

SENIOR DESIGN

The Senior Design three-course sequence is intended to simulate a professional work environment, to provide experience working in a group on an open-ended problem and to develop information gathering and communication skills. Substantial interaction between students, faculty and industrial and governmental institutions is an integral part of this experience.

Engineering students make up the majority of the senior design teams but the sequence is open to seniors in any discipline. During the fall the students form their teams, select an area of interest, then extract and explicitly state their design problems and methods of solution in formal proposals to the Design Faculty. The teams develop their own solutions during the Winter and Spring, the culmination of which is a formal report of the results. The faculty encourages the students to place as much emphasis upon the process of defining the problems and developing the solutions as is placed upon the actual end products. To reflect that concern, proposals, progress reports and final reports are required in both written and oral formats.

This year more than 500 seniors formed approximately 135 design teams. There were over 100 faculty, industrial and governmental personnel serving as advisors. These projects demonstrate the wide variety of interests and abilities of the seniors.

The Senior Design Final Presentations are our way of providing a forum in which the project engineers (the students) can communicate their results to the community.

This Spring, eight groups will be selected as the best representatives of their department with at least one group from each department. These students will compete at the Group Competition to be held on June 6, 2012. Students will receive prize money and award certificates. The competition will be held in the Bossone Research Center Auditorium from 9:00 a.m. – 3:30 p.m.

Adam Fontecchio
Associate Dean
Senior Project Design Coordinator
College of Engineering

CAEE-01

SCHUYLKILL RIVER TRAIL CROSSING AT GRAYS FERRY AVENUE

Advisor: *Dr. Joseph P. Martin*

Team:

Matthew Albracht	Civil Engineering
Robinson Eng	Civil Engineering
Connor Mueller	Civil Engineering
Richard Munns	Civil Engineering
Martin Williams	Civil Engineering

A pedestrian bridge crossing the Schuylkill River near the Grays Ferry Avenue Bridge is needed to connect two sections of the Schuylkill River Banks Trail. The target is to cross the Schuylkill to southwest Philadelphia and connect to the Bartram Gardens. The area has an abandoned railroad bridge in place. An assessment of the condition of the bridge has been performed. Permitting and acquisition of right-of-way will be a large part of the project.

The key engineering issue for this project is the production of a crossing over a navigable waterway. In order to meet vertical clearances for ships, the crossing must be raised to a minimum of 50 feet above the mean high tide of the river. The new design includes a new structure crossing the river while incorporating the old truss into the design. The trail connecting to Bartram Gardens will be finalized when the crossing is complete.

Sponsor: Schuylkill Banks

CAEE-02

DELAWARE RIVER INTEGRATED WATERFRONT LINE

Advisor: *Dr. Joseph Martin*

Team:

Bridget Botchwey	Civil Engineering
Gananath Chandratilleke	Civil Engineering
Kenny Chen	Civil and Architectural Engineering
Chelsey Weaver	Civil Engineering
Menelik Yilma	Civil Engineering

Philadelphia has several attractions that many residents and tourists are unfortunately unable to enjoy due to the lack of access by public transit. Some of these major attractions include the newly built Sugarhouse Casino, the Philadelphia Navy Yard, and Columbus Boulevard's big-box stores, bars, and restaurants. A transit line has been proposed to provide a public route to reach these locations. Furthermore, this proposed transit could create a more convenient public transit method to the Philadelphia stadiums and Philadelphia Navy Yard. A feasibility study of locations has been administered to examine several possible constraints. Variables such as an attraction market study and estimated ridership demographics have determined the best possible routes. Interchanges evaluated include the Market-Frankford line, Broad Street line, and PATCO line. Moreover, use of old rail utilities has been explored to determine workability, feasibility, and cost effectiveness.

CAEE-03

PILOT-SCALE SURFACE-POND BIO-REACTOR AT A MUNICIPAL SOLID WASTE LANDFILL

Advisor: *Dr. Mira S. Olson*

Team:

Carolyn Comer	Environmental Engineering
Erin Hughes	Environmental Engineering
Ashley Mundackal	Civil Engineering
Matthew Wenrick	Environmental Engineering

Excess liquid production from the compaction and decomposition of solid waste landfill must be collected and treated prior to release to natural waters. This liquid, known as leachate, contains not only significant amount of suspended solids, but also dissolved metals and high nutrient levels. The transportation and treatment of over 40,000 gallons incurs an expense of \$2500 per day. The team's design evaluates the feasibility of pretreating the leachate with an open-pond algae bioreactor onsite to reduce nutrient levels. Rainfall collection and effluent recycling is used to dilute the leachate and also allows sunlight penetration for photosynthesis of the algae while gentle paddle-wheel mixing ensures gas diffusion and prevents settling. Once a maximum biomass is produced, the algae can be harvested to create a cost-offsetting biofuel. The final design is approximately a 1/1000th pilot-scale, oblong-shaped, versatile bioreactor capable of controlling environmental and hydraulic conditions to further the research of algae growth in a landfill leachate medium.

Sponsor: EPA P3 Award, Delaware Solid Waste Authority

CAEE-04

EXPANSION OF THE PROPOSED COLLEGE OF ENGINEERING DESIGN FACILITY

Advisors: *Dr. Robert Brehm, Dr. Eugenia Ellis (ARCH)*

Team:

Julius Campanella	Architectural Engineering
Samuel Cocchia	Civil Engineering
Klaus Horsch	Civil Engineering
Michael J. Whelan	Civil and Architectural Engineering
Alexander Yeganeh	Civil Engineering

In the original proposal, a building dedicated to the College of Engineering was created. When the previous proposal was presented to the Dean, he felt that the site was not fully utilized due to the elevation as well as the footprint of the building.

From this, the new proposal will be dedicated to the Department of Civil, Architectural and Environmental Engineering. The structural as well as the architectural aspects are the main focus of this project. This building will house offices, classrooms, laboratory spaces and auditoriums for the CAEE Department. Space for students will be maintained by creating an updated and larger Cad Lab area. A CAEE library will also be added for students to have better access to design standards and relevant information and will also contain a space to display previous models or projects like the Concrete Canoe and Steel Bridge competitions.

CAEE-05

THE INTEGRATED DESIGN OF A GOVERNMENT OFFICE BUILDING LOCATED IN OMAHA, NEBRASKA

Advisor: *Prof. James E. Mitchell*

Team:

Bilal Baqai	Civil Engineering
Sara Beg	Architectural Engineering
David Fratamico	Architectural Engineering
Adrian Lu	Architectural Engineering
Emily McNally	Architecture
Vaibhav Paritosh	Electrical Engineering
Dylan Short	Architectural Engineering

CAUTELA Engineering is comprised of seven individuals specializing in various disciplines of architectural engineering and building design working together to compete in the 2012 National ASCE/AEI Student Competition sponsored by the Charles Pankow Foundation. The name CAUTELA is derived from the Latin word for “security,” an overarching concept in the firm’s integrated design of the architectural, structural, mechanical, and electrical systems of the proposed LEED Gold government office building located on 601 Riverfront Drive in Omaha, Nebraska. The 66,000 square-foot building is rated with a high-asset value and a high Homeland Security Threat Condition. It is designed to house approximately 250 occupants. The building’s most critical assets which are protected from terrorist attacks and local environmental hazards include its occupants, valuable archives, and essential building functions. In addition to a security design that provides both transparency and fortification, CAUTELA has developed a high-performance design of building systems that are redundant, sustainable, cost-effective, and innovative.

CAEE-06

ESTABLISHING WATER DISTRIBUTION SYSTEMS IN LÉOGÂNE, HAITI

Advisor: *Dr. Franco Montalto*

Team:

Kristin O’Neill	Environmental Engineering
Brendan Quann	Environmental Engineering
Bethany Shumaker	Civil Engineering

On January 7th, 2010 a massive earthquake occurred in the Republic of Haiti. The epicenter of the earthquake occurred in the Léogâne Commune of Haiti, approximately 20 miles west of Port au Prince. In response to this tragedy, unprecedented amounts of international aid have been pledged to the rehabilitation of effected areas. The scope of this project is to establish a sustainable drinking water system that services the unmet needs of the Léogâne population through the investment of this pledged aid. The design incorporates an analysis of available hydraulic resources to most efficiently service the community and limit future vulnerability.

CAEE-07

SOUTH STREET – PENN’S LANDING PEDESTRIAN BRIDGE REDESIGN PROJECT

Advisor: *Dr. Ivan Bartoli*

Team:

Pat Callahan	Civil Engineering
Frank DiCianni	Civil and Architectural Engineering
Kyle Jurgelewicz	Civil Engineering
Ian McEwing	Civil Engineering

Within the past decade, the Delaware Valley Regional Planning Commission developed a comprehensive plan to rejuvenate Philadelphia’s waterfront. The plan calls for development throughout the riverfront area, which incorporates convenient access points from the city grid directly to the waterfront. Since South Street is a heavily trafficked area of the city, its connection to the waterfront is essential for igniting Penn’s Landing development.

Connecting two Philadelphia landmarks, South Street and Penn’s Landing, requires a landmark bridge design. Therefore, the goal of this project is to engineer a pedestrian bridge that symbolizes the gateway from Philadelphia’s grid to Penn’s Landing. The bridge selected for this project is a cable-stay bridge. Designing the bridge was divided into two parts: defining the structural parameters, and designing the individual bridge components. A structural analysis model is also produced to analyze the bridge, as well as a construction schedule, sequence and cost estimate.

Sponsors: Chris Menna, City of Philadelphia Bridge Department; Chuck Davies, PennDOT

CAEE-08

REDEVELOPMENT OF BUILDING 624 AT THE PHILADELPHIA NAVY YARD

Advisor: *Dr. Kurt Sjoblom*

Team:

Steve Bartram	Civil Engineering
Daniel Culbert	Civil and Architectural Engineering
Kyle Earthman	Civil Engineering
Jeff Weinberger	Civil and Architectural Engineering
Anthony Wisniewski	Civil and Architectural Engineering

The Grünwald Adaptive Reuse proposal includes the transformation of existing Building 624 at the Philadelphia Navy Yard in to a dynamic mixed-use facility offering prime Class A retail, dining, and office spaces. The park will have a large retention basin, as well as outdoor seating to compliment various dining spaces proposed in The Grünwald. Within the building footprint, there will be a core out of a large section from grade level to roof level to create a large courtyard.

This proposal includes several significant environmentally sustainability features on the site. A green roof will be installed encompassing the building’s footprint to manage storm water. The green roof will also contribute to the mitigation of the heat island effect and insulation within the building year round. Additionally, a retention basin will be installed at the adjacent park area to manage storm water from the parking lot. Some of the engineering solutions proposed include filling the basement with aerated concrete and installing a truss system in the lobby. It is estimated that the cost of this project will be \$74 million.

**CAEE-09
MIRIMAR WATER DISTRIBUTION**

Advisor: *Dr. Joseph Martin*

Team:

Brandon Hinman	Architectural Engineering
Erik Mangan	Civil and Architectural Engineering
Jake McCarthy	Civil and Architectural Engineering
Anthony Nanfro	Civil and Architectural Engineering
Tejas Patel	Civil and Architectural Engineering

The town of Mirimar, El Salvador, does not have a sufficient system to provide clean water to its 150 residents. There are two public hand dug wells and ten private wells throughout the village, but they contain high levels of fecal coliform and are unusable for drinking. The lack of knowledge and skill to create a system to hydraulically pump water up to the elevation of the village is the limiting factor.

The water will be retrieved from the river via a settling pond. From there the water, which is now significantly cleaner due to the settlement of solids, will be transported to a high efficiency pump. The pump will then bring the water from an elevation of 375 feet to an elevation of 675 feet and empty it into a large storage tank which is connected to a nearby slow sand filtration system.

**CAEE-10
GREEN REDEVELOPMENT OF DREXEL UNIVERSITY STUDENT RESIDENTIAL QUAD**

Advisor: *Dr. Paul Block*

Team:

Mashal Ali	Civil Engineering
Scott Jeffers	Environmental Engineering
Matthew Ryan	Civil Engineering
Julian Safar	Architectural Engineering

In conjunction with Drexel University's Planning Department, we have prepared a plan for redevelopment of the residential square located between Drexel residential dormitories Calhoun and Towers Hall. The plan takes into account three major design criteria most important to the university. The first is the creation of a pathway system that connects to current pathways in the residential area. The second is to design an aesthetically pleasing environment that encourages the space to be utilized by students. The third is to manage stormwater runoff moving through the area. Using these design criteria, we have created a plan for future development in the area. Highlights of the plan include connective tree lined pathways linking together the dormitories of the area, both grassy and bench seating areas, and a bioretention basin to manage stormwater runoff.

**CAEE-11
POMPESTON CREEK BRIDGE RENEWAL PROJECT**

Advisor: *Dr. Emin Aktan*

Team:
Simbarashe Jhamba Civil Engineering
Jeffin Lukose Civil Engineering
Dan Seeberger Civil Engineering

The Pompeston Creek Bridge, owned by the Burlington County Bridge Commission, is in very poor condition and beyond repair. Pennoni Associates has worked with T&M Associates on a preliminary design for the new bridge, and it has been brought to JDS Associates for analysis and design of alternative bridges. Obstacles in our design will include the railroad bridge that runs parallel to the bridge in question. The railroad bridge and Pompeston Creek Bridge are approximately 2 feet apart and share the same continuous abutment and foundation. Another issue is the pile foundation that will be used to save on costs. After extensive research JDS has elected to go with the CON/SPAN design, which is a precast concrete arch system, due to not only its very simple and effective design, but also its cost savings. This type of bridge follows all AASHTO and NJDOT requirements, fits in well with the surrounding area and is very economical.

**CAEE-12
THE LIFE TOWER**

Advisor: *Prof. Louis DaSaro*

Team:
Scott Macpherson Civil Engineering
Peter Matthews Architectural Engineering
Thomas McGrew Civil Engineering
Monika Mickute Architectural Engineering
Jennifer Shin Architecture

Our senior design group is participating in the 2012 Chicago Mock Firm Competition. We have created a mock engineering firm, Vector Collaborative, and designed a 100-story multi-use high-rise building in Beijing, China, called the Life Tower, to compete in this competition. The Life Tower is designed to accommodate retail, residential, commercial, and hotel uses. We have used the International Building Code 2009 to design all aspects of the building, including the building envelope and structural, HVAC, electrical, fire protection and plumbing systems. Our building and site design incorporate sustainability, innovation, and the traditional Chinese philosophy of Feng Shui. We have achieved a certified LEED Platinum rating in our design, demonstrating our commitment to these principles. We have the backing of several sponsors to assist us with competition fees and traveling costs to Chicago in May in order to present our project.

CAEE-13
BIOGAS FACILITY – LEOGANE, HAITI

Advisor: *Dr. Patrick Gurian*

Team:

Tyler Buecher	Civil Engineering
Daniel Hegarty	Civil and Architectural Engineering
Ralph Hernandez	Mechanical Engineering
Martin Conor O’Toole	Mechanical Engineering
Chris Sokolowski	Civil and Architectural Engineering

This Senior Design Capstone Project aims to resolve several issues that Leogane, Haiti is currently experiencing after being stricken by a massive earthquake in 2010. The project’s goals include finding a sanitary alternative to the short-term latrines and pits currently in place, providing an alternative fuel source to charcoal and wood, and reducing the spoilage rate of food by providing a refrigeration unit to the local market. The project focuses on building an anerobic biogas facility that will use waste matter to produce biogas from which a distribution system of usable fuel will be readily available for the Haitian people. The biogas fuel alternative will resolve the current problem of waste removal while providing a solution to the deforestation problem and providing a source of fuel. The proposed facility will be modular in design, allowing for future expansion.

CAEE-14
A FRAMEWORK FOR THE DESIGN AND IMPLEMENTATION OF ENVIRONMENTAL SENSOR NETWORKS IN COMMERCIAL BUILDINGS TO PROMOTE ENERGY EFFICIENCY AND IAQ

Advisor: *Dr. Michael Waring*

Team:

Adams Rackes	Architectural Engineering
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Environmental sensor networks (ESNs) for routine monitoring of indoor air quality (IAQ) have the potential to help reduce building energy use while protecting occupant health and comfort. The project focuses on development of a framework for ESN design and implementation in commercial buildings. The first stage of work included researching sensor characteristics, developing a method for quantifying network performance, and establishing a Monte Carlo simulation procedure for evaluating network designs. The second stage of work included building a complex, time- and spatially-resolved model of an office in the multi-zone airflow simulation program CONTAM, identifying initial possible sensor layouts and interpolation rules, and implementing the Monte Carlo evaluation procedure in the context of these network designs. The third stage of work included using empirical procedures, such as clustering and regression, to identify optimal number of sensors and interpolation rules, given perfect information (i.e., highly resolved concentration data), and then use similar techniques to predict or estimate the optimal network design parameters, given the information customarily available to designers (e.g., design airflow rates, spatial and HVAC zone topology).

CAEE-15 QUARTERS A” RETROFIT FOR SUSTAINABILITY

Advisor: ***Dr. Eugenia Ellis (ARCH)***

Team:

Corey Griffiths	Architectural Engineering
Asrah Khadr	Environmental Engineering
Maria Sofia Sanguinetti	Environmental and Civil Engineering
Gozde Unkaya	Civil and Architectural Engineering
Malin Viberg	Environmental Engineering

Many residential houses and buildings in Philadelphia are very old and thus have many functional problems. Generally these problems include leaky building envelopes, wet basements and inefficient energy usage. This Senior Design Project is a framework on how to retrofit a characteristic Philadelphia historic building to meet today’s energy-efficiency goals for sustainable architecture. To create this framework, a building was chosen as the pilot in order to work with actual data and parameters. “Quarters A” is an historic building situated at the Navy Yard that today is a high school called “The Sustainability Workshop” – a program in which high school students learn through project based learning. This design project was broken into four parts that are typical problem areas for an old building in Philadelphia: electrical lighting, HVAC, building envelope and stormwater management. In theory, this framework demonstrates reduced costs in utilities and a better indoor air quality.

CAEE-16 REDUCING THE ENVIRONMENTAL FOOTPRINT OF ALUMNI ENGINEERING LABS AT DREXEL

Advisors: ***Dr. Charles Haas, Dr. Eugenia Ellis (ARCH)***

Team:

Thomas Bosc	Architectural Engineering
Christina Giannascoli	Environmental Engineering
Ryan Monkman	Civil and Architectural Engineering
Matthew Shinton	Civil Engineering

This project is an effort to reduce environmental impact of the Alumni Engineering Labs by using forefront green technologies in an effort to match Drexel University’s sustainable movement and incorporation of these technologies to reduce the energy consumption for the facility. The incorporation of high performance fenestration, green roofing, storm water management, efficient lighting and redesigned HVAC system to improve efficiency highlight the numerous design improvements to the building. Consideration throughout the project has come from Philadelphia green building guidelines, Philadelphia Water Department Storm water guidelines and Department of Energy sustainable guidelines. Rather than perform a complete tear down and redesign of Alumni Engineering Labs; this project is produced to serve as a University model of sustainable renovations for use at Drexel University. As full demolition and redesign is costly to the environment and character of the University.

CAEE-17**FEASIBILITY STUDY TO INVESTIGATE THE NEED FOR A PUBLIC TRANSPORTATION CONNECTION ACROSS THE DELAWARE RIVER WITHIN BURLINGTON COUNTY, NEW JERSEY**

Advisor: *Dr. Franklin Moon*

James Drogalis	Architectural Engineering
Brandon Glencross	Architectural Engineering
Neil Patel	Civil and Architectural Engineering
Brandon Weaver	Civil and Architectural Engineering
Charles Young	Civil and Architectural Engineering

Residents of Burlington County, New Jersey currently lack an efficient public transportation system. As a result, a significantly lower number of residents utilize public transportation than in surrounding counties. A major reason why people are not using public transportation is accessibility and convenience. In order for commuters to travel by rail from Burlington County to Pennsylvania, they must cross the Delaware River. A feasibility study was conducted to assess connecting the NJ Transit River LINE and the SEPTA Trenton line with a public transportation link over the Burlington Bristol Bridge.

The feasibility study consisted of constructing a finite element model of the Burlington Bristol Bridge to assess the loading carrying capacity and need for retrofit. This model allowed for the consideration of several rail alignments. The outcome of this project was a recommendation to the Burlington County Bridge Commission considering the recommended alignment and retrofits.

CAEE-18**DESIGN OF A CENTRALIZED WASTE TREATMENT FACILITY FOR HYDRAULIC FRACTURING WASTEWATER**

Advisor: *Dr. Charles Haas*

Team:

Nathaniel Cain	Environmental Engineering
Matthew Fritch	Environmental Engineering
Edward Lennon	Environmental Engineering
Christopher Nase	Environmental Engineering

Hydraulic fracturing in the regions of Pennsylvania underlain by the Marcellus Shale poses a significant problem when it comes to treating or disposing of produced wastewater from drilling activities. The natural-gas industry must invest in a dedicated facility that can handle extremely brackish water (total dissolved solids greater than 50,000 mg/L) as well as radioactive byproducts that are naturally present in the flowback fluid. Our design choice is an elaboration on the MVR evaporation plant that includes chemical treatment in order to produce a marketable sodium chloride product by the addition of sodium hydroxide. Our goals are to design a facility that will effectively treat the contaminated water according to state and federal standards, provide a long-term, cost-efficient solution for natural gas companies, and reduce the environmental impact of drilling activities in the Marcellus Shale.

CAEE-19

REDESIGN AND RECONSTRUCTION OF THE DELAIR BRIDGE

Advisors: *Dr. Kurt J. Sjoblom, Dr. Ivan Bartoli*

Team:

Allyson Canestri	Environmental Engineering
Lauren Reiter	Civil Engineering
Samuel Steffes	Civil Engineering
Daniel Usher	Civil Engineering

The Delair Bridge, built in 1895, crosses the Delaware River just south of the Betsy Ross Bridge. At its completion, it was the first bridge connecting Philadelphia to southern New Jersey, and replaced ferries as the main source of freight transport between the two locations. Other than an addition of a movable lift span in the 1950's, the bridge has not been modified or updated since its initial construction. Currently, the Delair Bridge services New Jersey Transit (NJT) passenger trains and Conrail's freight service. Structural analysis completed by the New Jersey Department of Transportation has determined the severe need for both short and long-term investment in the bridge, and its approaches in order to ensure its continued functionality. Additionally, major structural work is needed to maintain the 286 kip freight capacity of the bridge necessary to transport freight. An environmental assessment has been done on the bridge and surrounding area. A redesign and reconstruction of this structure is being done with the following objectives: improve structural quality of bridge and employ preventative measures of deterioration, improve bridge reliability and functional flexibility, enhance capacity to meet current and future regional freight and passenger demands, implement procedures to reduce environmental impact.

CAEE-20

REPURPOSING OF THE MANAYUNK BRIDGE AS URBAN GREEN SPACE

Advisor: *Dr. Sabrina Spatari*

Team:

Colin Henner	Civil Engineering
Jonathan Hubler	Civil Engineering
Steven Squibb	Civil Engineering
Michael Thorley	Civil Engineering

The Manayunk Bridge was built in 1918 over the Schuylkill River to service the Pennsylvania Railroad before being purchased by SEPTA in 1976 to connect the Cynwyd and Ivy Ridge regional rail stations. However, the iconic arch bridge has not been used since 1986 due to concerns surrounding the structural integrity of the rail and bridge. In the 1990s, a rehabilitation of the bridge structure was performed, leaving the bridge underutilized and full of potential. With the increasing demand for urban public green spaces, this bridge offers an interesting project to repurpose an underutilized urban space for use as a public park. The redesigned bridge, which connects Manayunk and the Cynwyd Heritage Trail, will provide a much-desired park trail for cyclists, joggers, and walkers. The expected outcome of this project is to determine the most sustainable practices and designs for the renewal of this abandoned rail bridge.

CAEE-21

WARMINSTER COMMUNITY PARK - BASEBALL AND SOFTBALL COMPLEX

Advisor: ***Dr. Richard Weggel***

Team:

Robert Hudson	Civil Engineering
Long Tran	Civil Engineering
Rebecca Small	Civil Engineering
Christopher Snavelly	Architectural Engineering

The township of Warminster, PA has requested the design for a baseball complex comprising of five fields and a multipurpose building. The Warminster Baseball/Softball Association desires a central location to hold tournaments and regular practices. The township has an area about four acres in size that will be used for this complex. There will be one regulation size field, two little league fields, and two softball fields. The building will have restrooms, an area for selling concessions, and a second floor for announcing booths. This multipurpose building will be installed with electric, water, and sewer utilities. There will be a two lane roadway intersecting the complex and multiple parking lots to allow access to the fields. The complex will be equipped with proper runoff drainage that will be connected to a detention basin. This complex will be constructed with a three phase plan per the client's request.

CAEE-22

STORMWATER MANAGEMENT FOR UNITARIAN SOCIETY OF GERMANTOWN

Advisors: ***Dr. Patricia Gallagher, Dr. Charles Haas***

Team:

Glenn Aller	Environmental Engineering
Matthew Carideo	Environmental Engineering
Wei Chen	Civil Engineering
John Jones	Civil Engineering

In recent years, the City of Philadelphia has changed their billing of stormwater runoff from meter based, to parcel-size based. The total area of impervious surfaces within the property is responsible for the majority of the billing. The Unitarian Society of Germantown is one property owner whose bill will be inflated by this new policy. The Philadelphia Water Department offers credits for property owners who implement runoff prevention methods and/or devices. Some such devices include porous pavement, green roofs, cisterns, stormwater basins, and rain barrels. In working with the church and considering their budget, an appropriate design system will be selected to minimize construction costs. With church approval, this design implemented on their property will minimize the monthly stormwater charge. The proposed design will be compared with Philadelphia Water Department's suggestions, to ultimately reduce the economic hardship burdening the church.

CAEE-23
KERR CLUB BOATHOUSE PROJECT

Advisor: *Prof. James E. Mitchell*

Team:
Kelly Downes Architectural Engineering
Marty Khait Architectural Engineering
Peter Schmidt Architectural Engineering
Jake Sloan Civil Engineering

Drexel University has an exclusive outlet in Fairmount Park that is leased from Bachelor's Barge Club for use by the University's Crew Team. Unfortunately, the rent for this boathouse is growing while the structure deteriorates. The crew team struggles to store eight 60 feet shells, four 40 feet shells and four 30 feet shells in just one 80'x18' bay. Drexel University is in search of a new permanent and sustainable facility for use as a recreational address, an intercollegiate competitive venue, and as a retreat to be used by those affiliated, to meet current standards among winning programs.

The team will investigate a few solutions for this problem. They range from a buy-out and renovation of the current location to building a brand new structure in several possible locations. Case studies of similar structures and projects will also be used to guide the group in the right direction.

CAEE-24
DREXEL PARK DORMITORY

Advisor: *Dr. Joseph Mullin*

Team:
Yun Bai Architectural Engineering
Lemond Brown Architectural Engineering
Dmitriy Gorbachik Civil Engineering
Sierra Tilton Civil Engineering
Qian Wang Civil Engineering

The multi-story dormitory building will house graduate and undergraduate students. The proposed site for this new facility is located at 31st and Powelton St., which is currently known as Drexel Park. The new dormitory will provide housing to 408 students, and is intended to mitigate the overcrowding of the existing dorms. The dormitory will features suite style housing and takes advantage of the expansive view of downtown Philadelphia. The design includes provisions for a Wawa food market on the ground level and a green roof accessible for faculty, students, and staff.

CAEE-25

REDEVELOPMENT OF MOYERS LANDFILL AS A LAND IMPROVEMENT PROJECT

Advisor: *Dr. Sabrina Spatari*

Team:

Brian Conzentino	Civil and Architectural Engineering
Caroline Edwards-Mack	Civil and Architectural Engineering
Justin Johnson	Civil and Architectural Engineering
James Monahan	Civil and Architectural Engineering
Eric Rice	Civil Engineering

We evaluated the feasibility of redeveloping the vacant Moyers Landfill brownfield located in Montgomery County, Pennsylvania. As a former landfill, the site has been remediated by the EPA, and will be released for development in August of 2012. We finalized our design for a strip mall, comprising of one large warehouse store, 8 smaller storefronts, and a parking lot to be built on the site. Our group completed phase one and phase two geotechnical investigations and soil summaries, evaluated site and water management plans, computed structural load requirements for the buildings, designed a foundation system to support the structures, and created a detailed cost estimate for the project. Our submission also includes a brief history of the site conditions at the Moyers Landfill, and relevant parts of a 2007 progress report acquired through contacts at the US EPA office.

CAEE-26

RENOVATIONS AND IMPROVEMENTS TO THE ACADEMY OF NATURAL SCIENCES OF DREXEL UNIVERSITY

Advisor: *Dr. Robert Brehm*

Team:

Daniel Brown	Architectural Engineering
Bryan Gilliam	Architectural Engineering
Ryan Pinkowski	Civil Engineering
Adam Trosko	Architectural Engineering

The Academy of Natural Sciences of Philadelphia (ANS) was built in 1876, and has undergone many renovations and additions between then and the present day. Today, the ANS is faced with several challenges. First, many of the building's heating, ventilation, and air-conditioning (HVAC) systems are beyond their economic lifespan. Additionally, the ANS staff has expressed the desire for a new aesthetic scheme in the main exhibit area. Finally, the ANS wishes to create a new exhibit highlighting an emergent technology in the field of environmental sustainability. The group will attempt to solve these challenges by addressing each area. Supplementary air handling units will be placed on the roof to provide adequate air supply to meet the building's demand. The original building's atrium will be restored to create a more dramatic exhibit space. Finally, an exhibit demonstrating the process of converting biomass to usable biofuel will be designed to educate patrons.

CAEE-27
NORTHEAST EXTENSION OPTIMIZATION

Advisor: *Dr. Anu Pradhan*

Team:

Erik Bagasevich	Civil Engineering
Patricia Bookh	Civil Engineering
Timothy Bratton	Civil Engineering
Matthew J. Schreffler	Civil Engineering

The 10.5-mile corridor of the Northeast Extension between the Schuylkill Expressway (I-76) and Rt. 63 is one of the most observable instances of traffic congestion in the area due to outdated and overloaded roadway designs. Recently, the Pennsylvania Turnpike Commission approved plans for a “Total Reconstruction and Widening Project” to begin construction in 2014 that would transform the existing four-lane roadway into a modern, six-lane highway with three 12’ lanes dedicated to each direction.

In order to justify an alternative solution, a conceptual life-cycle design must prove more beneficial than the approved plans. The current design features innovative concepts and emerging technologies based on heavy research of traffic analysis and Intelligent Transportation Systems (ITS). The benefits incurred through the use of multidirectional lanes, traffic analysis methods, and ITS systems will prove a more adaptable, safe, and life-cycle cost effective design than the currently approved plans.