.

Site Analysis - Site Reconnaissance

Photogrid

Figure 39.1 - Photogrid Images
Josh Muckenhirn

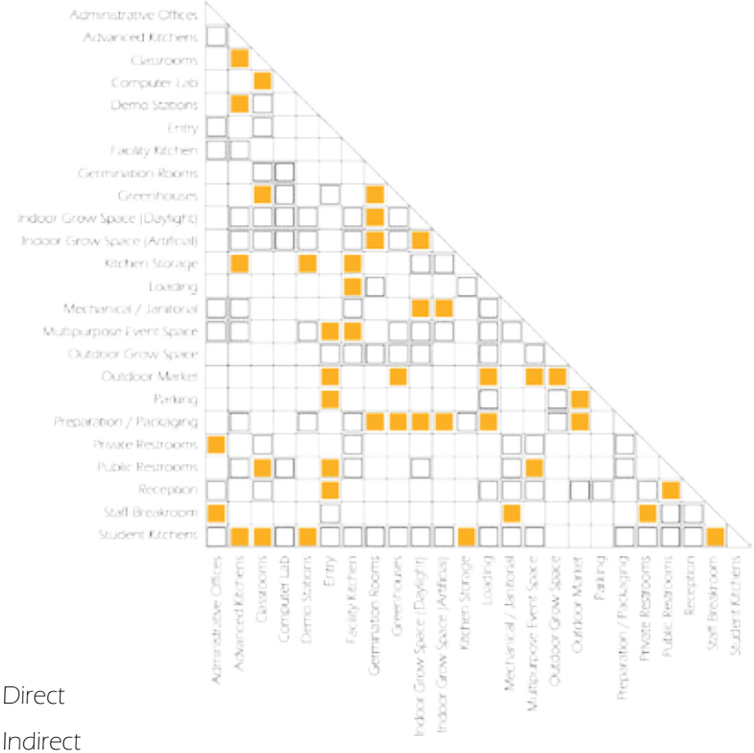
Site Analysis - Site Reconnaissance

Figure 39.2 - Photogrid Images
Josh Muckenhirn

Site Analysis - Site Reconnaissance

Figure 39.3 - Photogrid Images
Josh Muckenhirn

Interaction Net



Direct

Indirect

**Blank space denotes no connection*

Figure 40.1 - Interaction Matrix

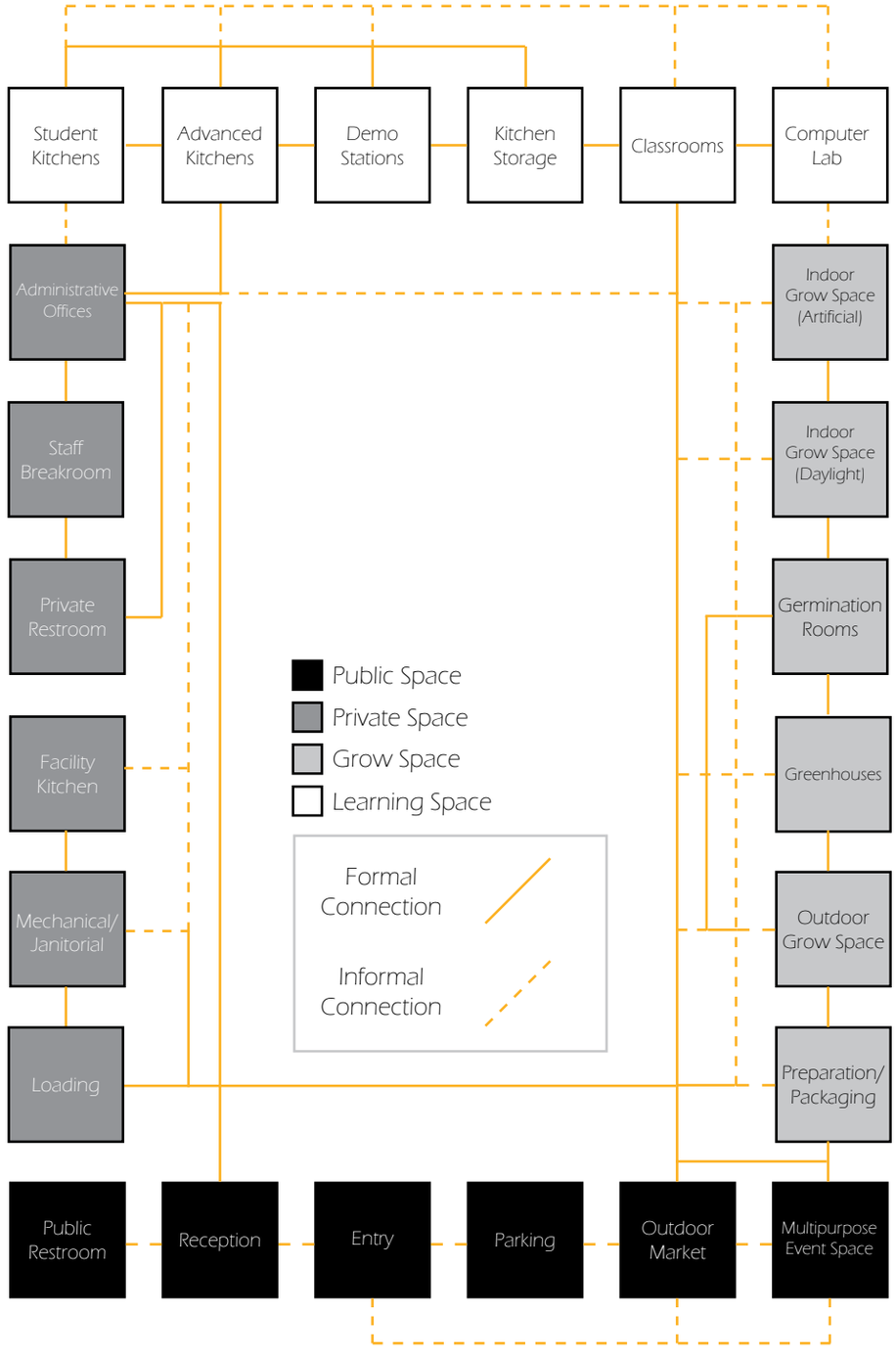


Figure 40.2 - Interaction Net

Programmatic Requirements

Administration

Copy/Mail Room	200 sf	200 sf
Conference Room	375 sf	375 sf
Offices	1,200 sf	200 sf x 6
Reception	1,150 sf	1,150 sf
Staff Break Room	350 sf	350 sf
Staff Restroom	150 sf	75 sf x 2
		2,525 sf

Grow Space

Germination Rooms	400 sf
Indoor Grow Space (Artificial Light)	10,000 sf
Indoor Grow Space (Daylight)	5,000 sf
Outdoor Grow Space	*up to 5 acres*
Outdoor Market	5,000 sf
Preparation / Room	1,750 sf
	22,150 sf

Education

Advanced Kitchen	4,700 sf
Butchery Lab	1,500 sf
Classroom	5,250 sf
Computer Lab	1,500 sf
Demo Station	350 sf
Mock Supermarket	3,400 sf
Storage	1,000 sf
Student Kitchen	5,000 sf
	22,700 sf

Miscellaneous

Breakout Seating	1,500 sf
Custodial	1,000 sf
Display Space	1,200 sf
Facility Kitchen	2,500 sf
Gift Shop	3,750 sf
Loading	1,500 sf
Mechanical	5,000 sf
Multi-purpose Event Space	5,500 sf
Public Restroom	1,100 sf
Storage	1,000 sf
	23,800 sf

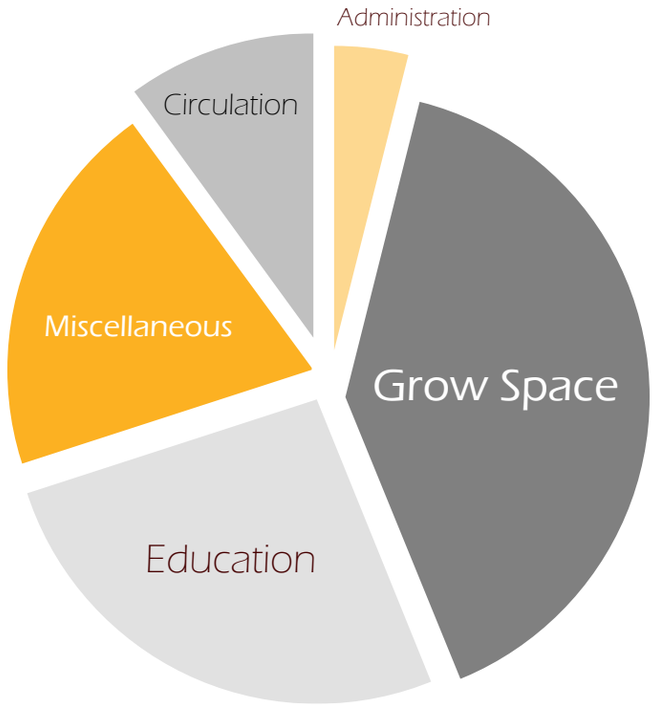


Figure 41 - Program Requirements

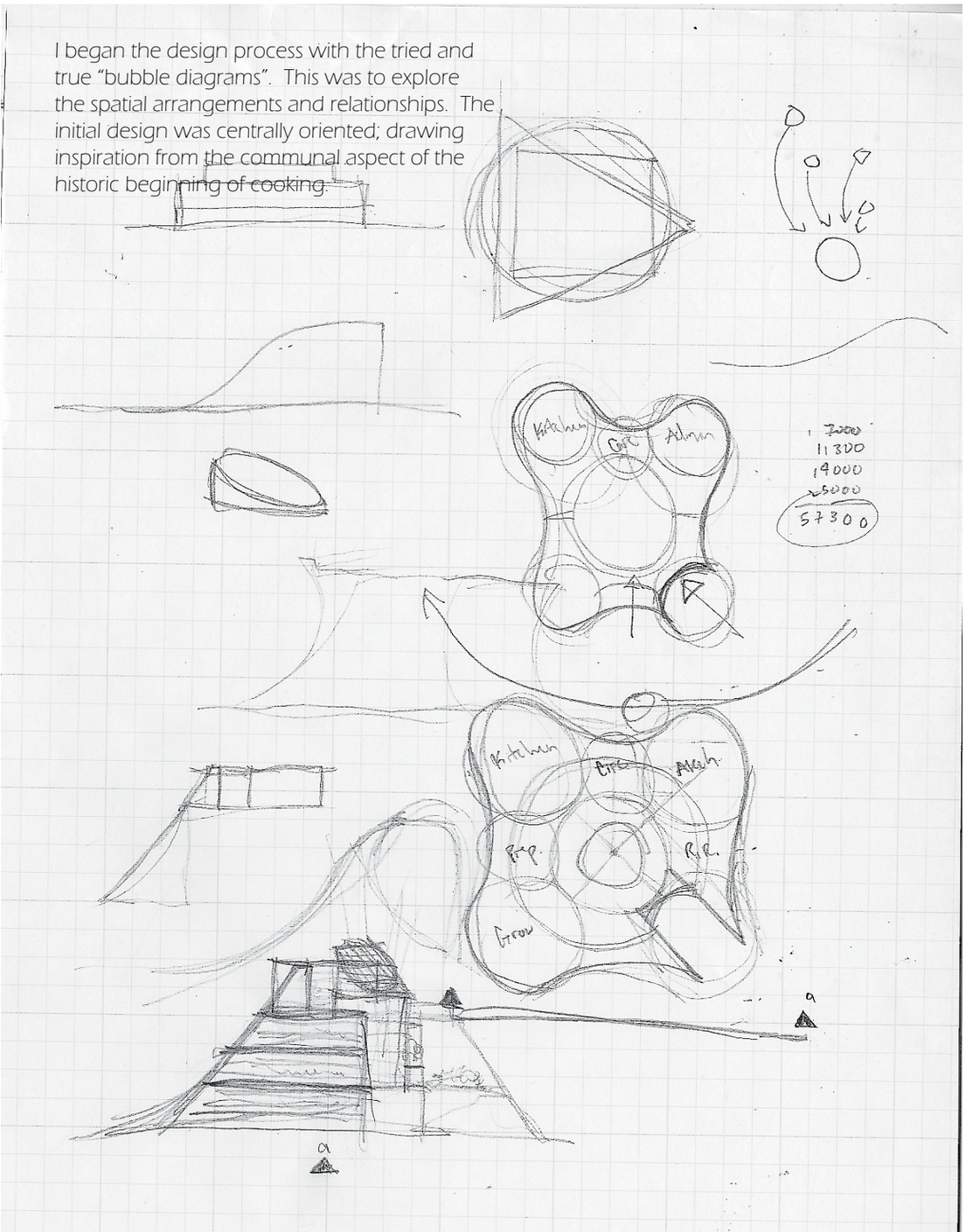
Total Square Footage:	72,000 sf
+ 20 % Circulation:	14,400 sf

Total SF: 86,400 sf

The Process

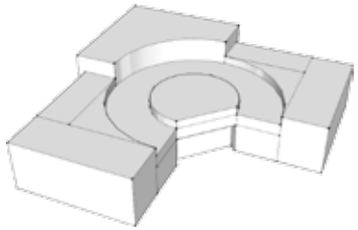
Process

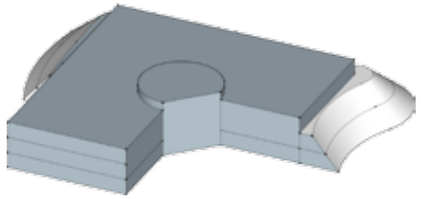
I began the design process with the tried and true "bubble diagrams". This was to explore the spatial arrangements and relationships. The initial design was centrally oriented; drawing inspiration from the communal aspect of the historic beginning of cooking.



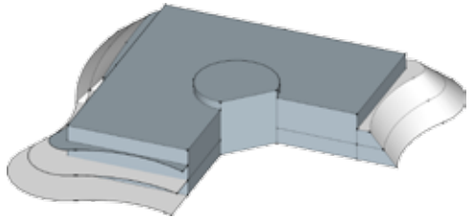
Problems with initial design...

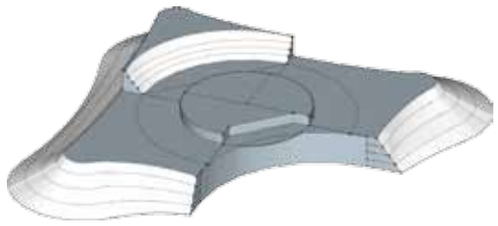
1. Too tall and intimidating
2. Too centralized; not addressing potential views
3. Not addressing the site



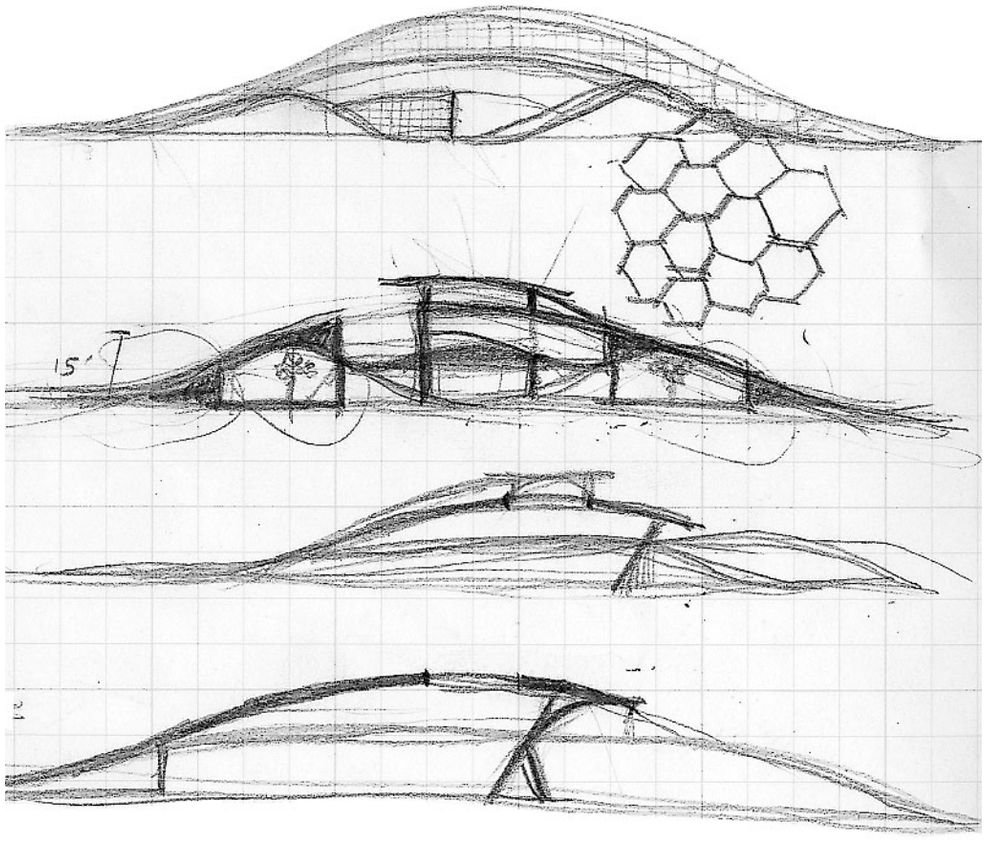


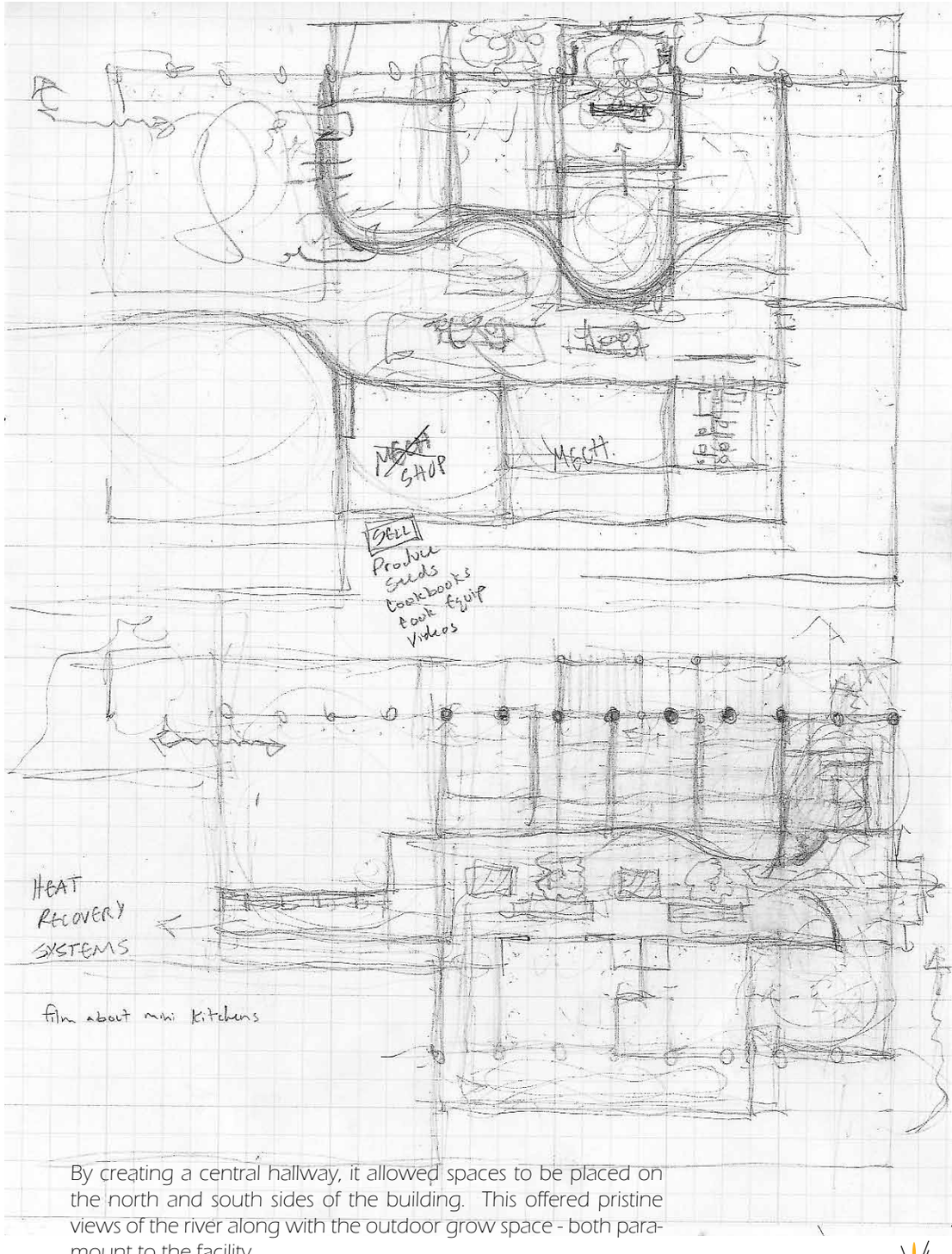
In order to fit the program into a space such as this, the building began to climb higher. Soon, it became 4 to 5 stories tall. I felt as though this went against one of the main goals of the thesis - to decrease the intimidation factor. By having young children approach a 5 story building which juts out of the flat landscape, they would immediately be intimidated by the building itself. This needed to change...





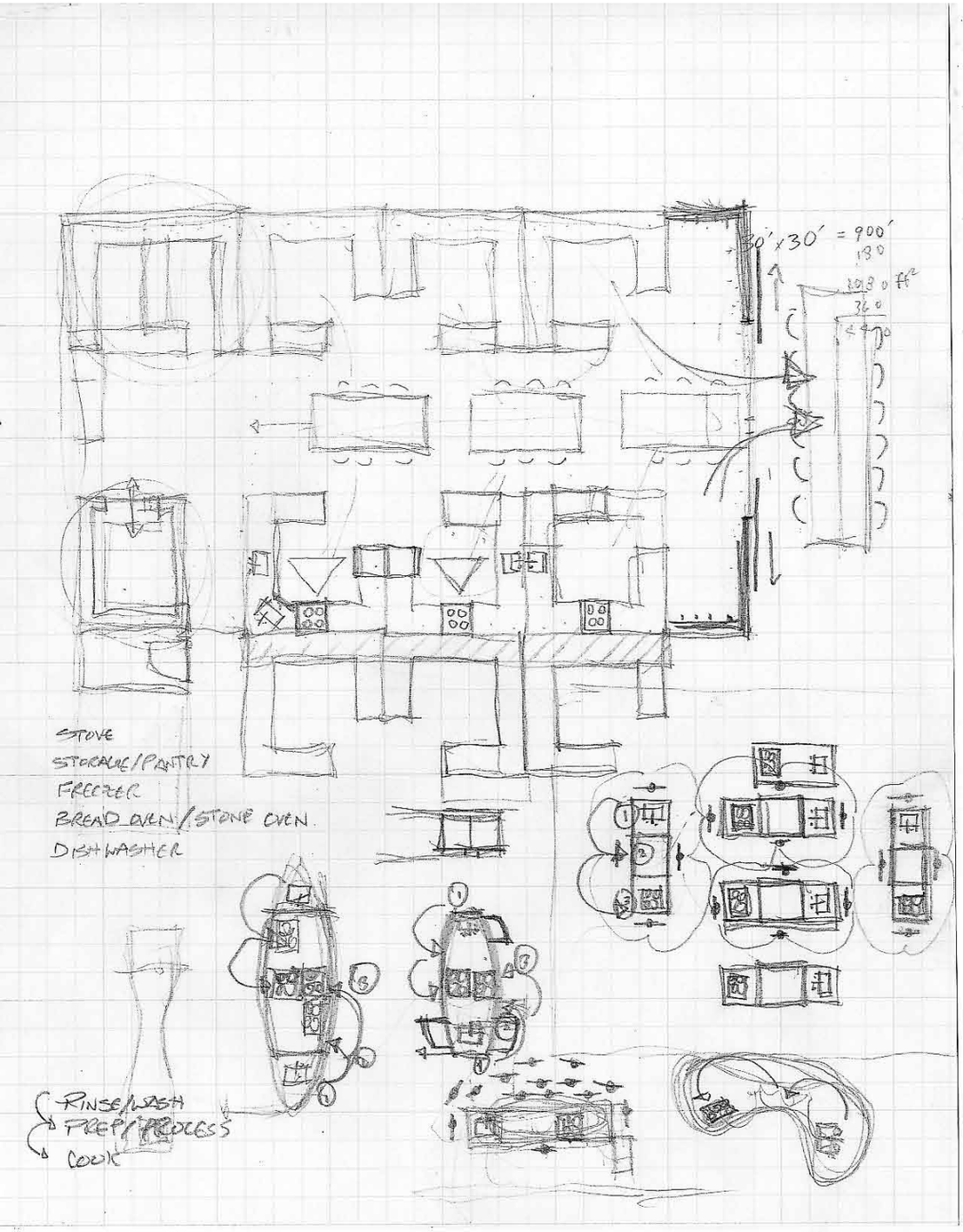
I scrapped the initial design and decided to return to the sketch pad once again. No matter what I drew, my hand always wanted to make a very subtle curve that sat with a very low profile to the ground. This seemed like a much more sensitive form for the site and program.

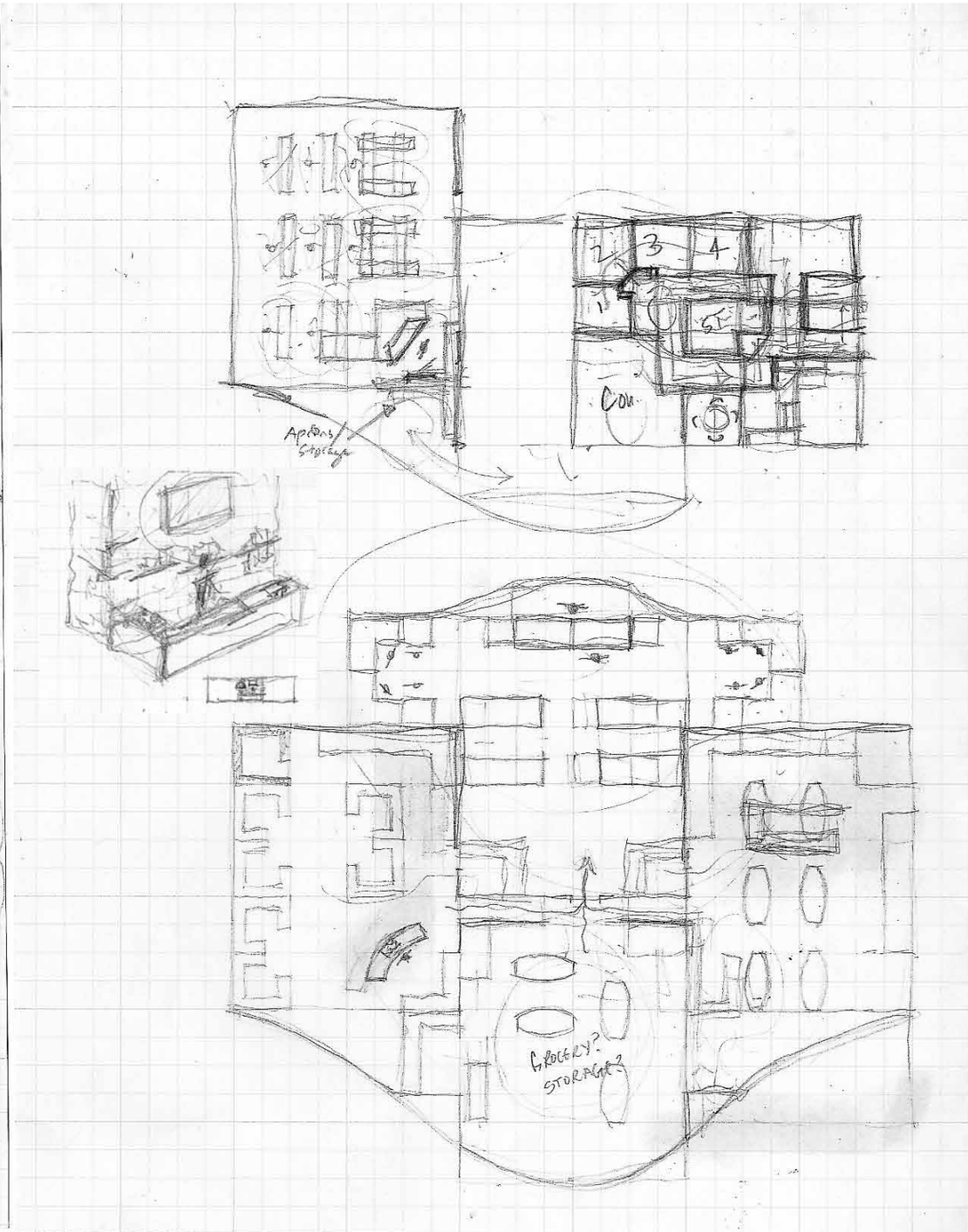


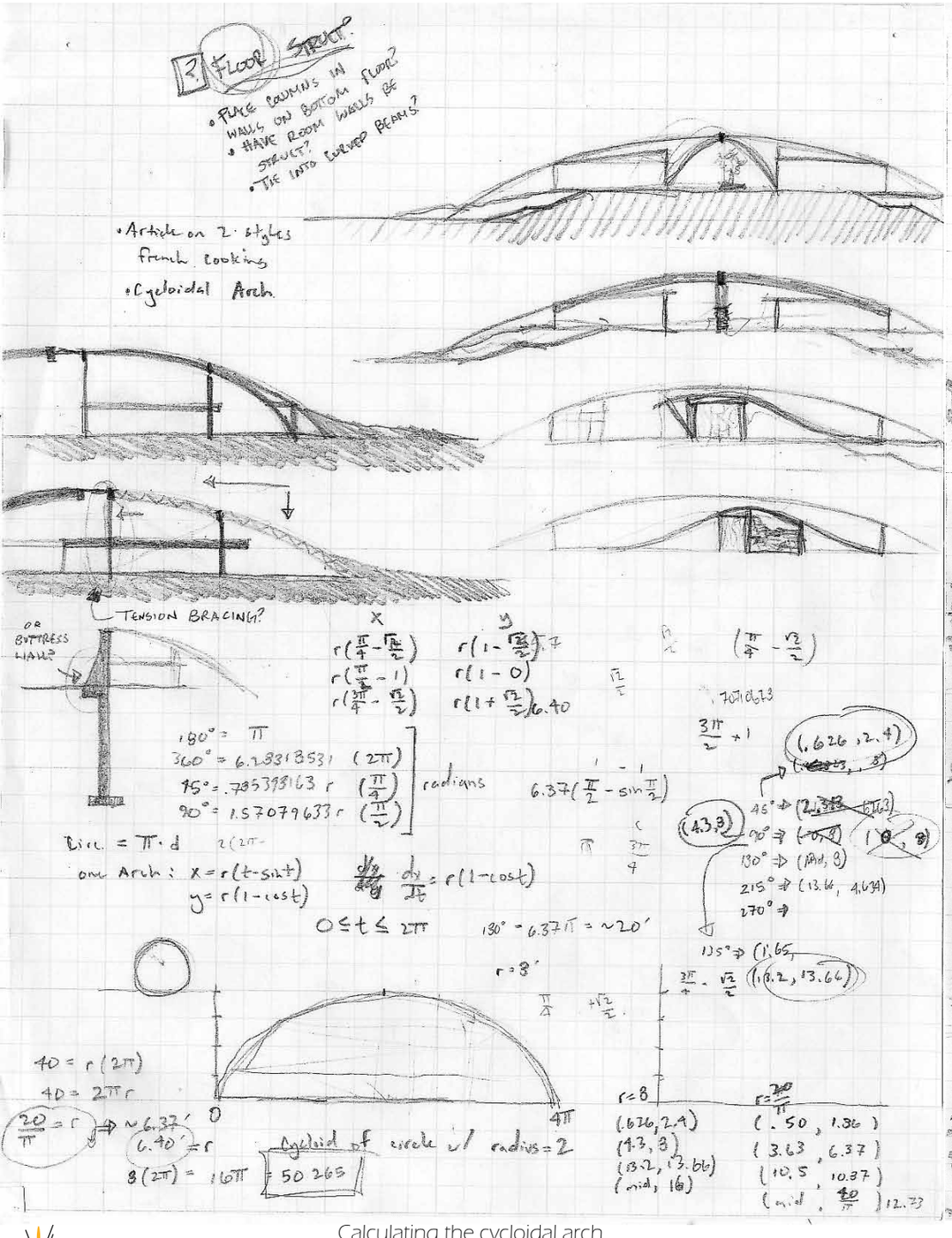


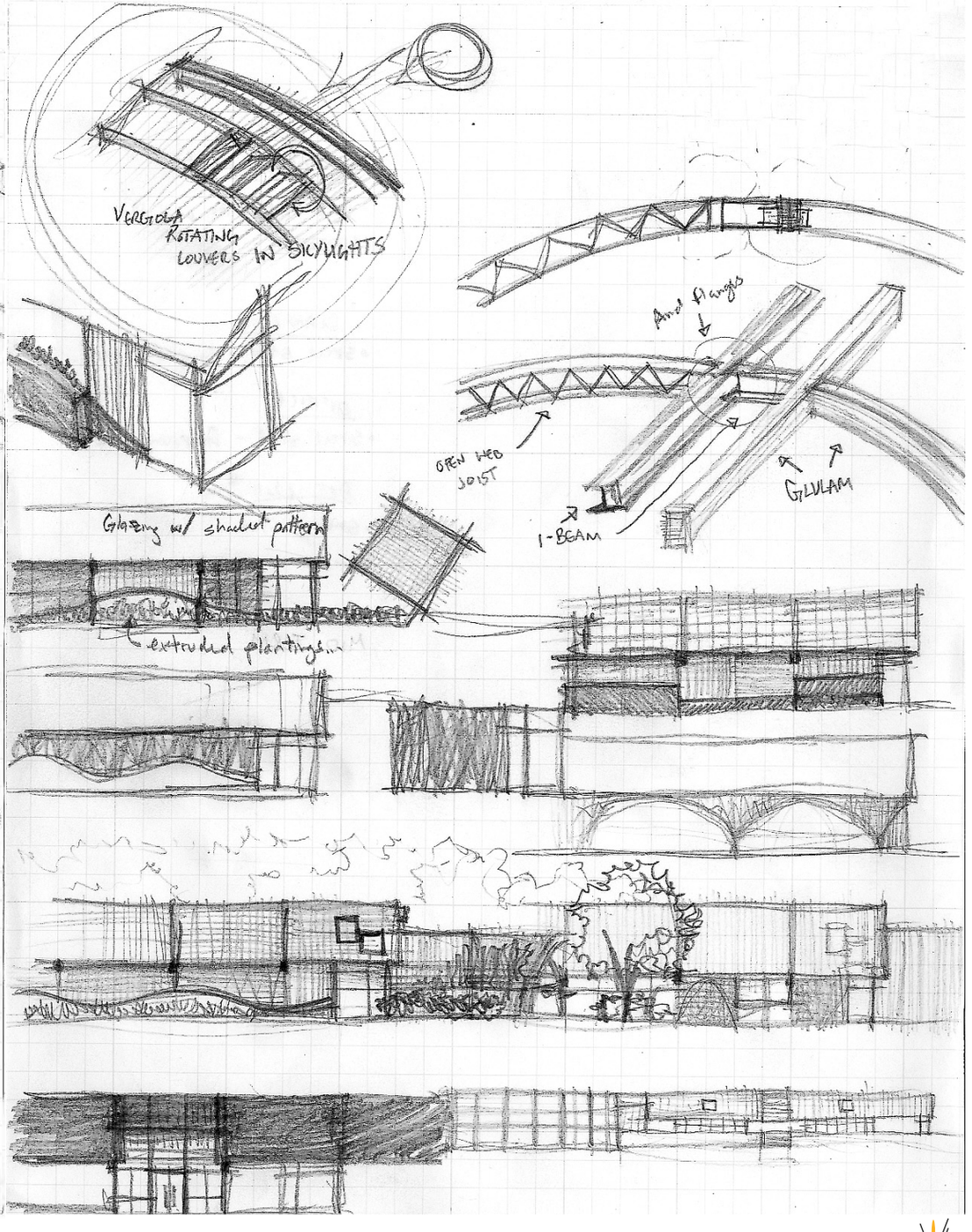
By creating a central hallway, it allowed spaces to be placed on the north and south sides of the building. This offered pristine views of the river along with the outdoor grow space - both paramount to the facility.

Process: Kitchen Layouts

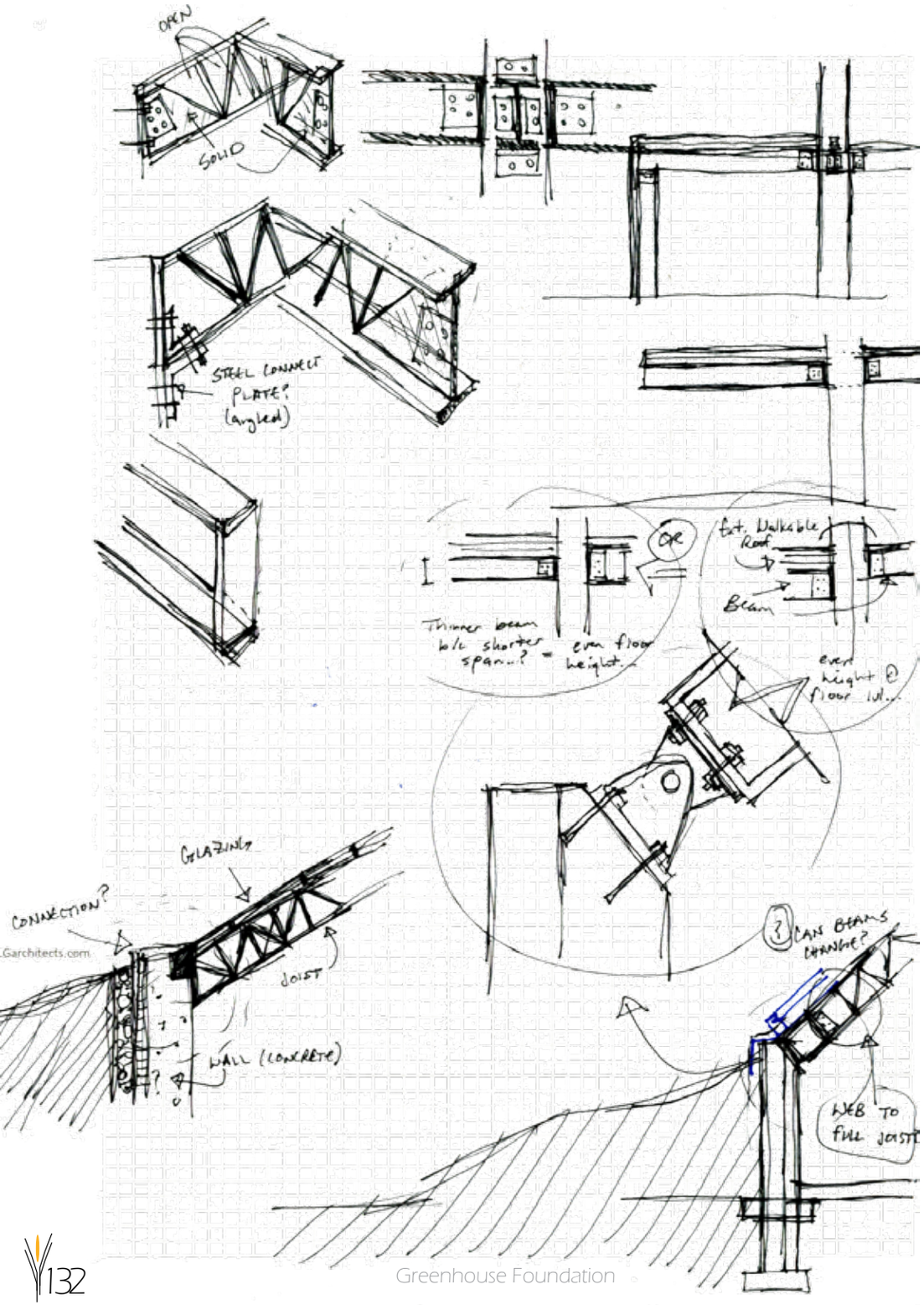




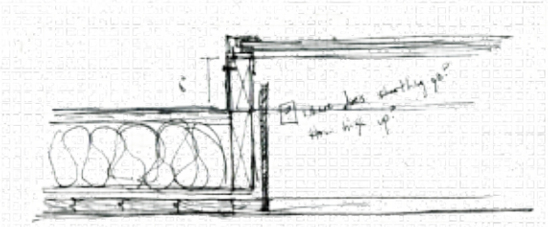




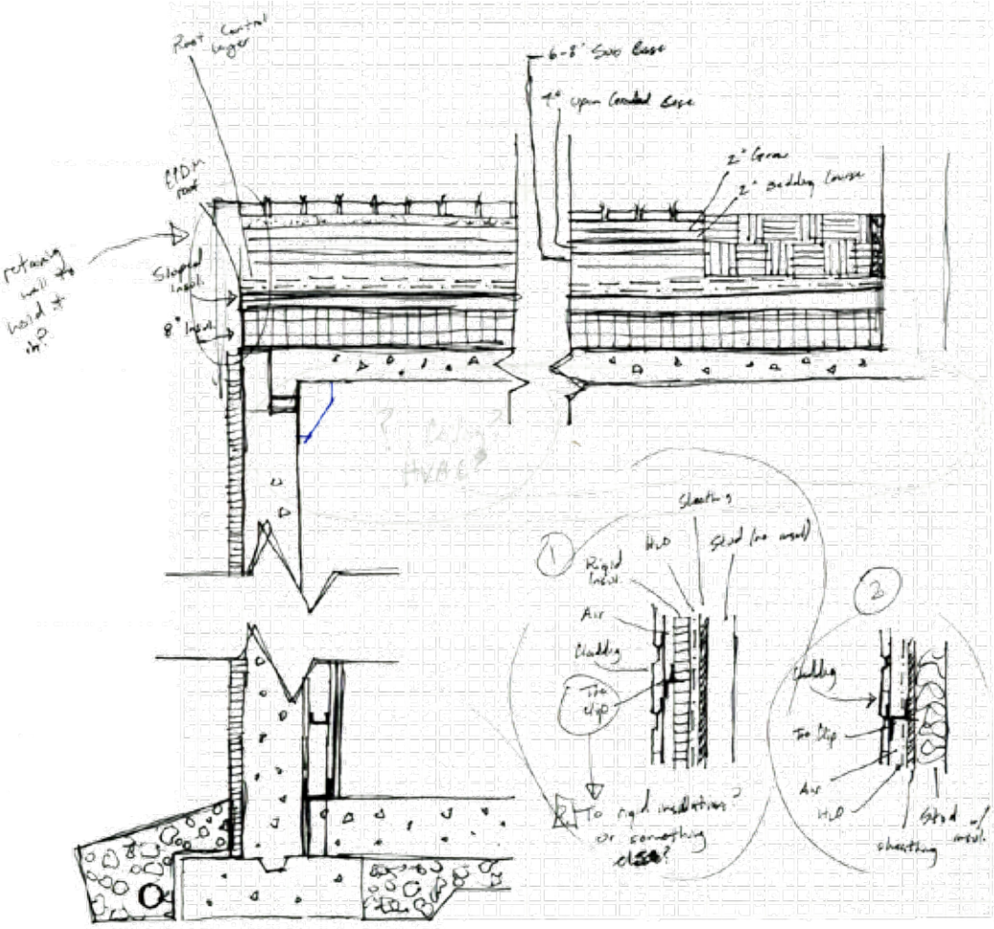
Calculating the cycloidal arch.



Greenhouse Foundation

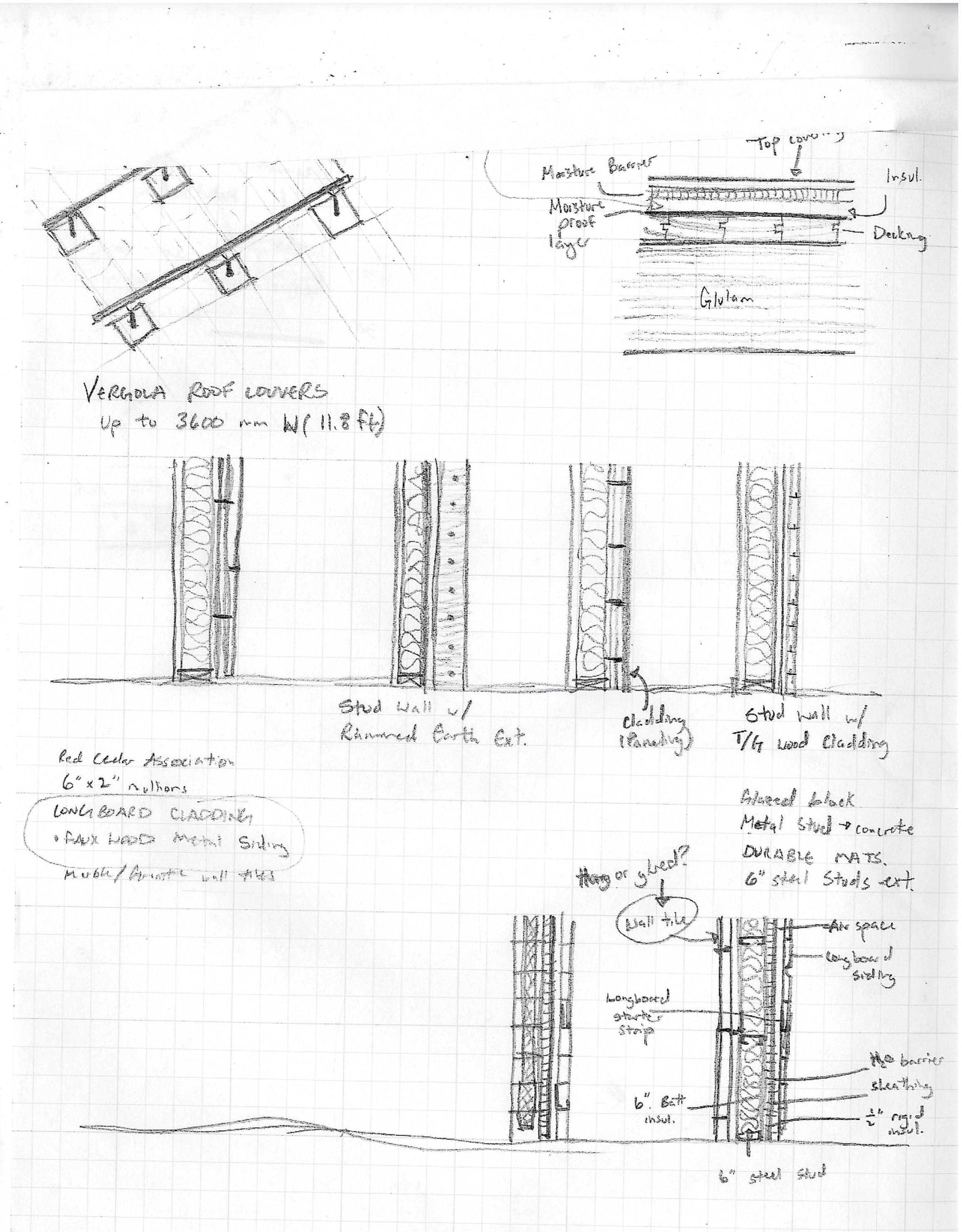


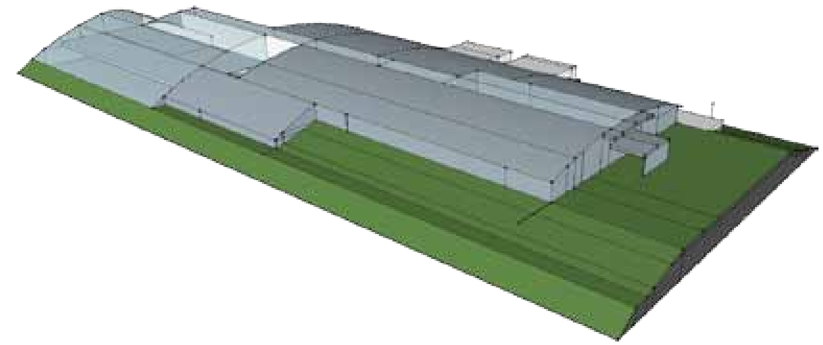
Skylight Framing

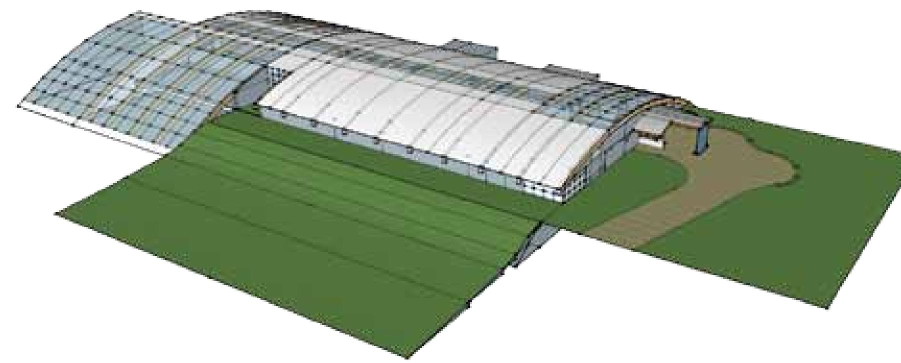


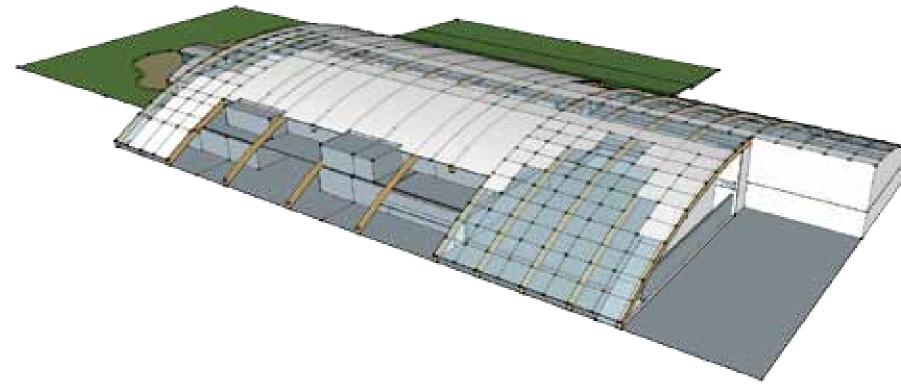
Wall and Exterior Walkway

Exterior Wall Construction


Top covering
Moisture Barrier
Insul.
Moisture proof layer
Decking
Glulam
VERGOLA ROOF LOUVERS
Up to 3600 mm W (11.8 ft)
Stud wall w/ Rammed Earth Ext.
Cladding (Paneling)
Stud wall w/ T/G wood Cladding
Red Cedar Association
6" x 2" mullions
LONGBOARD CLADDING
• FAUX WOOD Metal Siding
Glazed block
Metal stud → concrete
DURABLE MATS.
6" steel studs ext.
Hung or glued?
Wall tile
Air space
Longboard siding
Longboard starter strip
sheathing
6" Batt insul.
1/2" rigid insul.
6" steel stud







The Solution

The Program

1 Lecture Classrooms

Students are taught basic nutrition information within the lecture classrooms. This will provide basic background knowledge necessary to continue the program.

2 Laboratory Classrooms

The information taught in the lecture classrooms will be supplemented and built upon within the lab-based classrooms. These will give students hands on experience with growing vegetables. This is meant to teach students where the food actually comes from and to reconnect them with the food origins.

3 Novice Kitchens

The Novice Kitchens are used to show students how to put the nutrition information to everyday use. The culinary experience will teach students how the nutrition education fits into their lives and how it translates into an actual meal. This will spark the behavioral change that is missed through purely text-based education.

4 Mock Supermarket

Between each kitchen space is a shared Mock Supermarket. As a part of the program, students will need to learn to decipher various recipes and physically gather the needed ingredients from the supermarket setting. This will make students more familiar with the supermarket environment and teach them how to shop smart and efficiently.

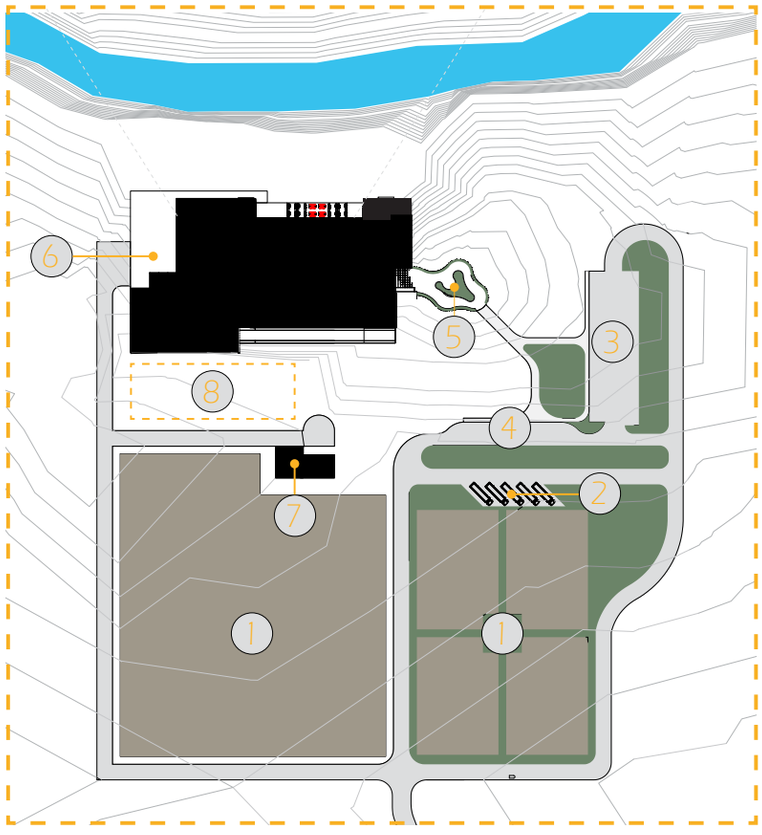
5 Advanced Kitchens

The Advanced Kitchens are found on the bottom floor, and will offer students practice in more difficult culinary techniques. These kitchens are designed to teach students to cook efficiently when space is limited.

6 Performance Kitchens

The culinary program culminates with the students putting on a culinary recital in which they share their newfound skills with their family and friends.

Proposed Site Layout



1 Outdoor Grow Space

2 Bus Parking

3 Visitor Parking

4 Drop Off Zone

5 Entry Plaza

6 Loading

7 Farming Storage

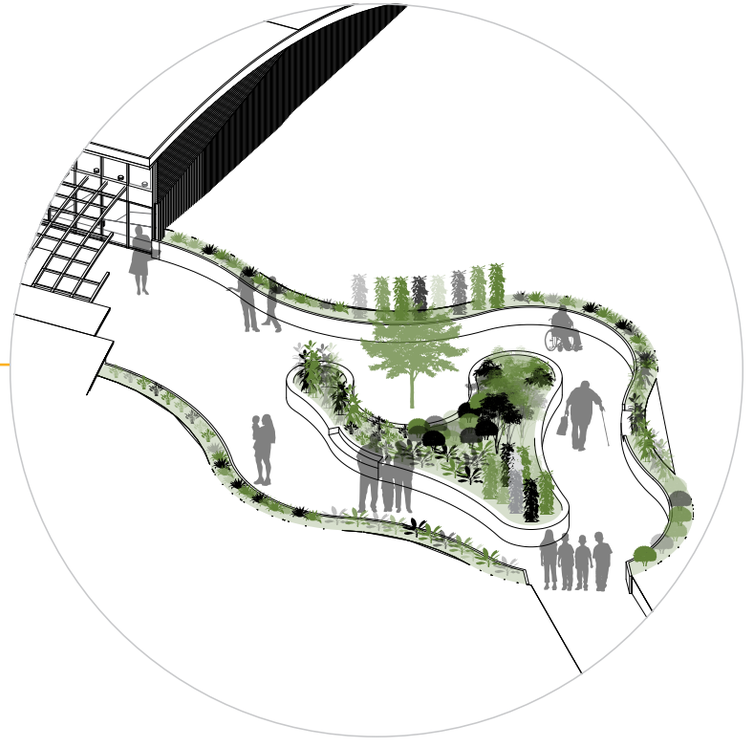
8 Farmers Market

Grow Space: 4.33 Acres

Building Square Footage: 96,000 SF

Entry Plaza

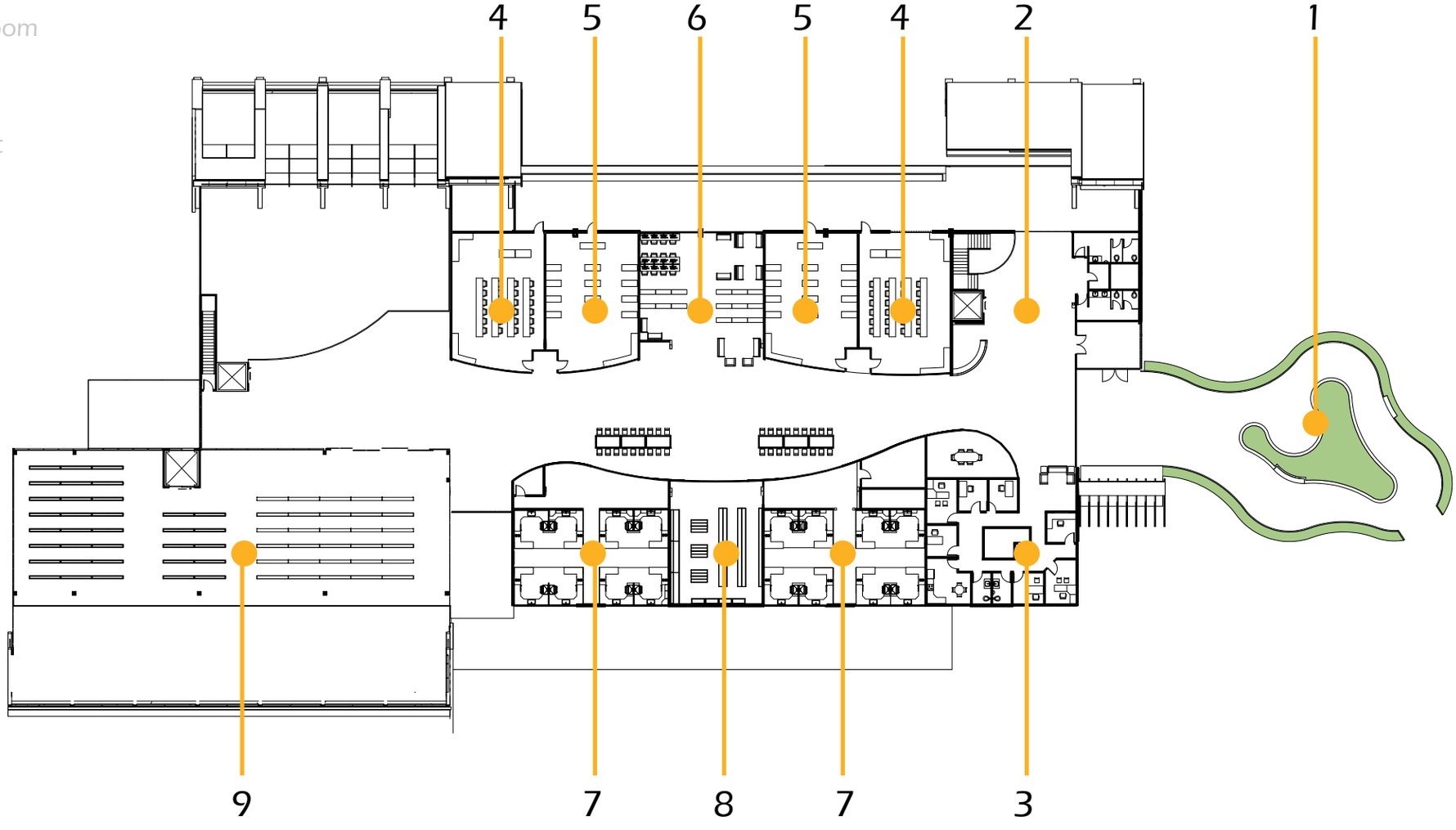
This will display a variety of produce grown within the facility. Each variety will be accompanied by information boards and displays that will highlight nutritional and general information regarding each vegetable. This will begin the educational experience immediately upon arrival.



Entry Plaza

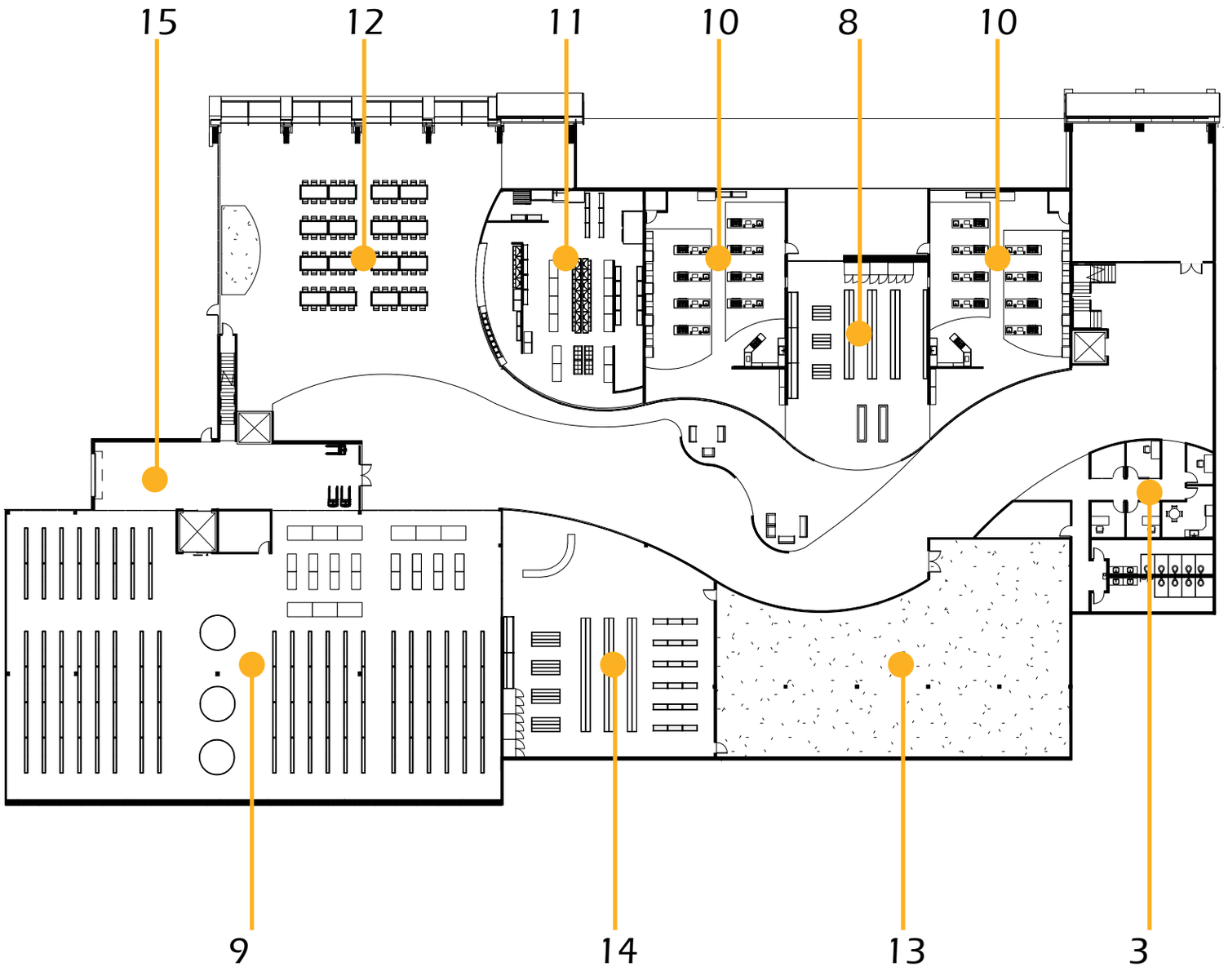
Main Floor

1 Entry Plaza
2 Reception
3 Offices
4 Lecture Classroom
5 Laboratory Classroom
6 Media Center
7 Novice Kitchen
8 Mock Supermarket
9 Greenhouse



Bottom Floor

1 Entry Plaza
2 Reception
3 Offices
4 Lecture Classroom
5 Laboratory Classroom
6 Media Center
7 Novice Kitchen
8 Mock Supermarket
9 Greenhouse
10 Advanced Kitchen
11 Performance Kitchen
12 Multipurpose Space
13 Mechanical
14 Market
15 Loading



Main Hallway

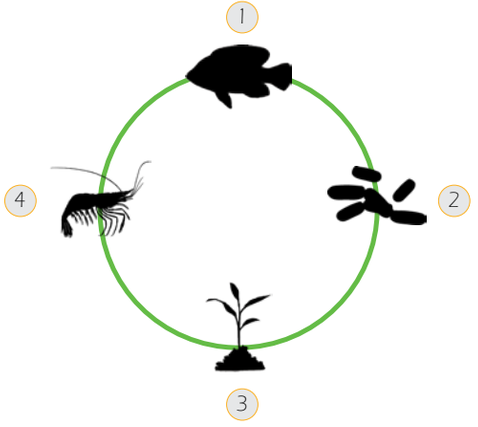
Outdoor Grow Space

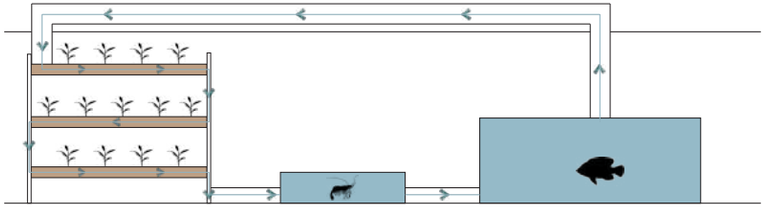
Indoor Grow Space

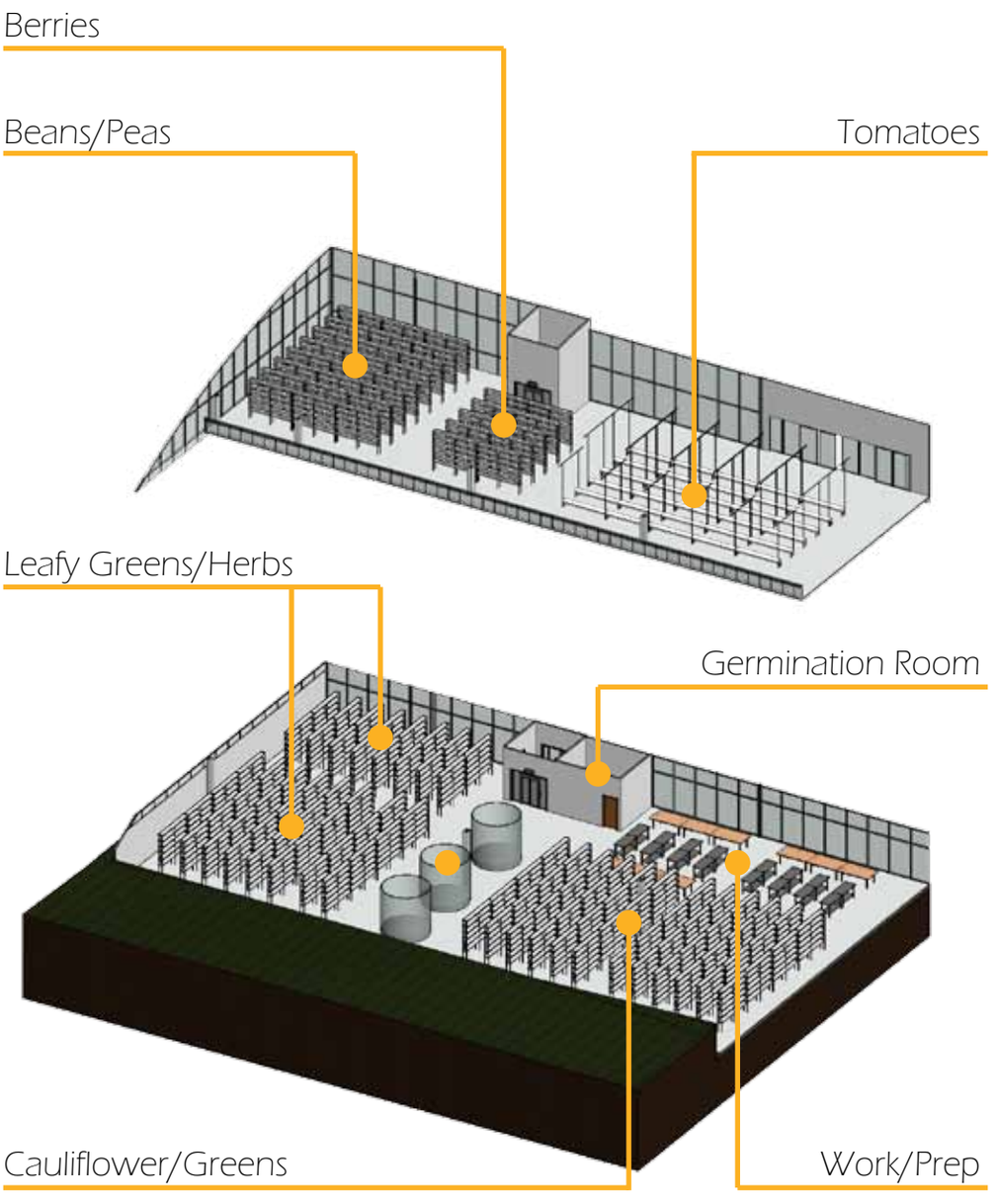
Magenta LED Lighting

- Optimum frequency for maximum plant growth.
- Supplements natural daylight

1. Fish produce ammonia rich waste
2. Microbes convert ammonia into nutrients for the plants
3. Plants use nutrients and filter the water
4. Prawns aerate the water - bringing in oxygen for the fish





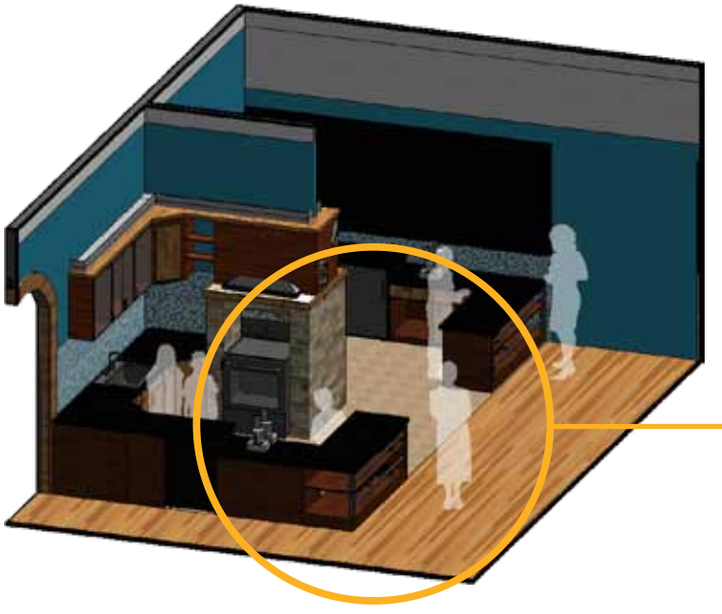


Novice Kitchen

Novice Kitchen

Novice Kitchens

Used by students to expand upon the previous information given to them. The culinary experience will teach students how to actually use the nutrition information in their everyday lives.



1 Familiar Environment

Kitchen stations designed to resemble "home" kitchen. This will help create a familiar environment for the students to help alleviate possible anxieties.

2 Lowered Countertops

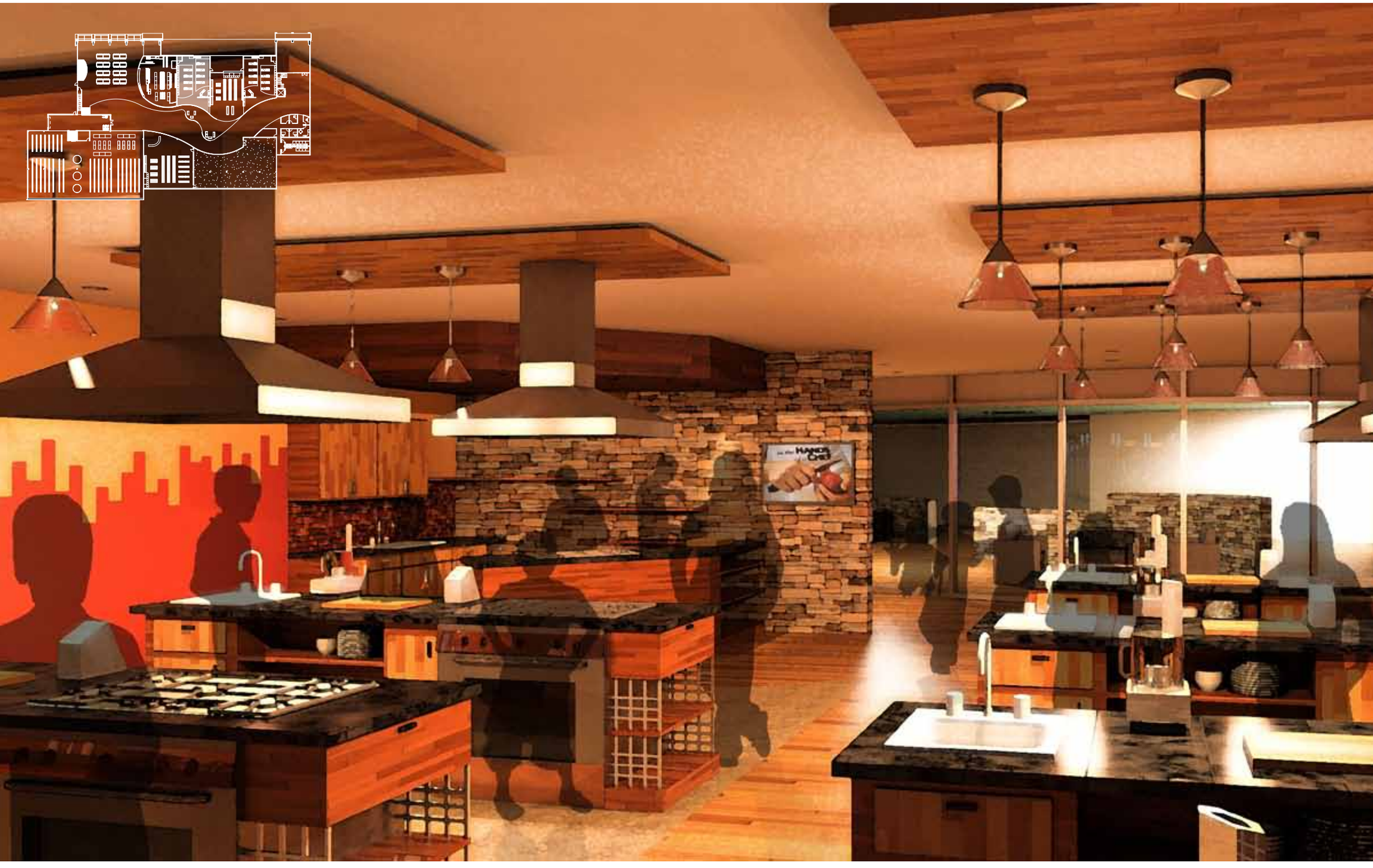
Decreases the need for stools to stand on.

3 Aisle Location

Instructors can maintain a constant view on the students as they prepare their food.

...designing for the user...

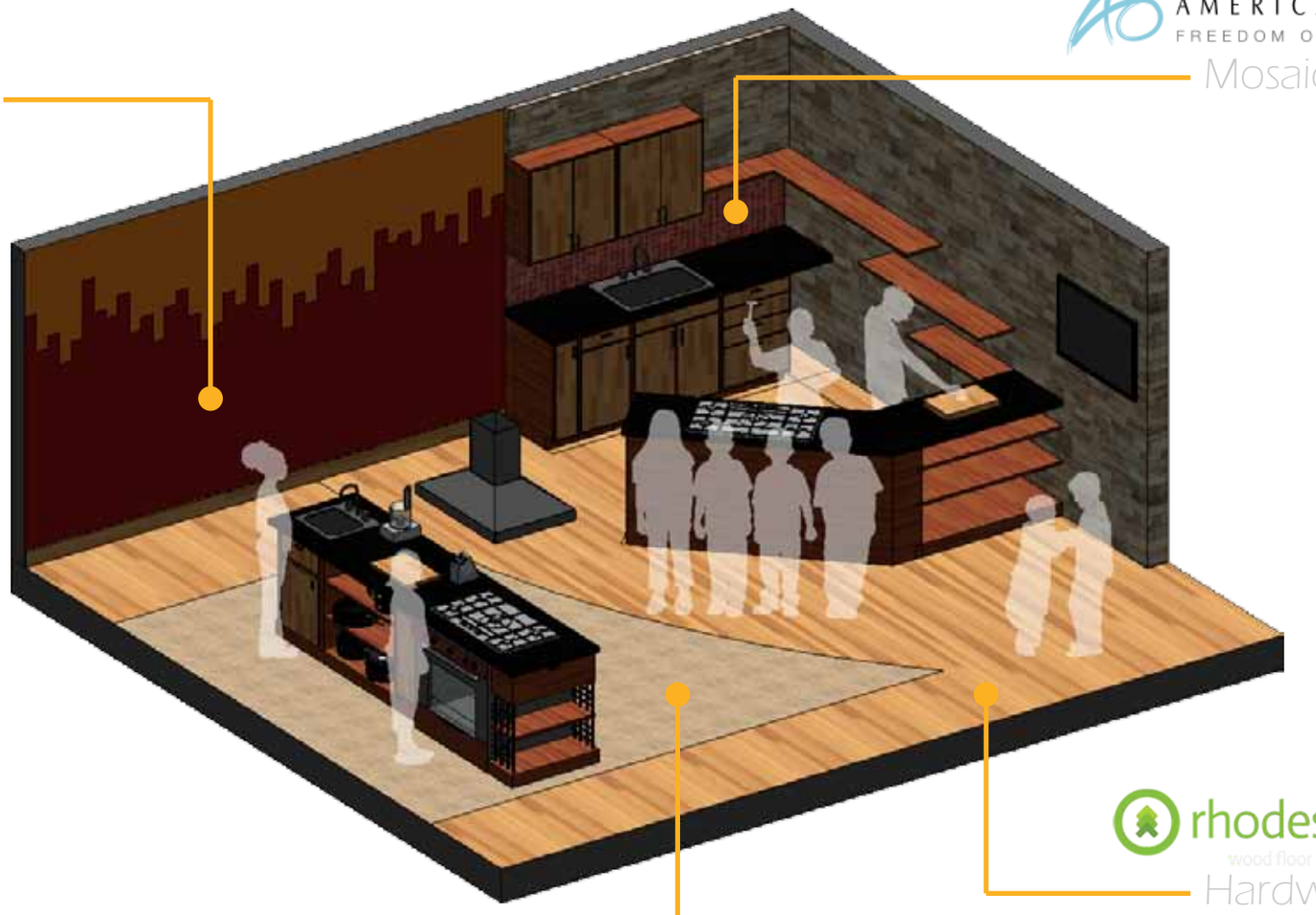
Advanced Kitchen

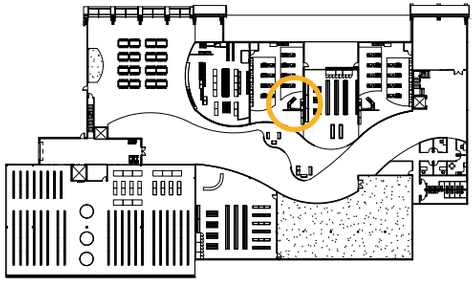


Advanced Kitchen

Advanced Kitchens

These are found on the bottom floor and will offer students practice in more difficult culinary techniques. The Advanced Kitchens are designed to teach students to cook efficiently in limited space.



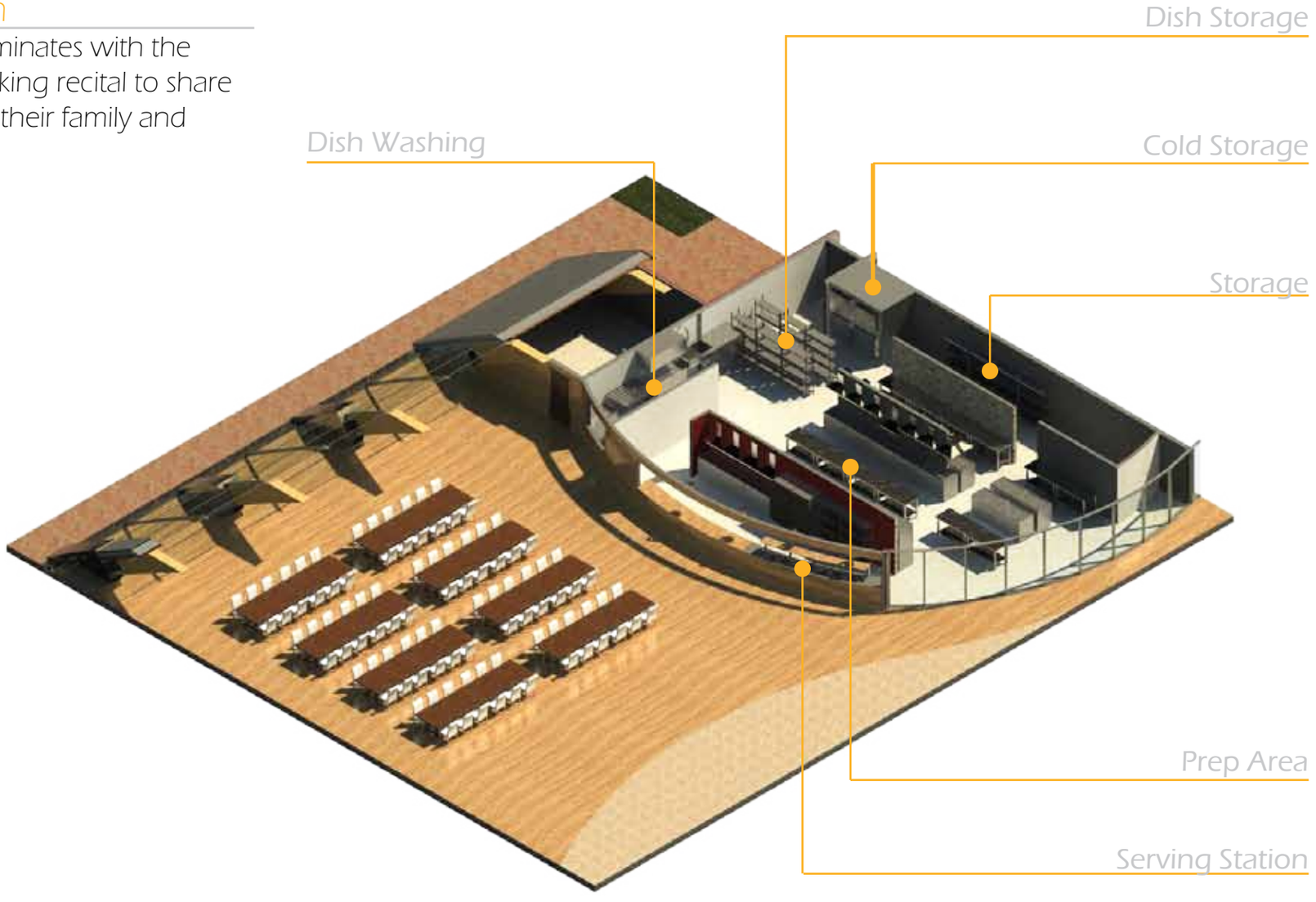


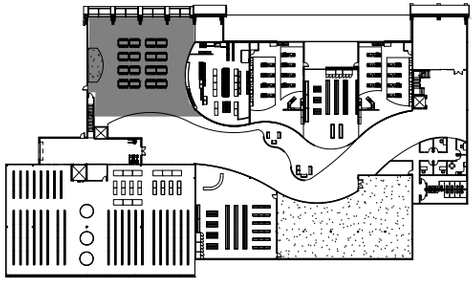
Performance Space

Performance Space

Performance Kitchen

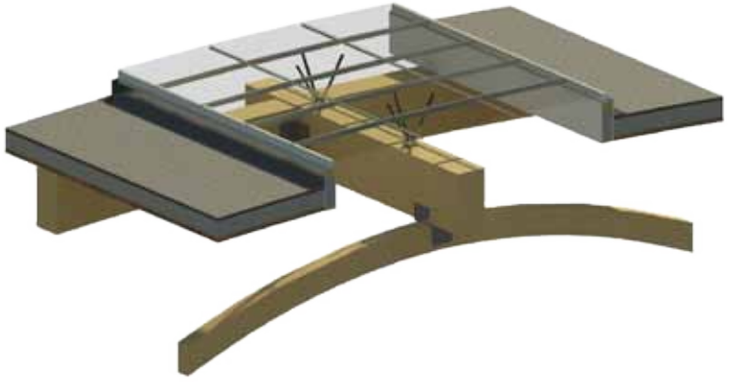
The culinary program culminates with the students putting on a cooking recital to share their newfound skills with their family and friends.



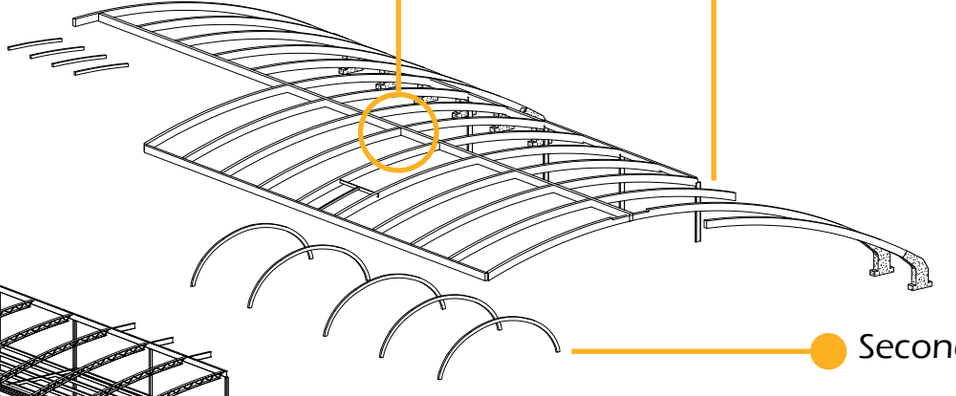


Systems

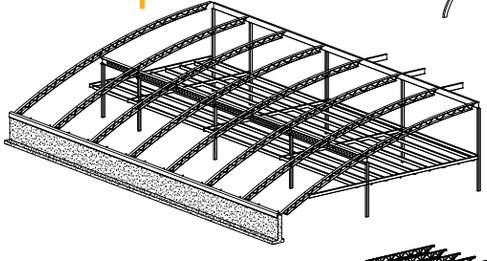
Structure



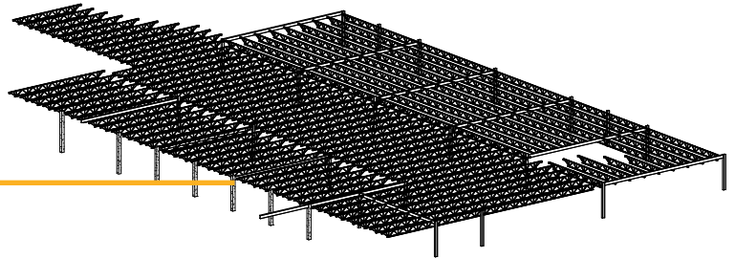
30″ x 16″ Glulam Beam
(20′ 0.C.)



24″ Open Web Steel Joist
Necessary due to extreme conditions within greenhouse

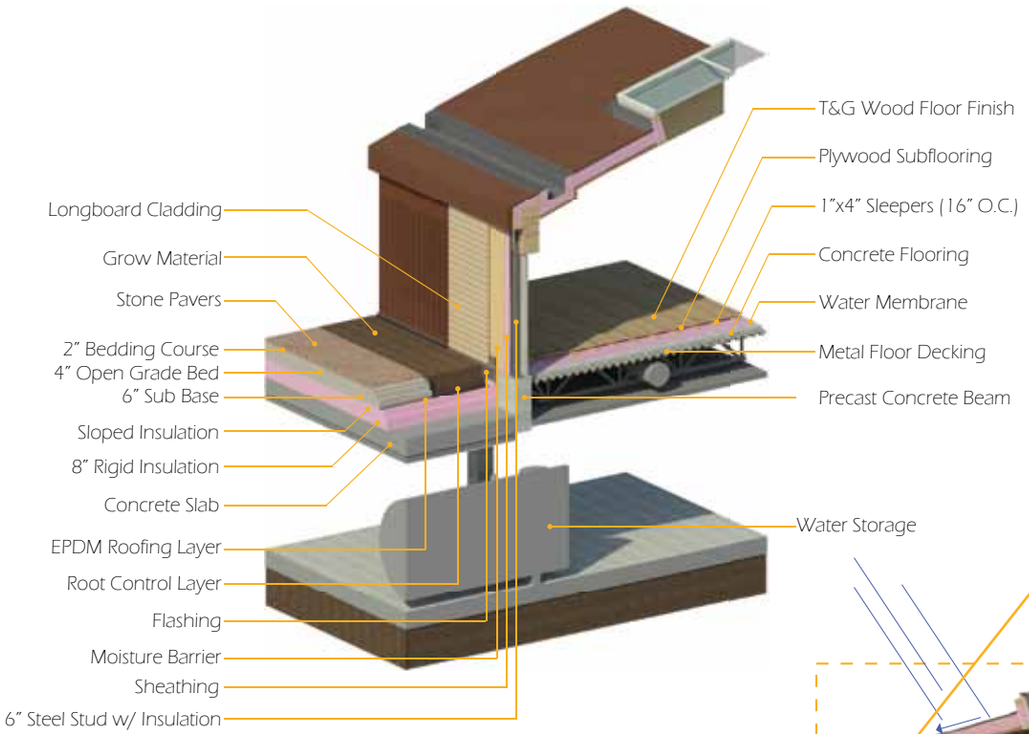


Secondary Cycloidal Arch



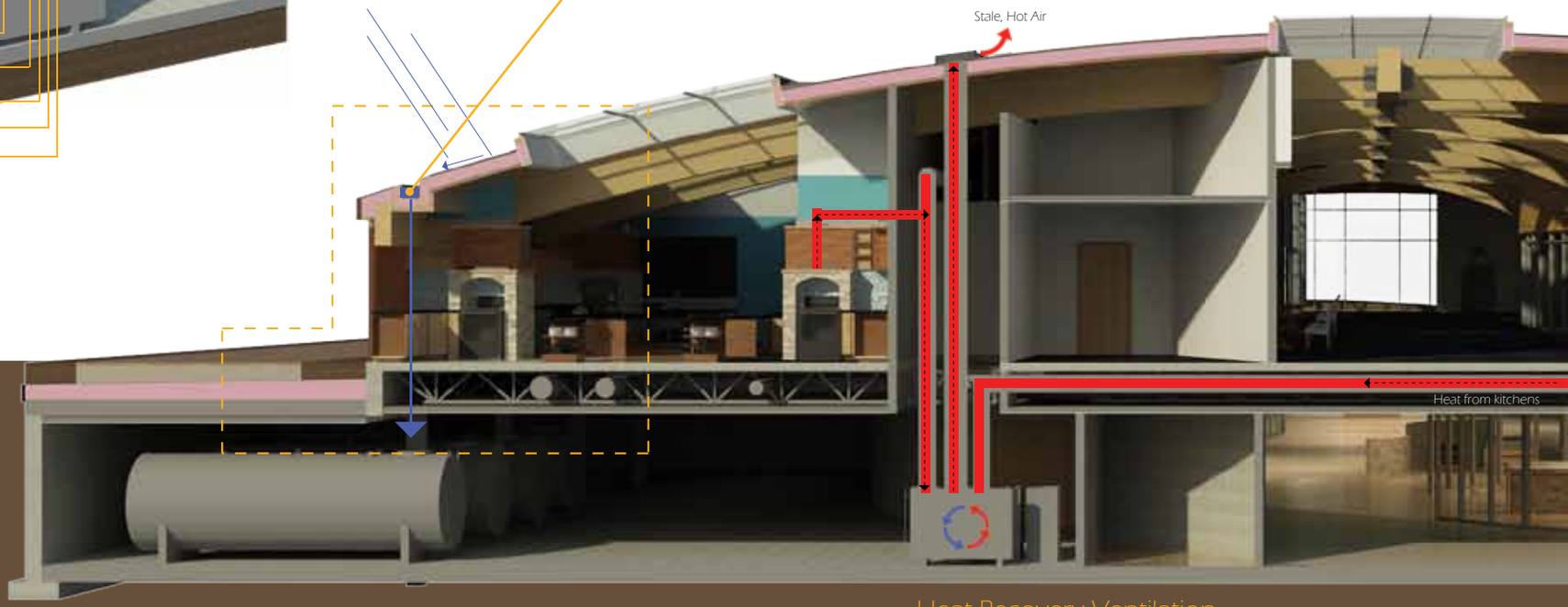
Steel Beam System

Systems



Rain Collection

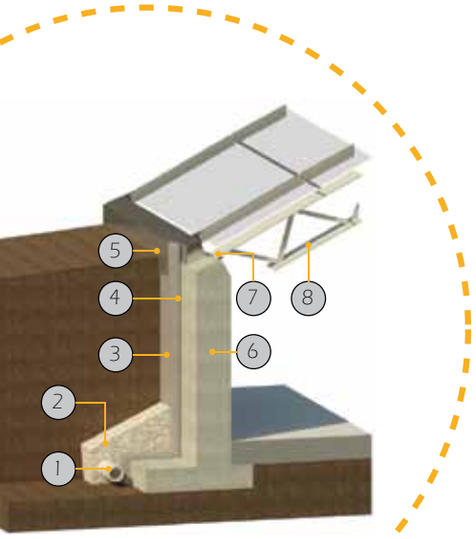
Gutters located at every structural column direct water to the collection tanks in the mechanical space.



Heat Recovery Ventilation

As the cool, fresh air passes through the heat recovery unit, the stale, hot air from the cooking spaces will heat it. This will provide fresh, warm air to the building while getting rid of building exhaust. Because of the amount of heat generated by the cooking spaces, little outside energy will be required to heat the building.

Details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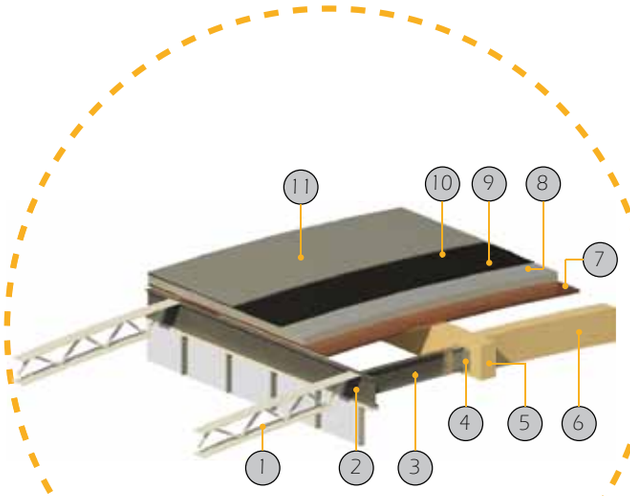
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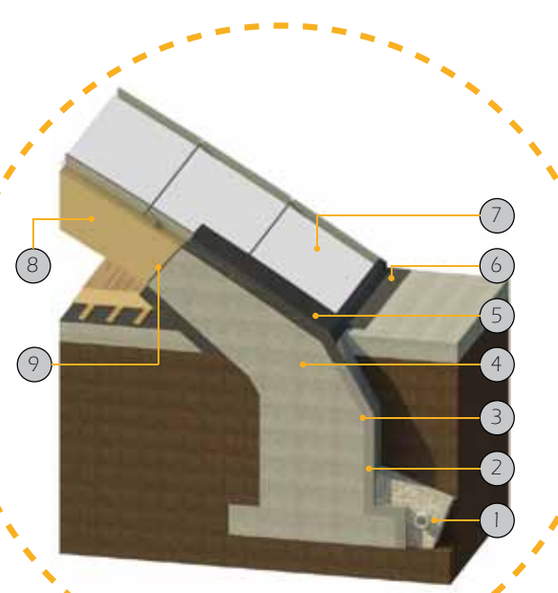
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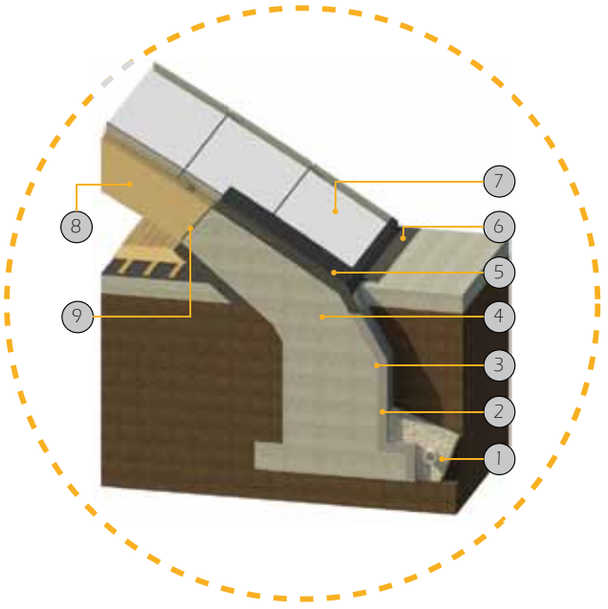
Greenhouse Supply
Facility Supply

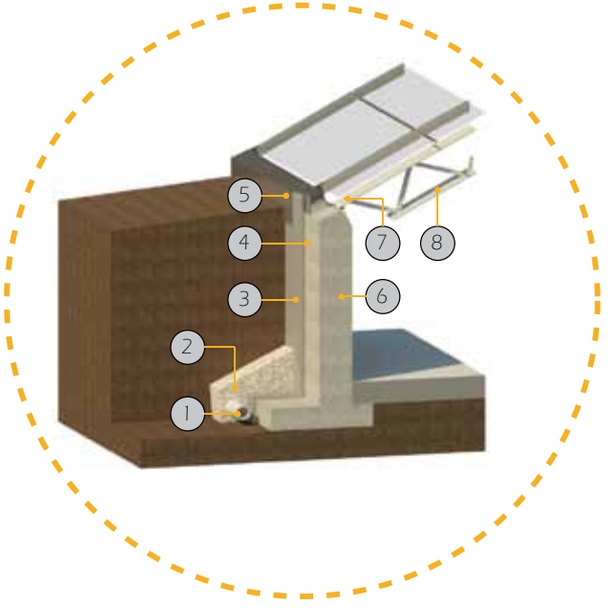
Details

1. Coarse Drainage Stone wrapped in filter fabric
2. Rigid Insulation
3. Moisture Protection
4. Concrete Footing
5. Steel Encased Footing Insulation
6. Steel Flashing
7. Glazing System
8. 24" Glulam Beam
9. Steel Connection Pressure Plate

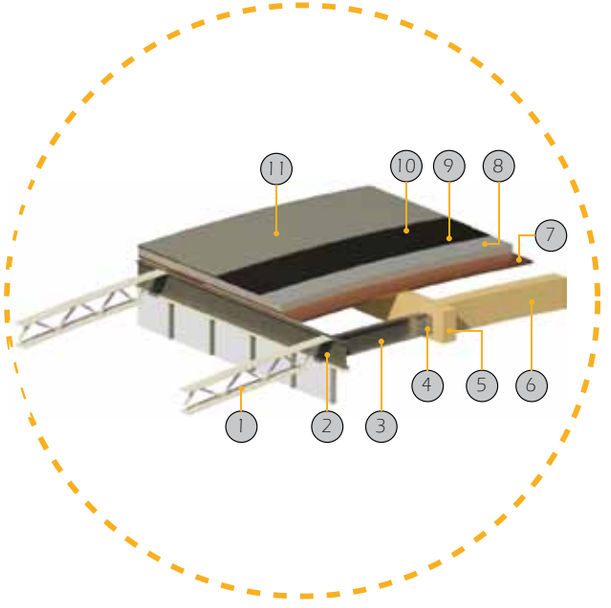


Performance Space Foundation

1. Perforated Drain Pipe
2. Coarse Bedding
3. Rigid Insulation
4. Moisture Protection
5. Metal Flashing
6. 18" Cast-in-place Concrete Foundation
7. Steel Angle
8. 30" Steel Web Joist



Greenhouse Foundation



Greenhouse Connection

1. 24" Steel Web Joist
2. 26" Steel Wide Flange Beam
3. 18" Steel Wide Flange Beam
4. Steel Beam Connection
5. 30" Glulam Truss
6. 24" Glulam Truss (20'-0" O.C.)
7. Wood Decking
8. 8" Insulation (minimum)
9. Moisture Layer
10. Moisture Protection
11. Metal Roofing

Display Boards

Physical Display

The physical display consisted of the display boards, an animation, a site model, and two different recipe handouts - one featuring four main dishes and one featuring four side dishes. Each recipe has an ingredients list, nutrition facts, and have been priced out on a per serving basis.

It is my desire that this thesis project not only educates readers on its content, but stimulates interest producing supplementary exploration. There is a profound skill which is being lost in our lack of cooking – one which I believe should be a second language to us.

Cooking is what makes us human.

Appendix

Classroom Recipes

http://www.csgn.org/cooking-kids-and-recipe-resources

Curriculum Guides

https://sites.google.com/a/isd709.org/farm-to-school/resources

Edible Schoolyard Resources

Classroom Lesson Videos

http://vimeo.com/album/2035624

Online Lecture Series

http://vimeo.com/album/2192316

Classroom Lesson Resources

http://edibleschoolyard.org/program/edible-schoolyard-berkeley?quicktabs_programs=1

Farm to School Webinars

http://www.farmtoschool.org/webinars.php

School Garden and Nutrition Curriculum

http://dug.org/school-garden-curriculum/

Starting a School Garden Guide

http://www.lifelab.org/wp-content/uploads/2010/06/GettingStarted.pdf

Aquaponics System

FAQ

http://www.friendlyaquaponics.com/commercial-faq/

System Design

http://aquaponicsjournal.com/docs/articles/Ten-Thoughts-on-system-Design.pdf

Aquaponics Journal

http://aquaponics.com/

6,000 lbs of Food on 1/10th an Acre

http://www.youtube.com/watch?v=NCmTJkZy0rM

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Personal Identification

Figure 42 - Josh Muckenhirn Image

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"Give a man a fish, and he eats for a day. Teach a man to fish, and he eats for a lifetime." - Chinese Proverb

Personal Interests

Ever since I began to live independently away from home, I have acquired an avid interest in personal health and nutrition. The "Ramen Diet" was good for a short duration, but I began to desire something more. My sister is a Registered Dietician, and has always been an advocate for nutrition. I respect her immensely, and have always utilized her as a personal resource. I have no doubt she has profoundly influenced my desire to live a more healthy lifestyle. Over time, I taught myself how to cook a variety of meals and cuisines, and through this experience, I have learned how easy cooking can be. It has no doubt drastically improved my personal health since abandoning the "Ramen Diet" which is seen by many young college students today.

In the past few years, my curiosity in cooking has stemmed into an intense fascination with bread baking. I have experimented with dozens of different bread recipes, and have begun to refine a few of the more "successful" ones.

Baseball has been apart of my life ever since I was born. I attended my first baseball game when I was just a few days old because my father was playing in a state tournament. I have played baseball since then, and enjoyed four amazing years on NDSU's Club Baseball Team. During the summer, I continue to satisfy my need for the sport by playing on Delano's amateur baseball team - the Delano Athletics.

A few miscellaneous interests of mine include: golfing, fishing, Star Wars, Star Trek, technology, and snowboarding.