



EGR 353

LEED Project 2

LEED Platinum Building Design & Construction (“BD&C”)

of a new College for Elizabethtown University

Elizabethtown College Engineering

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May 6, 2026

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Overview

Our team has been tasked with designing a new agricultural college for Elizabethtown University located in Elizabethtown, Pennsylvania. Elizabethtown is located along State Route 283, just northwest of Lancaster, Pennsylvania and Southeast of Harrisburg, Pennsylvania. The college is looking to expand its campus and introduce a new school to the growing college. The local area has a growing population of Amish and local farms. In order to optimize the local community and take advantage of the local resources, and align with the colleges' efforts to become a green campus, our team has designed a LEED platinum agricultural school concept layout and buildings located on the East side of the existing Elizabethtown college campus.

Site Plan

Attached below are the site plans from our “Project 1 LEED Platinum Neighborhood Development (“ND”) of a new College for Elizabethtown University”. The site plans show the overall layout of the site including the building footprints, roads, walkways, and parking areas. This project will be a continuation of project 1. Our team will continue to build off of the attached site plan to design the buildings in Revit. Along with analyzing psychometric charts and sun lighting to design the new Elizabethtown University school of Agriculture meeting LEED platinum requirements.



Photo 1: Aerial View of Site Plan

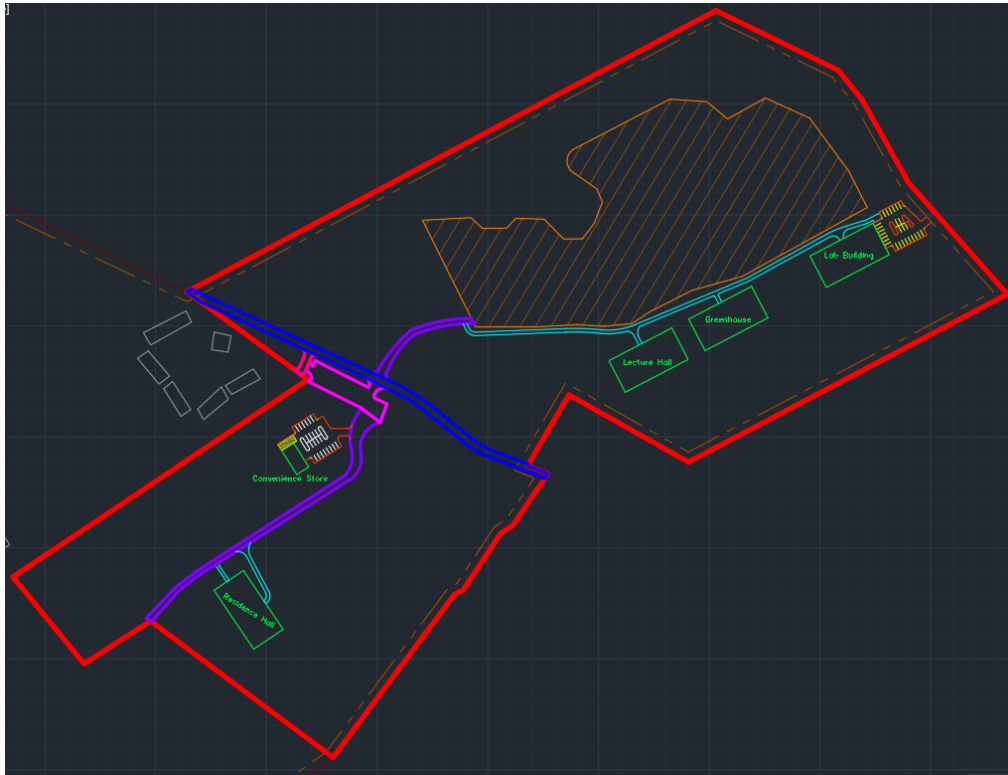


Photo 2: Site Plan



Photo 3: Site Plan with Topographical Map

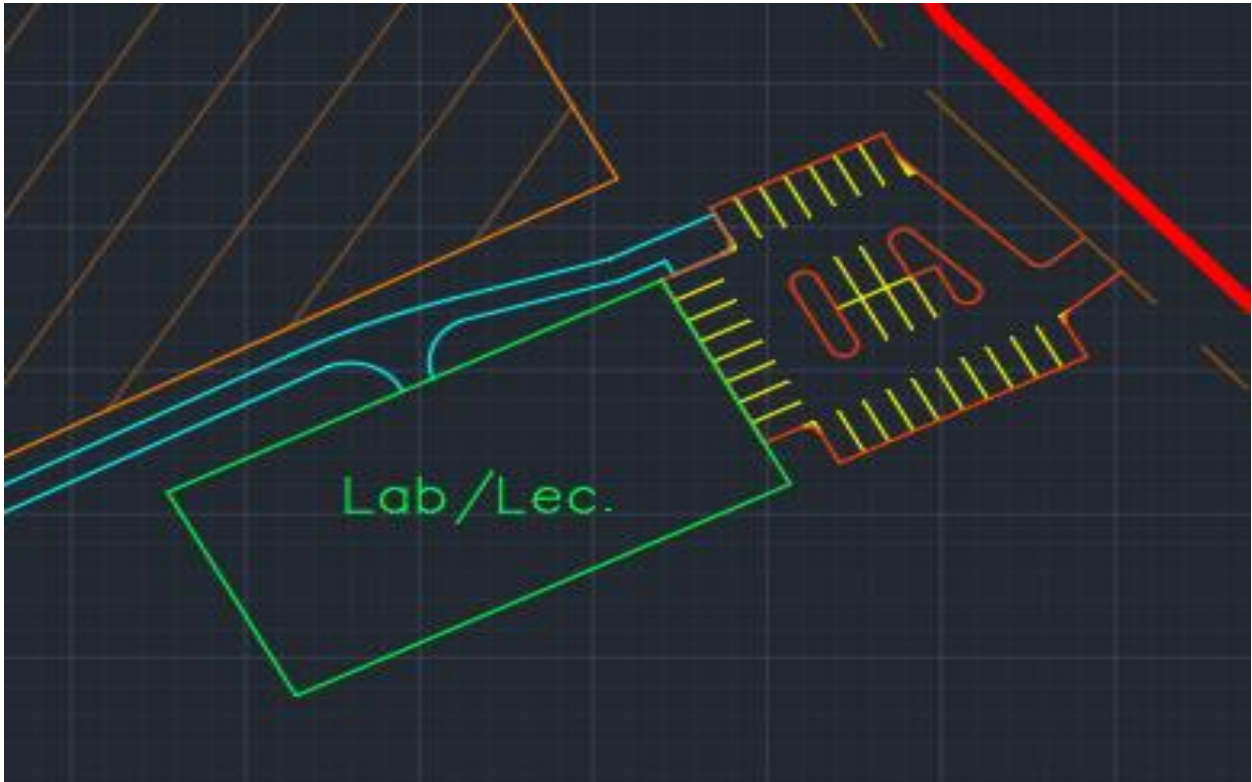


Photo 4: Lab Building Parking Lot

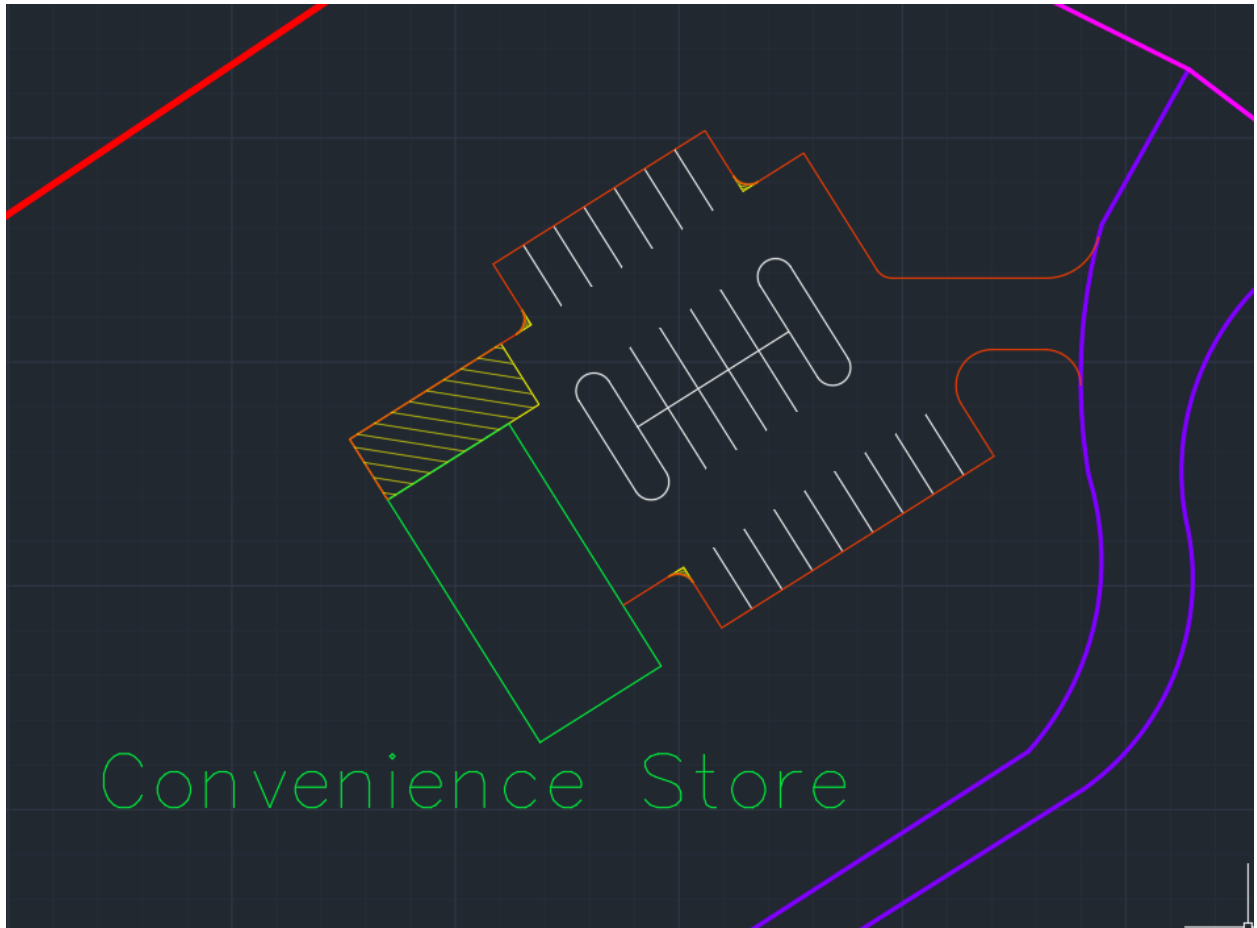


Photo 5: Convenience Store Parking Lot

Building Design

Lecture Hall

emporary Hide/Isolate

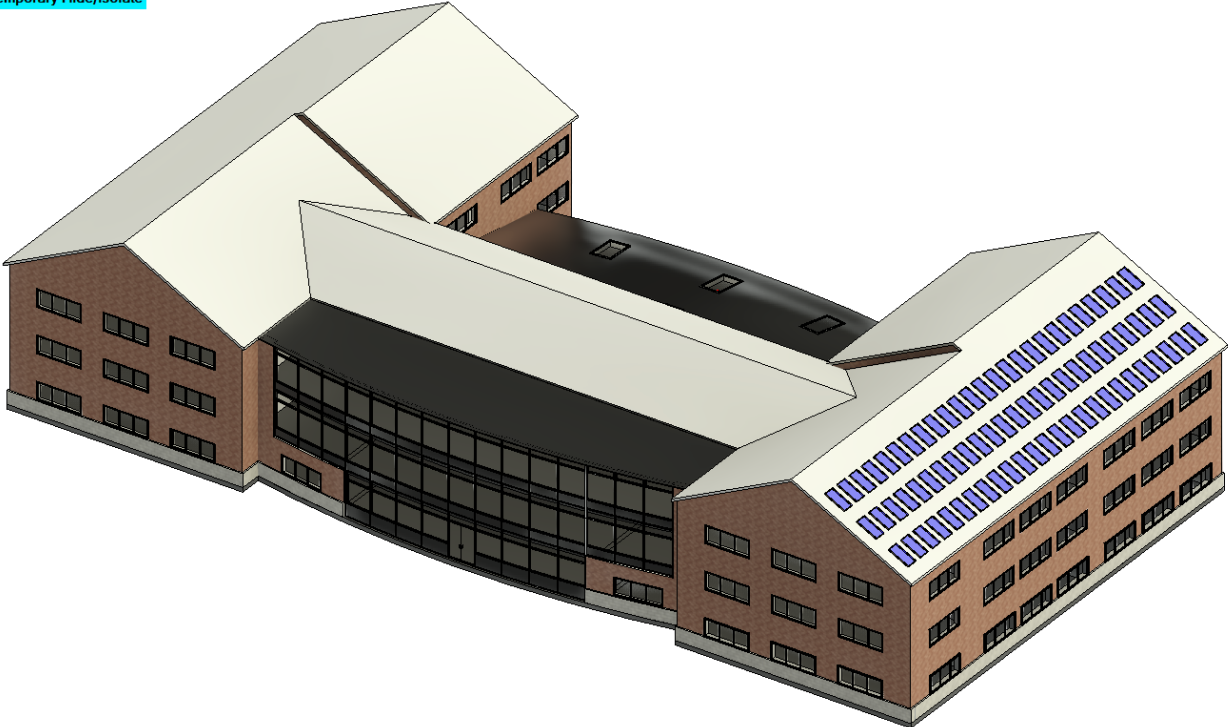


Photo 6: Lecture Hall 3D Model



Photo 7: Lecture Hall Interior Windows

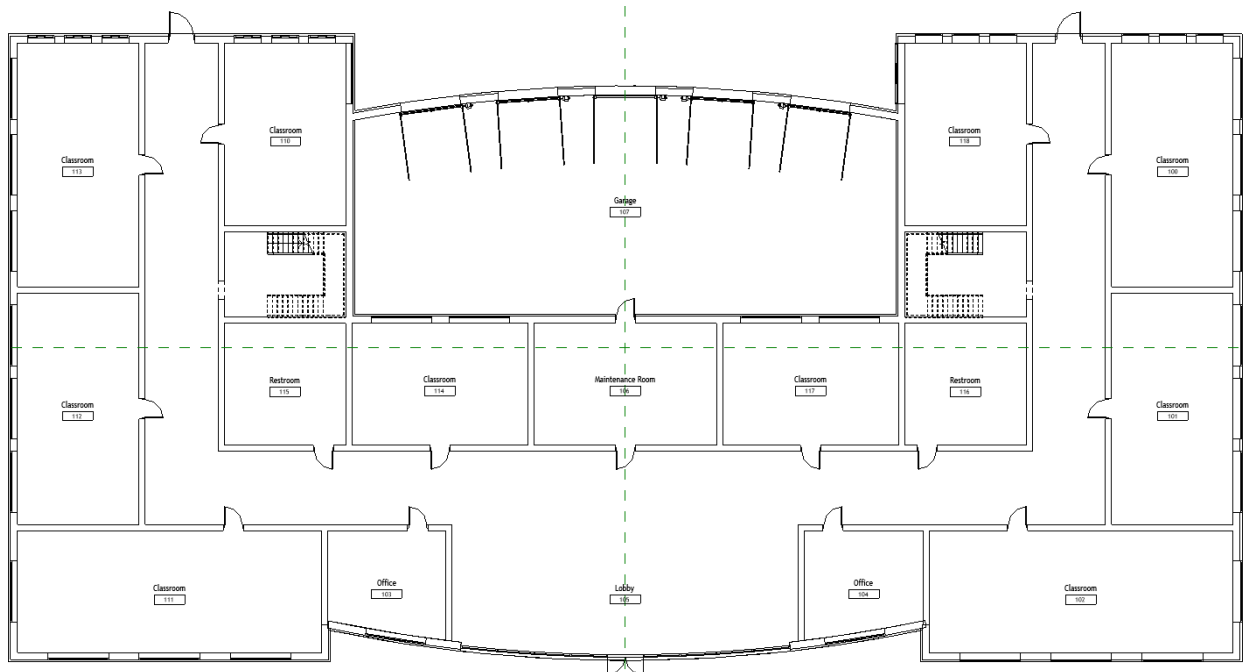


Photo 8: Lecture Hall Floor Plan

The pictures attached above show the new Elizabethtown University School of Agriculture three story lecture hall. Starting externally, the building features a brick on CMU construction to match the existing Elizabethtown College vernacular. In accordance with recent college additions, we equipped this hall with white/reflective roofing. In an effort to have a sustainable green design with innovative features, we decided on the white roofing based on the many benefits it provides, namely its solar heat rejection. The reduction of heat gain will result in a lower cooling energy usage, reduction of heat island effect, and improve the HVAC efficiency. Multiple windows throughout the building will have a view of the university's agricultural field. This allows for a beautiful scenic view for both students and staff, along with a personal connection to the project they are working on. The windows will also let natural daylighting into the building giving the building a relaxed natural ambience. The exterior of the building will also include parking for staff, a bicycle rack similar to the rest of those around campus, roof mounted solar panels, and a raingarden used for water collection, which can be used to irrigate the agricultural field. Internally, each level will have a lobby featuring a glass curtain wall letting in natural daylighting as well as passive heating. The building will be outfitted with a garage to store all of the agricultural equipment. The garage will have 5 bays with both internal and external access. The roof of the garage will be a skylight to allow natural daylighting into the space. There will also be classroom windows looking out into the garage to match the existing Elizabethtown College Bowers Center interior gymnasium observation windows. Overall, the building is 41 room building that is interior dominated featuring innovative designs from natural daylighting to rain gardens used for water collection.

Residence Hall

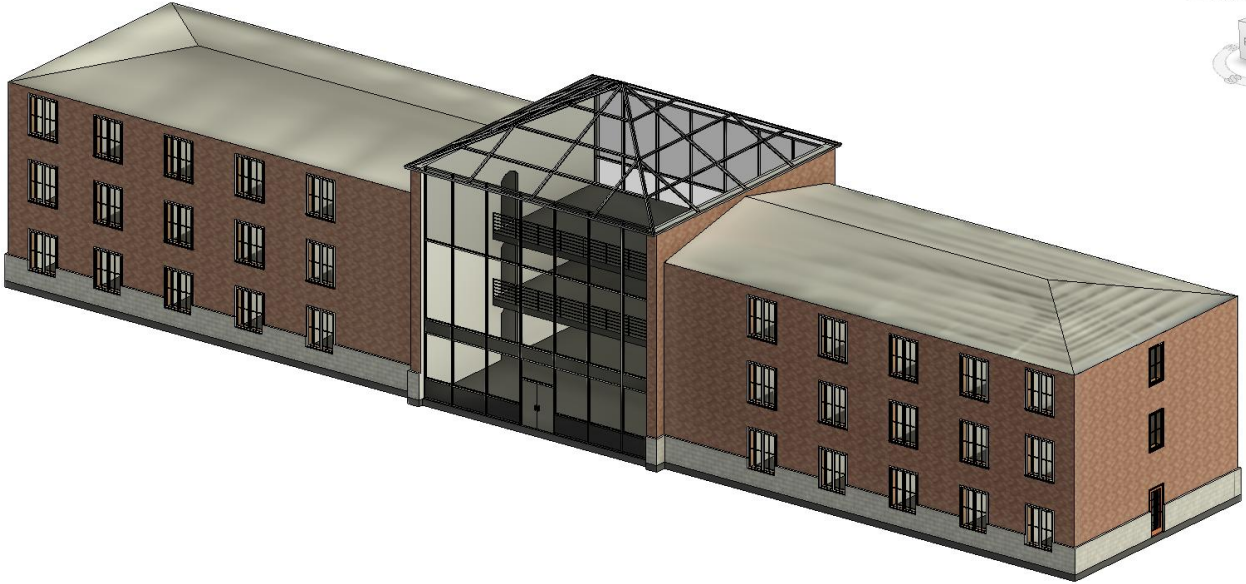


Photo 9: Residence Hall 3D Model

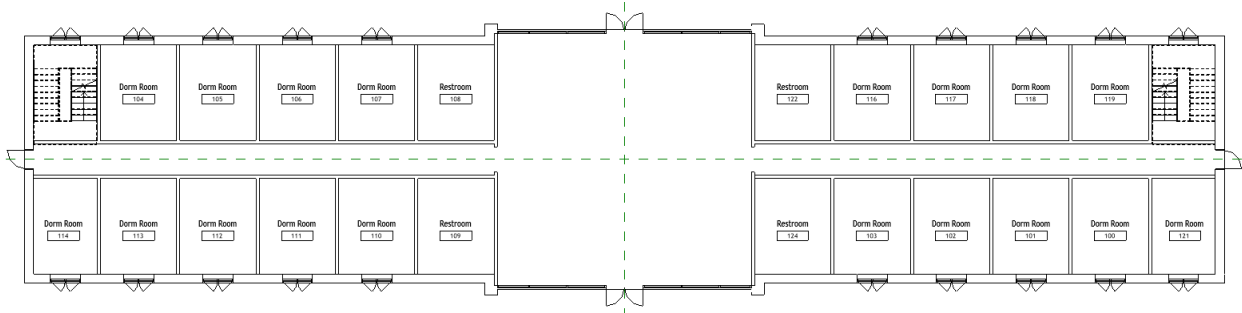


Photo 10: Residence Hall Floor Plan

The pictures above display the new Elizabethtown University School of Agriculture three story residence hall. The exterior of the building was designed to match the existing Elizabethtown College vernacular through the use of brick facade on CMU. The Residence hall features white roofing to reduce the heat gain, lower the cooling energy, reduce the heat island effect, and improve the HVAC performance. The building will also feature a parking lot (area TBD) and bike racks for both students and staff. The center of the building features a common area with layered balconies on every floor with a curtain wall to let in natural daylighting and passive heating. The common area provides students with a place to either socialize or work outside their room or the classroom. Inside the building each room will be fitted with their own HVAC unit for each student to set their own comfort zone to improve the dorm room experience at the new

Elizabethtown University. Due to the individualized HVAC units, the residence hall was designed to be internal dominated to stabilize the internal temperature and save on electricity costs. Each floor will provide two stairwells with four total bathrooms on every floor. Overall, the new residence hall is a 3 story 54-unit interior dominated building featuring LEED-centered designs for energy efficiency and comfort.

Greenhouse

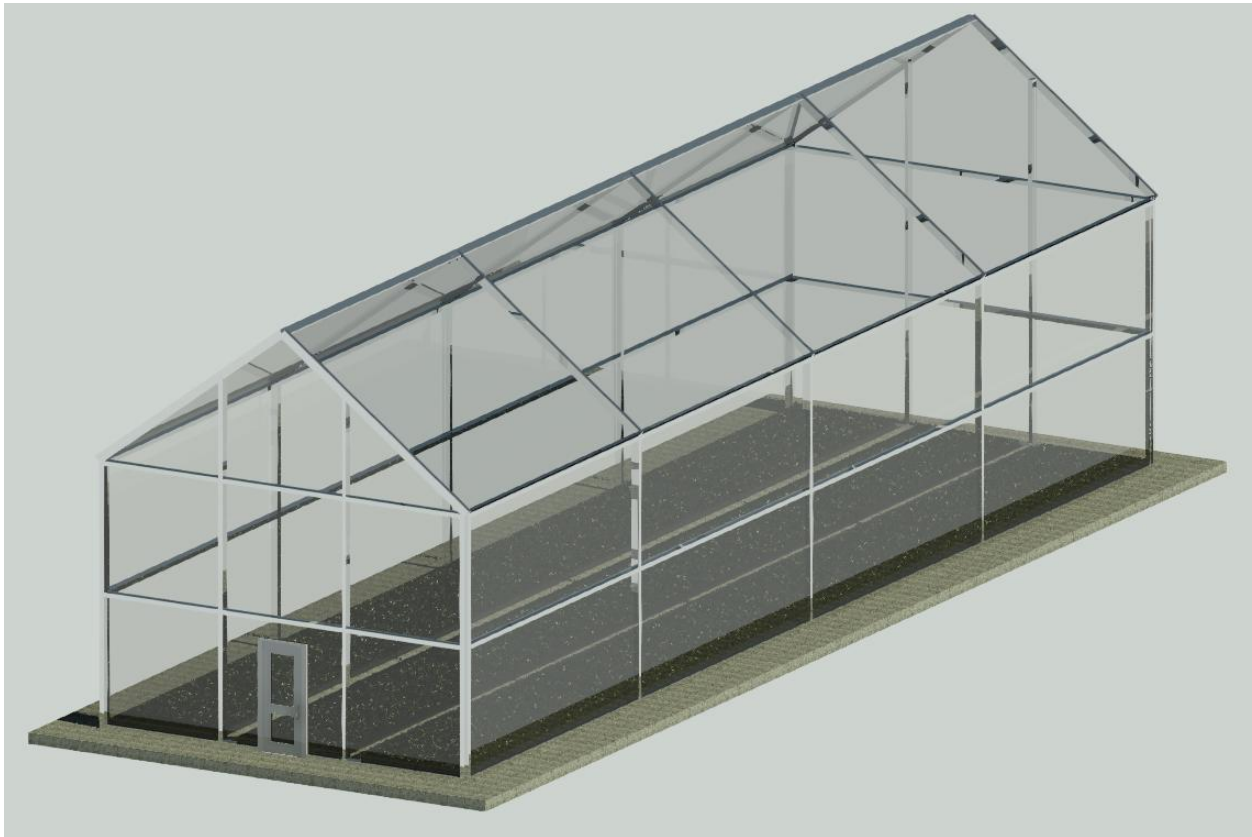
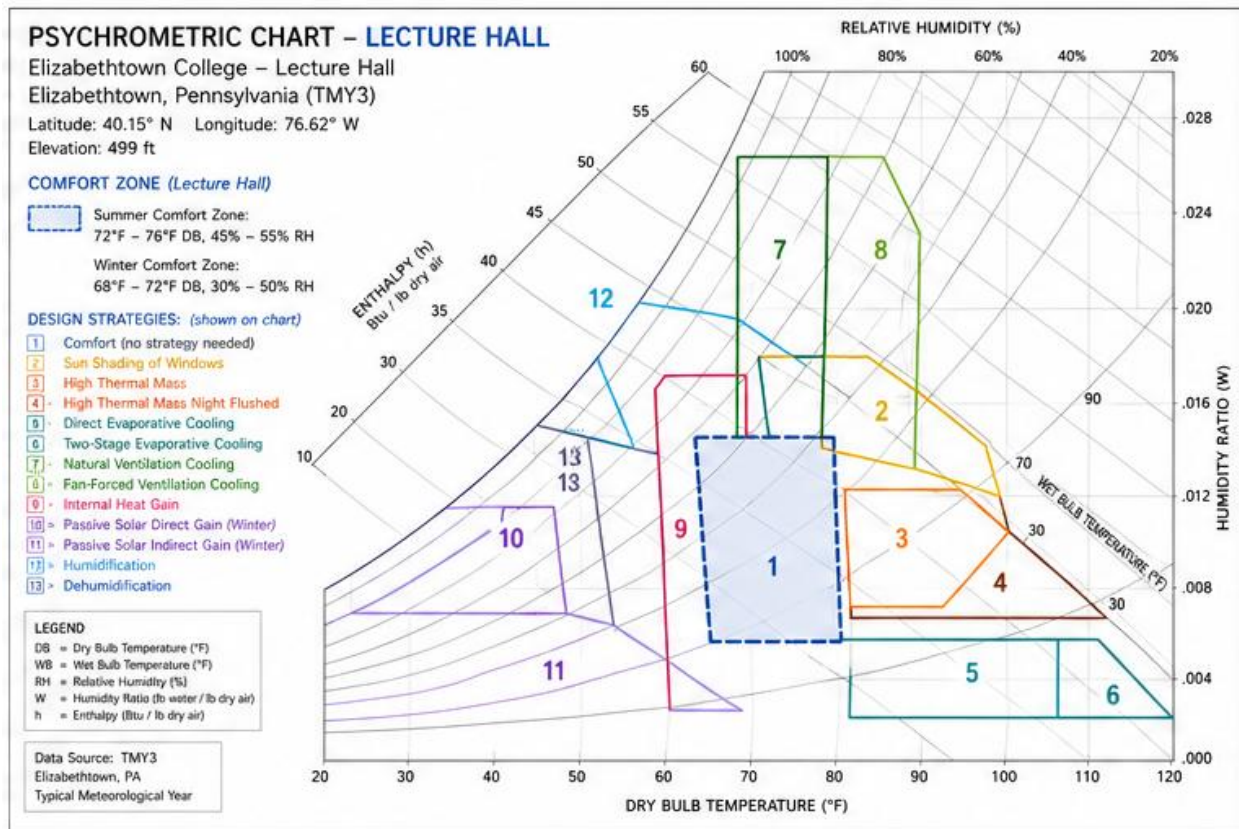


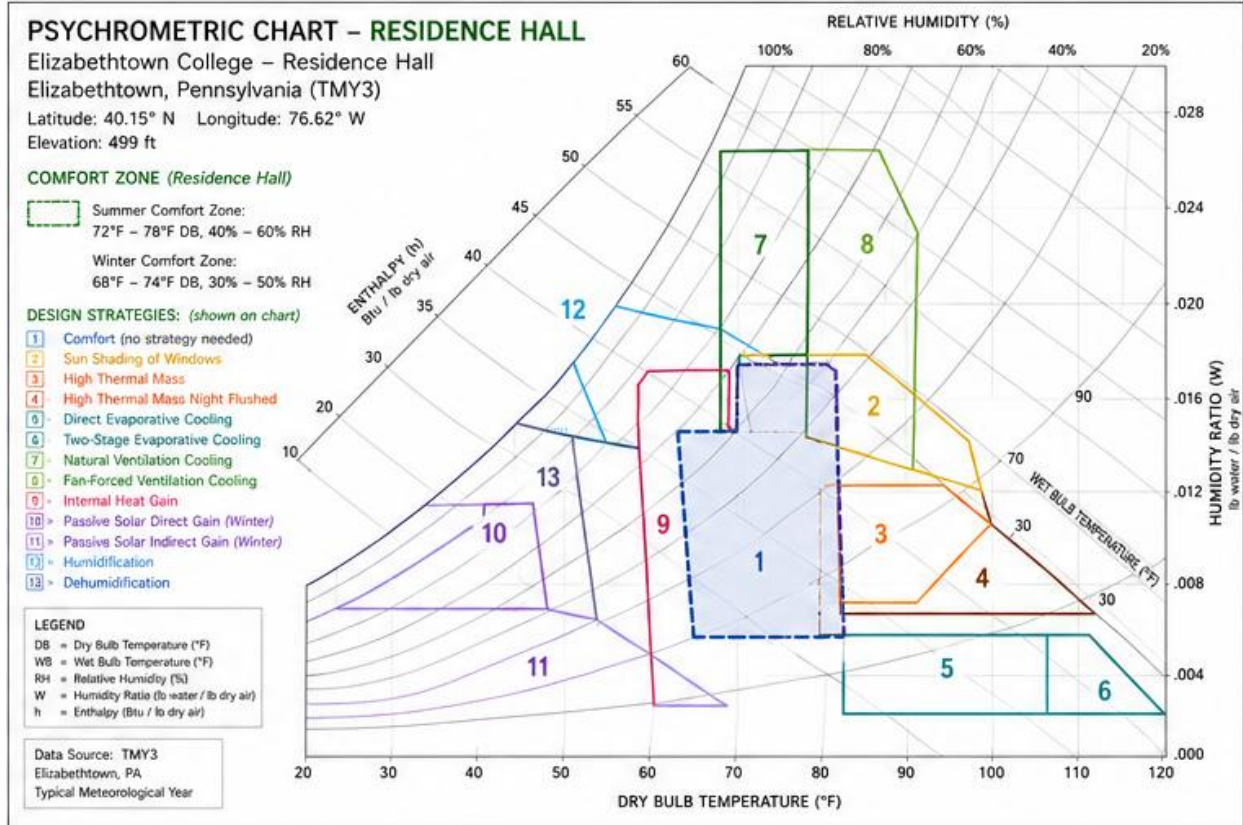
Photo 11: Greenhouse 3D Model

Pictured above is the new Elizabethtown University School of Agriculture greenhouse. The greenhouse will be used to grow and study plants year-round. The exterior of the greenhouse is made up of double-wall polycarbonate panels and steel framing. The polycarbonate panels allow for light and passive heating to enter the greenhouse. While high-frequency light can enter the greenhouse, the double-wall polycarbonate panels retain low-wavelength light and heat the space to allow for optimal plant growth through the winter months. The greenhouse was designed to be tall to allow plants to hang from the ceiling as well as be planted on the floor. There are three rows of possible planting areas located on the floor of the greenhouse. The greenhouse only has one entrance/exit to reduce heat loss throughout the building. Finally, the greenhouse will be fitted with a rainwater collection system to supply a water source to irrigate the plants inside the greenhouse.

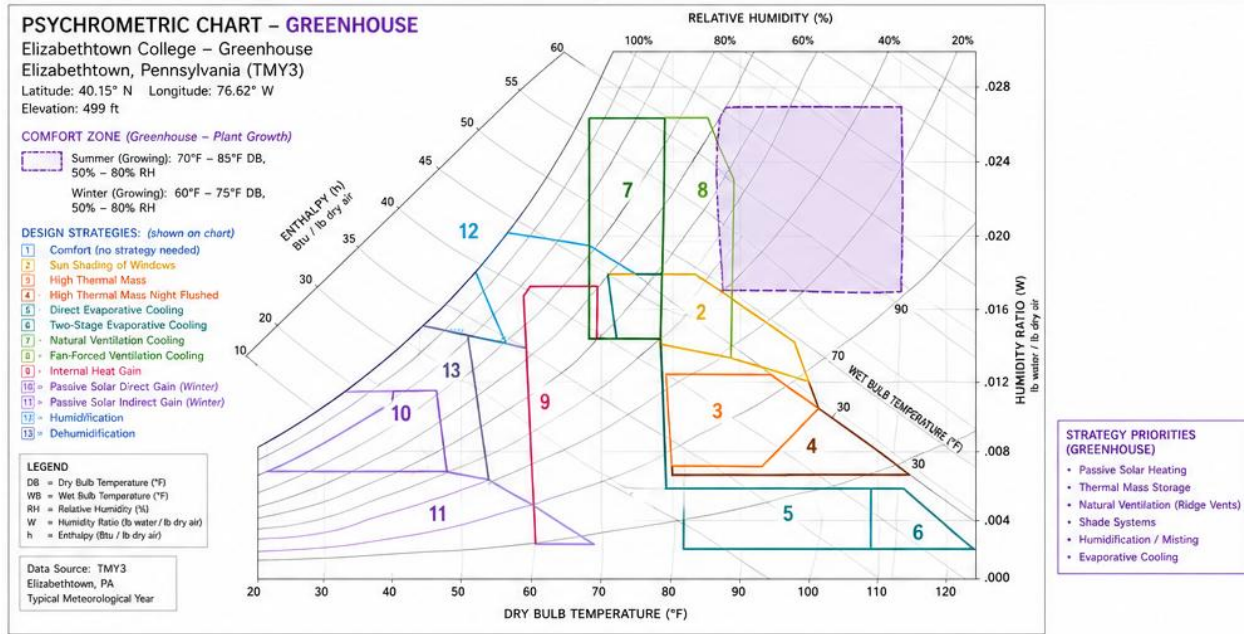
Psychrometric Chart



Attached above is the psychrometric chart for the new lecture hall that will be built for the new Elizabethtown University School of Agriculture lecture hall. Since this building will be built to meet the LEED platinum requirements, it allows for a narrow comfort zone. Which will be controlled through the design of this building and the LEED requirements. The comfort zone of this building will be 68 to 72 degrees F with 30 to 50 percent relative humidity. The summertime comfort zone is not analyzed and designed since the building will only be utilized from August through May, which are primarily cold months through the Pennsylvania fall, winter, and spring. Within this building, people will be partially active, with students and professors moving throughout the building at regular intervals, followed by periods of settling into classrooms. By keeping the comfort zone between 68 and 72 degrees Fahrenheit, it will allow the students and professors to remain at a comfortable body temperature throughout this cycle of their workday. The main contributor to this comfort zone will be the phase change materials that will be built into our building; the heat absorption and release of these materials will allow the building to remain within this comfort zone throughout the school year. The sun's radiation will be absorbed and retained to reduce the cooling loads of the building. Then released as the building starts to cool down to reduce the heating load of this building. Overall, it allows for a stable internal temperature of the building to allow the building to remain within the optimum temperature range of 68-72 degrees Fahrenheit.



Attached above is the psychrometric chart for the new residence hall. The majority of a student’s time will be spent here sleeping, working, and going through their daily routine. The comfort zone for the residence hall is 68 to 74 degrees Fahrenheit with 30 to 50 percent relative humidity. This comfort zone - combined with individual heating/AC units as Founders Hall has - allows students to be comfortable regardless of whether they like to sleep cold or hot. This was designed to optimize the environment for any type of student who attends the new Elizabethtown University. The wider comfort zone also allows for zone heating and cooling so that each student can choose their optimal temperature. While the common areas of the building remain comfortable for all the residents at 70 degrees Fahrenheit.



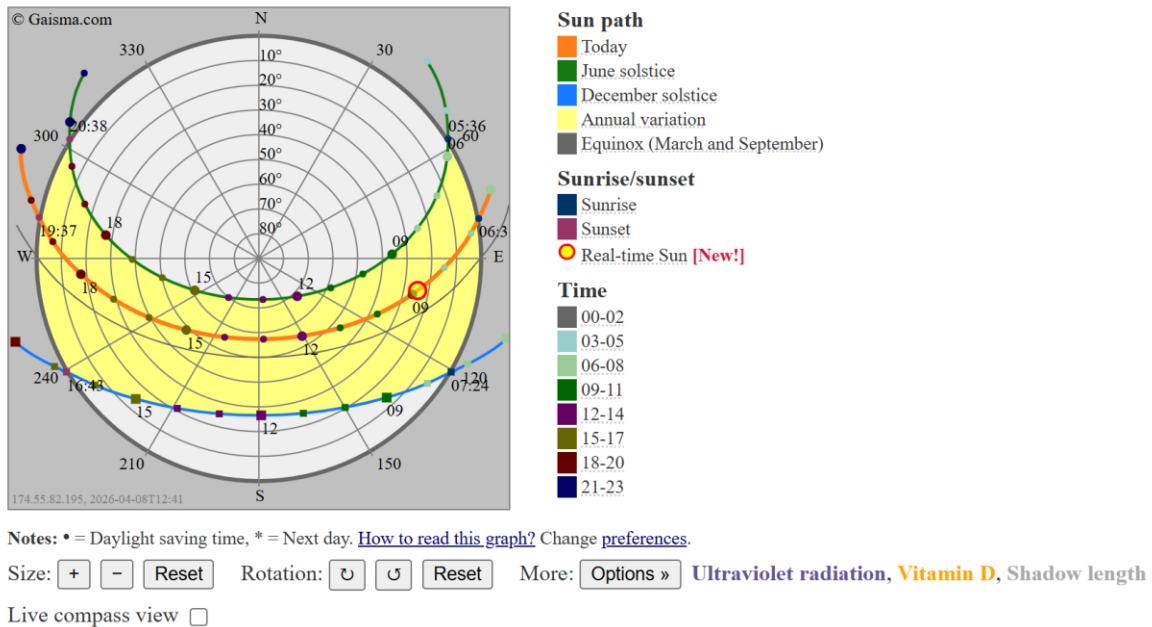
Attached above is the psychrometric chart for the new greenhouse. The greenhouse will be designed to be in use year-round. Leading to a large comfort zone based on the time of year and the type of plant that will be grown. In the summer, the comfort zone is 70-85 degrees Fahrenheit with a relative humidity of 50 to 80 percent. While in the winter the comfort zone is 60-75 degrees Fahrenheit with a relative humidity of 50-80 percent. This large comfort zone and increased humidity will be ideal for plant growth throughout the year to allow the students to have the opportunity to study a wide variety of crops. While it will be too hot and humid for students and staff long-term, the time spent within the greenhouse will be minimal when compared to the residence and lecture halls. The greenhouse will be heated by passive solar heating, and other design strategies will be implemented like thermal mass storage and shading to try to keep the greenhouse at the optimal temperature.

Sun Lighting

While referencing Photo 1: Ariel View of Site Plan, it is seen that the residence hall has been positioned with the main front and rear sides of the building facing East and West. This design was felt to be more effective for the students living in the dorm rooms rather than facing the hall in a North and South direction. We also took into consideration the time of year students will be using the hall. The fall through spring months is generally the only time students will be using this space. With this design, we see that during the summer months, the sun path will be stronger, especially on the west facing end of the building. This has been deemed to be ok due to little use during this time of year. If students were there, one main issue we would see is room overheating with little defense from the sun. Structurally, this can be avoided with the construction of an overhang, which could block the high angel of sunlight. During the late fall through early spring, when students will most likely be in the resident hall, the sun will be more Southeast to

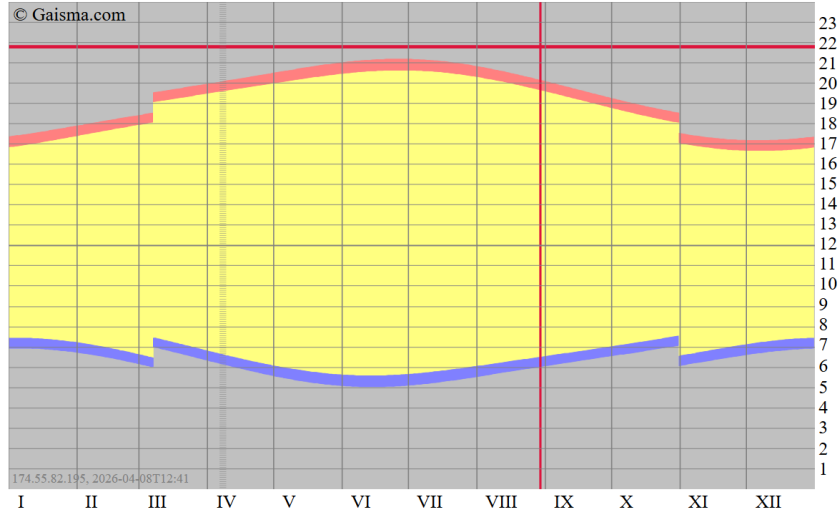
Southwest. Because it will be cold, there should not be a problem with welcoming in as much sunlight as possible. Passive heating can play a huge role in reducing electrical and natural gas costs to heat the space. Students on the East side of the hall will be woken up to sunlight more than students shaded by the building in the West. This can be looked at as a pro or con, simply depending on how you like to wake up. On the contrary, students in the west can find the sun to be disturbing and will need shades to block direct light from entering.

Lancaster, Pennsylvania, United States - Sun path diagram



Contrary to the residence hall, the lecture hall is positioned in a different direction, facing North and South. As with the residence hall, there is a design intent that should not be overlooked. It is crucial to understand what the building will be used for. In this case, students will occupy this building during the same time of year as the residence hall, but at a different time of day. Throughout the hours of 8am and 4pm, this building will be full of students. Positioning the building in this direction will allow direct sunlight at all points in the day. This is why using windows as a large portion of the North and South facing sides is crucial. If we are able to keep the electrical and lighting cost down by using sunlight, this will benefit students, Elizabethtown College, and community members just by reducing the amount of energy we pull from the grid. As seen in the lecture hall design, skylight on the south facing side of the building will serve as a free light source throughout each day. Speaking from experience, it is obvious that being able to keep lights off in a building during they day will drastically reduce the electrical cost of the building. Additionally, using a brick face front on the lecture hall will be a solid way of adding in passive heat during the winter months. Overall, students and faculty will be more comfortable during the day due to this design.

Lancaster, Pennsylvania, United States - Sunrise, sunset, dawn and dusk times, graph



Darkness Dawn Sunshine Dusk Notes: [How to read this graph?](#) Change [preferences](#).

Date: 2026-08-29 Time: 21:48 Day of year: 241 Elapsed: 66% Remaining: 34%

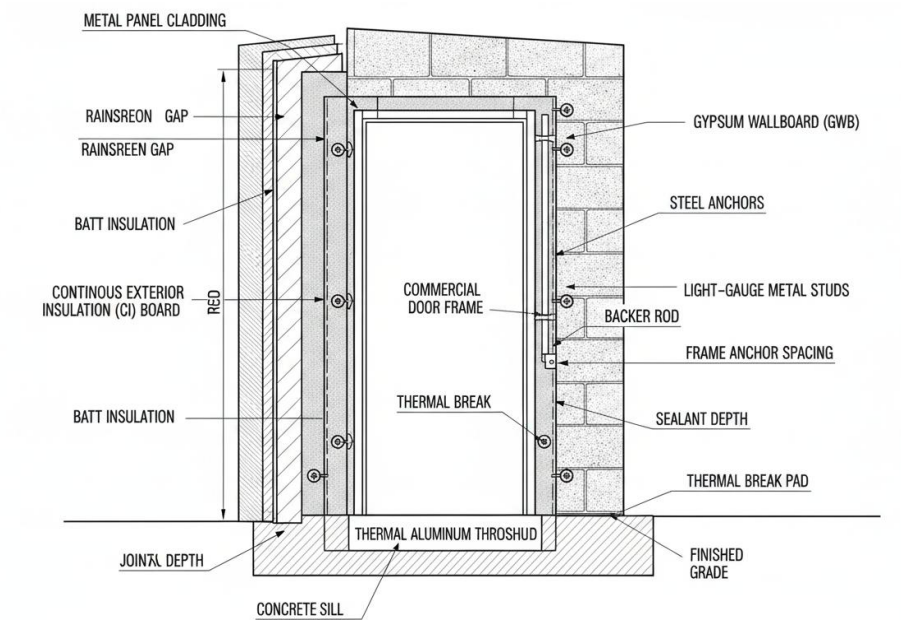
Size: More: [Evaluate the effects of different time zone and daylight saving time settings](#)

Architectural Detail

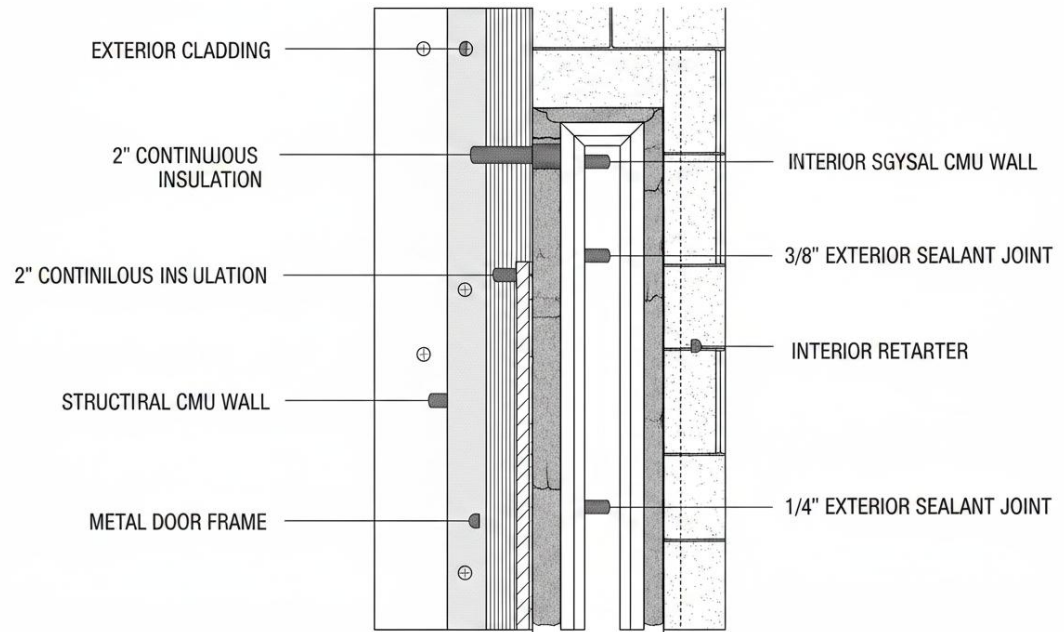
An essential part of any design phase is the creation of common and specific technical details for essentially all elements of the project. Contractors use these technical design details as a guide to

construct the intended design. Each detail essentially serves as a visual instruction manual detailing the correct look. Additionally, contractors use details to ensure all appropriate fasteners, fittings, etc. are being used during construction. Our team has gone through the 12 lectures called out in the LEED Platinum BD&C and created a 2-dimensional drawing detail for one design topic in each lecture. Each detail includes a plan and profile view as shown below.

1. Thermodynamics, Air Quality, and Health

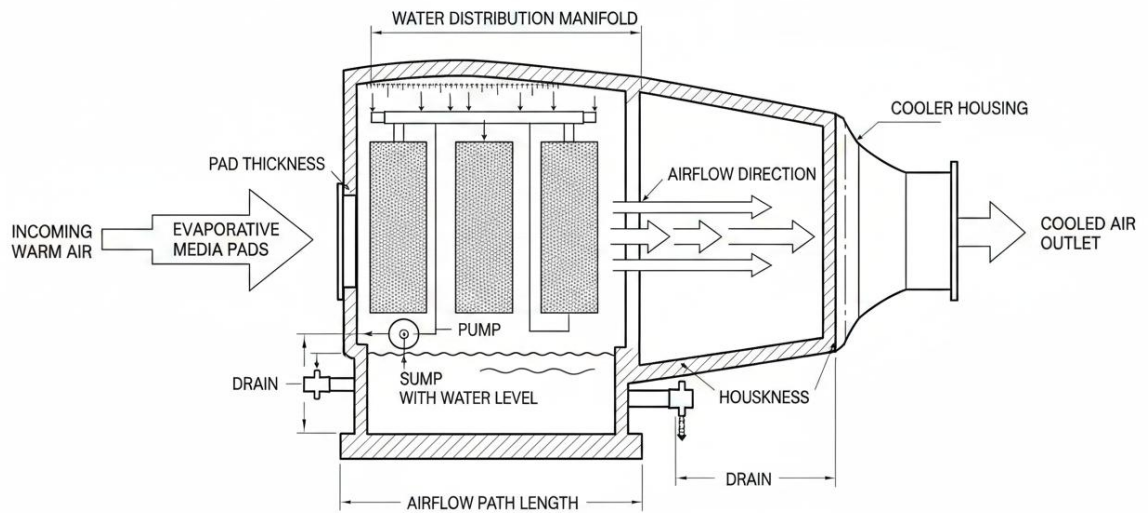


Detail 1.1: Showing the plan view of a commercial building door with insulation barriers surrounding the seal.

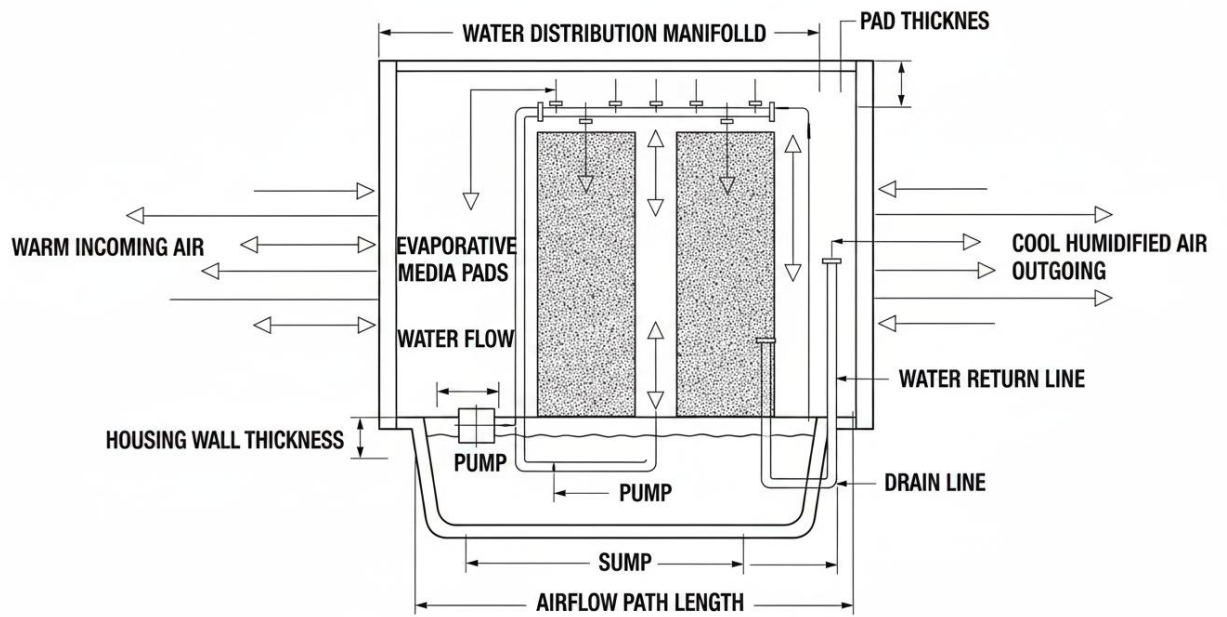


Detail 1.2: Showing the section view of Detail 1.1

2. Thermal Comfort and Health

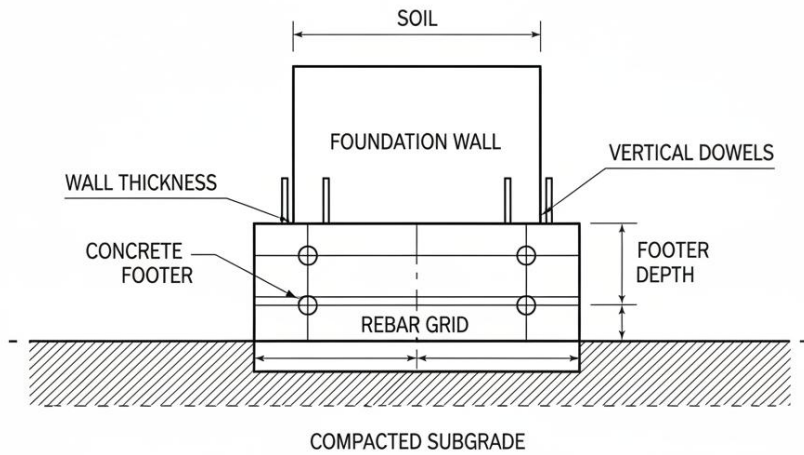


Detail 2.1: Showing the plan view of an adiabatic evaporative cooler.

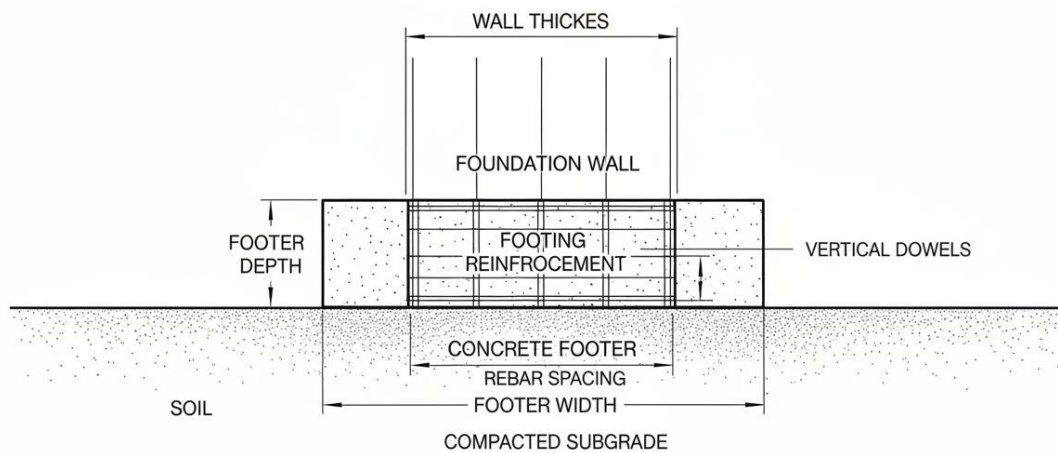


Detail 2.2: Showing a section view of detail 2.1

3. Climate and Site Design



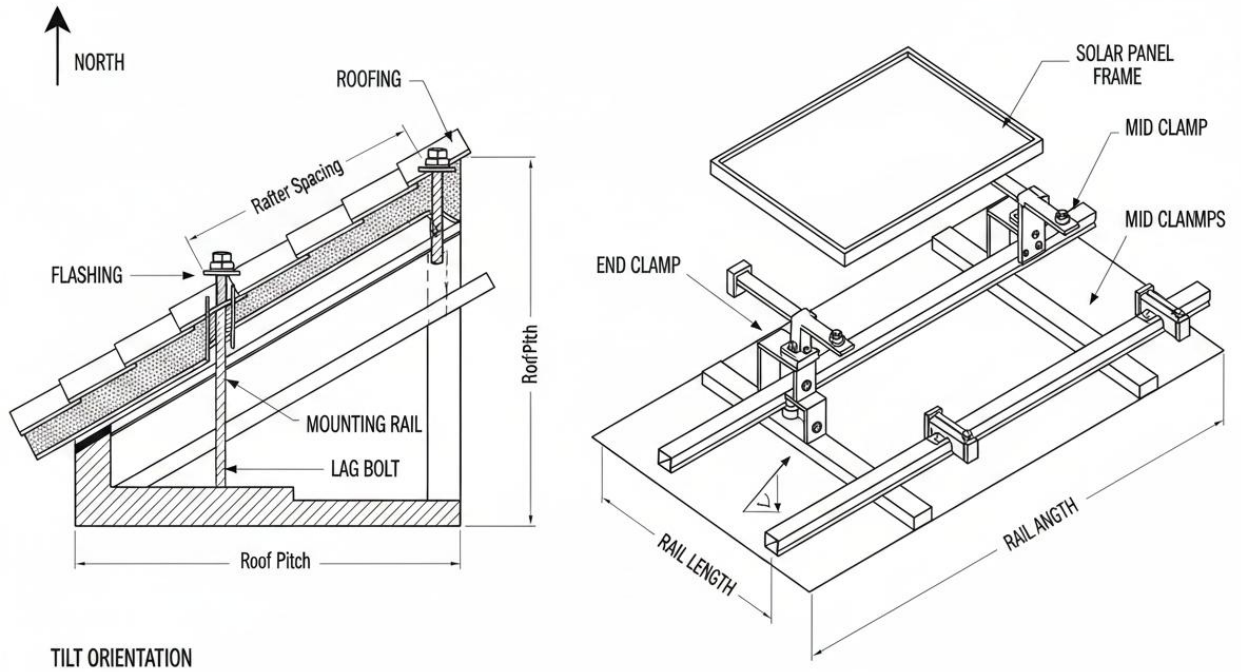
Detail 3.1: Showing a standard detail for the concrete pouring of a building foundation using rebar supports.



Detail 3.2: Showing a section view of Detail 3.1

4. Solar Geometry

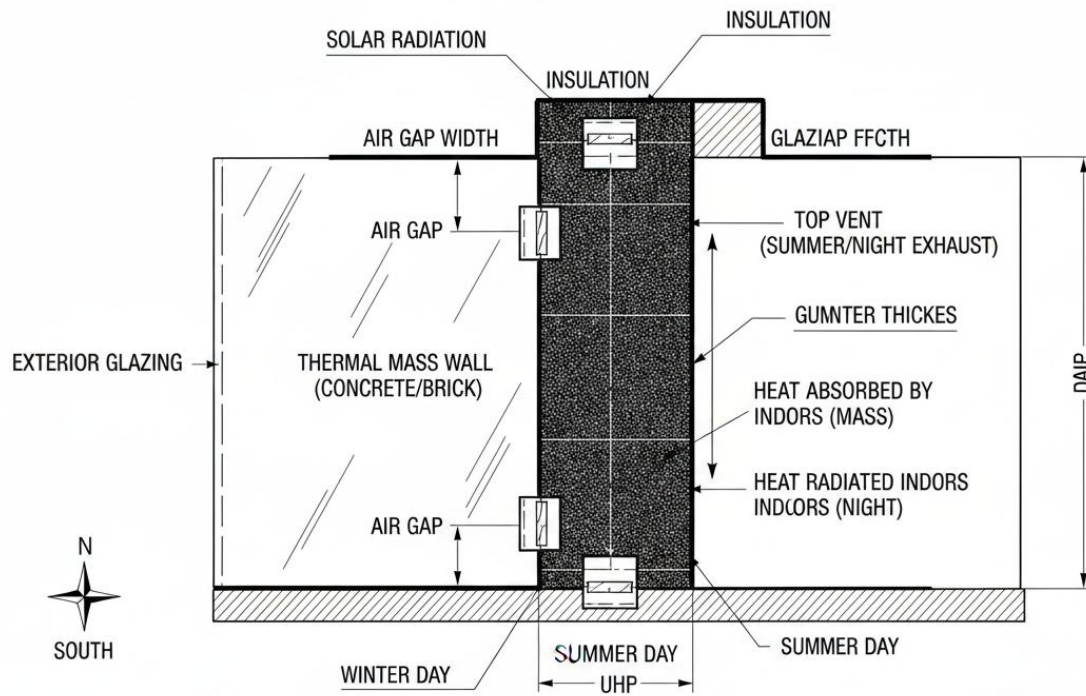
SOLAR PANEL ROOF MOUNT DETAIL - NORTH FACING



Detail 4.1: Showing the plan and section view of solar panel brackets and panels mounted to a slanted roof.

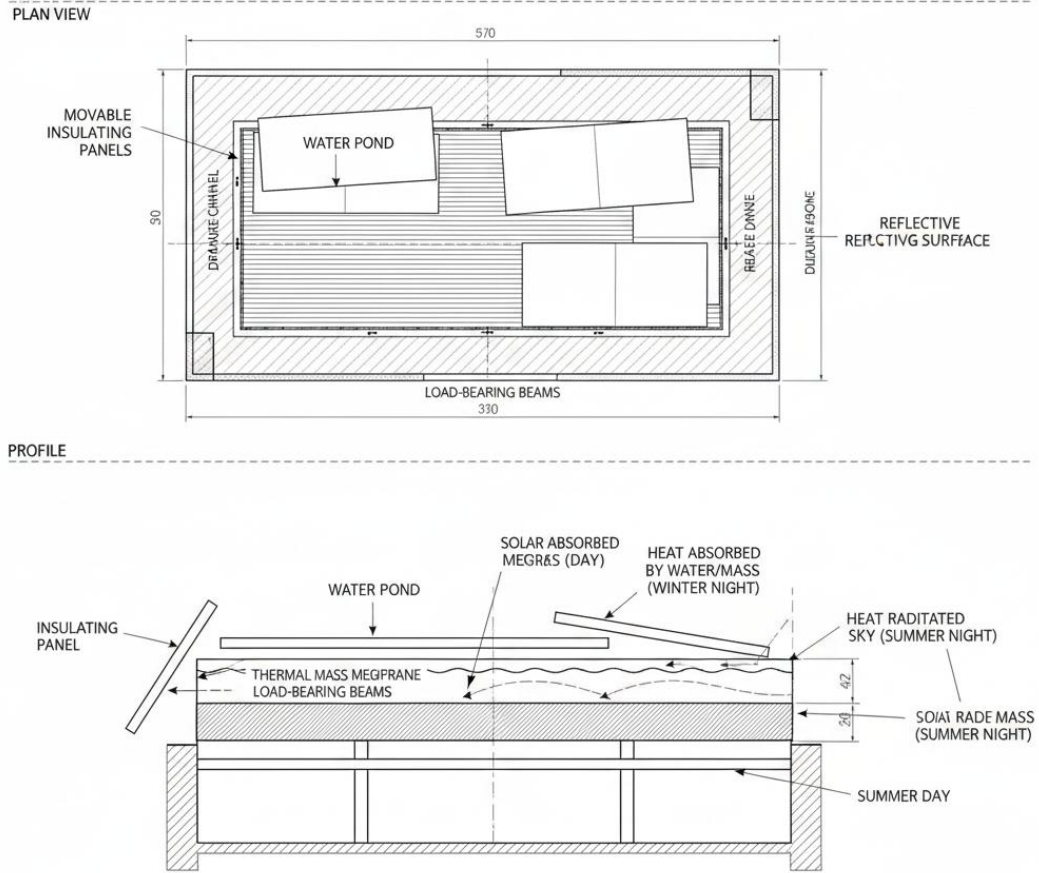
5. Passive Solar Heating

TROMBE WALL DETAIL - PASSIVE SOLAR HEATING SYSTEM



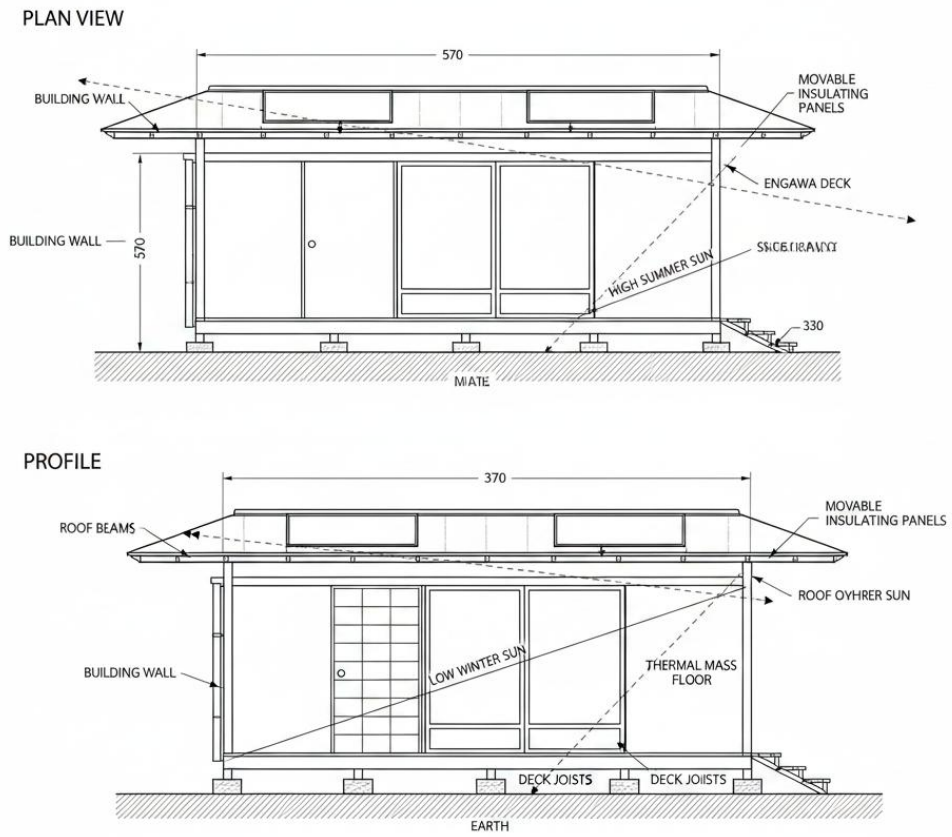
Detail 5.1: Showing the plan view of a Trombe wall detail added as a creative way to include passive solar heating.

6. Active Solar Heating



Detail 6.1: Showing a water pond detail that is built on top of a commercial building, allowing for active solar heating.

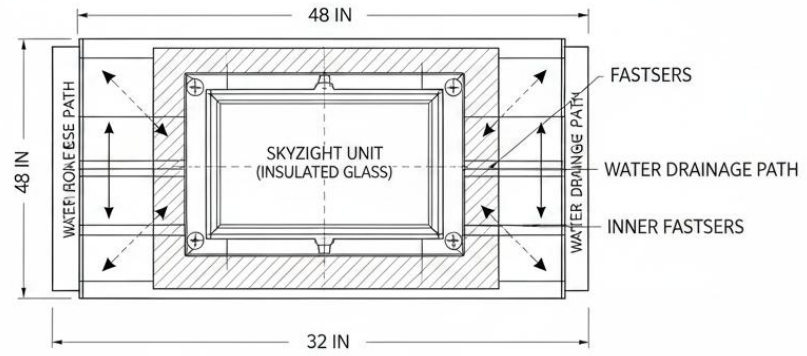
7. Passive Cooling (and Shading)



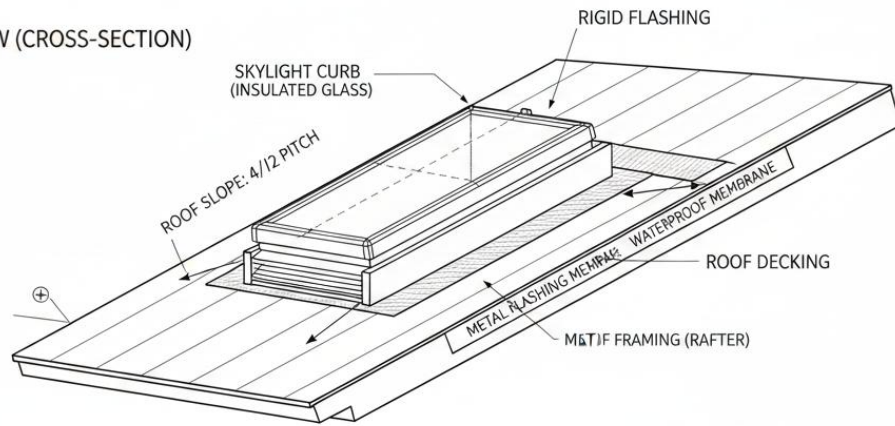
Detail 7.1: A plan and profile view illustrating a type of passive cooling with a Japanese Engawa style porch.

8. Natural and Man-Made Lighting

PLAN VIEW

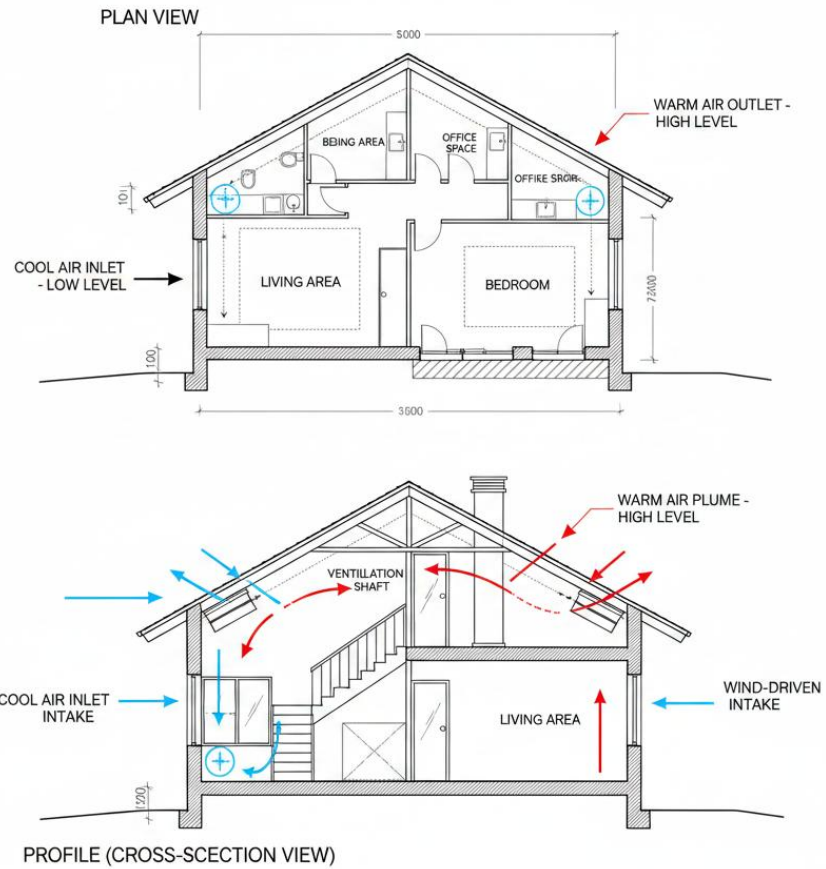


PROFILE VIEW (CROSS-SECTION)



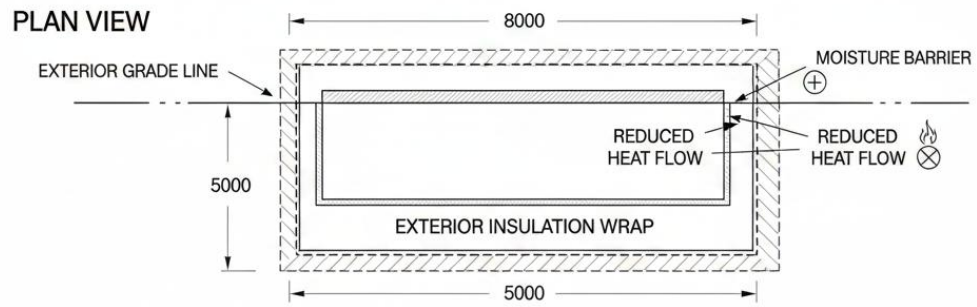
Detail 8.1: Showing a type of natural light through the use of a ceiling skylight.

9. Natural Ventilation

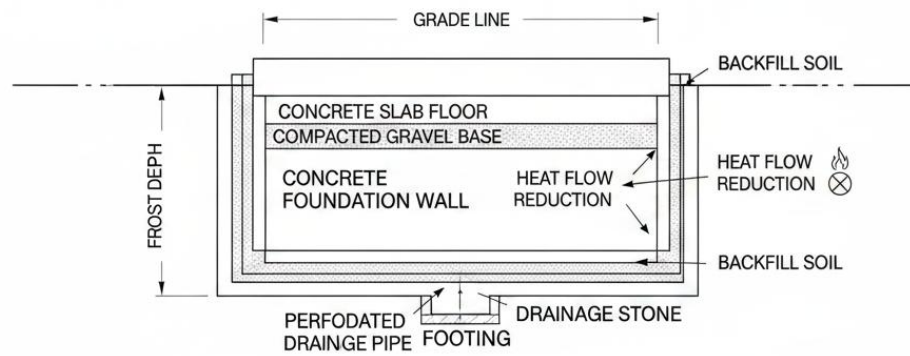


Detail 9.1: Showing a full house plan and section view of how natural ventilation can be used through a series of vents and windows.

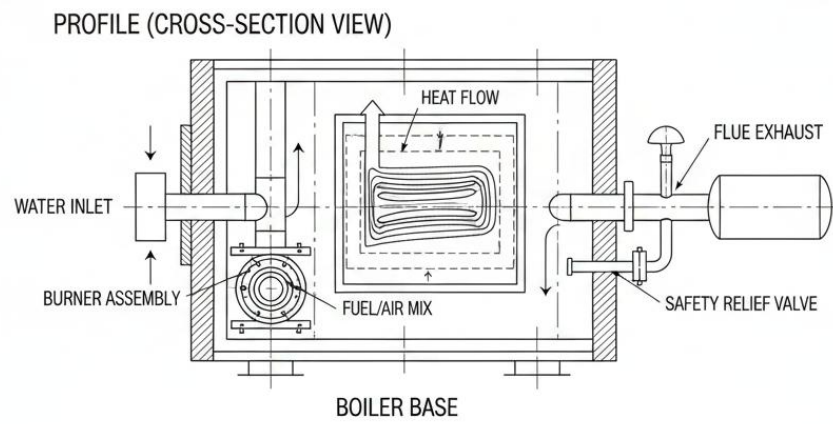
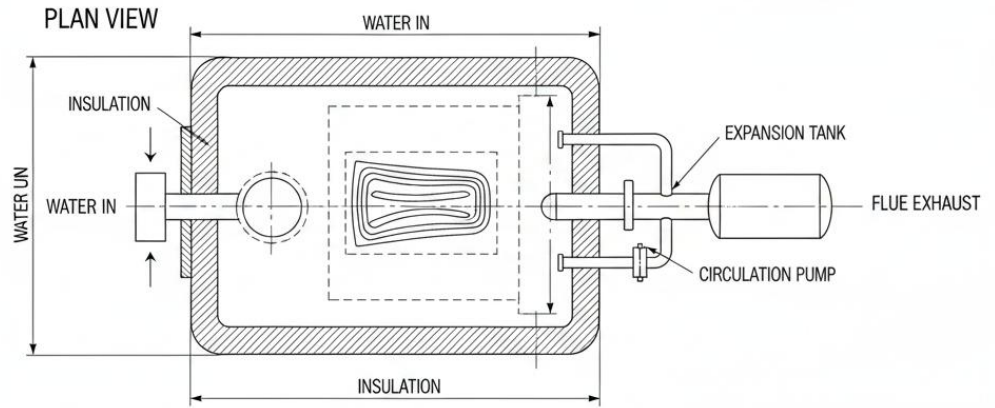
10. Building Thermal Envelope



PROFILE (CROSS-SECTION VIEW)

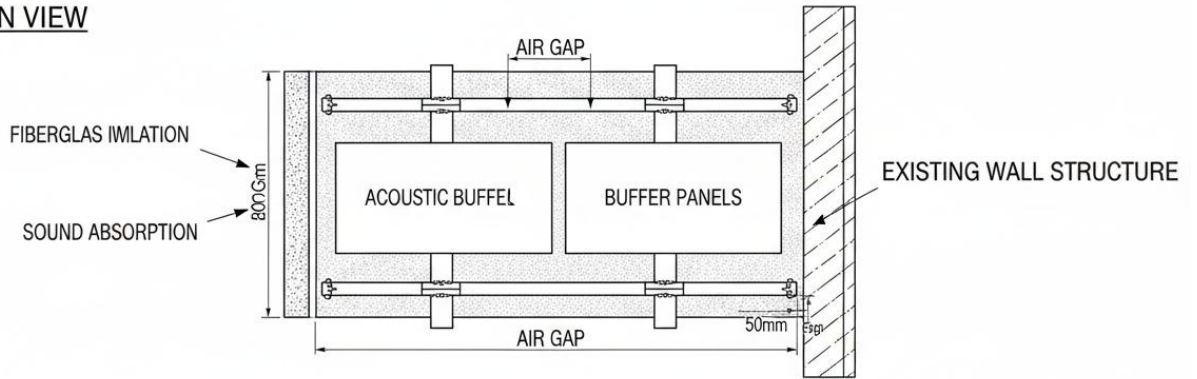


Detail 10.1: Showing the plan and section view of thermal heat wrapped around the building foundation to secure the thermal envelope.

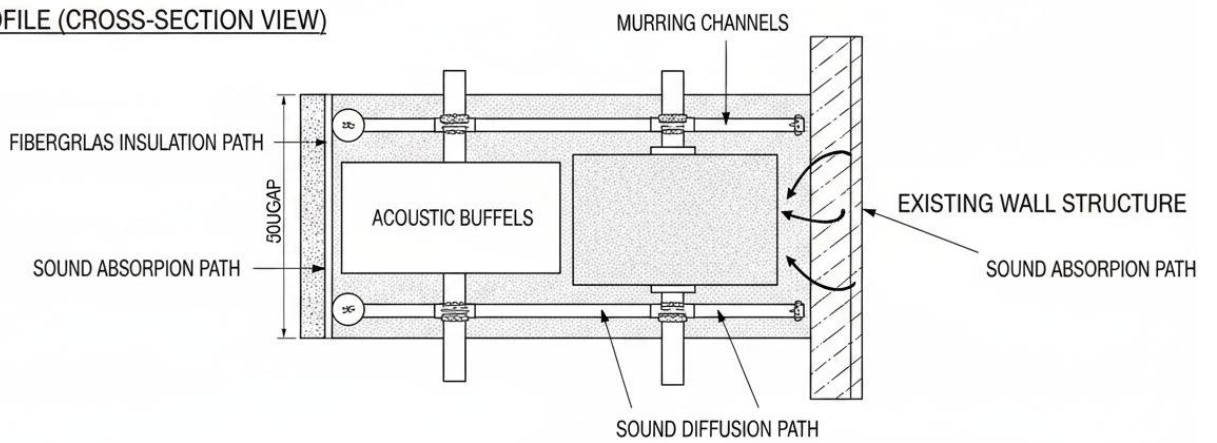


Detail 11.1: Showing the plan and section view of a water boiling system used for water temperature.

PLAN VIEW



PROFILE (CROSS-SECTION VIEW)



Detail 12.1: Showing an acoustical sound buffer for the social and lecture halls to reduce sound travel and echo.

Leed Check sheet



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

Project Name: **Elizabethtown University School of Agriculture**
Date: **May 6, 2026**

Y	?	N			
Y			Credit	Integrative Process	1
0 0 0 Location and Transportation 16					
10	6		Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
1	1	1	Credit	High Priority Site	2
3	2		Credit	Surrounding Density and Diverse Uses	5
5			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
2			Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
3			Credit	Rainwater Management	3
1	1		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
4	2		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
5	1		Credit	Enhanced Commissioning	6
16	2		Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
1	1		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
3	2		Credit	Building Life-Cycle Impact Reduction	5
1		1	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
2			Credit	Enhanced Indoor Air Quality Strategies	2
1	2		Credit	Low-Emitting Materials	3
		1	Credit	Construction Indoor Air Quality Management Plan	1
2			Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
2			Credit	Interior Lighting	2
2	1		Credit	Daylight	3
1			Credit	Quality Views	1
1			Credit	Acoustic Performance	1
0 0 0 Innovation 6					
2	1	2	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
87 27 11					Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

Attached above is the LEED v4 BD_C New Construction and Major Renovation Check sheet for our LEED platinum lecture hall. The lecture hall scored a total of 87 points well above the 80 point requirement for LEED Platinum requirements. The first section, Location and Transportation, has a total of 32 possible points. Our lecture hall scored a total of 21 out of 32 points. 10 points were earned from LEED for neighborhood development location. As Elizabethtown College is growing into Elizabethtown University, it continually strives for innovative designs. Along with its surrounding communities such as Lancaster and Harrisburg, PA. As the surrounding areas continue to grow and develop their LEED standing. Elizabethtown University continues to strive to bring innovative LEED platinum standards to a rural farming community earning 10 out of 16 points. Continuing within this section the new lecture hall will provide bicycle facilities and close proximity to quality transit. Highways, railroads, and airports are only a couple of miles from the new facility. The parking lot for the new lecture hall will be condensed and optimized for a low impact

footprint featuring charging stations for green vehicles. The sustainable site section of our lecture hall earned 8 out of 10 points. These eight points were earned through site assessment, protection of habitat, open space, rainwater management, heat island, and light pollution reduction. The site will be fully assessed by multiple consulting firms. Featuring a protected farm field, conserved open space round the lecture hall and a rain garden located on the site. Light pollution will attempt to be mitigated through the use of internal lights and windows providing enough ambient light to illuminate the outside without causing additional light pollution. 9 out of 11 points were earned within the water efficiency section. A natural rain collection system will be installed to remove the need for any additional irrigation for the agricultural school. Along with top of the line metering devices and low flow appliances will be utilized within the building to mitigate the indoor water use. 28 points from the energy and atmosphere section were earned out of 33 possible points. Green power and renewable energy production will be provided directly on site. The lecture hall will be fit with a photovoltaic system mounted directly on the roof of the building and tied into the adjacent solar field. The system has been sized to provide ample energy production to run the lecture hall year-round. To provide this, top-of-the-line metering devices will be installed by industry professionals. Along with all the utilities will be the most energy efficient model in order to aid in long-term savings. The lecture hall earned 6 out of 13 points within the materials and sourcing section. A construction and demonstration waste management plan will be put in place and agreed upon with the contractor prior to the start of the project. Additionally, the building has been designed with a long-life cycle with easy access to areas that may be worn over time for replacement. All materials and sourcing shall be done locally with companies that have sustainable harvesting. 14 out of 16 points were earned from indoor environmental quality. Thermal, sun lighting, and acoustical analysis have been done to provide the most efficient and comfortable environment for both students and staff. The lecture hall has been designed to have 6-9 air exchanges per hour. This was designed to fight against Covid and other air-bound diseases. The lecture hall will boast elegant views of the adjacent agricultural field and beautiful Elizabethtown scenery. Additionally, all materials will be specified as low emitting prior to the contractors' bid. Finally, the lecture hall earned 3 out of 6 points for innovation. Utilizing the rainwater management system to provide irrigation and the indoor lighting providing external lighting for the exterior of the building is cutting edge innovation in the fight against water waste and light pollution.