Right Sizing

Building fixed, purpose-specific labs for only those programs that require it and using open labs within flexible casework wherever possible allows right sizing the fixed versus flexible.

Designing to a modular layout allows the changeover of research labs to teaching labs and vice-versa.

Calculating heating and cooling loads based on actual equipment lists and envelop R-Values, not code minimums and then considering reasonable diversity allows right sizing equipment, not over sizing.

Energy Conservation in the Building Envelope

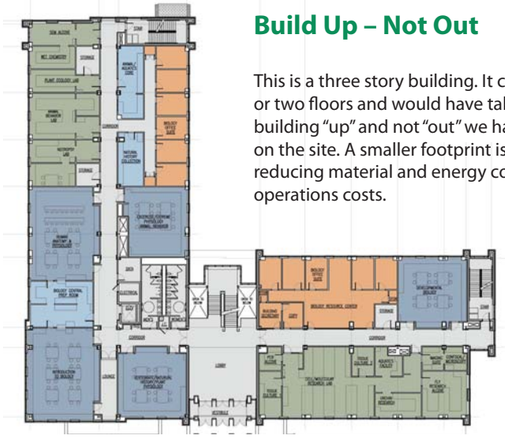
The building envelope is designed to minimize the amount of energy required to provide a comfortable interior environment. A high level of insulation is provided at all exterior wall and roof assemblies. The building envelop has an air barrier, which prevents the loss of heat and cooled interior air. High performance windows and doors are provided at all openings. Insulating glass is even specified for the greenhouse. All these strategies provide a reduction in the amount of energy required for the building, resulting in less cost to operate the building and all equipment to be reduced in size.

Daylight

The introduction of daylight into the interior of this building is maximized within the context of the building design. Daylighted buildings use substantially less energy while providing a connection to the outdoors, providing for a more integrated neighborhood. It is also a superior quality of light.

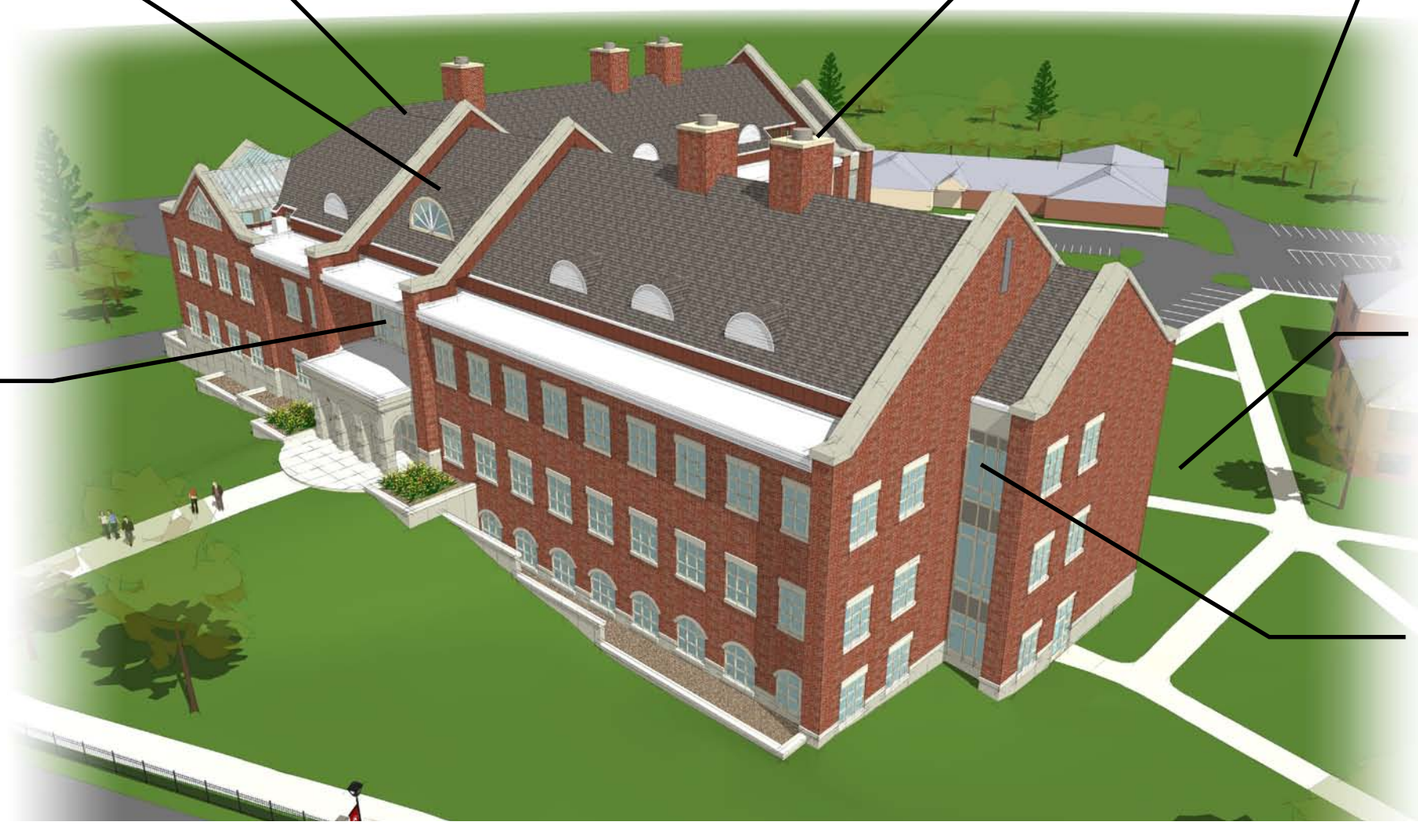
Daylight contributes to reduced initial, operating, and maintenance costs (fewer lights). It also increases worker productivity and student learning, along with the health and well-being of building occupants. Daylighting also helps to conserve natural resources (coal, oil, etc) and reduces air pollution due to energy generation and consumption.

Daylight used in combination with lighting controls will reduce the number of light fixtures in each space. Reducing the number of light fixtures will result in a smaller cooling load. This in turn can result in the reducing the size of the HVAC equipment. This saves both cost and the use of electricity to power the equipment. In addition, fewer lights mean that less electricity is required. All these things lead to a better environment.



Build Up – Not Out

This is a three story building. It could have been built all on one or two floors and would have taken up much more of the site. By building "up" and not "out" we have minimized our impact on the site. A smaller footprint is more resource efficient, thereby reducing material and energy costs, as well as maintenance and operations costs.



Susquehanna University's New Science Building

Green Design Story

Dual-Flue Exhaust

The fume hoods in the teaching labs will be exhausted with a unique dual-flue system. Instead of a single flue with a nighttime set-back valve, there will be two flues connected to the fume hood exhaust stack, enabling one or both to be opened as the conditions require.

The dual flues will allow both flues to be utilized at design peak flow and one flue to be utilized in a night set-back mode and reduced airflow. This maintains a safe discharge velocity from the flue stack at all time and allows the energy saving of reduced flow by slowing down the exhaust fans.

Preferred Parking

Preferred parking is being provided for Low-Emission and Fuel-Efficient Vehicles. Vehicle fuel consumption and emissions contribute to climate change, smog, and particulate pollution, all of which have negative impacts on human health. The infrastructure required to support vehicle travel increases the consumption of land and nonrenewable resources.

For individuals that don't have access to mass transit or car/van-pools, these vehicles are the next best thing. Providing preferred parking for this type of vehicle will encourage individuals to be part of the solution.

Native Vegetation

Native vegetation is used throughout the site. This landscaping is adapted to the local climate and the site's micro climate. Native landscaping reduces or eliminates water needed for irrigation while also attracting native wildlife and creating a building site integrated with its surroundings. In fact, a permanent irrigation system will not be required for this site, thus reducing the need for potable water. Native landscaping also requires less fertilizer and pesticides, which lessons the amount of negative environmental impact.

High Performance Glazing

The high performance insulated glazing units incorporate coatings on one or more surfaces of the glazing. These coatings allow short-wave radiation (visible light) to enter through the window while minimizing the amount of long-wave radiation (infrared or heat) from entering or leaving.

Blocking unwanted heat gain in the summer can reduce the cooling loads and reduce the size of the HVAC equipment. It also reduces the amount of energy required by the building, thereby saving natural resources and the generation of pollution.

A decision was also made to provide operable windows in all offices for individual ventilation and thermal control--a method of improving interior environmental quality.

Low-Vac: Products and materials

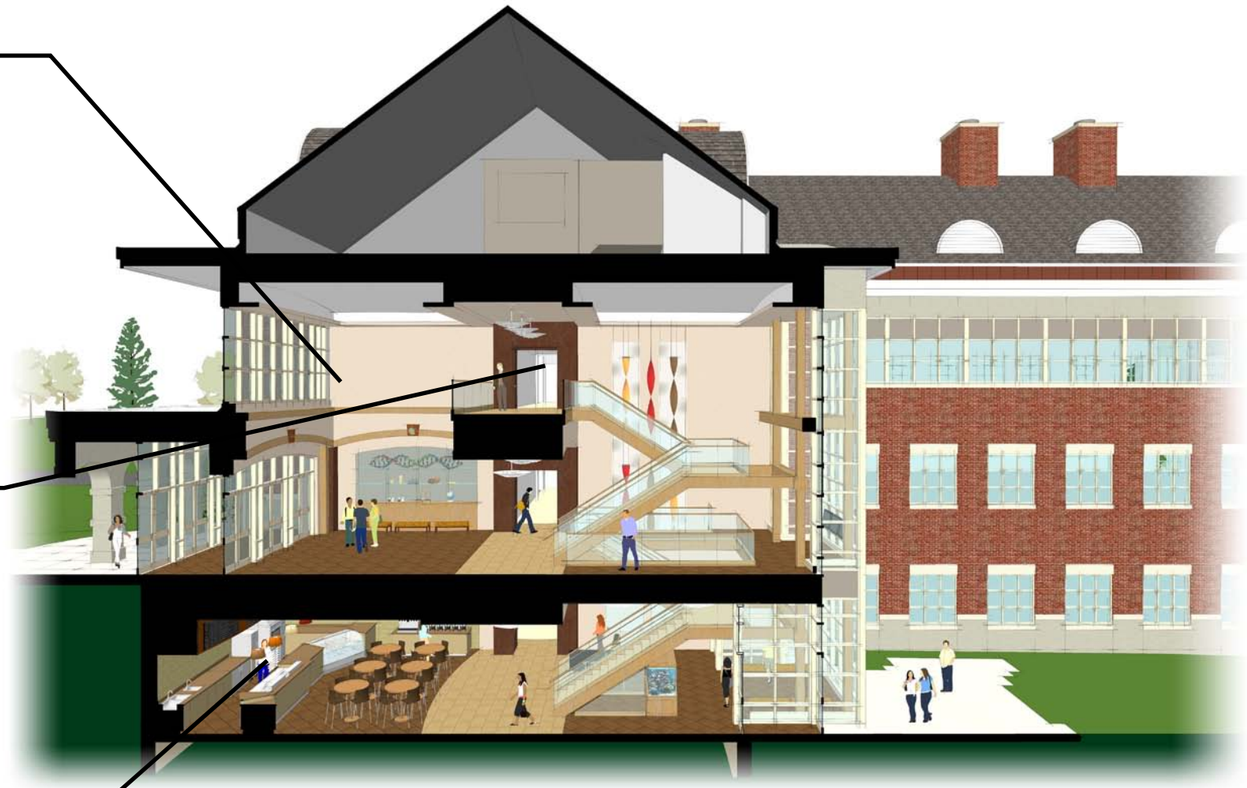
Materials such as carpeting, paints, and sealants that are used throughout the interior of the building have low amounts of VOCs (volatile organic compounds). These compounds off-gas from materials after they are installed, and if they form a large enough concentration in the air, can have a detrimental affect a person's feeling of well-being, and even make them sick. The materials in this building have been carefully selected to provide a healthy interior environment.

Other sustainable aspects of the design include use of recyclable and recycled materials. During construction, debris will be sorted and recycled.

Recycling Program

Recycling collection stations will be located throughout the building to promote occupants to recycle. Recycling diverts solid waste storage from landfills, thereby conserving natural resources and reduces energy costs and associated pollution.

Some products are even considered "cradle to cradle" in that they stay in a continuous loop of Use-Recycling-Manufacture-Use etc.



Green Tenant Coffee Bar

There is a coffee bar located on the lower level of the atrium. In addition to coffee, a variety of food offerings will be served. Local products and produce will be offered greatly reducing the amount of transportation typically associated with bringing in products. This results in less greenhouse gas being released into the atmosphere.

The "coffee" bar also prescribes to a "Green Cleaning" philosophy, whereby they utilize non-toxic cleaning materials. Typical chemical-based cleaning materials can have a detrimental affect on a person's feeling of well being, and even make them sick.

Water Conservation

Low -flow and dual-flush restroom fixtures will contribute to a minimum 30% reduction in the use of potable water. Large volumes of water increase maintenance and life-cycle costs for building operations and increases cost for municipal supply and treatment facilities. Using water efficiently will reduce costs through lower water use fees, lower sewage volumes to treat, and energy and chemical reductions. The reduction of portable water use reduces the amount of water withdrawn from rivers, streams, lakes, and underground aquifers. Reducing water use projects the natural water cycle and saves resources for the future.

Eco-Alcove

The first floor of the atrium will house an "Eco Alcove" consisting of informational signage and real-time building system LCD monitories. This will be a learning station for all occupants and visitors to understand and view the building's operations, and learn what makes this a green building

Monitors will display

1. What makes a building green
2. What is LEED
3. The building's Green Story
4. The building's energy consumption including:

- Present Electrical Demand
- Electrical Consumption this Month
- Energy Recovery Rate
- Inside and Outside Air Temperatures
- Indoor Relative Humidity Percent
- Water Usage for a Month
- Gas Usage for a Month

Energy Conserving Mechanical/Electrical Systems

The following energy, conserving mechanical/electrical systems are especially important in the lab building that is by nature a high energy consumer.

- Multiple high efficiency boilers (97% effective) will allow staging of the heating load to match the heating requirements of the building. This prevents boilers being kept hot when not needed. Half the annual gas utilized on conventional boilers is while they are idling. The high efficiency boilers sends the heat into the heating water, versus up the flue.
- Multiple high efficiency air-cooled chillers allow staging of the cooling load response. Multiple chillers will allow the number of chillers in use to match the buildings cooling load. Not having chillers running as long at peak load is more efficient.
- Heat recovery coils will recover energy from the exhaust air stream and preheat/pre-cool incoming outside air. Air coils in the exhaust air stream collect energy out of the exhaust, and through runaround glycol under pumping system, deliver it to preheat or precool the outside air entering the penthouse air handling units. This reduces the load seen by the boilers and chillers.
- Variable speed drives on exhaust fans will reduce the air flow during unoccupied hours. This matches the fan speed to the actual air flow required. As the occupancy changes within the building, the amount of exhaust air changes. The variable speed fans increase or decrease the airflow to match the needs of the building. This prevents conditioned air from being wasted and saves on horsepower utilized by the fans as well.
- Variable volume exhaust stacks (dual-flue stacks) will maintain proper exhaust velocity. As the exhaust quantity changes within the building due to fume hoods being in use or unoccupied, the air will be exhausted thru either one or both stacks to keep the discharge velocity at a safe level to prevent reentering of contaminates.
- Light switch occupant sensors will turn out lights and signal for reduced airflow in unoccupied rooms and set temperatures to unoccupied set points, which saves energy.
- Captured cooling coil condensate will be circulated through an evaporative coil to boost efficiency of the heat recovery coils. There is cold condensate water generated from the cooling coils in the air handling units. Typically this water is sent to a drain. This water will be captured and used to boost the efficiency of the heat recovery coils.
- Variable frequency drives for chilled water and hot water pumps will allow the flow of the pumps to match the actual load request. This saves horsepower utilized by the pumps. The pumps speed up and slow down to produce just enough hot and cold water to condition the building.
- High load equipment will be cooled with fan coil type units supplied from the process chilled water loop. This prevents expensive ventilation air from being utilized to cool equipment spaces. Using ventilation air for cooling is expensive because it takes a lot of energy to dehumidify the air to a humidity level that can be used in a building. Fan coils spot cool the load without bringing outside air to that space.
- Variable volume air handling units will allow airflow to match actual load requests. The air handling units produce just enough air to meet the buildings heating or cooling load. This saves on horsepower utilized by the fans as well as the cost to heat, cool or dehumidify the air.
- Economizer cycles on air handling units will use cool outside air when viable. Saving on chilled water required to cool the building. When outdoor air is cool and dry enough that it will meet the building load, it introduced into the building without being heated or cooled, then exhausted to the penthouse mechanical room.