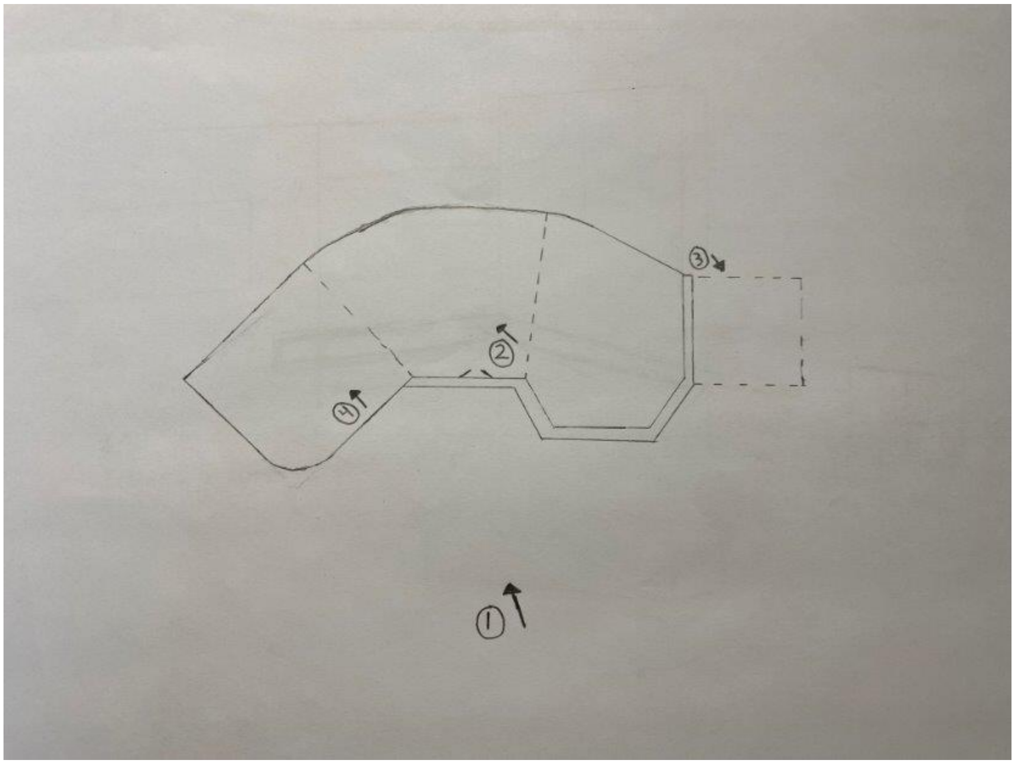
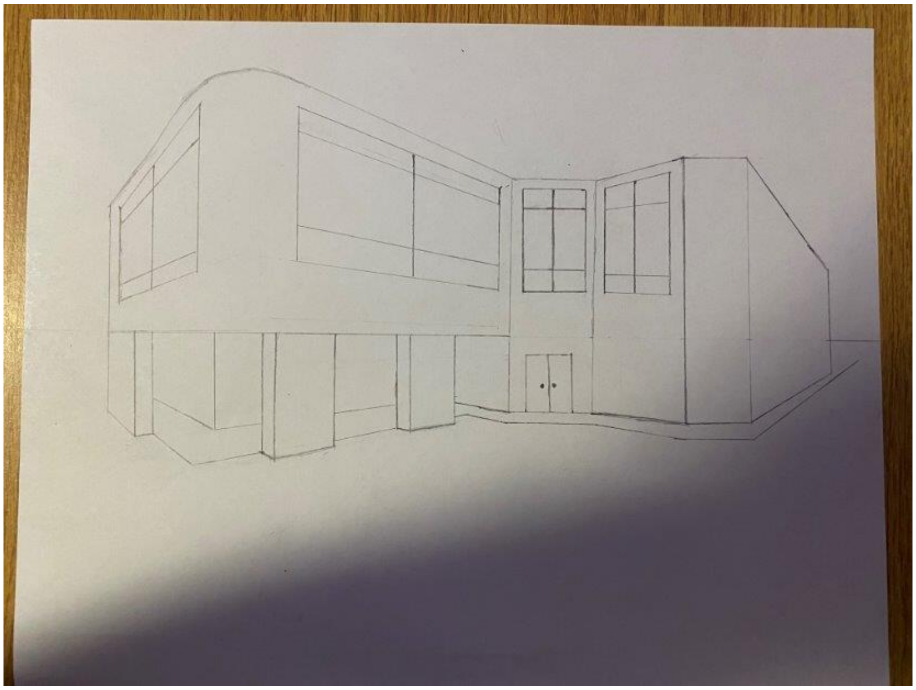
Project 2 LEED BD&C

Grant Bolze and Hudson

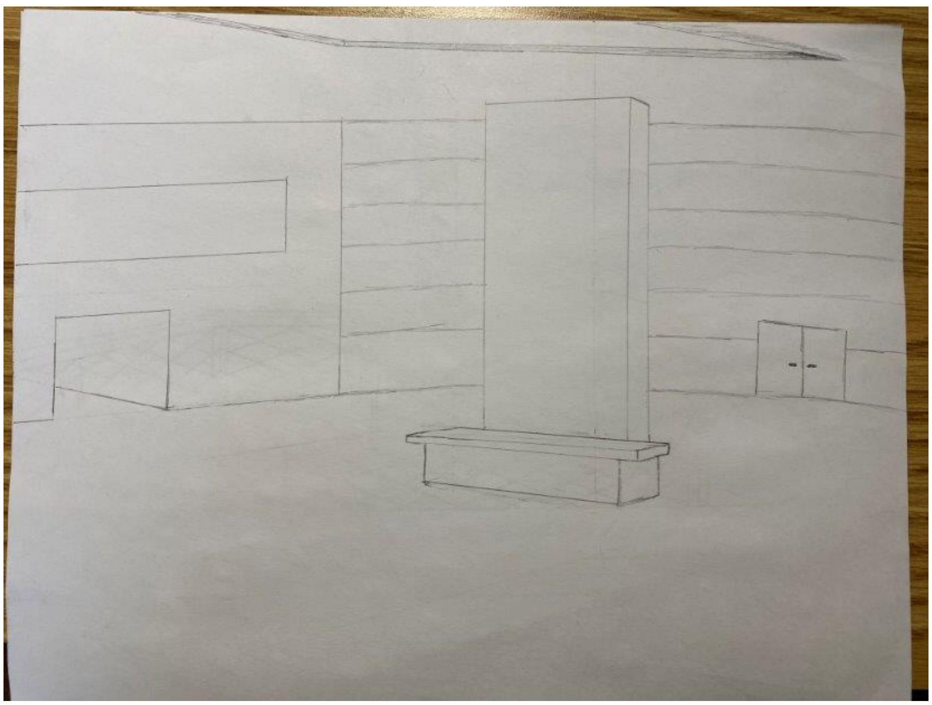
Initial Conceptual Building Floor Plan and Directions for Images:



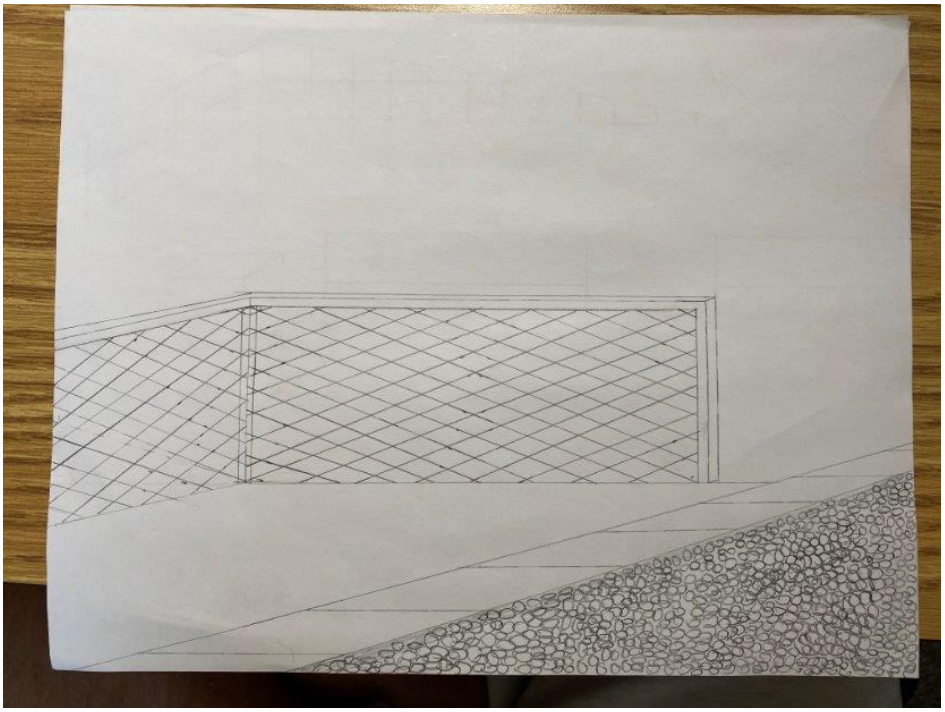
Drawing 1: External Front View of Building



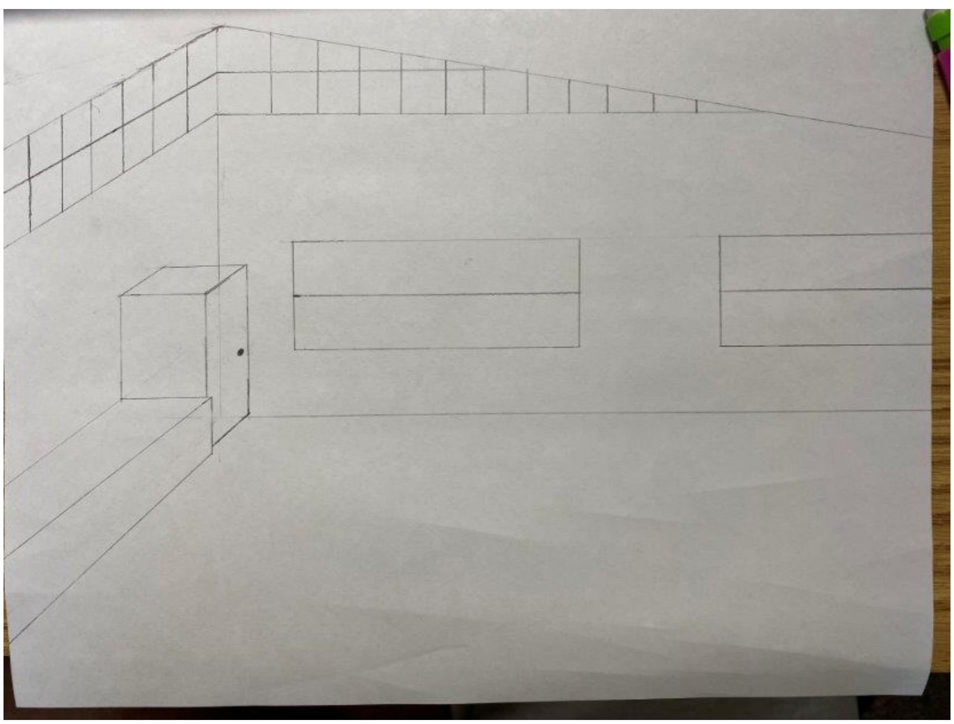
Drawing 2: Entryway and Lounge Area



Drawing 3: Outdoor Classroom and Stone Garden



Drawing 4: Athletic Kitchen/Eating Area and Workspace



LEED Platinum Checklist:

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

Project Name:
Date:

Y	?	N			
1			Credit	Integrative Process	1
0	0	0		**Location and Transportation**	**16**
			Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
2			Credit	High Priority Site	2
5			Credit	Surrounding Density and Diverse Uses	5
4			Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
0			Credit	Green Vehicles	1
0	0	0		**Sustainable Sites**	**10**
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
0			Credit	Site Development - Protect or Restore Habitat	2
0			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
5			Credit	Indoor Water Use Reduction	6
0			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			Credit	Enhanced Commissioning	6
16			Credit	Optimize Energy Performance	18
0			Credit	Advanced Energy Metering	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
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
2			Credit	Enhanced Indoor Air Quality Strategies	2
3			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
1			Credit	Interior Lighting	2
3			Credit	Daylight	3
1			Credit	Quality Views	1
1			Credit	Acoustic Performance	1
0	0	0		**Innovation**	**6**
4			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

94 - Platinum

Our new school of athletic training and physical therapy will complement Elizabethtown College both culturally and architecturally. By emphasizing athletics, all the sports teams can make the move across the road. This will open more room on Etown's campus for additional academic buildings, housing, or parking. For the sports teams, they will now have an entire plot of land dedicated to enhancing their playing ability, increasing their strength, and improving their knowledge of the game. Elizabethtown's slogan is educate for service, and with athletics moved, education will be solidified as the top priority. Architecturally, the new campus will clearly be related to Elizabethtown College. The new buildings will be made of red brick, just as many of our academic buildings are. Additionally, the same Elizabethtown branding will be used, such as the Etown "E" appearing on buildings and walkways.

When designing our buildings to adequately control thermodynamics, air quality, and health, there were many factors that we considered. When looking at the three methods of heat transfer, conduction, convection, and radiation, there were many different ways of heating and cooling that we looked at. In terms of conduction, our building will be designed to resist this heat conduction with insulation between the walls and windows while also using double-paned windows. To resist convection, our building will be designed to use a mix of factors to balance our hot and cold climate that Central Pennsylvania receives. Drawing 2 shows the high ceilings that will be used in our building effectively during the summer months to get rid of heat. Drawing 3 shows the use of low ceilings to trap the heat in amongst the people during the colder months. In any door frames, our building will also make the use of infiltration barriers in walls, and "weather stripping" around doors and windows (Shown in Figure 1 below) to prevent undesirable heat loss or gain.

Figure 1: Weather Stripping

In terms of air quality, our group is designing our building to simultaneously making sure that we have a means of naturally or artificially letting outside air flow into our building while also letting the outside air out. We are achieving this by allowing about 6 to 9 air exchanges per hour (according to post-Covid recommendations).

In an assumption to design our building for thermal comfort, we wanted to design our athletic center to have adjustable temperature not only through thermostats, but through the number of windows in the building. This can help mitigate the temperature of the building and allowing for more natural heating and cooling as shown in Drawing 2 and described in greater detail below.

When designing the buildings for our athletes, we needed to consider several environmental aspects. Our climate is very similar to that of Indianapolis, Indiana where cold winds are a big design concern. The three most important climatic design strategies for our climate are to keep heat in and the winter cold out, to protect against cold winds, and to let the winter sun in. We plan to utilize several design strategies to produce the most efficient and effective buildings for our new campus.

First, we needed to analyze the topography and slope of the land. The plot of land is relatively flat, so we do not need to worry about avoiding building on northern slopes. The northern slopes get much more wind and much less sunlight. Instead, we will focus on designing our buildings to be compact with a minimal surface-area-to-volume ratio. Compact building designs, such as those that are two stories, have less surface area exposed to the wind. It is important to orient the building so that their longer, more open sides face the south. Minimizing window area on all sides but the south side will result in more winter sunlight entering the building. Additionally, using an open floor plan will allow for the sun to penetrate through the building and reach far corners. Finally, precautions can be taken to block the winds. Planting trees or other vegetation on all sides but the sunny south side, or clustering several buildings together provide protection from cold winds.

Other things we need to keep in mind during our site design include the natural stream running along the north of the plot of land. We would also need to determine the soil type to effectively design the building foundations. Finally, we know this area is subject to occasional flooding and with the ongoing climate change, flooding is likely to increase.

To develop a campus that is appropriate for receiving enough sunlight, the buildings must be oriented in order to achieve both the maximum solar window, while also allowing light into buildings to create an aesthetic atmosphere. Our building, shown in Drawing 1, is faced primarily to the south so that the sun will curve over the building throughout the day, and will receive sunlight in the mornings and the evenings. This was also placed so that the Japanese garden, which is placed right outside the building will be able to receive sunlight throughout the day without being put in the shade from the building.

The buildings are designed to the best of their ability to account for the changes between the summer and winter solstice which occur on the 21st of June and December, respectively. The buildings will receive the most favorable light during the Autumnal Equinox, taking place on

September 22nd, and will receive the least favorable light during the Vernal Equinox, taking place on March 20th.

When designing our proposed neighborhood, our group made sure to highlight the values of Japanese design, both in the total campus and the Japanese garden. The Japanese garden is designed to act as a node, where a combination of paths are joined together to connect to each other. The Japanese garden will also include a small Torii, to create an area of peace with a plethora of surrounding vegetation to create almost a gateway towards this sacred and peaceful area. The paths will be designed using the red brick currently being used in the academic quads and will be arranged according to the “Ken System”. The bricks will be placed using the Tatami floor mat design as an allusion to this “Ken” design while also providing rhythmic balance to the area. Overall, the goal for the floor plans of these buildings is to be designed according to Japanese Engawa. The buildings will be designed for an open floor plan allowing for the spreading of light and a space available for multi-purpose use.

The act of passive solar heating is defined as collecting, storing, and redistributing energy without fans, pumps, or complex controls. Our group wanted to take a page out of Frank Lloyd Wright’s book by designing our building to make use of his style of optimized overhangs as shown in Drawing 1 and a “Solar Hemicycle”, which is a curved building to match sun paths as shown in the Top View Plan. This passive solar heating is much more useful than active solar heating because it requires less maintenance, it is more reliable, and has better overall architecture. You can see that in our group’s designs because it complements the aesthetics and vernacular of the college as described above by using the local materials (red brick), local styles, and it complements the overall surroundings of the college. A thermal mass choice that our group made to highlight this passive solar heating is by providing a clerestory, as shown in Drawing 4, to bring in more light and keep a high window above eye level.

The building shall not specifically rely on active solar heating, but we wanted to provide an option for the building to possibly run off the nearby solar grid while also generating some of its own solar energy. In Drawing 2, there is a skylight above the reception desk in the entryway. Our group wanted to design that aspect of the building to include photovoltaic glass on the windows which collects the ultraviolet and infrared rays and converts it to electricity while also still transmitting light into the interior of the building.

Passive cooling and shading is an important aspect of any building by using minimal technology. One of the ways that our group can help this process is by adjusting the orientation of the windows. In the warmer months, the south doesn't receive much sunlight, so our group is including shade in the south just before and after midday. The second passive cooling strategy that our group has provided in the design of our building is our tall ceilings and large windows. As an exterior shading method, our group wanted to include an outdoor classroom which could operate as a team meeting area as well. Our group has included a trellis on the exterior of this patio placed vertically and we will also add vines along this side to enhance the shading when it is needed (Shown in Drawing 3). The most crucial aspect of this shading is including high-canopy plants along the building's exterior. Our group will include deciduous trees around the exterior of the building to block the summer sun through its leaf structure.

Our new campus building will make the most of natural lighting. Open floor plans will allow sunlight to reach far corners of the buildings. The windows will be made from Low-E glass that will allow maximum lighting through while blocking heat. We will consider the orientation of our buildings as well. The front side of the buildings will be built to face the north which will provide the best year-round lighting with low intensity. We can channel additional light into our buildings through reflection techniques. Our drawing of the outdoor collaboration area/classroom shows the use of white rocks that reflect light into the neighboring building.

When designing the thermal envelope of our building we considered both heat gain and heat loss. Heat is gained through either internal gain from people, lighting, and appliances, or solar gain from the sun. One cannot necessarily control how many people enter a building and ultimately the amount of heat gained, and for that reason designing for heat loss is given more attention. Heat loss is a significant issue, with 25% of heat loss leaking through the roof, 25% through doors and windows, 35% through outside walls, and 15% through ground floors. We will insulate our walls and roof with fiberglass batts (3.5 R per in). Combining the fiberglass batts with walls of appropriate thickness, we will meet the recommended min Rt of 50 for roofs and 20 for walls. We will prevent heat loss through windows with multiple pane windows and insulated curtains or drapes. Finally, to control air flowing in and out of the building, we plan to weather strip cracks in doors and windows.

Another important aspect of our building will be the HVAC design. The first thing to consider is the thermal zones of our athletic buildings. The athletic building will be large enough to develop a few thermal zones requiring their own thermostat. For this reason, we will lean towards an electric heating system that is compact, quick to respond to temperature change, and can be easily zoned for the different building areas. The next design aspect to consider is the refrigeration cycle, or how the heat will be pumped. Our HVAC system will use the vapor compression method. This method makes use of heat vapor changing from a liquid to a gas. Heat is released when the gas condenses back into a liquid. The system will also have a direct refrigerant system for cooling. This is the simplest cooling method and is appropriate for our medium sized building. Finally, ventilators will be included to improve indoor air quality. Fresh cool air will be supplied while polluted warm air is exhausted through the ceiling with our displacement ventilation system. The entire HVAC system will be built into the architecture to give off a natural, aesthetic look.

We strove for acoustic comfort with the design of our buildings. Four important criteria make up an acoustic comfort environment, with those being speech intelligibility, speech privacy, low distractions and annoyance, and sound quality. We designed for an office open plan that emphasizes interaction with focus areas. We envision that the different teams will utilize the different focus areas to discuss film or tactics. With all open floor plans, controlling sound can be an issue. We plan to use high ceilings and CAC 35 Standard MF (sound absorption rating of 0.65-0.50) for our walls to block sound.

Our new campus will be LEED Platinum Neighborhood Development to LEED version 4.1 standards. We will ensure our new campus is easily reachable, with a crosswalk connecting to the existing Elizabethtown College campus. There will also be a bus stop to ensure public transit is always available. Many of our athletes may choose to bike to their athletic building and outside each building there will be a conveniently located bicycle rack. The new campus will have well-lit sidewalks running alongside the main access road and to each individual building. The buildings will be oriented with windows on their southern walls to allow for natural lighting and for heat during the winter months. The new campus buildings will also have optimized energy performance by being entirely powered by the neighboring solar panel field. Together, these ideas will produce a new campus designed and operated at the upmost efficiency.