

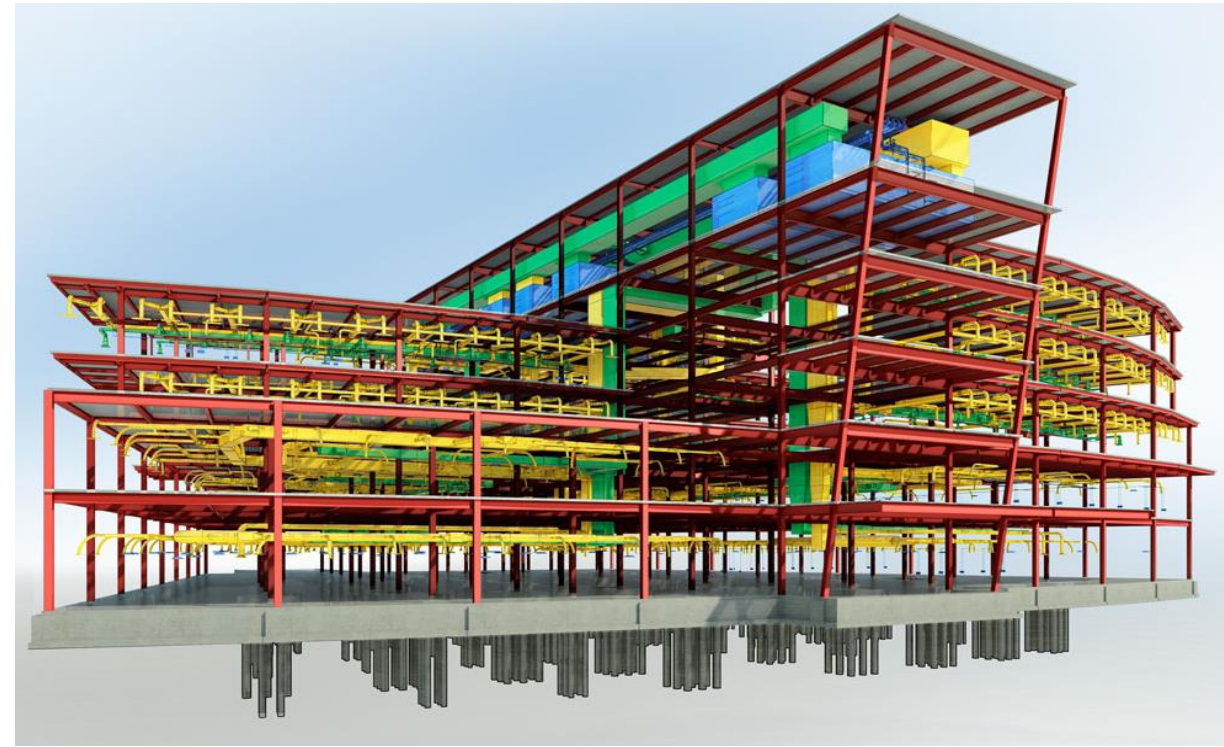
NJARNG 3D Building Models

(Everett/Trias/Riddell)

Use Autodesk software to create 3D Building Models

- ReCap to stitch point clouds
- REVIT to draw 3D Building Models
- Insight to model energy consumption

www.autodesk.com/solutions/bim/overview



<http://www.articbuildingservices.com>

Students have to use secure workstations in RH 222.
Two semester commitment to THIS clinic is required.
Contact Prof. Everett w/questions.

NJARNG 3D Building Models - Description

Create 3D computer models of New Jersey Army National Guard (NJARNG) buildings. Learn the Scan-to-BIM technique by importing Faro scans into Autodesk ReCap and creating 3D building information models (BIM) in Autodesk Revit. Assist Rowan University by providing NJARNG with comprehensive BIM models that can be used in energy modeling and building maintenance plans.

Looking for CEE majors interested in the architectural, engineering, and construction industries. This project can lead to paid summer internships or Master's degree opportunities. Students work in RH 222 during the clinic period on powerful PC workstations. In-person site visits to NJDMAVA/ARNG facilities NOT required.

Clinics in the Sustainable Facility Center

- Work with the **NJ Department of Military and Veterans Affairs** to sustainably manage **Army National Guard Facilities**
- Gain access to SFC lab (Rowan Hall 222) to study or do homework outside of clinic hours
- Good for careers in the Architecture/Engineering/Construction (AEC) Industry, Facility Management or Sustainable/Green Engineering
- Can lead to a paid summer internship
- Can lead to a paid graduate school position in the SFC

NJDMAVA Sustainable Facilities

(Everett/Trias/Riddell)

Use cutting edge sustainable facility management software

- BUILDER SMS & FacilityDude

Develop solutions to unique problems at National Guard facilities

Submit Preventative Maintenance Plans to the client

- www.state.nj.us/military
- www.sms.erdc.dren.mil
- www.dudesolutions.com



There are site visits!
Two semester commitment to SFC clinics preferred.
Contact Prof. Everett w/questions.

NJDMAVA Sustainable Facilities - Description

Help the New Jersey Department of Military and Veterans Affairs (NJDMAVA) and New Jersey Army National Guard (NJARNG) manage ~ 250 buildings. Learn structural, HVAC, plumbing, and/or electrical systems. Optimize the maintenance and repair of buildings and equipment using FacilityDude CMMS and USACE's BUILDER SMS apps. Create unique building maintenance schedules and planned maintenance recommendations. Work for and present to an actual client and interface with building managers. In-person site visits to NJDMAVA/ARNG facilities required.

Looking for CEE/ME/ECEs interested in the architecture/engineering/construction industry, especially the lucrative career of facilities management. Can lead to summer internships or a paid Master's degree. Students will meet F2F in Rowan Hall Rm. 222 during clinic times.

Clinics in the Sustainable Facility Center

- Work with the **NJ Department of Military and Veterans Affairs** to sustainably manage **Army National Guard Facilities**
- Gain access to SFC lab (Rowan Hall 222) to study or do homework outside of clinic hours
- Good for careers in the Architecture/Engineering/Construction (AEC) Industry, Facility Management or Sustainable/Green Engineering
- Can lead to a paid summer internship
- Can lead to a paid graduate school position in the SFC

NJDMAVA Building Audits

(Riddell/Trias/Haas/Ji)

Conduct Building Audits (Energy & Water) for NJ Department of Military & Veterans Affairs

- Use field equipment to collect data
- Make recommendations used by client to save energy and water
 - www.state.nj.us/military
 - www.state.nj.us/military/publications/energy

There are site visits! A two-semester commitment to the project is preferred. Looking for CEEs, MEs & ECEs. Encourage your ME/ECE friends! MEs/ECE must request the NJDMAVA Building Audit clinic in **their** discipline. Contact Prof Riddell w/questions.



NJDMAVA Building Audits - Description

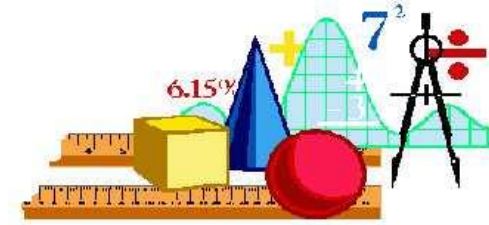
Conduct building energy and water assessments for the New Jersey Department of Military and Veterans Affairs (NJDMAVA) and New Jersey Army National Guard (NJARNG). Analyze building energy and water consumption to identify, research, and propose energy and water efficiency measures, as well as renewable energy projects. Identify and learn building systems through the use of field equipment such as light meters, kilowatt meters, ballast checkers, thermal cameras, and flow bags during site visits. Present findings to an actual client!

Looking for CEE/ECE/ME majors interested in the architectural, engineering, and construction industries. This project can lead to paid summer internships or Master's degree opportunities. Students meet in-person during the clinic period. In-person site visits to NJDMAVA/ARNG facilities required.

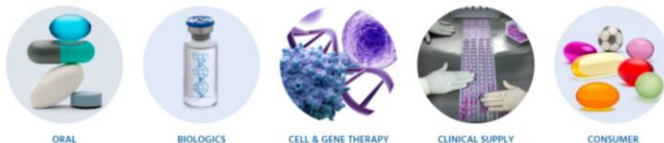
ENGINEERS ON WHEELS

Dr. Kauser Jahan, PE

Professor and Head of Civil and Environmental Engineering



Sponsor: CATALENT

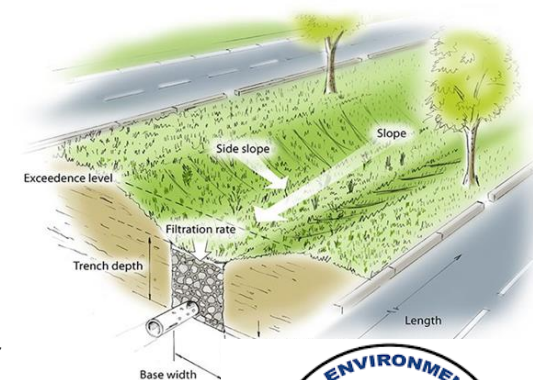
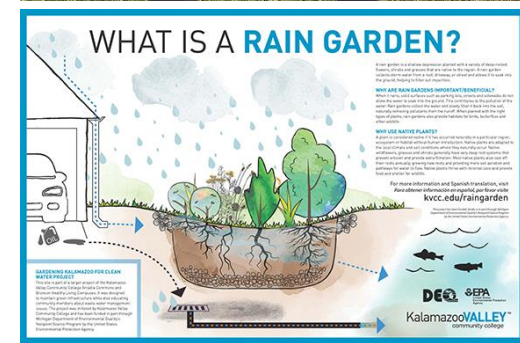


- Develop fun exciting hands on activities for K-12 students and teachers
- Virtual/physical visits to area schools during clinic period to expose engineering careers
- Prepare publications for conferences

Watershed Protection and Green Infrastructure Education

Dr. Kauser Jahan and Dr. Zhiming Zhang

- Involve Rowan Engineering and Glassboro High School students to use a detention basin as a demonstration project for watershed protection and Green Infrastructure Design.
- Glassboro high school already has a conveniently located stormwater basin. Students will be involved in collecting and analyzing water quality samples weekly for nitrogen, phosphorus and E Coli. They will also identify the best management practice to convert the existing system to a Green retention basin.
- Assist with basin retrofit and planting proper flora fauna for environmental protection.

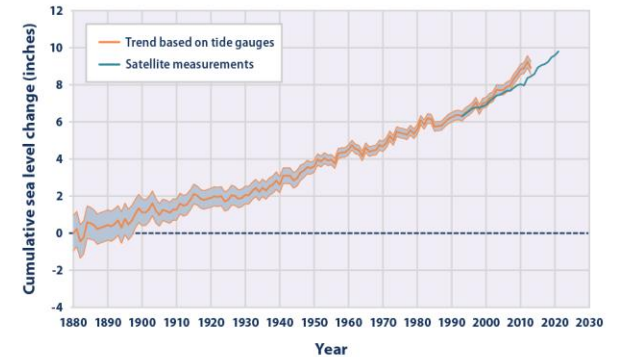


Project E³: Energy, Environment and Education

Dr. Zhiming Zhang and Dr. Kauser Jahan



- Climate change has been accelerated due to greenhouse gas emissions, which results in increasing extreme weather events and sea-level rise. The U.S. is heavily investing in alternate clean energy and lowering of the carbon footprint. New Jersey is at the forefront of using renewable clean energy and has recently invested in two more new wind farms in the Atlantic Ocean.
- This project focuses on the education of future generations about their environment: specifically renewable energy and climate change. Students will acquire knowledge regarding the causes and effects of climate change, such as impacts of climate change on South Jersey.
- The wind and tidal data collected from hands-on and outdoor activities will be used to predict the amount of power generated by nature and to estimate the reduction in greenhouse gas emissions. Decision-making process will be practiced for a low-carbon future.

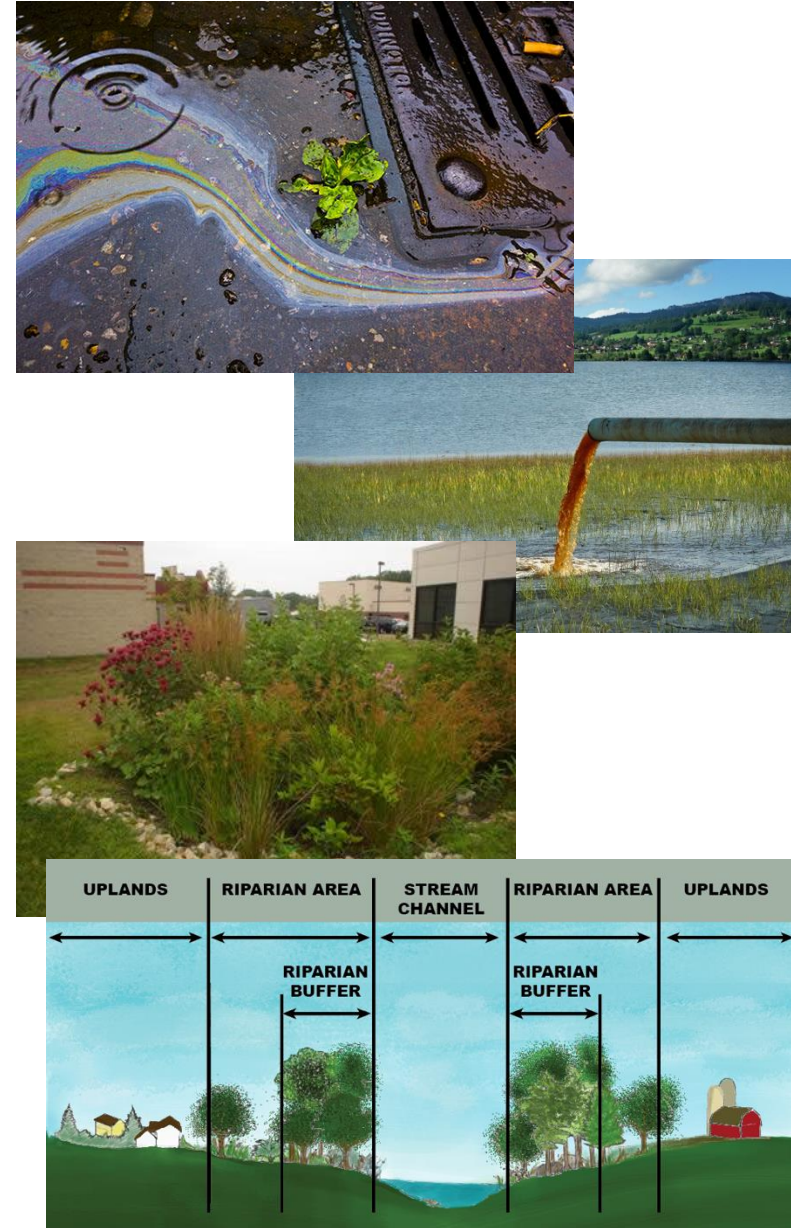


Green Infrastructure Optimization for Freshwater Protection

Dr. Zhiming Zhang and Dr. Kauser Jahan

Freshwater systems are of vital importance as they serve critical functions for the environment, ecosystem, and human development. Despite of their importance, more than half of the coastal rivers in the US has been moderately to severely polluted. Stormwater runoff is the most common way that nonpoint source pollution reaches freshwater systems.

- Riparian buffer strips have been widely applied as an effective green infrastructure practice to protect rivers and streams. The optimization of riparian buffer strips will be investigated via addition of soil amendment.
- Rain gardens are cost-effective and aesthetically pleasing stormwater best management practices (BMPs), but nitrate cannot be effectively removed. Optimization of nitrate removal will be explored by enhancing microbial activities for denitrification.
- Bioswale retrofitting will also be investigated through soil amendment and engineered mulch chips.

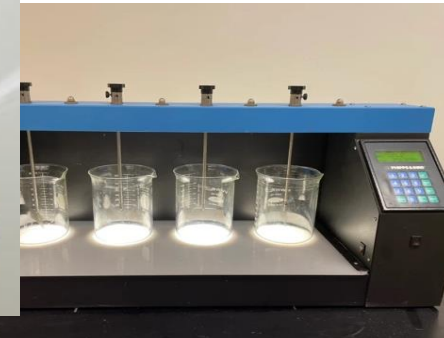
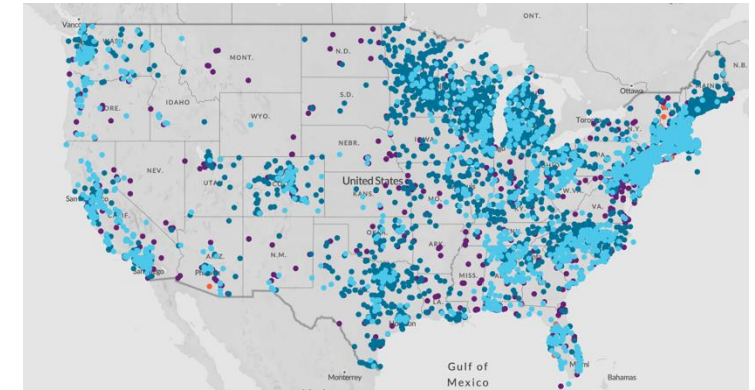


Identification and Sustainable Removal of PFAS

Dr. Zhiming Zhang and Dr. Kauser Jahan

Urban stormwater runoff is a major non-point pollution source that transports contaminants to receiving water bodies, particularly during the growth of urbanization and climate change. The contaminants in stormwater like per- and polyfluoroalkyl substances (PFAS) are prevalent and cancer-causing, posing threats to aquatic and human health.

- To learn PFAS migration towards freshwater systems, stormwater runoff samples from Trenton and Glassboro will be analyzed to identify PFAS.
- A solid waste, drinking water treatment residuals, will be repurposed to remove PFAS in the stormwater runoff.
- Different types of ion-exchange resins will be tested for the removal of PFAS compounds via batch sorption tests in the lab.



Electric Curing of Conductive Concrete

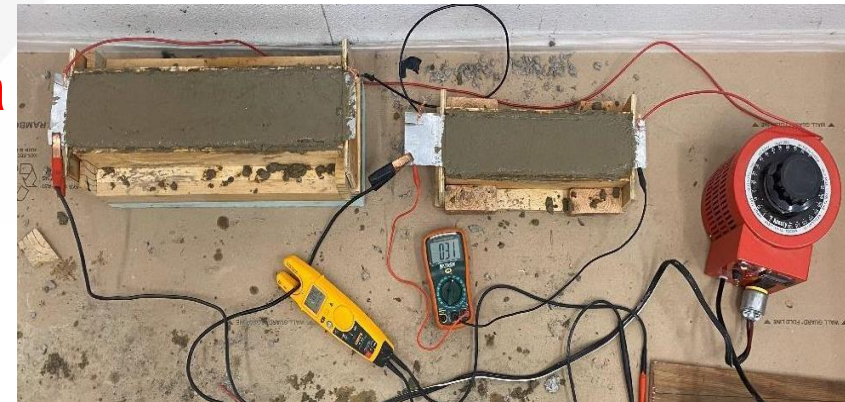
Students will work on federally funded project to develop electric curing regime for conductive concrete for construction in Arctic Regions. This project is funded by US DOD (**2 CEE, 2 ECE students**)

Advisor: Dr. Islam Mantawy and Dr. Shahriar Abubakri

Graduate Student: Alyssa Sunga and Mohamed Masbouba

Over the next semester, the students will:

- Student will work on development of different concrete mixes
- Students will work on setting up electric curing regimes
- Collect and analysis data



Hint: Work will be conducted in cold room at CREATES, please check if you have any health or feeling uncomfortable working in cold room



ASCE Concrete Canoe

This clinic is devoted for ASCE Concrete Canoe Competition for both Regional and Hopefully National Competition. For first time, Rowan will seek to 3D-print the whole canoe. This clinic will work closely with Additive Construction Canoe (5 CEE Students)

Advisor: Dr. Islam Mantawy

Graduate Students: Aly Ahmed

Over the next semester, the students will:

- Understanding the rules of 2024-2025 competition
- Getting concrete mixes for both casting and printing the Canoe
- Print small versions of the canoe for demonstration





Concrete Additive Construction

Our goal is to get familiar with operation of the large-scale concrete 3D-Printers and envision and print next generation of structures that are (1) topologically optimized, (2) deployable, (3) reconfigurable, and (4) carbon negative **(3 CEE, 1 ME, 1 ECE students)**

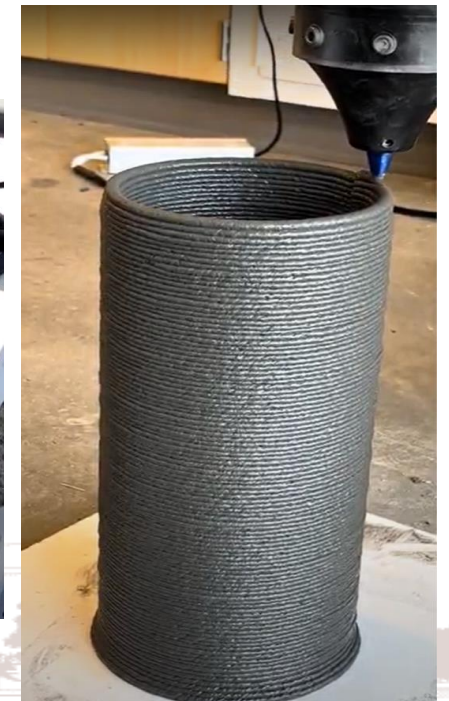
Advisor: Dr. Islam Mantawy

Graduate Students: Anthony Mackin, Jenna

Migliorino, Aly Ahmed, Zaid Hanoun, Mike Dustal

Over the next semester, the students will:

- Students will continue the work started during 2022-2024
- Envision new structures enabled by additive construction
- Design and Analyze the envisioned structures
- Additively construct the envisioned structure
- Ensure structural capacity and functionality of the envisioned structure



The Scholar Bridge: Bridge Dynamics

Advisor: Dr. Adriana Trias; trias@rowan.edu;

Rowan Hall 233

Graduate Student: John Vrabel

This clinic project focuses on capturing and defining the vibrations of a 15-foot-long bridge with the objective of detecting damages at the support level.

Students will use accelerometers and a LiDAR scanner to capture the vibrations. This project is part of the NJDOT Bridge Resource Program.

- The team will go over a literature review of basic structural vibration and mode shape concepts, non-destructive evaluation methods, and state-of-the-art technologies.
- The team will participate in hands-on data collection and data processing.

School Bus Safety Involved in Emergency Situations

Advisor: Dr. Mohammad Jalayer

In this engineering clinic, students will conduct a comprehensive literature review, analyze the crashes involving school buses, recommend safety countermeasures and strategies, and create awareness in combating pedestrian crashes in school districts.

Potential publication opportunity



Wrong-Way Driving Crash

Advisor: Dr. Mohammad Jalayer

In this engineering clinic, students will evaluate best practices to collect data, analyze data, and develop recommendations to reduce wrong-way driving crashes.

Potential publication opportunity



P1: Intensely Cold Exposure of Young Concrete

P2: Cold-Weather Self-Consolidating Concrete

P3: Permeability and Porosity of Concrete

P4: Microwave Effects in Concrete

ENGINEERING CLINIC PROJECTS – FALL 2024

Intensely Cold Exposure of Young Concrete – Lomboy, Riddell, Fajardo



Concrete can deteriorate due to freezing

- a) Determine the effect of the **timing** of short temperature incursions ...
- b) Determine the effect of the **duration** of temperature incursions ...

during curing on the strength development of concrete with additive-based frost protection.

Intensely Cold Exposure of Young Concrete – Lomboy, Riddell, Fajardo

Research demonstrated that concrete with additive based frost protection (ABFP) can be mixed, cast, and cured at $-5\text{ }^{\circ}\text{C}$ while still developing strength comparable to control mixed cast and cured at $+20\text{ }^{\circ}\text{C}$. A significant benefit of ABFP concrete is to eliminate the need for cold weather protections such as active heating during curing, thus saving construction costs. These investigations will simulate a situation where concrete with ABFP is cast at $-5\text{ }^{\circ}\text{C}$, but an unexpected deep freeze (-10 to $-20\text{ }^{\circ}\text{C}$) occurs shortly thereafter. If you have questions about the topic, please contact Dr. Lomboy.
lomboy@rowan.edu

WHAT YOU WILL BE DOING –

Activities

- Review literature on the effect of the timing of short temperature incursions during curing on the strength development
- Mix concrete to make concrete specimens
- Quantify the damage of low temperatures on young concrete
- Make sure work areas are clean and orderly

Reports and Presentations

- Write a final report or paper and present at the end of the semester

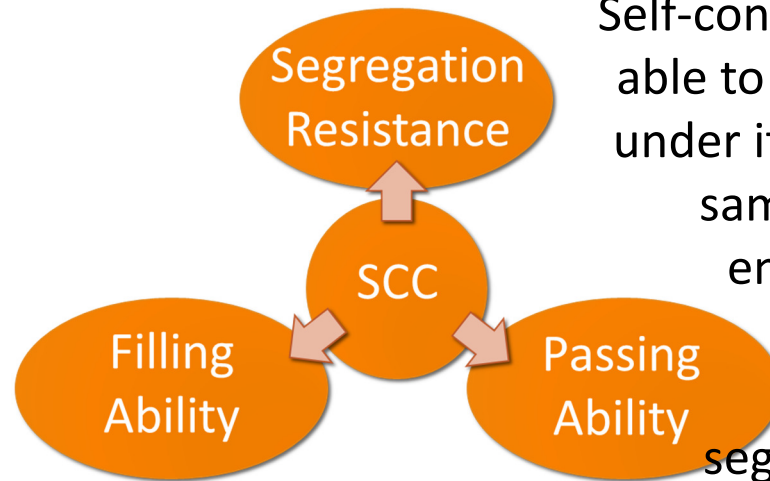
Cold-Weather Self-Consolidating Concrete (SCC) – Lomboy, Moraña



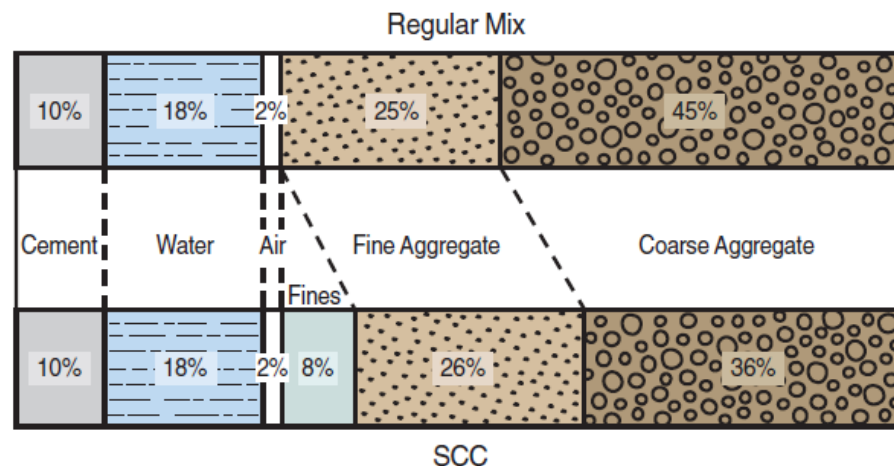
Measure the flow diameter.
More flow without
segregation is good



Goes around steel rebar



Self-consolidating concrete is able to flow and consolidate under its own weight. At the same time, it is cohesive enough to fill spaces of almost any size and shape without segregation or bleeding.



SCC has more fine materials and will have high range water reducer

Cold-Weather Self-Consolidating Concrete (SCC) – Lomboy, Moraña

Self-consolidating concrete (SCC) refers to concrete that has no resistance to flow and can be placed and compacted under its own weight. SCC must have low yield and high viscosity values. To balance deformability and stability, the amount of fine materials is typically high. In some cases, a viscosity modifying admixture is used to stabilize the concrete mixture. Polycarboxylate-based high-range water reducers are typically used to plasticize the mixture and lower the yield value. This project aims to develop a SCC for room and freezing temperatures. If you have questions about the topic, please contact Dr. Lomboy. lomboy@rowan.edu

WHAT YOU WILL BE DOING –

Activities

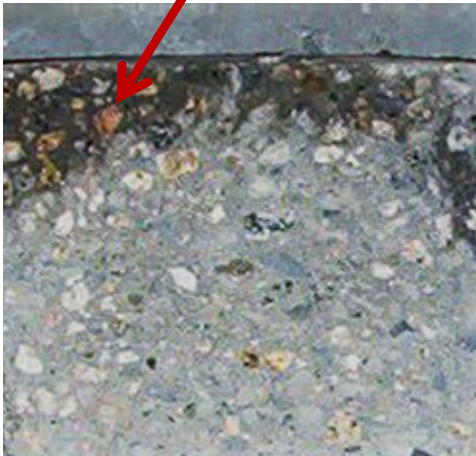
- Prepare materials for testing
- Mix concrete – at room temperature or inside a walk-in freezer at -5 °C
- Measure the physical and mechanical properties of SCC
- Make sure work areas are clean and orderly

Reports and Presentations

- Write a final report or paper and present at the end of the semester

Permeability and Porosity of Concrete – Lomboy, Looc

Water penetration



Concrete



**AASHTO T358
Surface
Resistivity Test**



**German's
permeability
test**



**ASTM D4404
Pore size
analyzer**

**Measure concrete permeability and
pore size distribution**

Permeability and Porosity of Concrete – Lomboy, Looc

High permeability combined with the concrete's exposure to the unfavorable environment will adversely affect the durability of concrete through physical effects that include surface wear, cracking, and exposure to extreme temperatures, as well as through chemical effects involving leaching of cement paste, sulfate attack, alkali-aggregate reaction, and corrosion of embedded steel. This study will measure the permeability and pore volume distribution of different types of concrete mixtures and relate these properties to resistivity and durability.

WHAT YOU WILL BE DOING –

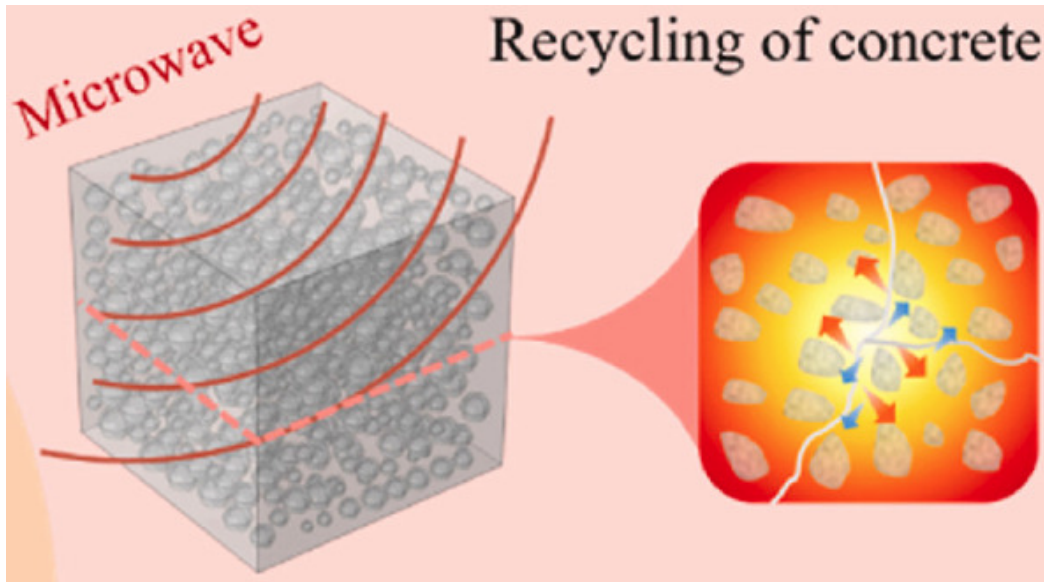
Laboratory Activities

- Mix concrete
- Test permeability properties of concrete using different methods
- Prepare materials for testing
- Make sure work areas are clean and orderly

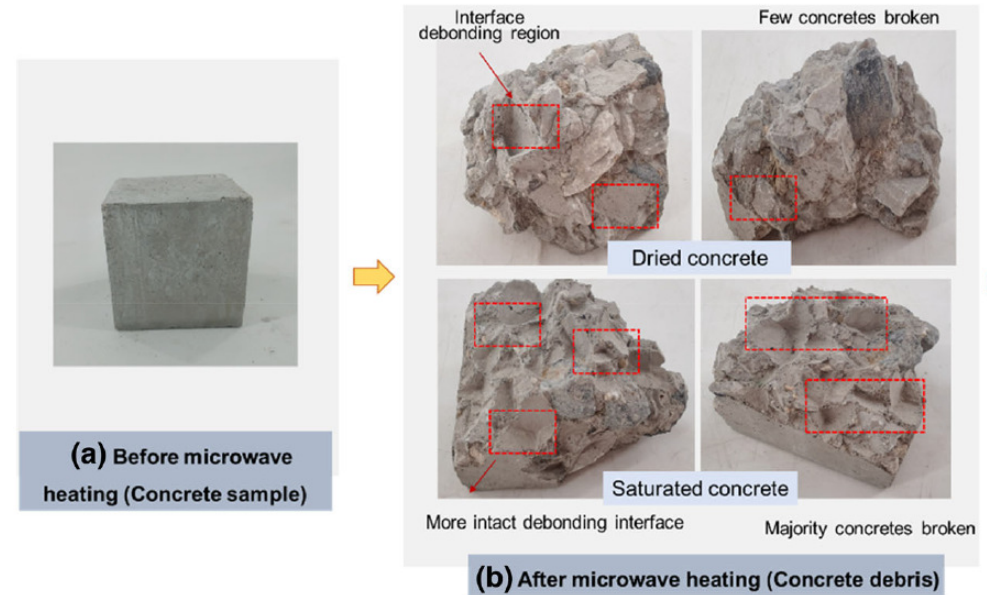
Reports and Presentations

- Write a final report or paper and present at the end of the semester

Microwave Effects in Concrete – Lomboy, Abubakri, Roshanbin



Xiao & Xue, 2024, Renewable and Sustainable Energy Reviews, 199:114498



Wei, et al. 2021, Matls and Struc, 54:142

- **Derive relationships between microwave and concrete parameters**
- **Determine penetration of microwave energy for concrete**
- **Loss of compressive strength of hardened concrete under microwave heating**
- **Effect of microwave heating on microstructure and porosity of concrete**

Microwave Effects in Concrete – Lomboy, Abubakri, Roshanbin

This project is a novel rapid microwave thermal process to accelerate the demolition, recycling, and repair of concrete structures. The success of the project would revolutionize the repair and maintenance of the pavements and highways by introducing new technology with higher efficiency (time and cost) compared to the conventional methods and assisting highway agencies to repair and reopen roads much sooner than current methods. The project aims to apply microwave energy to rapidly increase the internal temperature of concrete and, subsequently, damage the local concrete matrix, leading to accelerating the demolition process. If you have questions about these requirements please contact Dr. Lomboy. lomboy@rowan.edu

WHAT YOU WILL BE DOING –

Laboratory Activities

- Mix concrete
- Measure the properties of concrete under varying microwave power
- Make sure work areas are clean and orderly

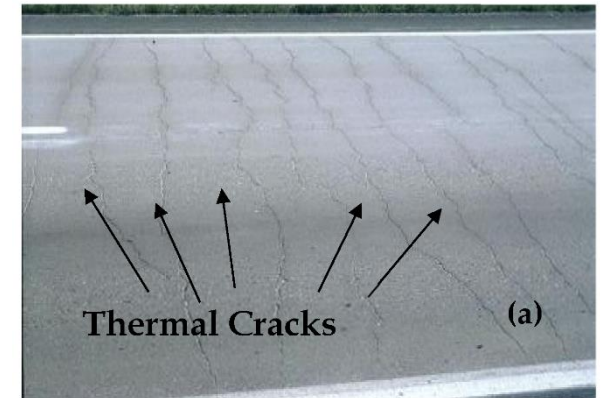
Reports and Presentations

- Write a final report or paper and present at the end of the semester

Evaluating the Use of Control Joints for Controlling Repeated Transverse Thermal Cracking

**Advisors: Dr. Yusuf Mehta, Ms. Caitlin Purdy, & Dr. Ahmed Saidi
(2 - 3 Clinic Students)**

- Thermal cracking is one of the major forms of asphalt pavement distresses in cold regions (i.e., permafrost is one of the main causes).
 - [Disruption in airfield operations](#)
 - [Increased budget for maintenance operations](#)



Our goal is to improve the resistance of flexible pavements to thermal cracking in cold regions using control joints.

Over the next semester, we will:

- Review the existing literature pertaining to the use of control joints and sealants,
- Identify, select, and procure material and equipment,
- Evaluate the performance of asphalt mixtures at various types of joint types (partial- vs. full-depth) and joint sealers.



Effect of Confinement on Dynamic Modulus of Porous Asphalt Mixtures

Advisors: Dr. Yusuf Mehta and Dr. Abhary Eleyedath (2-3 Clinic Students)

Porous asphalt allows water to completely drain through the layers. There is minimal water spray from truck tires after rain and no risk of hydroplaning.

Our team is one of the first in the nation to implement this for highway conditions!

Our goal for the semester is to evaluate the effect of confinement on dynamic modulus of porous asphalt mixtures to develop a more accurate pavement design methodology.

Over the next semester, we will:

- Learn about lab mixed and plant produced porous asphalt mixtures
- Prepare dynamic modulus samples from NJDOT-approved Modified Open Graded Friction Course (MOGFC) and Asphalt Stabilized Drainage Course (ASDC) plant mixtures
- Perform confined and unconfined dynamic modulus test and collect the data
- Analyze the data and compare the results with conventional dense-graded asphalt plant mixtures



Objective: Assess the aging characteristics of Highly Elastic Asphalt Binders (HEBs) that are used to mitigate the low temperature cracking at colder regions.

Impact of research work to DoD/Industry

- Develop more sustainable asphalt materials that have a lower environmental impact
- Longer service life of asphalt pavements by delaying low-temperature cracking and freezing temperatures – economical benefits

Production of HEB's

Sensor Installation



Specific Tasks

- Literature review on aging phenomenon of asphalt binders
- Produce HEB's in the laboratory
- Perform short-term and long-term aging of HEBs
- Characterize the aging effect on HEBs through chemical and physiochemical parameters
- Analyze test data, determine and compare the aging indices

Deliverables

- Understand the prominence of aging phenomenon
- On hands practical experience on producing and testing the HEB's in the laboratory
- Assess the effect of polymers (SBS and GTR), and corn oil on improving the asphalt binder aging properties
- Understand the impact of additives on the aging characteristics of asphalt binders

Work Zone Capacity Changes with Connected and Autonomous Vehicles (CAVs)

Dr. Fahmida Rahman

- Consider different freeway lane closure scenarios
- For each scenario, compare roadway capacity with varying Connected and Autonomous Vehicle (CAV) penetration rates
- Develop capacity adjustment factors for individual scenarios



CEE LIVING LABS

Dr. Fahmida Rahman and Dr. Kauser Jahan



Help the Civil & Environmental Engineering Department Labs come alive with REAL-TIME DATA!

We would like to integrate state of the art sensors that will provide real time data enveloping all core areas of civil engineering-structural, environmental (energy use, water and air quality) and much more. Living labs are interactive and will provide a dynamic environment for teaching and research.



Sponsor: Friends of CEE and CEE Alumni

Commercial Motor Vehicle Crashes in New Jersey

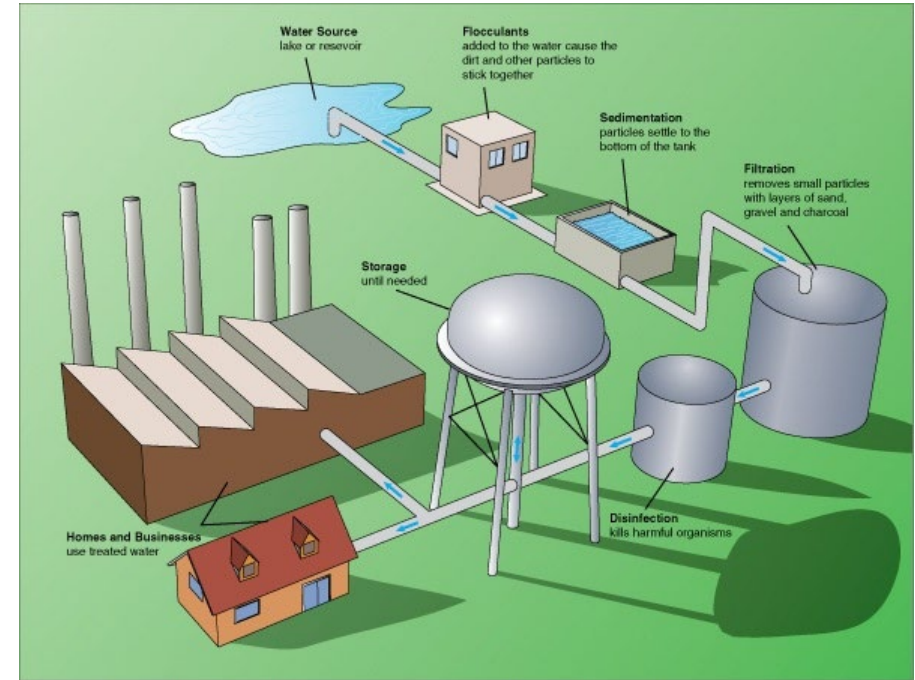
Dr. Fahmida Rahman

- Conduct a review of the literature available for commercial motor vehicle (CMV) crashes. It will focus on:
 - ❖ CMV data availability
 - ❖ Factors of CMV crashes
 - ❖ Methods used by DOTs, Local Agencies, and Researchers to analyze CMV crashes
 - ❖ Identify countermeasures adopted to reduce CMV-related crashes
- Identify main causes of CMV crashes using the Federal Motor Carrier Safety Administration (FMCSA) data and develop a crash prediction tool for NJ.



Sustainable Drinking Water (Riddell/Everett/Torlapati/Yenkie)

- New Jersey Board of Public Utilities (BPU) requires NJ companies & agencies to benchmark energy use for certain facilities
- New Jersey American Water provides drinking water to many NJ communities and is a large energy user that will be required to benchmark facilities.
- Project goals
 - Quantify energy used at all New Jersey American Water facilities by location and function. (completed 23-24)
 - Use benchmarking approaches to identify candidate facilities for detailed energy audits (this year)
 - Investigate energy use at multiple facilities (this year)
 - Recommend energy efficient improvement to systems and processes & Help NJ American Water apply for BPU grants
- We are looking for CEE and ChE students for this project.



By CK-12 Foundation - File:High_School_Engineering.pdf, page 73, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=16024233>

We anticipate site visits!
Two semester commitment to SFC clinics preferred.
Contact Prof. Riddell (CEE) or Yenkie (ChE) w/questions

Engineers Without Borders



Project Managers – Dr. Jagadish Torlapati, & Dr. Yusuf Mehta

- ▶ Prepare for implementation trip to Ecuador
- ▶ Complete the design of water tank to increase the water quantity
- ▶ Develop a filtration system to improve the drinking water quality
- ▶ Complete trip planning requirements
- ▶ **Requesting: 3 Students from any engineering discipline**



Bioremediation for Cold Regions

Project Managers – Dr. Jagadish Torlapati, Dr. Kiriti Yenkie & Dr. Yusuf Mehta

- ▶ Develop experiments for bioremediation of crude oil in cold regions
- ▶ Investigate ways to optimize the bioremediation process
- ▶ Collect literature data for model validation
- ▶ Project funded by Department of Defense
- ▶ **Requesting: 4 CEE students**

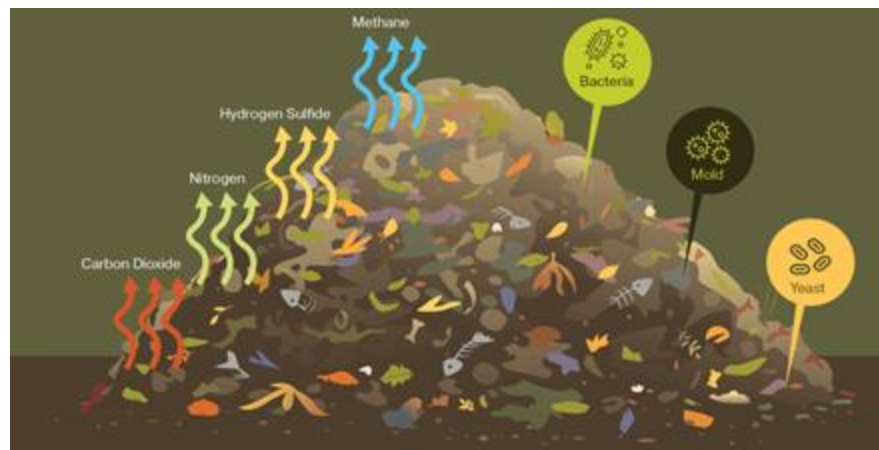




Food Waste Pathways

Project Managers – Dr. Jagadish Torlapati, & Dr. Kiriti Yenkie

- ▶ Identify the pathways for food waste disposal in New Jersey
- ▶ Identify the socio-economic impact of food waste disposal facilities in New Jersey
- ▶ Identify alternate ways for food waste disposal and recycling in New Jersey
- ▶ Investigate the beneficial use of food waste digestate
- ▶ Project funded by NJDEP
- ▶ **Requesting: 3 CEE Students**





Greening Camden

Project Managers – Dr. Jagadish Torlapati, & Dr. Mahbubur Meenar

- ▶ Identify locations to collect air quality samples in Camden, NJ
- ▶ Collect air quality samples at different location
- ▶ Complete data analysis for air quality measurements in Camden NJ
- ▶ Develop air quality training and education modules for Camden communities
- ▶ Project funded by EPA
- ▶ **Requesting: 4 CEE students**

