LEED Project 2

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Project Overview

Our proposed new agricultural university is situated on the eastern side of the current Elizabethtown College campus. Throughout the design of the university, the goal is to be mostly independent of the main college campus, especially because the agricultural program would run through the spring, summer, and fall terms.

Site Map, Layout, and Key

Listed above is a map of where we intend to put each building on the new campus, new roadways and parking lot, and sidewalks that will be in place to help travel both between the old campus and new campus, as well as make travel easier across the new campus.

Layout of Site Design

While doing the site design, our team considered many different aspects of the parcel when laying out the buildings, pathways, roads, parking lots, and other elements of the design. The buildings were laid out strategically so that there would be limited environmental disturbance by selecting areas of land that were already clear of trees and vegetation as well as being on relatively flat land.

The new apartment buildings will be built on the existing soccer practice fields, making them close to the already existing Hackman Apartments, as well as within reasonable walking distance of all campus buildings and facilities. The apartments will be especially ideal for students that are attending the newly constructed College of Agriculture and College of Soil.

The new greenhouse is located on a flat, relatively clear piece of land next to the preserved wildlife area. This location, according to the solar charts, receives a high amount of sunlight throughout the day making it extremely ideal for a greenhouse. It also helps reduce the number of utilities needed to keep the greenhouse at the temperature needed to grow the plants and vegetables. The greenhouse is right across the street from the College of Soil and College of Agriculture so that students and faculty can easily access it.

The Wawa is located along Campus Rd., which allows it to be easily accessed by non-campus residents while also being in proximity of walking paths which allow campus students to access it. The location that the Wawa is being built already has some parking, so limited parking will need to be added on. Thus, there is a decrease in the environmental impact of building it.

The College of Soil is located near the farm fields that directly relate to the curriculum being taught there. Students can easily walk to the fields to do crop studies, harvest crops, and do a variety of other things relating to soil and agriculture curriculum. The front of the College of Soil is purposely put facing the solar path so that natural light and heat can be used to reduce utility usage. The College of Soil is also connected to walking paths that lead to housing and the rest of campus.

The College of Agriculture, similar to the College of Soil, is designed to face the sun which allows natural light and heating. The College of Agriculture is designed on a flat, already clear piece of land to limit environmental impact. It has walking paths that allow it to tie into the College of Soil, the new BSC, and the rest of campus. The College of Agriculture also has a field area where livestock can be stored temporarily for classes.

The new BSC is on a clear, flat piece of land that limits environmental disturbance. The BSC is in between the College of Agriculture and College of Soil which allows students to easily access it for lunch and other amenities between their classes versus walking the whole way across campus. It also allows for a closer student union for students living in the quads and the new apartments. The front of the new BSC is also facing the solar path which allows for natural light and heating. It also has parking spaces located across the street which can allow workers to park close to the building.

Some of the other aspects of the site design include the preservation of wetlands, preservation of woodlands, a new parking lot, new pathways, new roads, and a rain garden. There are multiple low points throughout the property that already act as wetlands, so the plan is to preserve them by not disrupting them and adding in native plant species. These areas will provide natural drainage and can create habitats for wildlife. The preservation of woodlands is taking wooded areas along the property and ensuring that our layout does not interfere with them. The main area for this is in the northeast corner of the parcel by the farm fields. By doing this, the new buildings can be built while also leaving a habitat for animals such as deer, turkey, and Bluejays. There will also be a new parking lot constructed underneath the photovoltaic field. The solar panels will be able to be raised, and parking will be added underneath so that there will be more parking spaces for students and workers. There can also be the possibility of a bus station addition as well that ties into the current Lancaster City bus system which makes public transportation more accessible for not only Elizabethtown College students and faculty, but also the surrounding community. Another addition to the site will be the new pathways. With new buildings being built, pathways will be added to connect the buildings as well as connect them to the rest of the existing campus. There will also be added paths that allow students to have a scenic walk through the current woods and near some of the preserved wetlands. There will be a new road added to the photovoltaic parking lot that allows a direct connection to Spring Rd. This will allow students and workers to easily access the new parking lot, as well as make it easier for farmers to bring in livestock for the College of Agriculture. The last new addition to highlight is the rain garden. This will be a relaxing area with benches and chairs that anyone can come to. It will have native plant species and will be designed to not only be effective for drainage but also be atheistically pleasing.

Overall, there were many things taken into consideration in the site design for the growing Elizabethtown College. The design considers the current design of the College, the needs of the growing College, and the community while also focusing on sustainability as outlined by LEED.

LEED 1: Neighborhood Development

Shown in figure 1 is the LEED Project Checklist for the Neighborhood Development Plan for Elizabethtown College, which is expanding to a university. Based on the design, the Neighborhood Development Plan will be LEED Platinum scoring a 90, which is 10 points above the needed score of 80 for a LEED Platinum certified neighborhood.

Some of the highlights of the neighborhood include access to quality transit, restoration of wetlands, housing types and affordability, local food production, access to public space, and innovation.

For access to quality transit, the new campus will be within a mile of Amtrak station that services large cities like New York City, Philadelphia, and Pittsburgh. The new parking lot that is going in under the current solar panels will also provide access to highly traveled roadways, which could allow for the opportunity of an integrated bus station for buses that service Lancaster City and the surrounding areas.

Another key feature is the restoration of wetlands. In the northwest corner of the neighborhood is a low point where water drainage already goes. This wetland will be restored by adding in native wetland plants and making it a protected area that will create a habitat for wildlife while also functioning as a retention pond.

Another aspect of the neighborhood is the type of housing. In the western part of the neighborhood there is new apartments to house the students at the growing Elizabethtown College. These apartments will be much more spacious, sustainable, and modern compared to the current options around Elizabethtown College. These will allow more students to take advantage of apartments compared to traditional dorms, making Elizabethtown College a more attractive place to go to school.

Another aspect of the neighborhood is local food production. With the addition of the new College of Soil, there will be a crop field in the eastern part of the neighborhood that will go crops such as corn, soybean, wheat, strawberries, blueberries, potatoes, and other crop species that can be grown in Pennsylvania. The greenhouses will be in the western part of the neighborhood and will also grow produce such as tomatoes, cucumbers, and broccoli. These aspects of the new College of Soil will allow for fresh and locally grown produce to be used in the dining halls on campus.

The neighborhood will also have public spaces included within it. The primary one, being the Wawa, will be constructed in the eastern part of the neighborhood. This will be a convenience store offering food, drinks, and other basic products. There will be parking, and anyone from the surrounding community can use it. Thus, crossing the bridge between college students and the public makes it a mixed-use space. This will add a whole new aspect to not only the College, but also the town of Elizabethtown as currently there are very limited options for convenience stores such as this.

The last aspect to highlight from the LEED Neighborhood Development Plan is the innovation. The innovation aspects are listed in detail throughout the report. Some of the highlights include using energy-efficient glass, solar panels, natural lighting, eco-friendly materials, and photovoltaic windows. These aspects will make for a modern, sustainable, and high-tech neighborhood that will also help set Elizabethtown College apart from other schools, making it a more attractive place to go.

There are many LEED Neighborhood Development Plan aspects that are shown in Figure 1, and the ones listed above are only some of the highlights. Overall, the design of this neighborhood has been made so that it is to the highest standards, which is why it is considered to be LEED Platinum, meaning that it is environmentally friendly, innovative, and sustainable while also catering to the needs of the people who will be living in the neighborhood and using it.

LEED v4 for Neighborhood Development Plan
Project Checklist

Project Name:
Date:

Yes	?	No			
24	0	4		**Smart Location & Linkage**	**28**
Y			Prereq	Smart Location	Required
Y			Prereq	Imperiled Species and Ecological Communities	Required
Y			Prereq	Wetland and Water Body Conservation	Required
Y			Prereq	Agricultural Land Conservation	Required
Y			Prereq	Floodplain Avoidance	Required
10			Credit	Preferred Locations	10
		2	Credit	Brownfield Remediation	2
5		2	Credit	Access to Quality Transit	7
2			Credit	Bicycle Facilities	2
3			Credit	Housing and Jobs Proximity	3
1			Credit	Steep Slope Protection	1
1			Credit	Site Design for Habitat or Wetland and Water Body Conservation	1
1			Credit	Restoration of Habitat or Wetlands and Water Bodies	1
1			Credit	Long-Term Conservation Management of Habitat or Wetlands and Water Bodies	1
37	1	3		**Neighborhood Pattern & Design**	**41**
Y			Prereq	Walkable Streets	Required
Y			Prereq	Compact Development	Required
Y			Prereq	Connected and Open Community	Required
9			Credit	Walkable Streets	9
6			Credit	Compact Development	6
2		2	Credit	Mixed-Use Neighborhoods	4
7			Credit	Housing Types and Affordability	7
1			Credit	Reduced Parking Footprint	1
2			Credit	Connected and Open Community	2
0	1		Credit	Transit Facilities	1
2			Credit	Transportation Demand Management	2
1			Credit	Access to Civic & Public Space	1
1			Credit	Access to Recreation Facilities	1
1			Credit	Visitability and Universal Design	1
2			Credit	Community Outreach and Involvement	2
1			Credit	Local Food Production	1
2			Credit	Tree-Lined and Shaded Streetscapes	2
0		1	Credit	Neighborhood Schools	1

Yes	?	No			
24	0	7		**Green Infrastructure & Buildings**	**31**
Y			Prereq	Certified Green Building	Required
Y			Prereq	Minimum Building Energy Performance	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Construction Activity Pollution Prevention	Required
5			Credit	Certified Green Buildings	5
2			Credit	Optimize Building Energy Performance	2
0		1	Credit	Indoor Water Use Reduction	1
1		1	Credit	Outdoor Water Use Reduction	2
0		1	Credit	Building Reuse	1
0		2	Credit	Historic Resource Preservation and Adaptive Reuse	2
1			Credit	Minimized Site Disturbance	1
4			Credit	Rainwater Management	4
1			Credit	Heat Island Reduction	1
1			Credit	Solar Orientation	1
3			Credit	Renewable Energy Production	3
0		2	Credit	District Heating and Cooling	2
1			Credit	Infrastructure Energy Efficiency	1
2			Credit	Wastewater Management	2
1			Credit	Recycled and Reused Infrastructure	1
1			Credit	Solid Waste Management	1
1			Credit	Light Pollution Reduction	1
5	0	1		**Innovation & Design Process**	**6**
5			Credit	Innovation	5
0		1	Credit	LEED® Accredited Professional	1
0	0	4		**Regional Priority Credits**	**4**
0		1	Credit	Regional Priority Credit: Region Defined	1
0		1	Credit	Regional Priority Credit: Region Defined	1
0		1	Credit	Regional Priority Credit: Region Defined	1
0		1	Credit	Regional Priority Credit: Region Defined	1
90	1	19		**PROJECT TOTALS (Certification estimates)**	**110**

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

Figure 1 - LEED Neighborhood Development Plan Checklist

Site Analysis

Throughout our site, the intended goal is to maximize the sun's efficiency towards both our greenhouse areas as well as the area where the crops will be planted. This leads to the greenhouse facing in a south direction to maximize the amount of sun the crops will receive. This also helps during the fall and winter season to allow each green house to still receive natural heat from the sun. Which then leads to the new academic housing facing north which can allow the students not to be hit directly by the sun during the hottest hours of the day, especially since students will be housed during hotter times of the year. Both new classroom/lab buildings will be built west of the sun, allowing them to be hit with the morning light to begin to warm up, then slowly cool off as the day progresses. The new common area will then face west to maximize the sun when it is expected to be most populated. For the Wawa area, it will face east towards the road receiving the morning sun.

Based on where the intended school will be built, research shows that Alfisols and Histosols soil types are expected to be found. Alfisols is commonly located in central Pa and excellent for crop growth, while Histosols typically can be found in wetland areas, both of which we expect to be located at our new school of agriculture, but without further testing, it cannot be confirmed.

The frost line in Pennsylvania is on average 3 feet deep. Our foundations for our buildings will adhere to standard PA construction codes. One consideration for the site is the elevation raises concerns for possible flash flooding on the northern side of our solar parking lot. Due to the rainwater concern, we will be addressing storm drains and water run-off.

Solar Information

Figure 2 – Solar Path

The solar path shown is how the sun travels throughout the day in the location of the neighborhood. The buildings are strategically placed on the path. For example, the greenhouse is placed directly under the sun path between the hours of 11 am and 2 pm which helps, especially in the winter, with keeping the temperature up with using limited energy. The way the other buildings are oriented have the fronts pointed directly at the sun's path maximizing the amount of light they get and again, helping with natural heating as well as providing natural light for the insides of the buildings.

When designing each of the new structures, we prioritized building orientation to optimize energy efficiency. We considered how our selected brick and window materials will absorb heat during the fall and winter while reflecting or releasing it during the spring and summer. Each building's orientation is based on the sun's path, and we have integrated ventilation systems and phase-changing materials to enhance cooling during warmer seasons.

Vernacular

Elizabethtown College's current vernacular is in a colonial revival style. Following this architectural style, we carried the brick throughout the expansion, along with symmetrical designs and centered entries. We also wanted to make roads, paths, and other elements look seamless between the expansion and the pre-existing campus. Culturally, Etown and the surrounding areas are known for farming and agriculture, and so the agricultural university makes sense for the expansion of the college campus. We also would like to preserve the native plants and wildlife within the site and avoid disturbances throughout the construction process.

Design Specific Materials and Brands

For the greenhouse, by using Lexan greenhouse polycarbonate sheeting, we can minimize the insulation and energy costs. Recycled aluminum framing will be used to secure the panels and be eco-conscious.

By using brick for the exterior of all the buildings, we not only follow the current vernacular of the college, but we also comply with VOC standards without testing due to being "Inherently non-emitting material." We plan to get all our brick and hardscape items from a local supplier, Drohan Brick and Hardscaping, to minimize transport impact and cost.

For the classroom/ lab building, we will have recycled full-view aluminum garage doors on each wing to allow students an indoor-outdoor learning experience, and allow natural solar into the building, contributing to Indoor Environmental Quality (IEQ). The stand-alone structure in the middle of each classroom/lab building will also have a transparent green roof, allowing for natural lighting and energy efficiency.

Using Hempcrete to insulate our buildings will be eco-friendly, carbon-negative, and sustainable. Hempcrete is an insulation material made from hemp herds and lime binder. Hempcrete is fire-resistant, moisture-resistant, and insect-resistant. One downfall is that it needs a separate load-bearing structural frame, and the cost is slightly higher than traditional methods.

We opted not to use green roofs due to the weight loads added to the structures; however, we decided we would use Green Facades on the side of some of the buildings to allow for reduced energy usage, noise reduction, and biodiversity within the university. By using photovoltaic glass within our buildings, the aim is to become a net-zero or energy-plus university.

Solar Alignment

School of Soils
The new School of Soils will face southeast, allowing the building to be embraced by the morning sun. This creates a welcoming atmosphere for students arriving for morning classes. This orientation also allows the building to capture early solar heat, which is particularly beneficial for maintaining comfortable indoor temperatures during the winter.

Apartment Buildings
The fronts of both new apartment buildings will face northwest. This placement maximizes heat absorption in the latter half of the day, improving student comfort during colder seasons by utilizing natural solar gain.

Brossman Student Center 2.0 (BSC) New Common Building
The new common building will face southwest to capture maximum afternoon sunlight, providing an inspiring environment for students to watch the sunset during evening meals. As one of the primary structures hit by the sun, the building will store thermal energy and release it gradually throughout the day.

Greenhouse
The greenhouse will face northeast to take advantage of the morning sun as it rises. By midday, the structure will be directly under the sun, ensuring maximum light and heat for the crops. This exposure is vital during the winter months when natural light and temperatures are significantly lower than in the spring and summer.

HVAC
We intend to use MERV 13+ air filters to ensure that the air is as allergen-free as possible. By prioritizing air purification and fresh air exchanges, we ensure that dust, pollen, and odors do not impact the function and comfort of our buildings, especially with plants and animals involved within an agricultural setting.

By using purpose-specific indoor agricultural systems by Trane, we can ensure continued and consistent humidity and temperature controls, especially within our greenhouse spaces and labs. By using VRF (Variable refrigerant flow) systems, we can keep flexible temperature controls within our classrooms and common areas and stay energy efficient.

All the HVAC would be automated to ensure maintenance and monitoring are seamless, and to allow off-premises access to technicians for system controls. We will also have systems that monitor CO2 output within our sealed greenhouses.

Humidity control systems are important to our designs to ensure safety and functionality. For the laboratories and greenhouse, standard HVAC systems would be unable to maintain the levels required for use.

Psychometric Charts

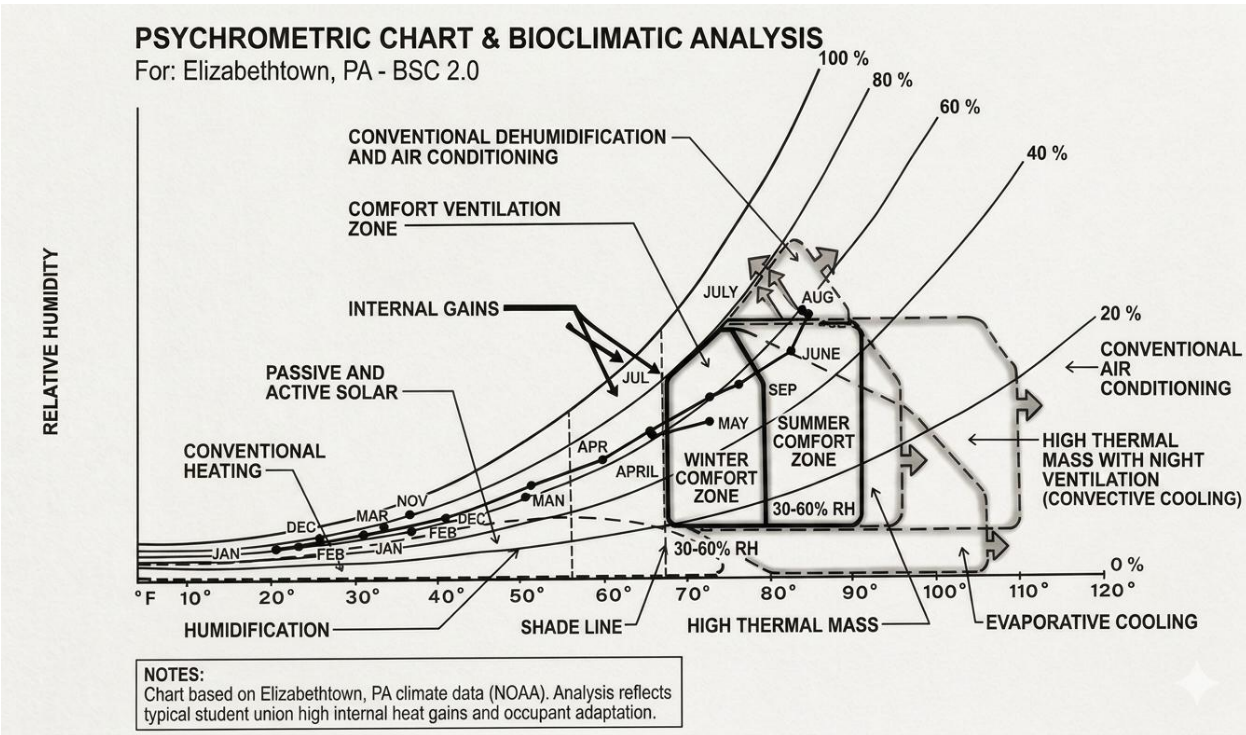

Figure 3 – Commons (BSC 2.0)

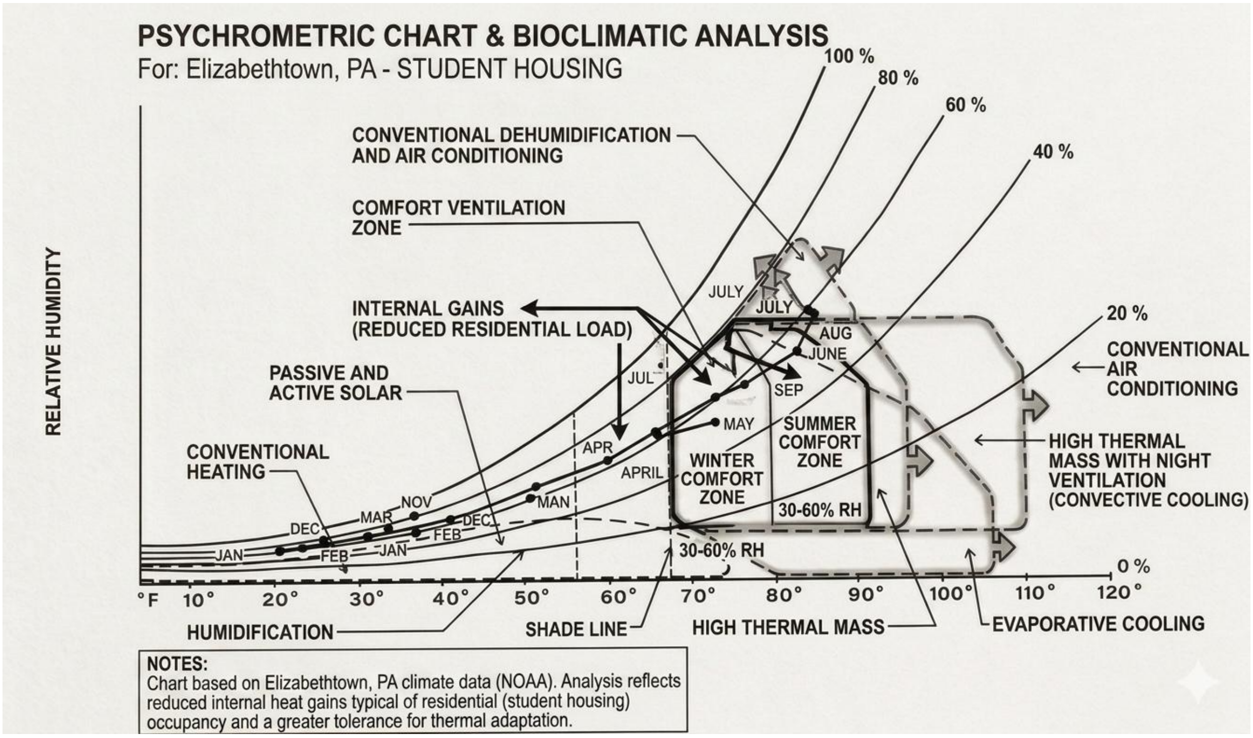

Figure 4 - Student Housing

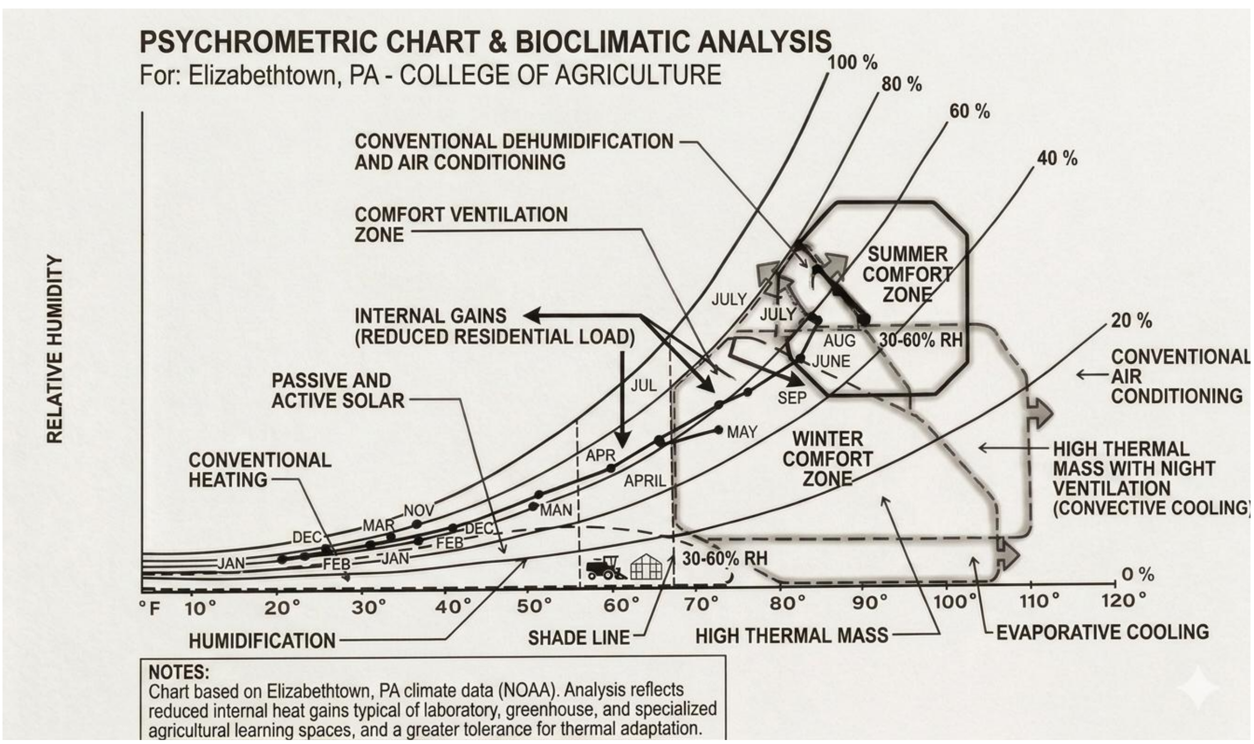

Figure 5 - College of Agriculture

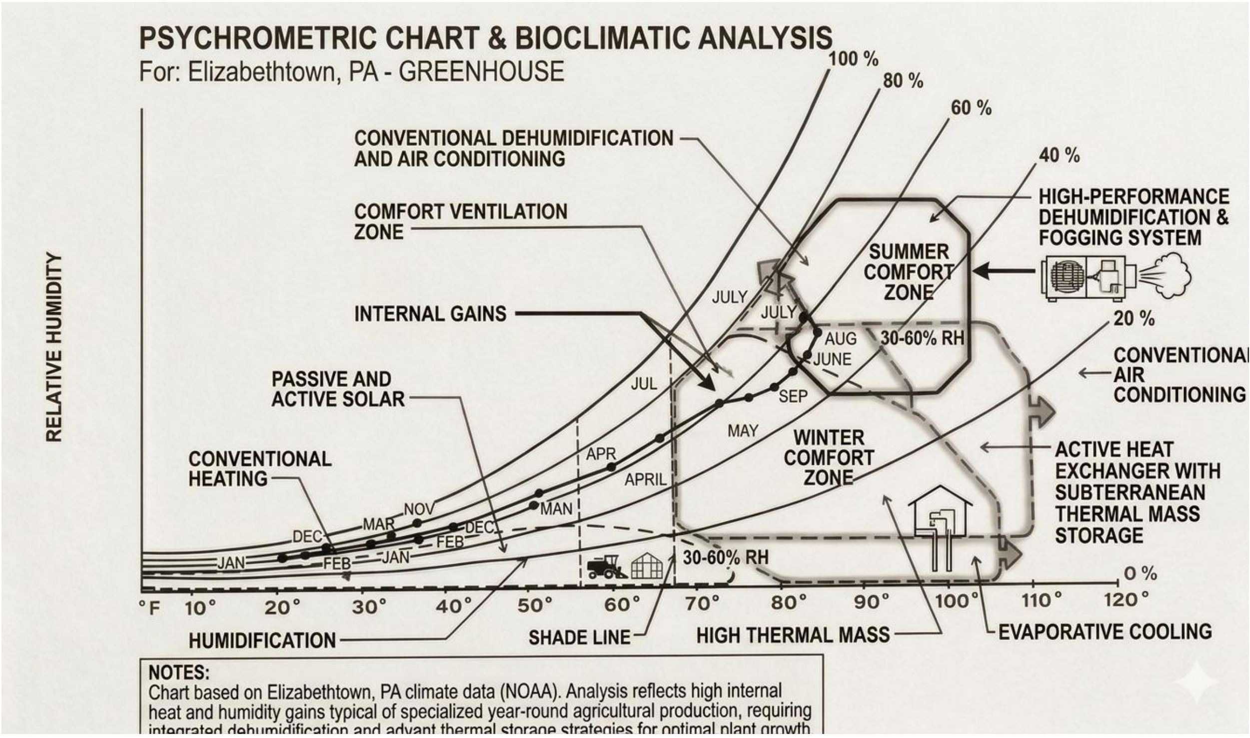

Figure 6 – Greenhouse

Figure 3 shows the psychometric chart for the BSC 2.0. This chart shows that the building utilizes conventional air conditioning and dehumidification during the summer when it is hot and humid. It also uses night ventilation to cool the building, making it more sustainable. When heating the building, it utilizes active and passive solar as well as conventional heating in order to obtain the winter comfort zone. It also uses the high volume of people within the building to provide heat too.

Figure 4 shows the psychometric chart for the new student housing. Similar to the BSC 2.0, the new student housing utilizes conventional air conditioning, night ventilation, and dehumidification during the summer months. During the winter months, it uses active and passive solar along with conventional heating to keep the building warm. It has reduced thermal gains compared to the BSC 2.0 due to having a lesser volume of people. Thus, relying more on solar and heating.

Figure 5 shows the psychometric chart for the College of Agriculture. The winter months will be similar to the new student housing. It will rely heavily on conventional heating and passive and active solar to make it as efficient as possible. Due to this being a classroom and lab building, it is assumed that people will have a higher thermal tolerance. Thus, during the summer months having the comfort zone be slightly higher. The building will rely on conventional air conditioning and dehumidification but will rely on it less than the BSC 2.0 and new student housing due to the higher thermal tolerance. The building will also use night ventilation for cooling. This will in turn make the building more efficient.

Figure 6 shows the psychometric chart for the greenhouse. In the winter, it is crucial to keep the greenhouse at a relatively high temperature. Thus, requiring more advanced heating elements. The greenhouse will take advantage of a subterranean thermal mass storage and an active heat exchanger that stores heat during the summer or when it is warmer out and releases it whenever it gets colder. For the summer when there is high heat and humidity, a advanced dehumidification and fogging system will be used in order to keep the humidity down. The fogging system releases water droplets into the air to absorb heat which helps lower the internal temperature and also helps with regulating the humidity.

LEED 2: New Construction and Renovation

Our LEED checklist achieves the goal of 108 possible points, which would put our building at LEED Platinum. For the checklist, we chose to do our common building, which includes outdoor seating, study areas, and dining areas. The location and transportation section has notable points for being a LEED-certified neighborhood development location, due to our green, sustainable design for the entire expansion, as well as the local public transportation.

Our energy and atmosphere contain notable points for optimizing energy performance, which we plan to do by having advanced lighting controls to prevent internal energy loads, focusing on passive designs with high-performance roofs for lower demands on HVAC systems.

Materials and resources are sustainably sourced, recycled materials (When possible), and locally produced and purchased (when possible). Our building is innovatively designed, with comfort and functionality in mind.

Our regional priority credits are from rainwater management, renewable energy production, sensitive land protection, and building/material reuse.

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name: Project 2 LEED Design, Group 7

Date: 5/4/26

Y	?	N			
1			Credit	Integrative Process	1

0	0	0		Location and Transportation	16
13			Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
2			Credit	High Priority Site	2
4			Credit	Surrounding Density and Diverse Uses	5
3			Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
	1		Credit	Green Vehicles	1

0	0	0		Sustainable Sites	10
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
1			Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
3			Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1

0	0	0		Water Efficiency	11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
6			Credit	Indoor Water Use Reduction	6
	2		Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

0	0	0		Energy and Atmosphere	33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
4			Credit	Enhanced Commissioning	6
16			Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
2			Credit	Demand Response	2
3			Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
2			Credit	Green Power and Carbon Offsets	2

0	0	0		Materials and Resources	13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
5			Credit	Building Life-Cycle Impact Reduction	5
2			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
2			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
2			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

0	0	0		Indoor Environmental Quality	16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1			Credit	Enhanced Indoor Air Quality Strategies	2
3			Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
1			Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
2			Credit	Interior Lighting	2
3			Credit	Daylight	3
	1		Credit	Quality Views	1
1			Credit	Acoustic Performance	1

0	0	0		Innovation	6
3	1		Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

0	0	0		Regional Priority	4
	1		Credit	Regional Priority: Specific Credit	1
	1		Credit	Regional Priority: Specific Credit	1
	1		Credit	Regional Priority: Specific Credit	1
	1		Credit	Regional Priority: Specific Credit	1

0	0	0	TOTALS	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

Figure 7 – LEED New Construction and Major Renovations Checklist

Architectural Details

Lecture 1: Thermodynamics, Air Quality & Health

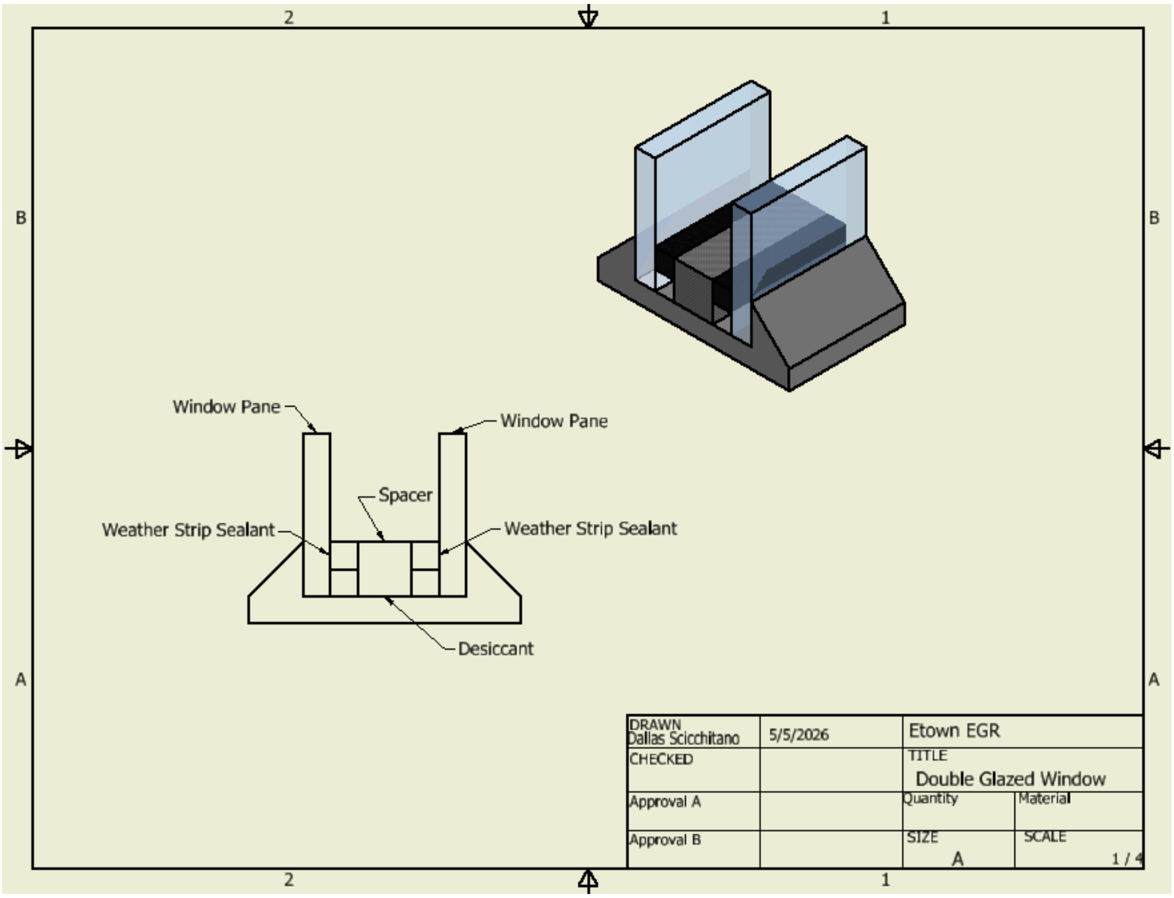

Figure 8 – Weather Strip

One of the main points of lecture 1 was discussing the amount of fresh air exchanges. The recommended amount is 6-9 exchanges per hour. However, we must also take thermodynamic efficiency into account when we are designing our buildings. We deemed using weather strips as a worthwhile device to help with this. It limits the amount of air exchanges that occur, but we believe our HVAC system will help with treating COVID in the air that the air exchanges assist with.

Lecture 2: A&E Thermal Comfort and Health

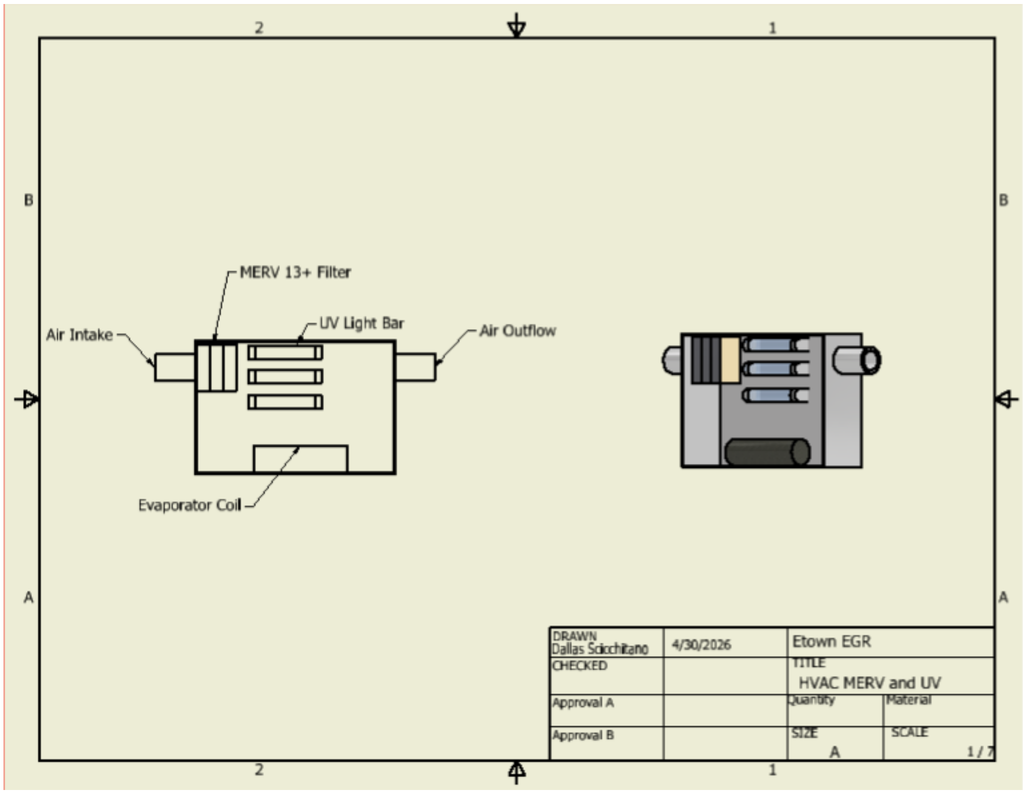

Figure 9 – UV Light Bars

Lecture 2 opens with a discussion on airborne sicknesses and diseases. In the larger cities, COVID was running rampant through skyscrapers since the buildings were airtight and did not have any degree of disinfectant. We believe adding UV light bars to our HVAC system would be highly beneficial since there has been links to UV light being able to kill COVID. Also, the UV lights have been linked to killing other serious illnesses like Ebola. We think this would be a critical thing to include in our commons building since the building will be handling food.

Lecture 3: Climate & Site Design

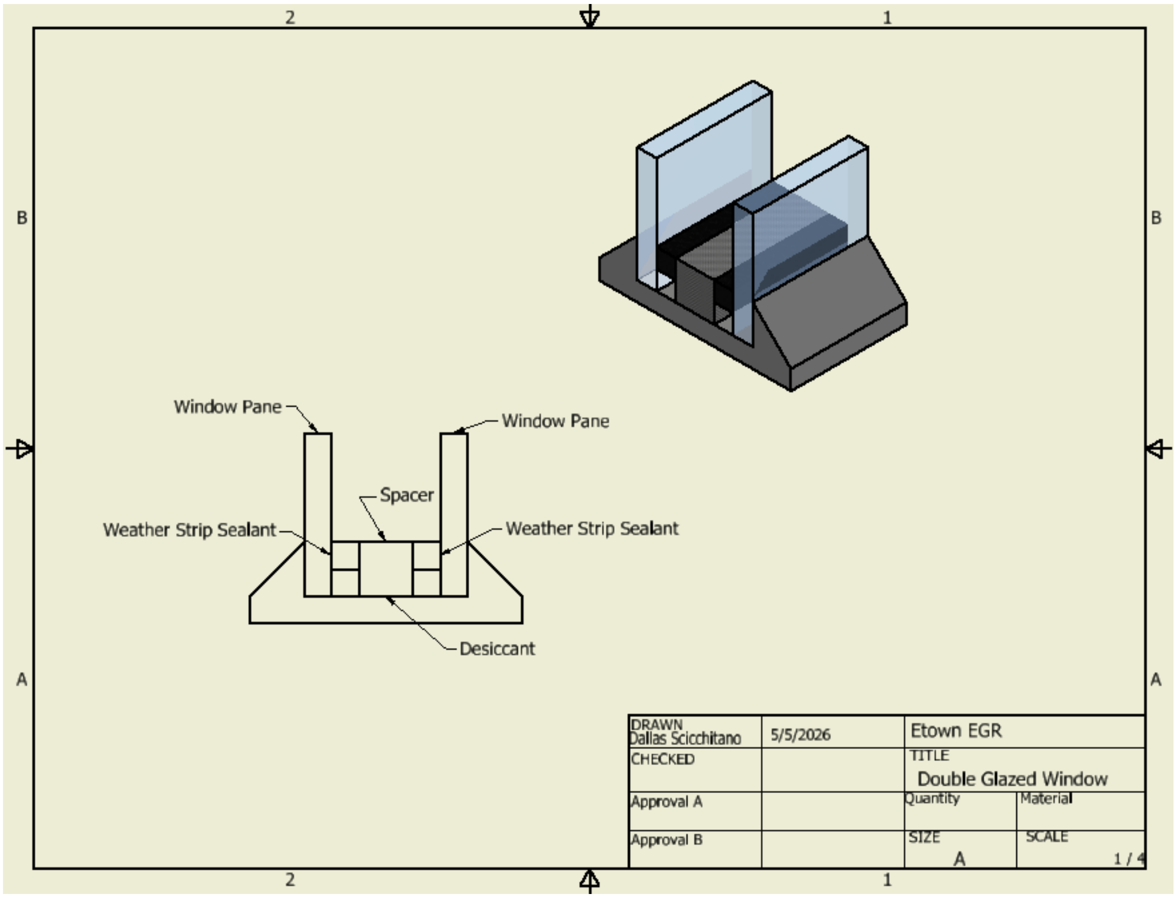

Figure 10 – Double Glazed Window Assembly

In lecture 3, we see the difference in climate depending on the region of the United States. Within those sections, there are design strategies for combatting the climate during the summer and winter months. The strategies differ between which region you are in. For Pennsylvania, there was an overlap between using double glazed windows as an all-around recommended strategy. Double glazed windows have a gap between two panes, typically air but could be filled with gases such as argon, the allows the temperatures from the outside climate to get “trapped” in the gas in the gap. Double glazed windows can still be installed to open, which we believe is a must have in the study room areas in the commons.

Lecture 4: Solar Geometry

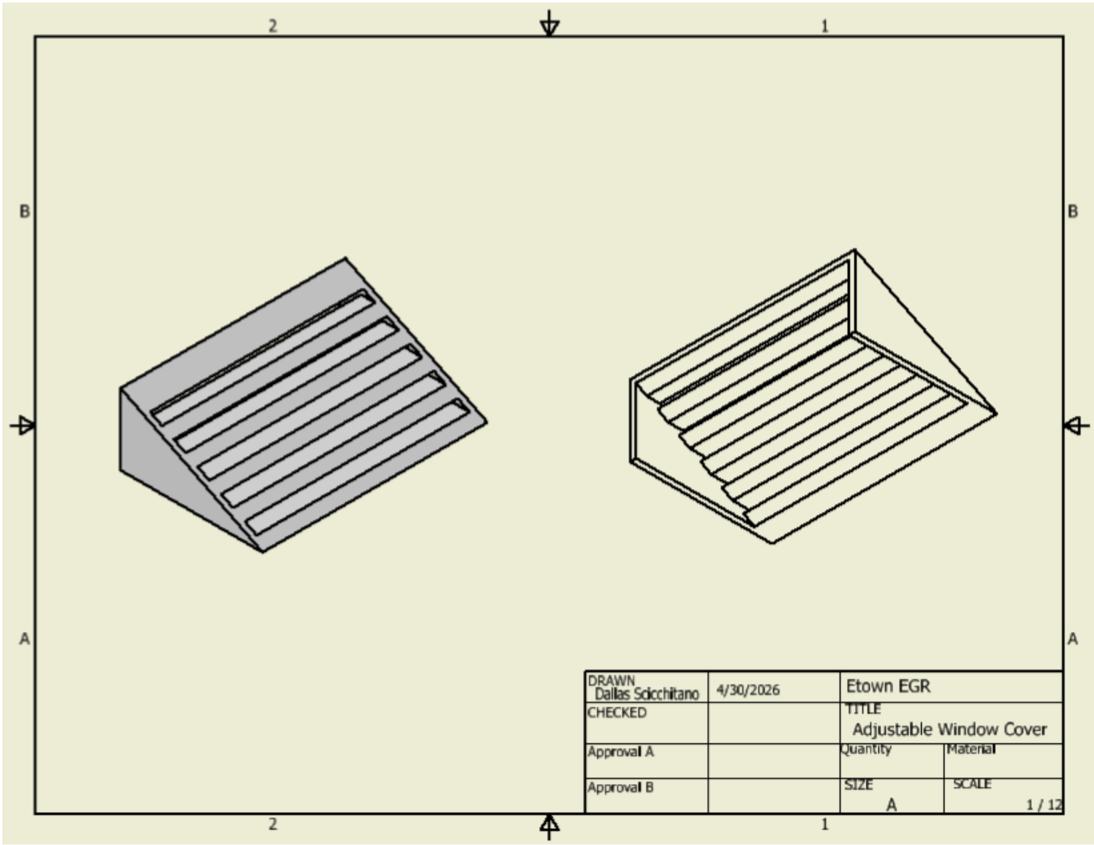

Figure 11 – Adjustable Window Cover

Lecture 4 stresses the importance of how the building is oriented and how that affects internal temperatures and lighting. We think that one of the best ways to help manage this is an adjustable solar window cover. These covers will be automatic by being able to read the light levels inside the building and adjust how much sunlight should be let into the room, we believe that his will be especially helpful during season changes.

Lecture 5: Passive Solar Heating, Lecture 6: Active Solar Heating, Lecture 7: Passive Cooling (and Shading), Lecture 8: Natural & Man-Made Lighting

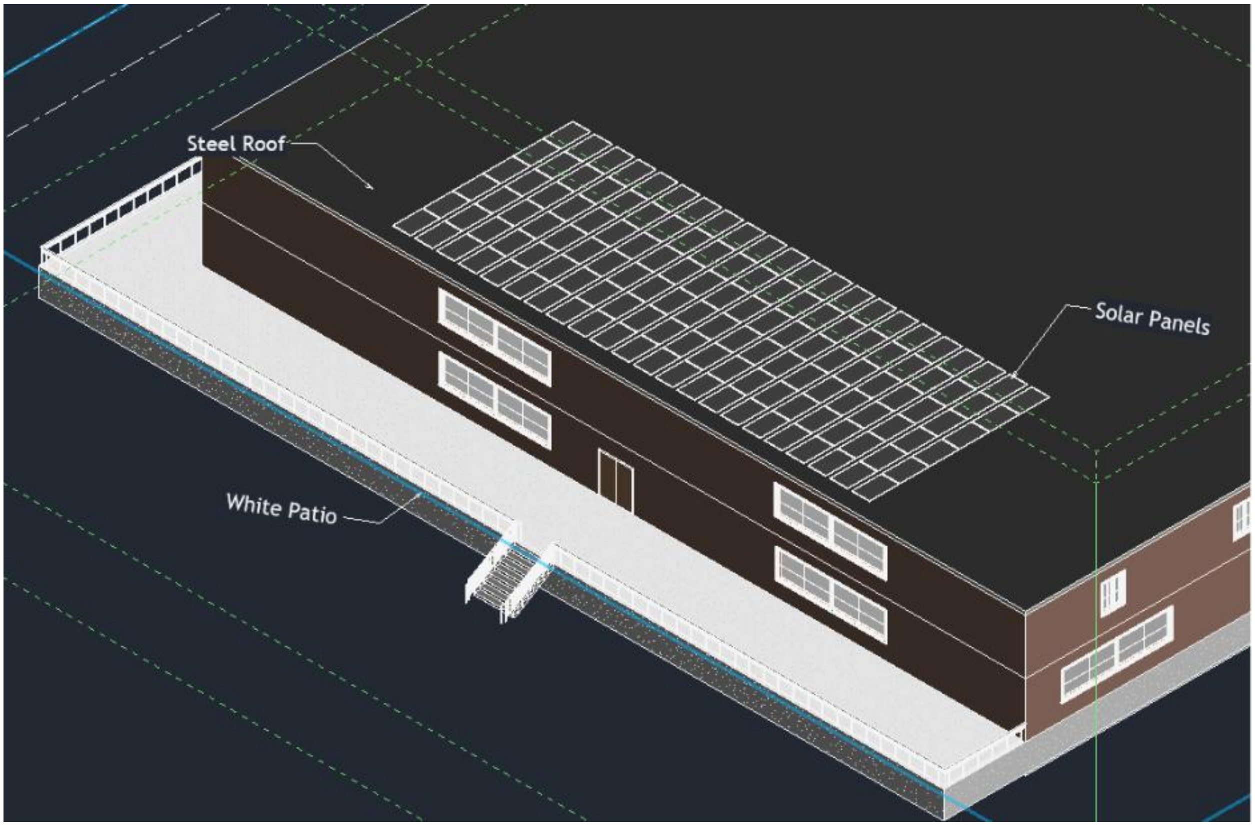

Figure 12 – Isometric Commons View

These 4 lectures are very similar to how they talk about reflecting sunlight as well as also absorption management. Lecture 5 talks about capturing the sun's energy and heat to use it later during the night. To address this, chose to use concrete floors since that is a common practice to get this effect. Lecture 6 is geared toward using solar panels to capture solar energy and use it for electricity, so we added solar panels to the roof. Lecture 7 talks about roof materials that reflect the most amount of light. The middle of the ground approach was to have a steel roof. We believe this is the best option. Lecture 8 mentions how to surround your building to have the most natural light reflects into the building. We chose to make the patio outside white to have light reflect into the commons building.

Lecture 9: "Intelligent Natural Ventilation with Automated Windows and Controls"

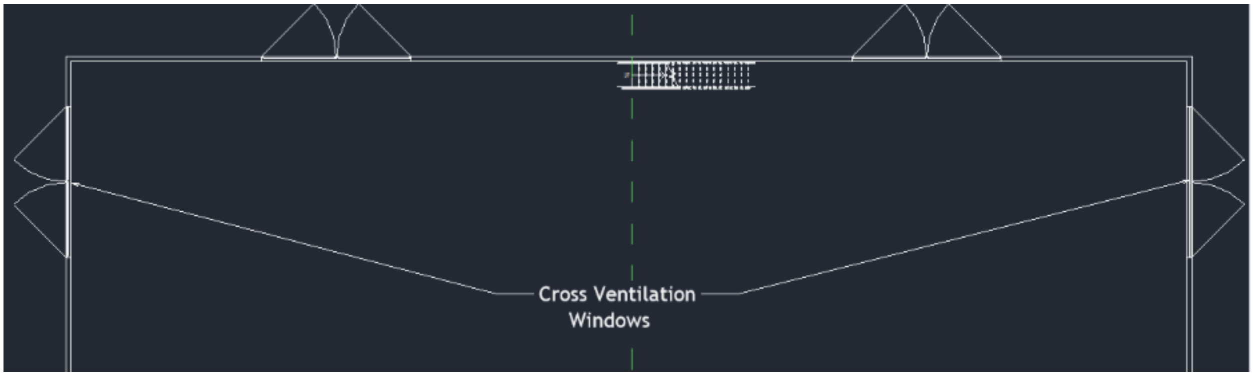

Figure 13 - Cross Ventilation

Lecture 9 speaks heavily about being able to open windows and effectively allow fresh air to circulate. One of the methods that was mentioned was using cross ventilation. Cross ventilation has windows facing each other on separate sides of the room that allows air to flow through one side and exit out of the other.

Lecture 10: Building Thermal Envelope

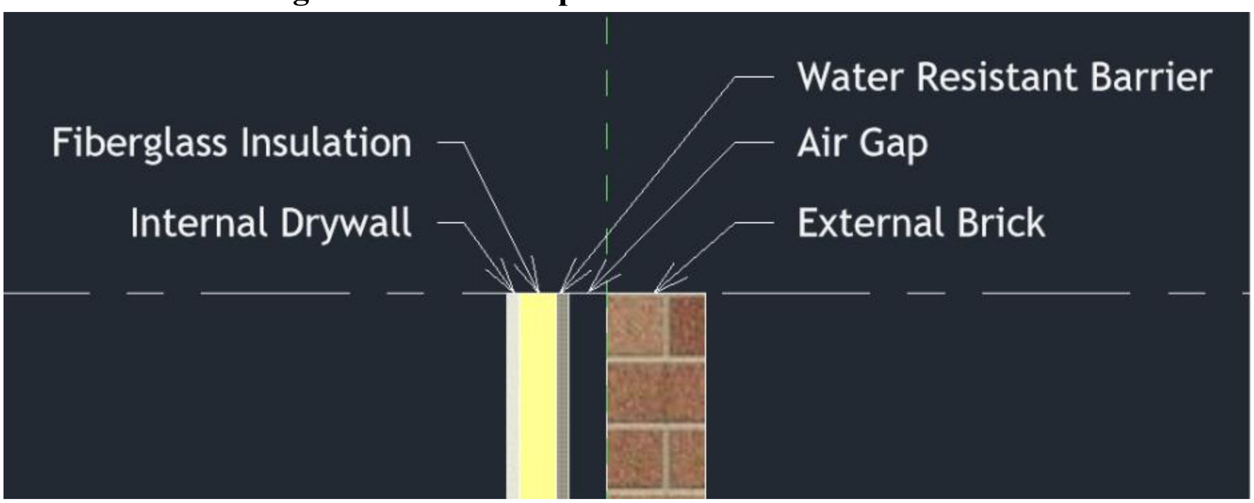

Figure 14 - External Wall Cross Section

Lecture 10 talks about the proper way to insulate your buildings. For brick walls, it is standard to have an airgap layer. This is where any moisture that builds up can collect and eventually drain out of weep holes at the base of the wall. There is also a water resistance barrier to prevent mold from building in the fiberglass. Fiberglass insulation is common in commercial and residential buildings.

Lecture 11: HVAC Techniques

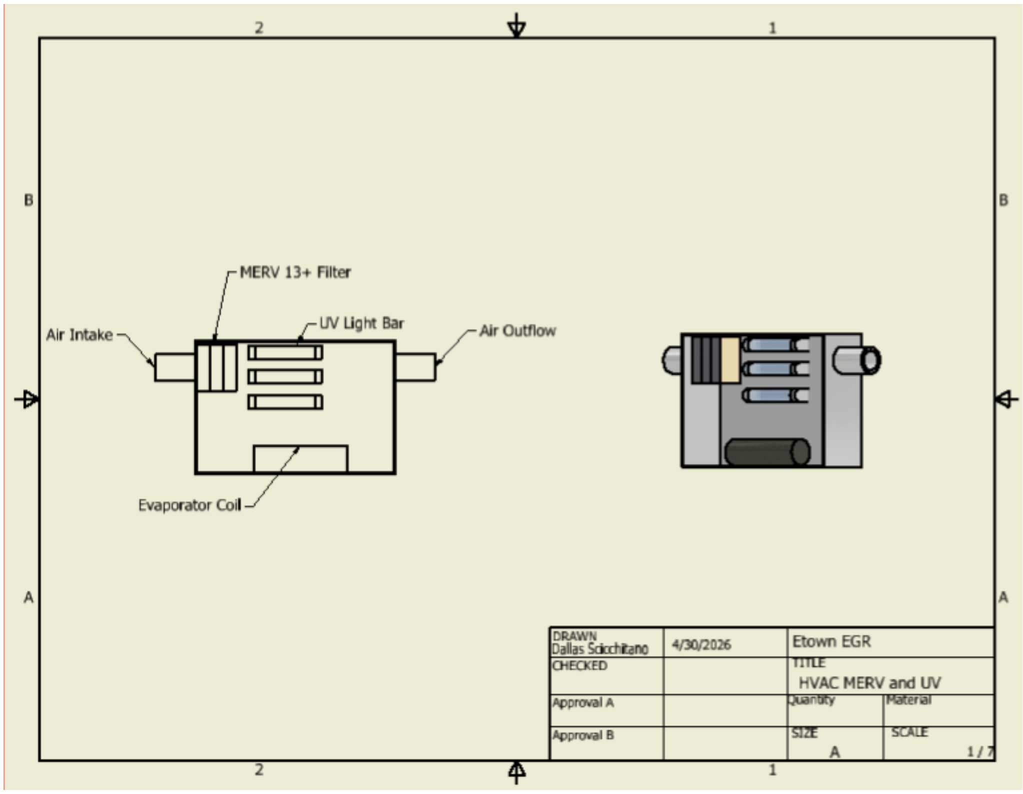

Figure 15 - MERV 13 Filters

We see methods on how to properly ventilate our buildings in lecture 11. It covers the different scales of MERV filters and their ability to remove particles from the air. We decided to go with MERV 13 filters since the next step in the MERV ratings is typically a scale used for personal protection and we think that would be overkill for this kind of scenario.

Lecture 12: Dr. K Roy Acoustical A&E Guest Lecture

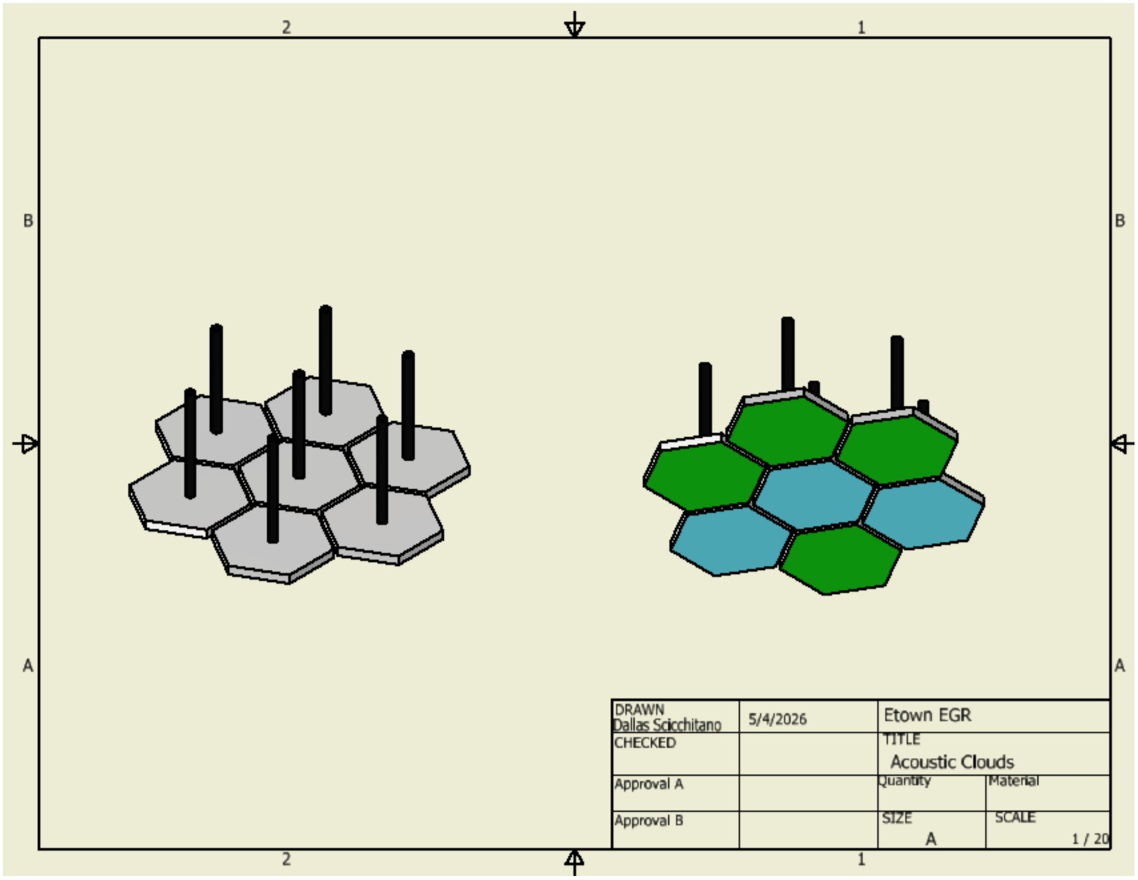

Figure 16 – Acoustic Clouds

Lecture 12 is about the importance of acoustics in a building. It talks about how to reduce echo, how to minimize the amount of sound getting into your room, and how to minimize the amount of sound getting out of your room. This is very important for instances where HIPPA would be considered. However, for our building, our main concern is echo. There are high ceilings next to the stairwell where we believe these acoustic clouds would be beneficial.

Visualized Building Exteriors

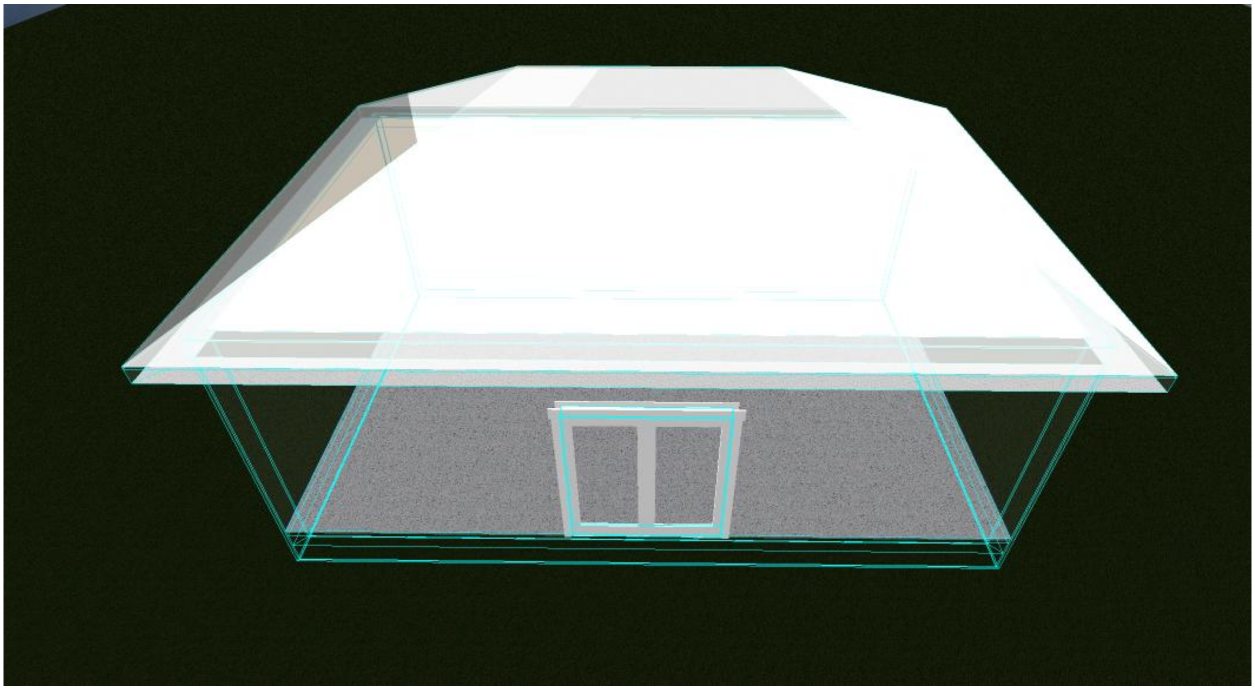

Figure 17 – Greenhouse

Since we are going for the college of agriculture, we believe that it would be important to have a greenhouse on campus. The greenhouse could be an opportunity for students to understand how certain plants can grow or thrive in certain climates. The greenhouse is like most greenhouses; the walls and ceilings are made of glass with an aluminum frame.

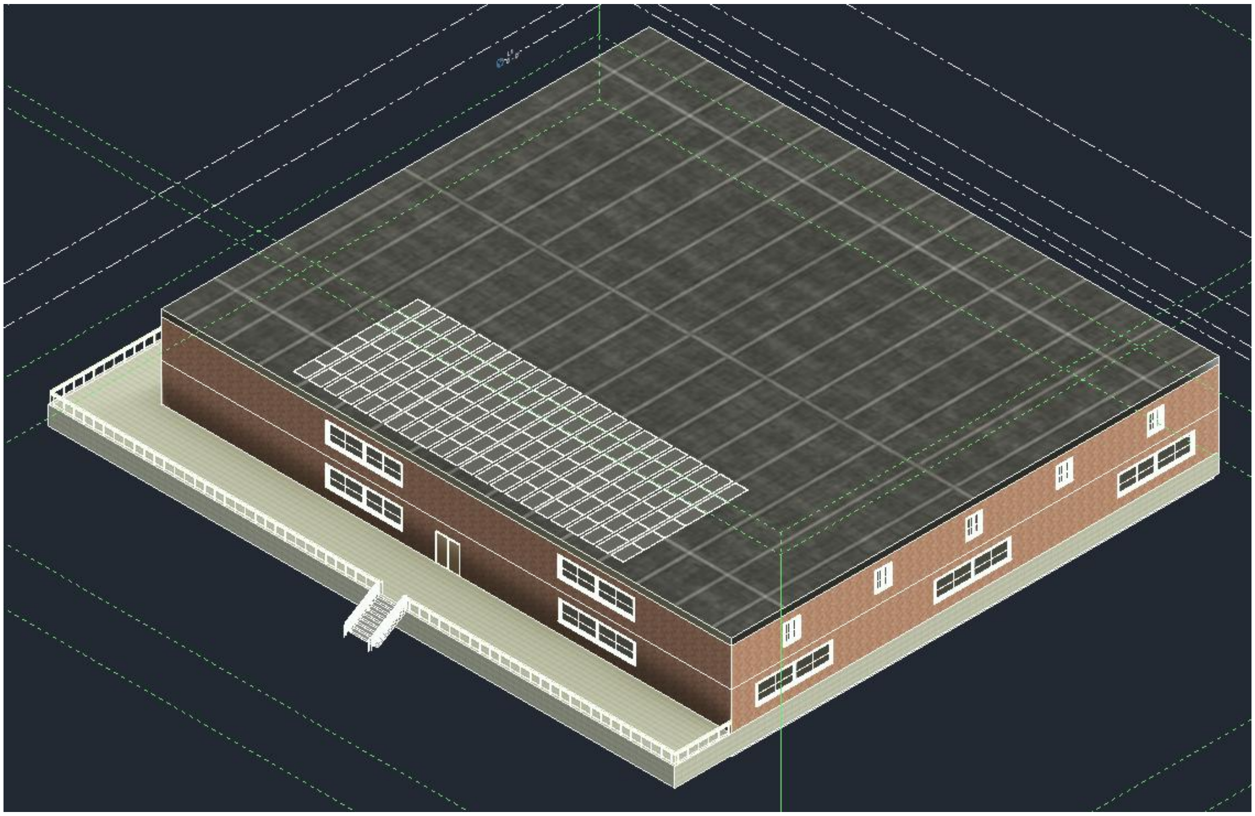

Figure 18 – Commons (BSC 2.0)

Since the dining hall has waves where it is difficult to find seating during rush hours, we believed that is was important to include another common building. The commons will have a dining area, a café, and multiple study rooms. The building follows The College’s brick with white accent vernacular. There is a patio outside for students to be able to eat, hang out, or study. Solar panels were added to the roof to continue to develop green energy on campus.

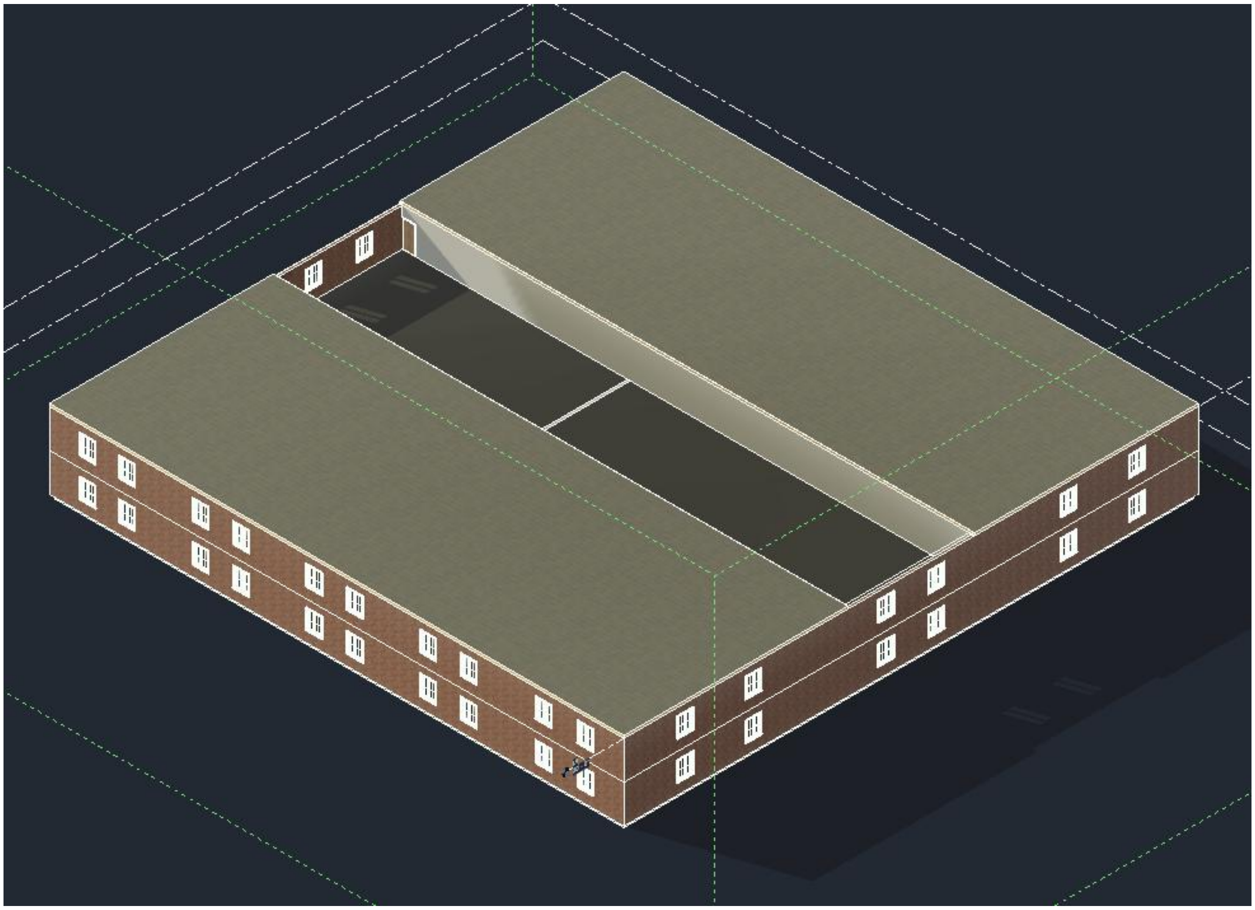

Figure 19 – Dorm Apartments

Since The College is almost near housing capacity every year, we believe it to be worthwhile to add more housing on campus. The building is two floors with 20 units, being able to accommodate 80 individuals. The center of the top floor is an common area with a glass roof to allow in the maximum amount of sunlight. The building follows The College's vernacular of brick buildings and white accent.

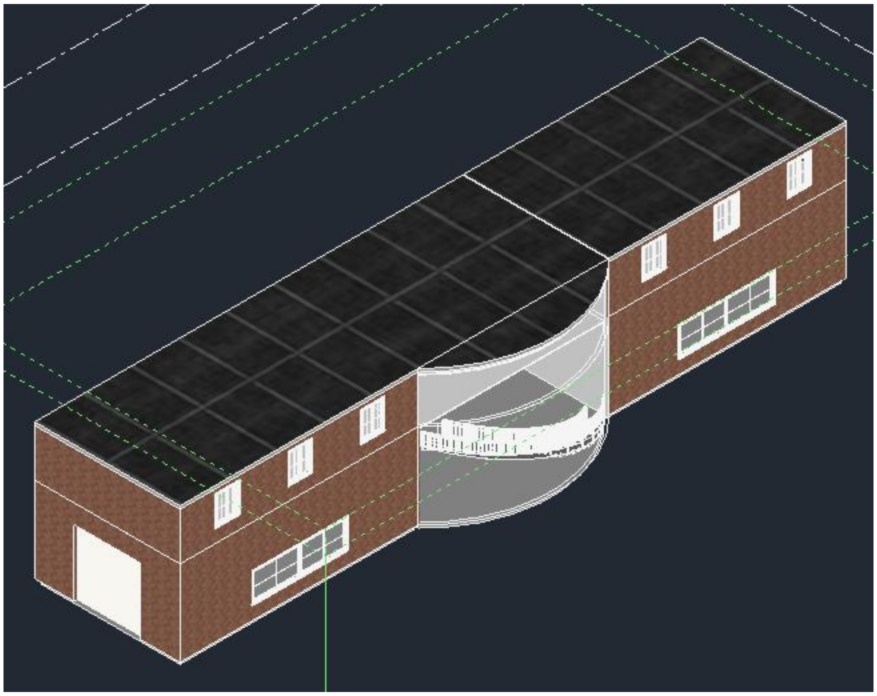

Figure 20 – Academic Building

The additional college will require Elizabethtown to add additional academic buildings. The bottom floor has two labs, and the top floor has two lecture halls/classrooms. The garage attached to the labs were inspiration from The Fabrication Lab in Esbenshade. The staircase has a massive window face to let in plenty of natural sunlight. The building follows The College's vernacular of brick buildings and white accent.

References

[1] "Hemp Lime Building Systems," *hempitecture.com,* Available: https://www.hempitecture.com/hempcrete/?srsltid=AfmBOooZY7RDk67tnE4BJc5puYqaWeS31mOiDZdoqVdqHQMz4baGItIh (Accessed: May 5, 2026)

[2] "Central Pennsylvania Supplier For These Brands," *drohanbrick.com,* Available: https://drohanbrick.com/ (Accessed: May 5, 2026)

[3] "Parking Canopies," *topregal.com,* Available: https://www.topregal.com/en/parking-canopies/ (Accessed May 5, 2026)

[4] "Indoor Agriculture Systems," *trane.com*, Available: https://www.trane.com/commercial/north-america/us/en/products-systems/systems/indoor-agriculture.html (Accessed: May 5, 2026)

Appendix A: Additional Revit and ArchiMaster Models

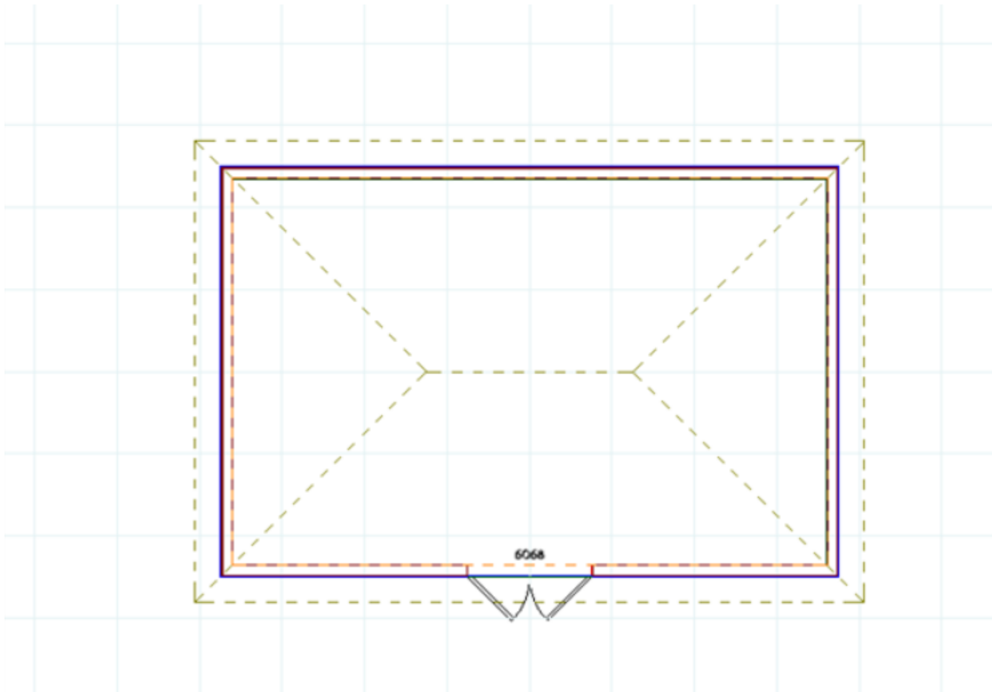

Figure 21- Greenhouse overview 2D

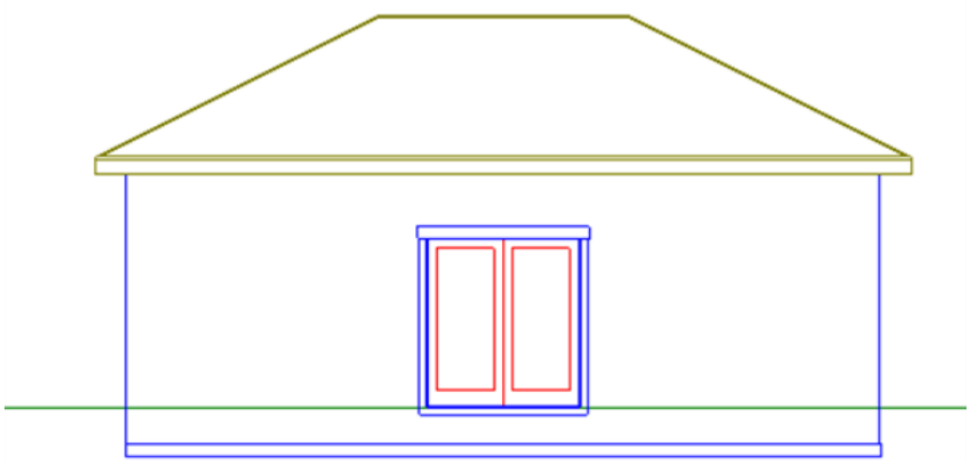

Figure 22- Greenhouse Front Face

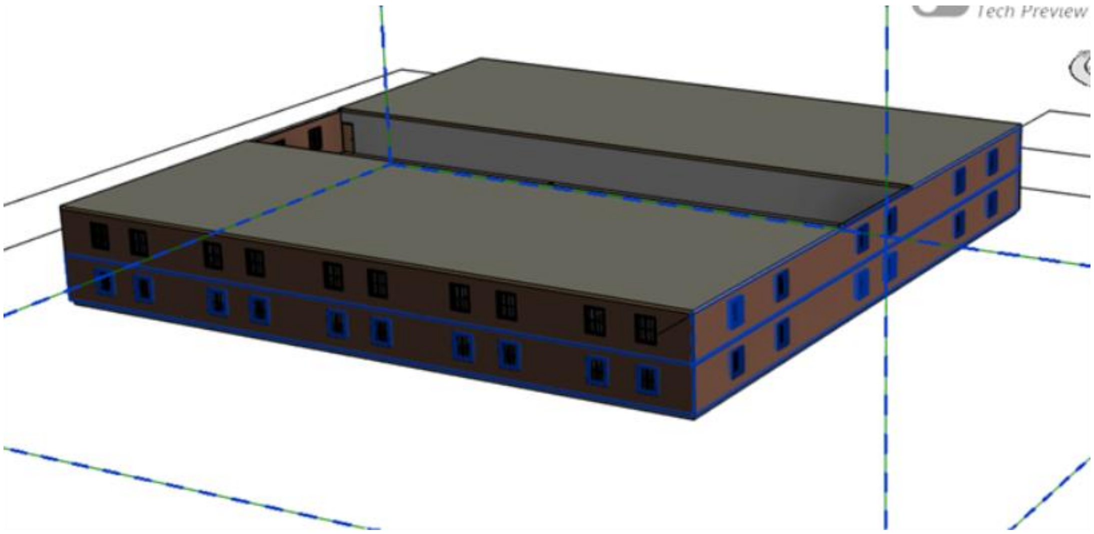

Figure 23 – Perspective View of Residential Building

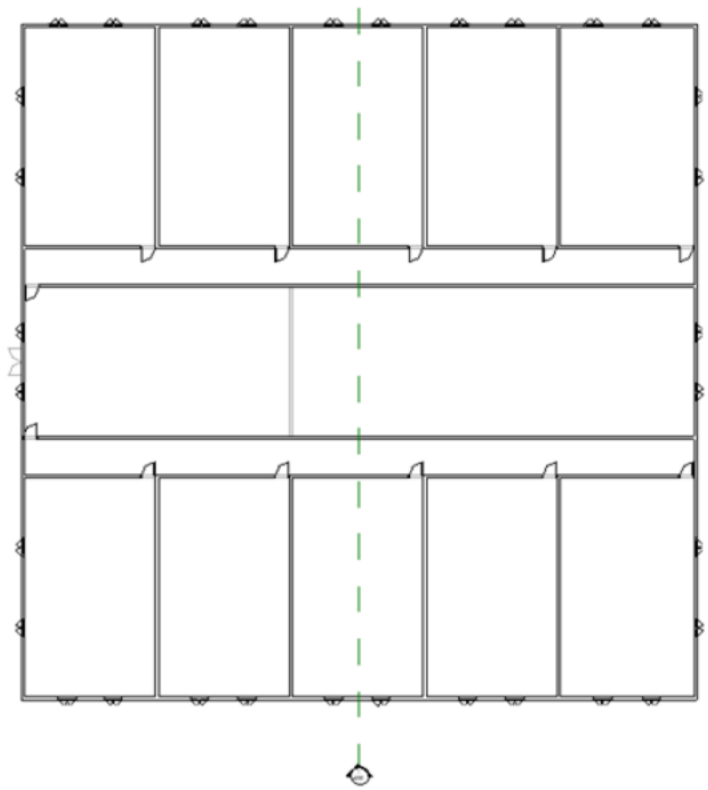

Figure 24 – Level 1 Residential Building Floor Plan

Figure 25 – Residential Building Front Face

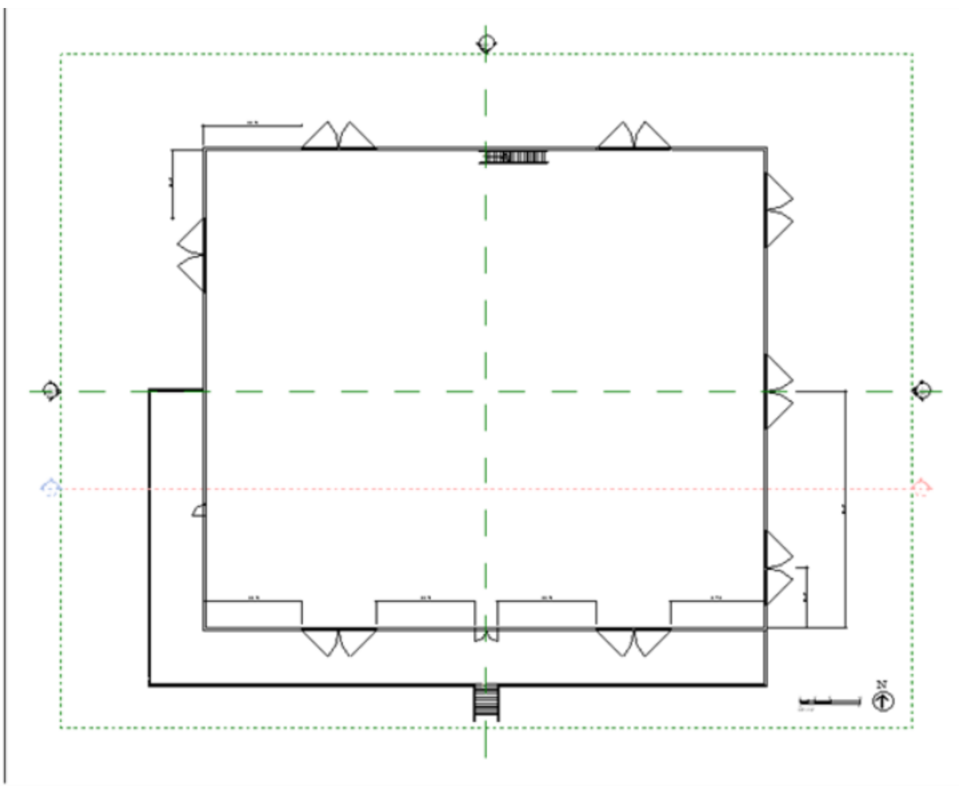

Figure 25 – Level 1 Common Building Floor Plan

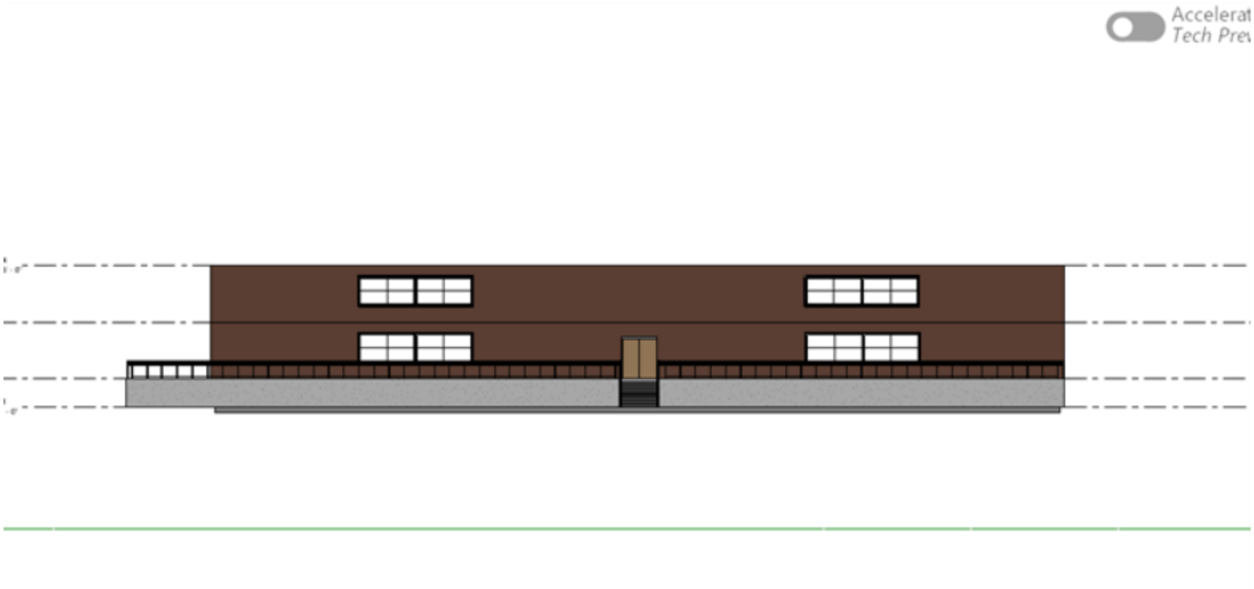

Figure 26 – Common Building Front Face

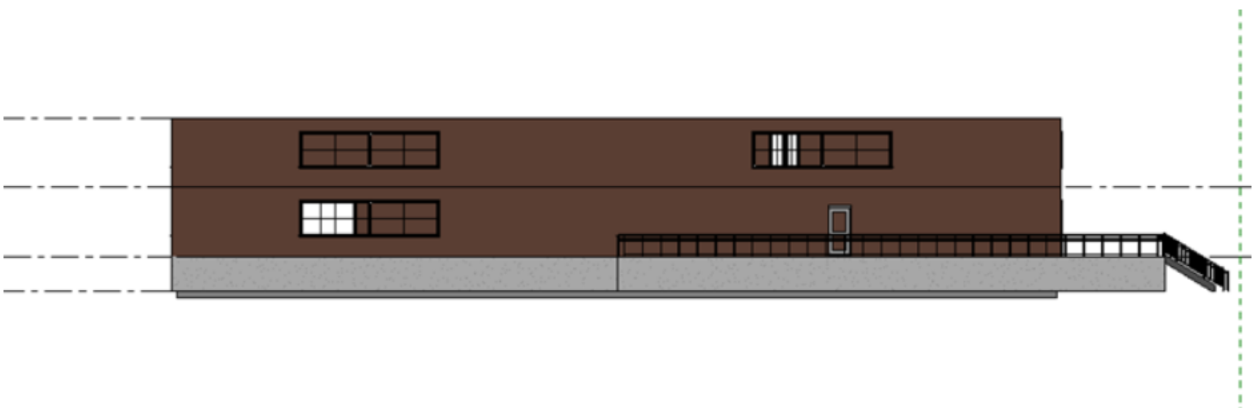

Figure 27 – Common Building Left Face

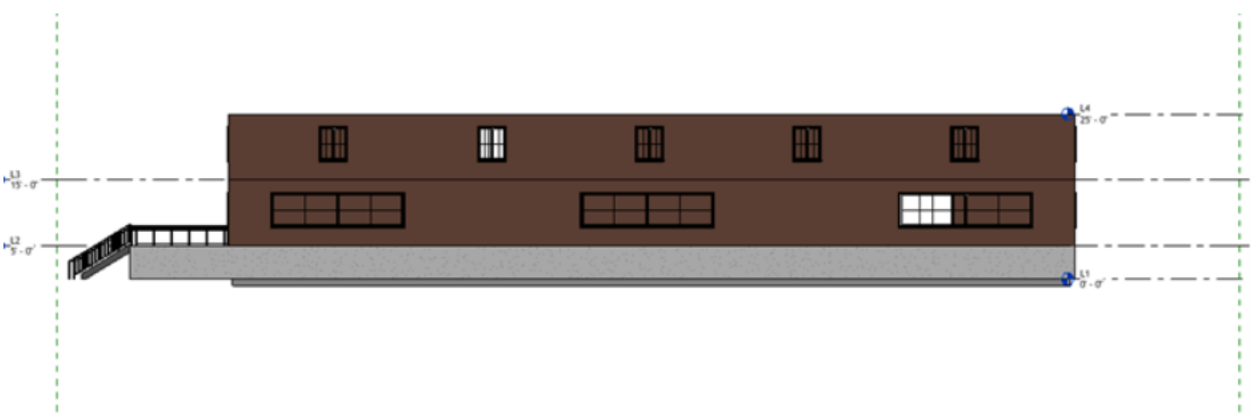

Figure 28 - Common Building Right Face

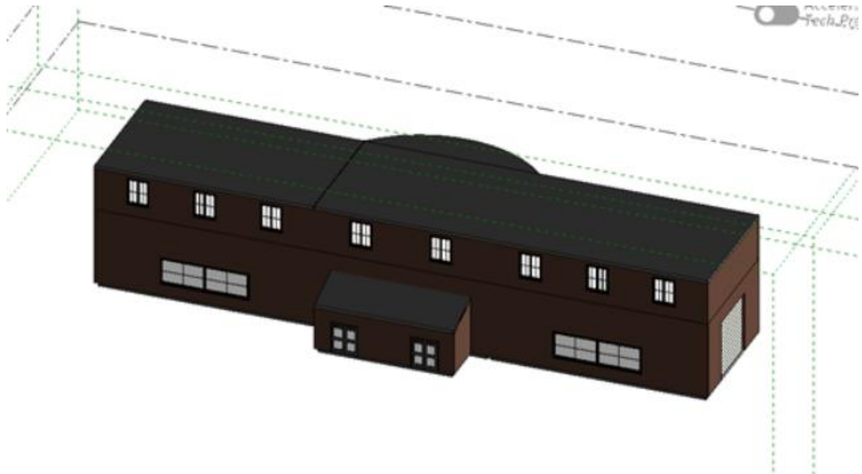

Figure 29 – Perspective View of Academic Building

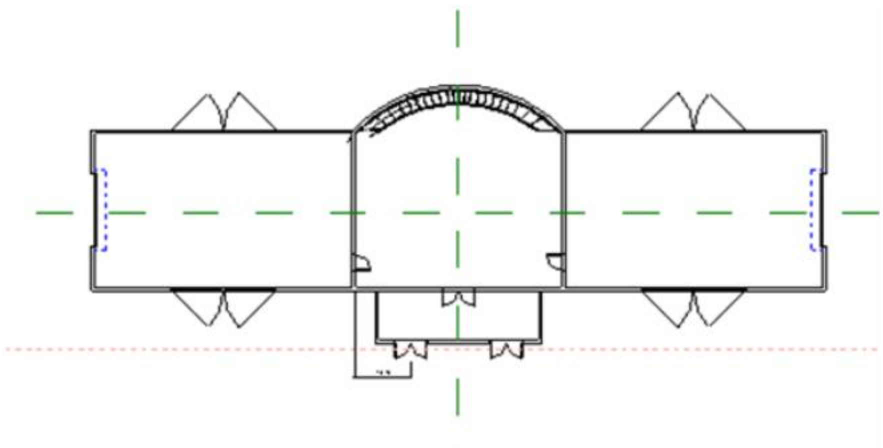

Figure 30 – Level 1 Academic Building Floor Plan

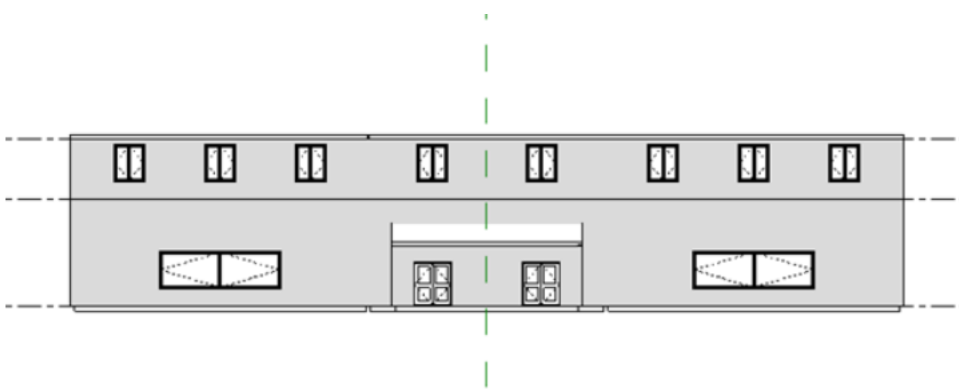

Figure 31- Academic Building Front Face

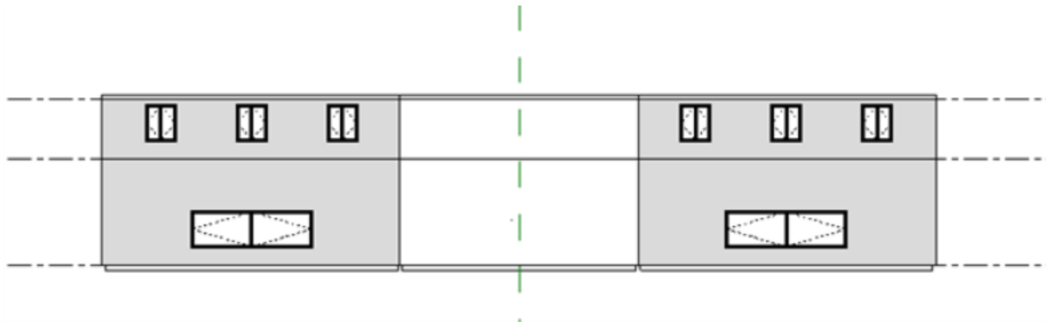

Figure 32 – Academic Building Back Face

Appendix B – Utility Drawings

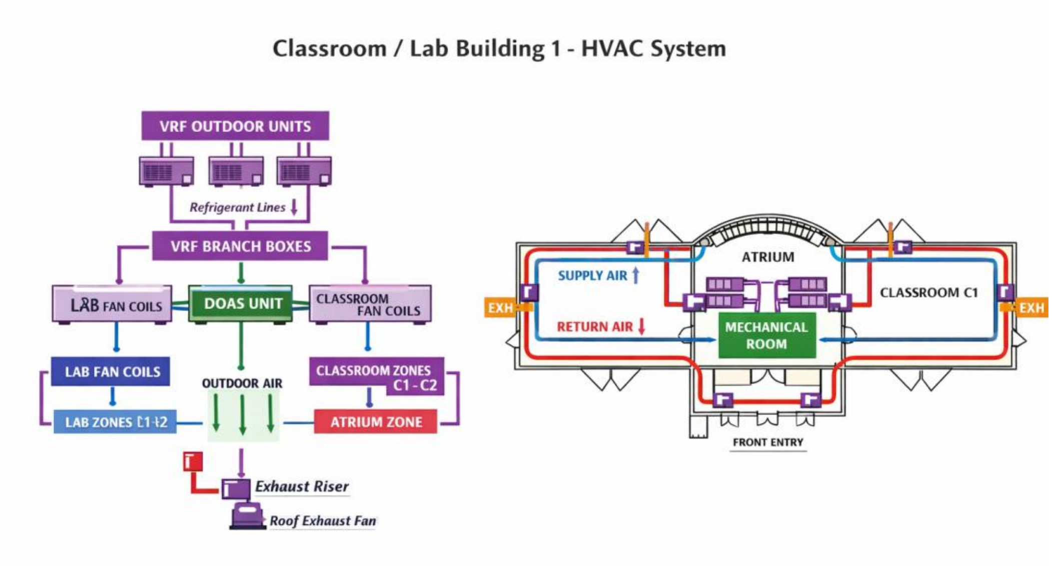

Figure 33 – Academic Building HVAC

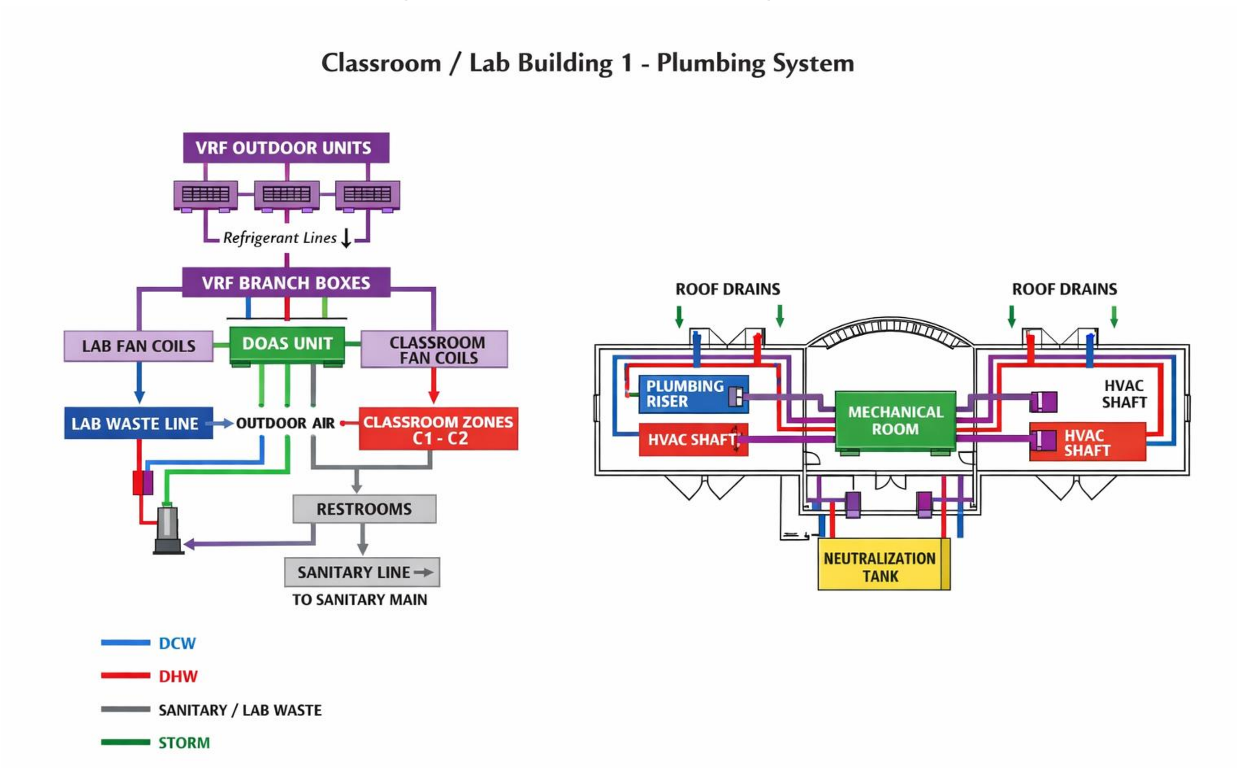

Figure 34 – Academic Building Plumbing

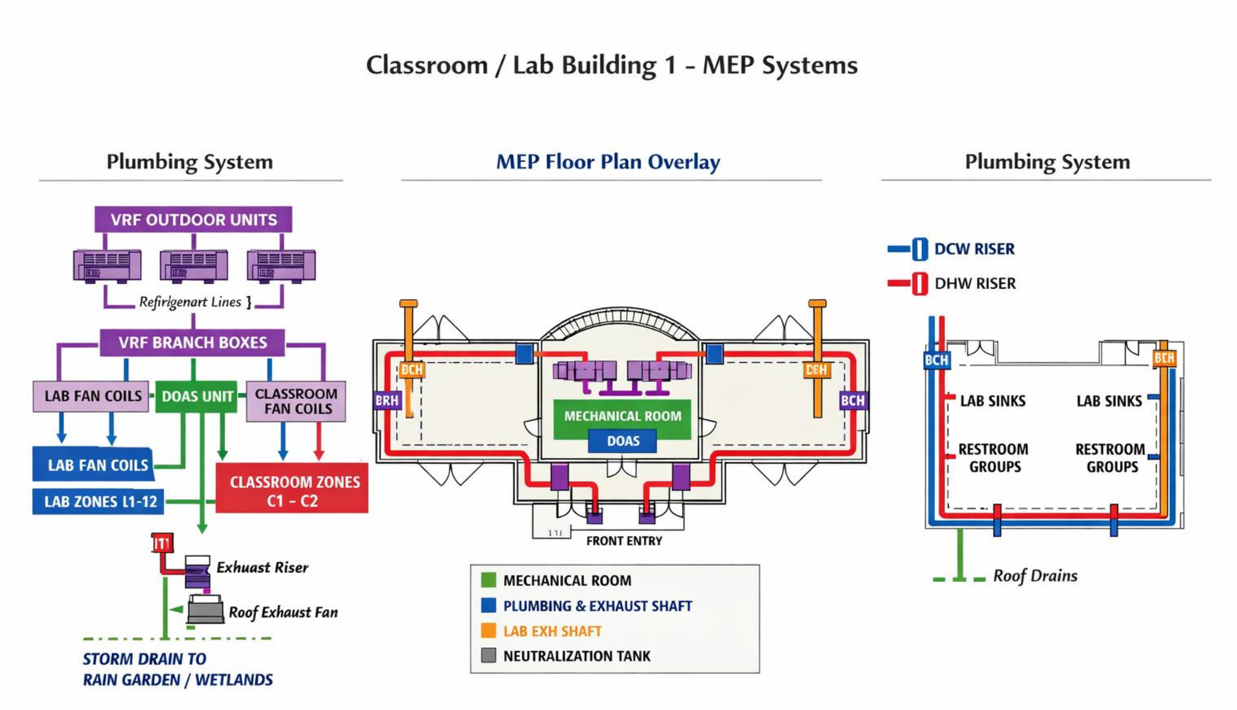

Figure 35 - Academic Building MEP