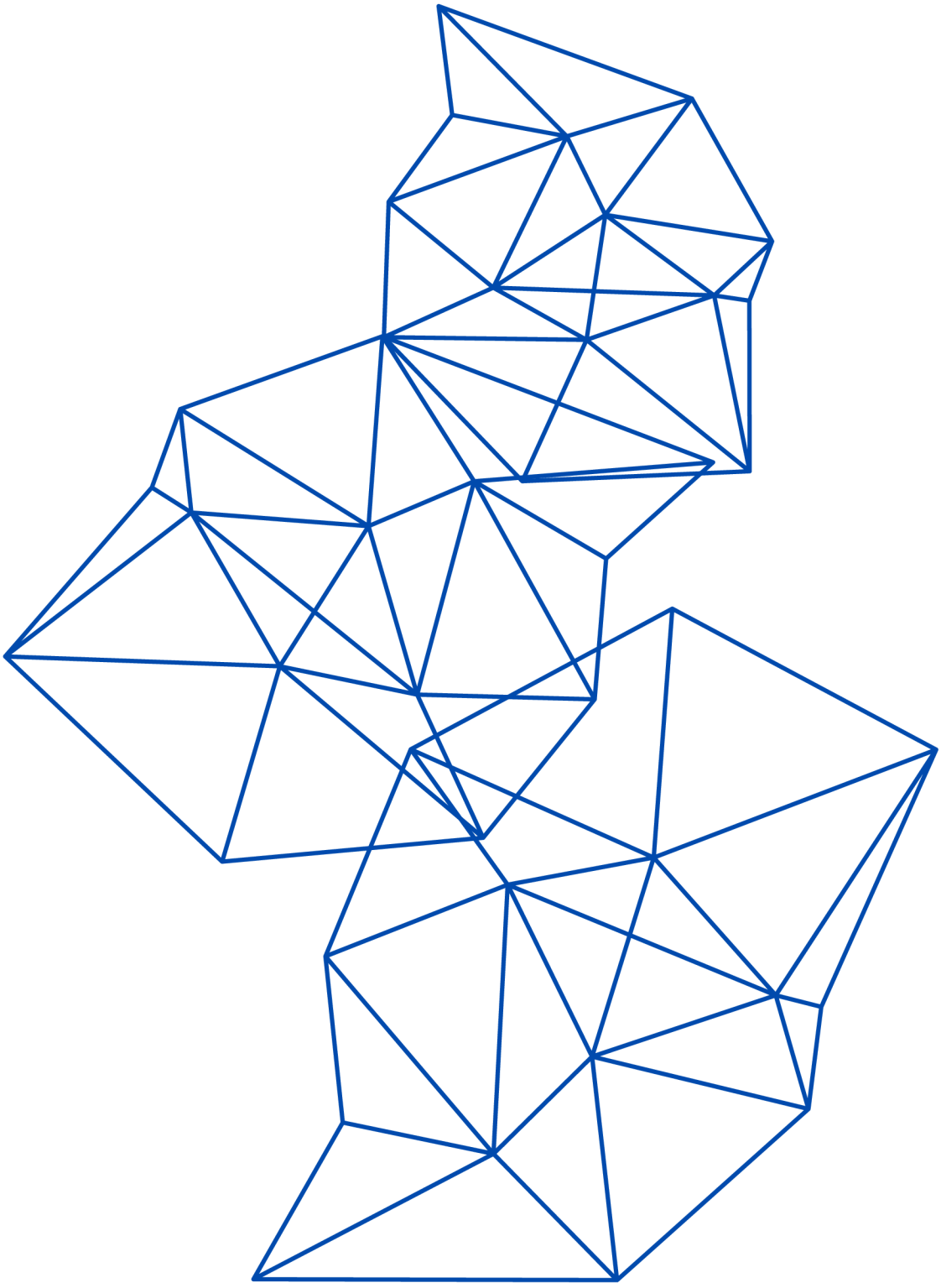
PORTFOLIO

MICHAEL SPEHALSKI

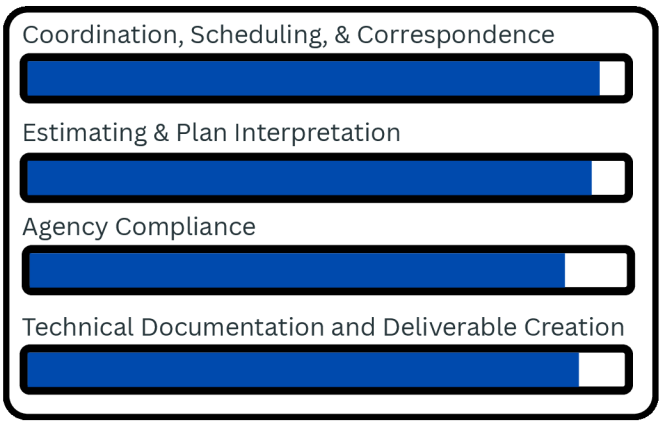


FOR INTERACTIVE PORTFOLIO:

MSPEHALSKI.COM

OVERVIEW

Assessment of Key Skills & Abilities



Technical Program Experience

Revit · AUTODESK AutoCAD · Inventor · BLUEBEAM · PROCORE · SketchUp · P6 ORACLE · ArcGIS · HydroCAD Stormwater Modeling

These serve as a non-exhaustive list of programs I've worked hands-on with. I pride myself in my ability to learn and adapt to new software and challenge myself beyond, specifically with exploration of AI capabilities.

Professional Projects

Construction Management *& Design Work*

Residential

- Bolton Portnow Apartments **($140 M)**
- *Bayonne Apartments*
- *Trenton Apartments*
- *Princeton University Tower Club*

Mixed-Use

- *Friedman Firehouse Apartments & Retail*
- *Unnamed Mixed-Use Project - Old Bridge*
- *Recreational Facility Extension & Sports Complex*
- *Unnamed Mixed-Use Project with Green Roof*

Commercial

- Ernst and Young **($1-5 M)**
- Morgan Stanley **($1-5 M)**
- Bank of America **($1-5 M)**
- *PrimeSpace Self-Storage*

Manufacturing

- LEGO Manufacturing Facility **($1 B)**
- Virginia Dare Lab Extension and Office Renovation **($20 M)**
- L'oreal Pre Weigh Room **($1-5 M)**
- Unnamed Warehouse Project - Jersey City **($8-12 M)**
- *QTS Data Center*

Healthcare

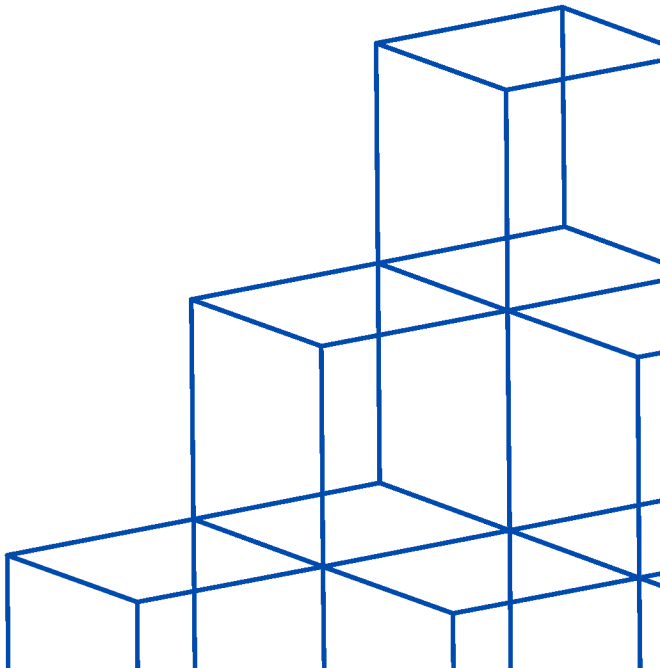
- Hackensack Meridian Health Urgent Care American Dream Mall **($1-5 M)**
- Penn Medicine In-Patient Office Fit-Out **($1-5 M)**

Entertainment & Recreation

- Scitech City - Jersey City **($300 M)**
- Caesar's Sportsbook Monmouth **($15 M)**
- iFly Edison **($1-5 M)**

Portfolio Contents

1. Senior Design - University of Delaware
2. MEP Work
3. Microbial Fuel Cell Research
   Engineers without Borders
4. Personal Projects



SENIOR DESIGN – UNIVERSITY OF DELAWARE

Project Description: My senior design project centers on the design, planning, and construction simulation of a Safeway retail store. The focus was on delivering a fully integrated construction plan that emphasized sustainability, cost-effectiveness, efficiency, and design quality—all while simulating a professional real-world project delivery process.

Figure 1. Screenshots of the full project BIM model, including an example of a floor layout. The model includes, but not limited to, a two-story parking garage, the site layout, architectural materials, and structural components. Full model was created individually by Michael Spehalski.

PROJECT COMPONENTS

Building Information Modeling (BIM)
- Developed a detailed BIM model based on complete construction drawings.
- Integrated key architectural and structural features such as walls, floors, roof, and circulation.
- Incorporated site design and layout with aesthetic features

Scheduling & 5D Simulation
- Created a schedule and cost-loaded simulation to visualize construction phasing and budget impacts.

Cost Estimation
- Detailed bid estimate of $23.8M, supported by unit quantity takeoffs using Revit and Bluebeam.

Equipment & Production Planning
- Planned and justified use of specific heavy machinery for demolition, excavation, compaction, and soil stripping.
- Included productivity rate calculations and layout visuals.

Contracts & Documentation
- Incorporated industry-standard contracts (AIA A201, A101, A401) to cover scope and division responsibilities.

Sustainability & LEED
- Achieved LEED Gold criteria and outlined additional steps for potential Platinum certification.
- Emphasis on energy performance, renewable energy, water efficiency, and lifecycle impact reduction.

Site Logistics & Safety
- Addressed site preparation, material management, equipment safety, and stakeholder engagement.
- Developed site staging and evacuation plans for safety and operational efficiency.

SENIOR DESIGN APPENDIX

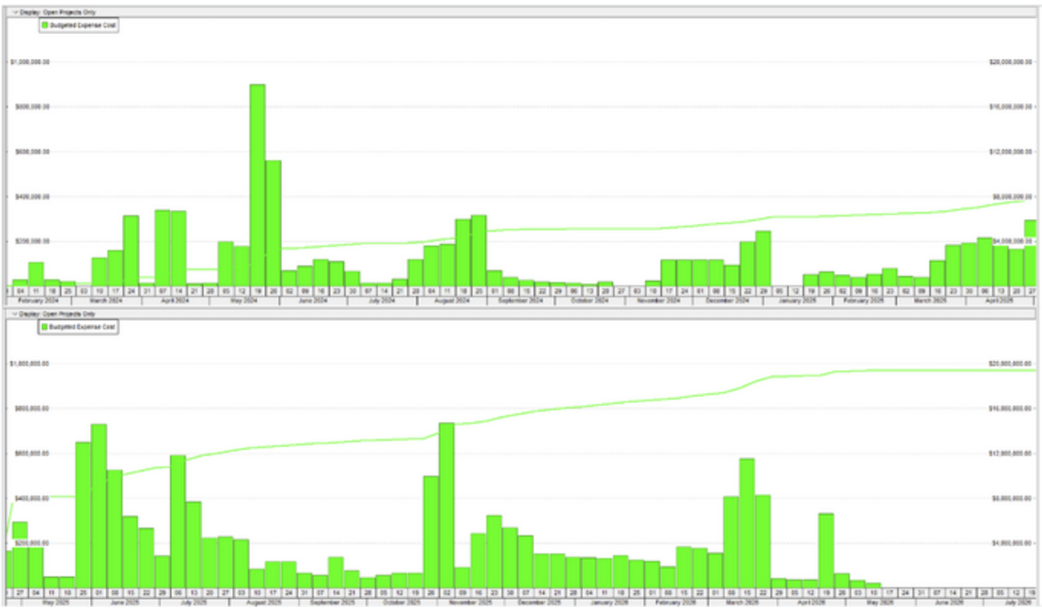
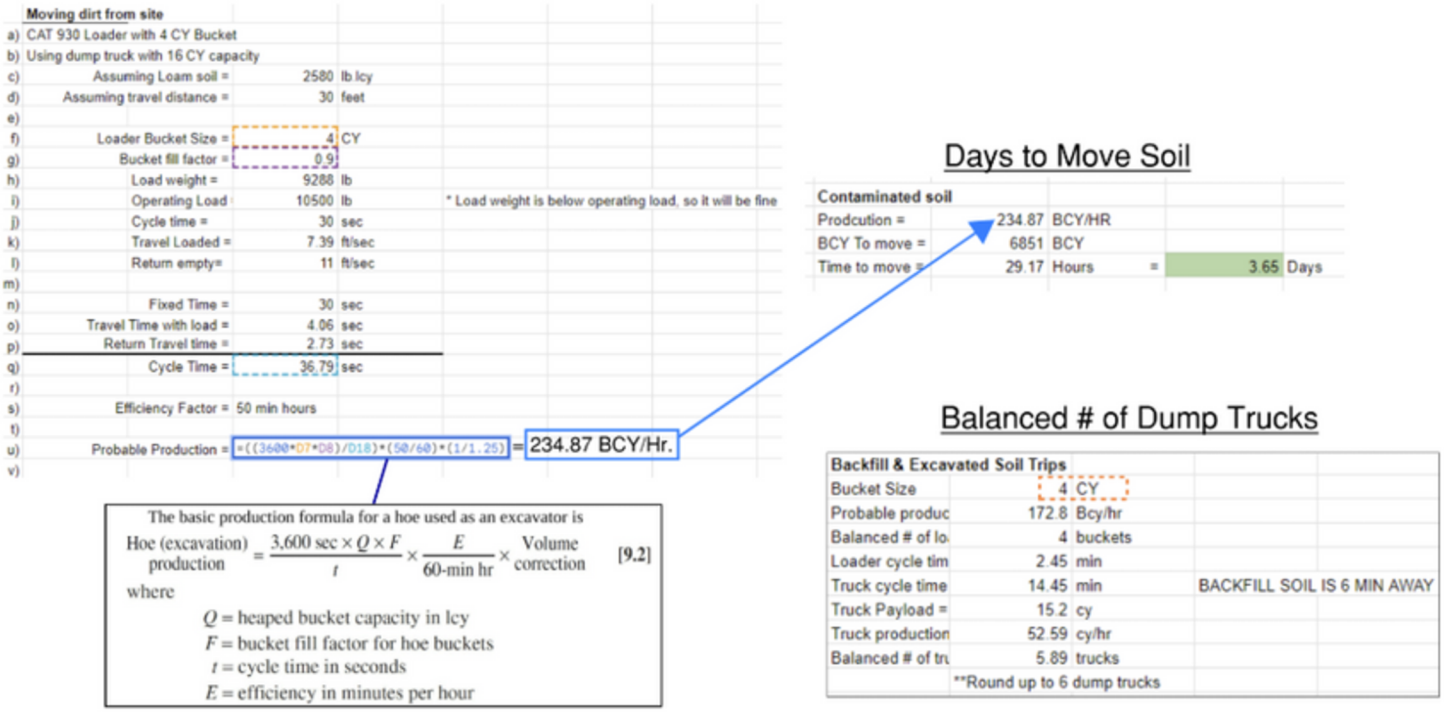


Figure 2. This cost and schedule graph illustrates the project's 5D simulation, integrating budget, scheduling, and sequencing into a unified visual. The green bars represent monthly construction costs, while the cumulative curve tracks overall project expenditure. This simulation enabled the team to visualize cash flow trends, align cost with construction activities, and assess the impact of task sequencing and scheduling decisions on project delivery and budget performance.



Moving dirt from site

a)	CAT 930 Loader with 4 CY Bucket			
b)	Using dump truck with 16 CY capacity			
c)	Assuming Loam soil =	2580	lb lcy	
d)	Assuming travel distance =	30	feet	
e)				
f)	Loader Bucket Size =	4	CY	
g)	Bucket fill factor =	0.9		
h)	Load weight =	9288	lb	
i)	Operating Load	10500	lb	* Load weight is below operating load, so it will be fine
j)	Cycle time =	30	sec	
k)	Travel Loaded =	7.39	ft/sec	
l)	Return empty=	11	ft/sec	
m)				
n)	Fixed Time =	30	sec	
o)	Travel Time with load =	4.06	sec	
p)	Return Travel time =	2.73	sec	
q)	Cycle Time =	36.79	sec	
r)				
s)	Efficiency Factor = 50 min hours			
t)				
u)	Probable Production =	=((3600*D7*D8)/D18)*(50/60)*(1/1.25)	=	234.87 BCY/Hr.
v)				

The basic production formula for a hoe used as an excavator is

$$\text{Hoe (excavation) production} = \frac{3{,}600 \text{ sec} \times Q \times F}{t} \times \frac{E}{60\text{-min hr}} \times \text{Volume correction} \quad [9.2]$$

where

Q = heaped bucket capacity in lcy
F = bucket fill factor for hoe buckets
t = cycle time in seconds
E = efficiency in minutes per hour

Days to Move Soil

Contaminated soil				
Prodcution =	234.87	BCY/HR		
BCY To move =	6851	BCY		
Time to move =	29.17	Hours	=	3.65 Days

Balanced # of Dump Trucks

Backfill & Excavated Soil Trips			
Bucket Size	4	CY	
Probable produc	172.8	Bcy/hr	
Balanced # of lo	4	buckets	
Loader cycle tim	2.45	min	
Truck cycle time	14.45	min	BACKFILL SOIL IS 6 MIN AWAY
Truck Payload =	15.2	cy	
Truck production	52.59	cy/hr	
Balanced # of tr	5.89	trucks	
	**Round up to 6 dump trucks		

Figure 3. This graphic demonstrates the application of equipment productivity and logistics planning to support earthwork operations. It showcases how standard construction formulas and site conditions were used to estimate production rates, determine the duration of soil movement activities, and balance the number of dump trucks required for efficient hauling. This example reflects the team's ability to perform detailed operational planning, ensuring that equipment, labor, and time are effectively aligned for smooth construction sequencing.

SENIOR DESIGN APPENDIX
(CONTINUED)

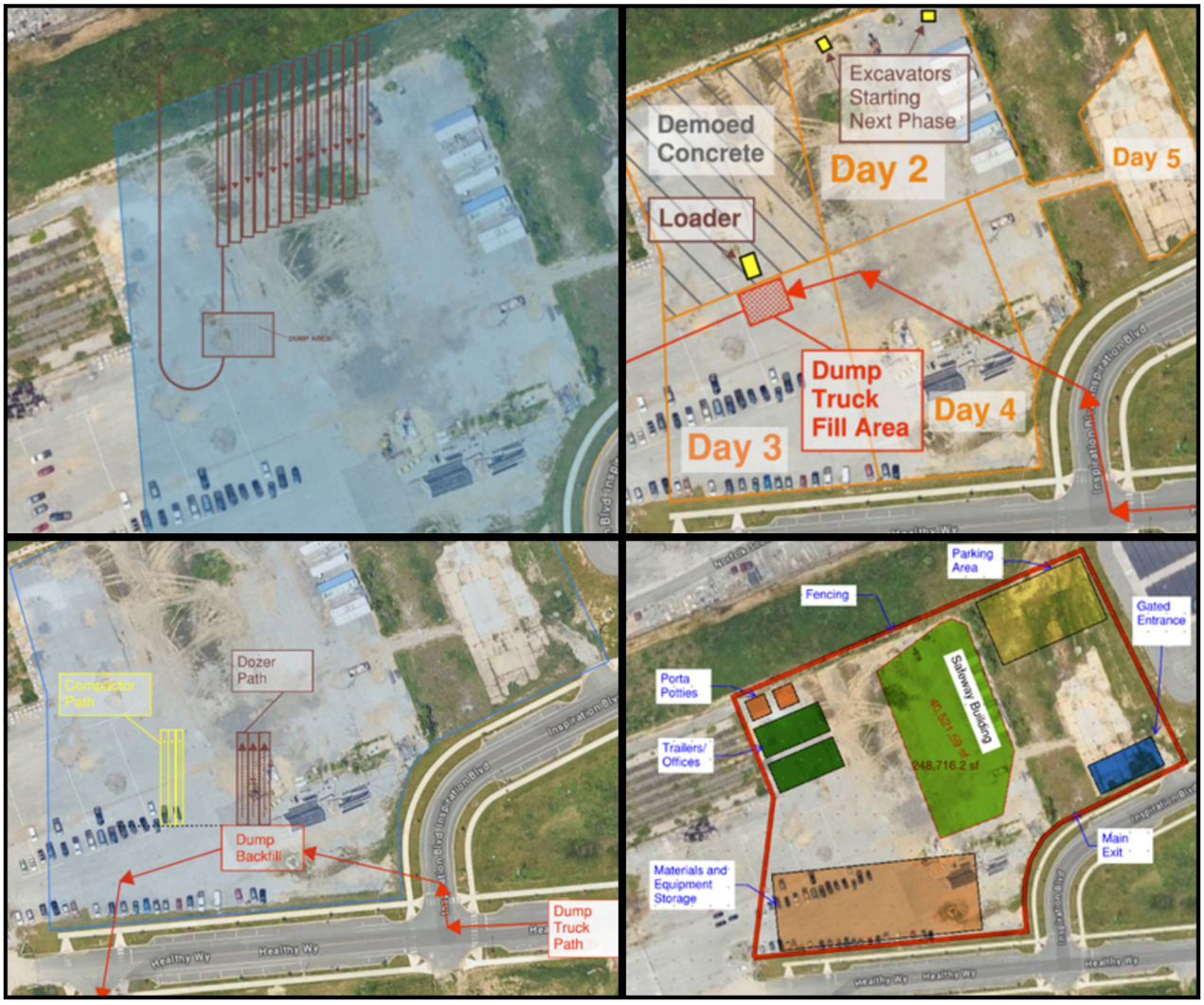
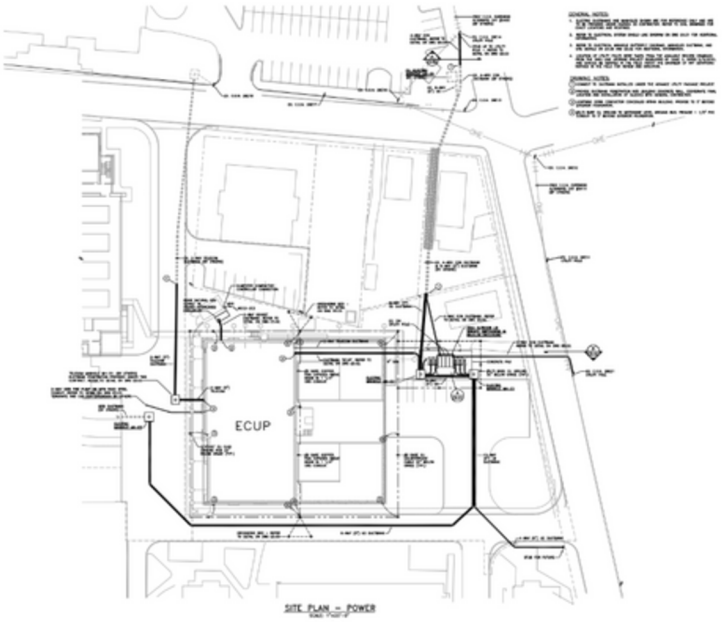
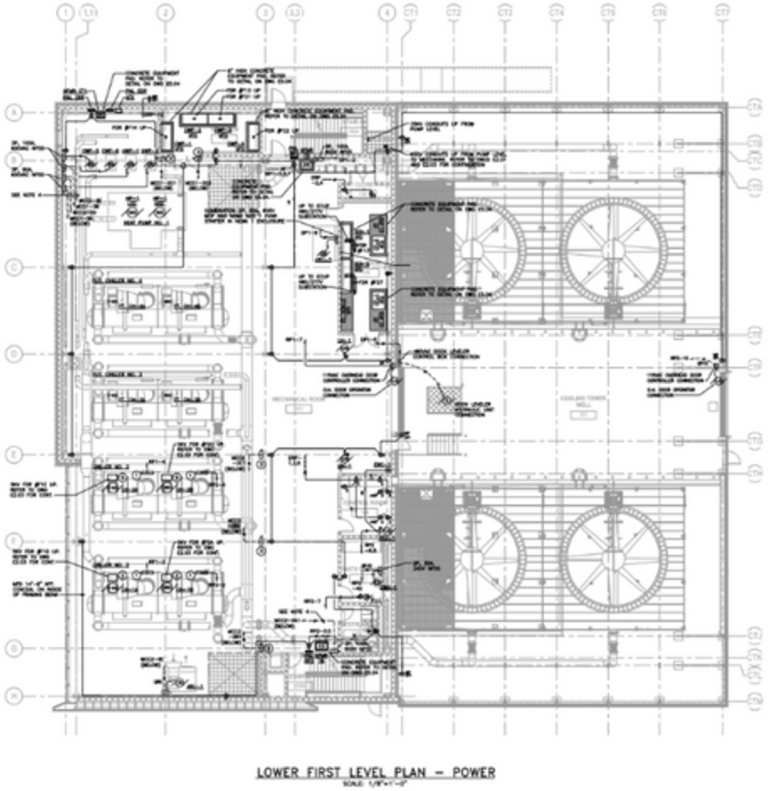


Figure 4. This series of site logistics and phasing diagrams showcases the planning and coordination behind early-stage construction activities. It includes a day-by-day breakdown of demolition and earthwork operations, equipment routing for efficient material movement, and a complete site layout detailing fencing, access points, storage zones, and worker facilities. Developed using real equipment specs and production rates, this plan reflects practical construction management skills and a strong understanding of site operations, safety, and sequencing.

MEP WORK

Within my coursework at University of Delaware, another class of interest was my MEP Design class. Within this course, we modeled a LEED certified building on campus. I was responsible for calculating heating/cooling loads, which involved analyzing building envelope components, occupancy levels, internal heat gains, and external weather data to size HVAC systems appropriately. Beyond thermal load calculations, I also gained experience with lighting design, where I evaluated illumination levels, fixture placement, energy efficiency, and compliance with lighting codes and standards such as ASHRAE and IESNA.

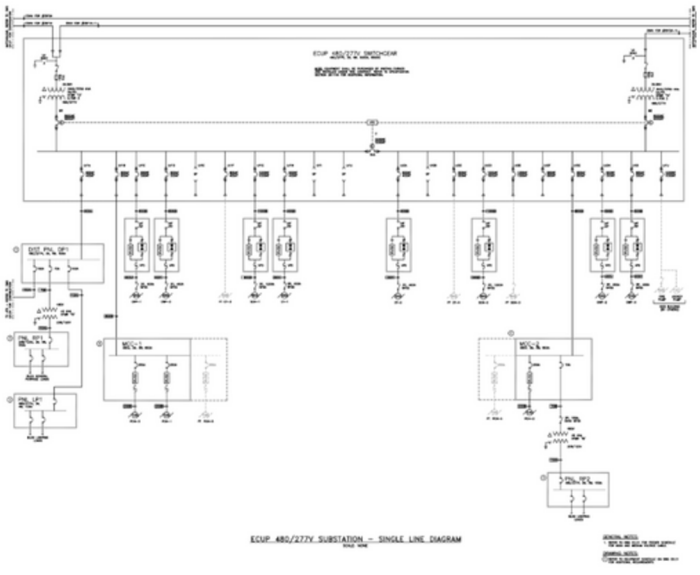




The course also covered electrical load calculations, which involved determining power requirements based on equipment usage, lighting loads, and receptacle layouts, as well as coordinating panel schedules and breaker sizing. Additionally, we explored plumbing systems, including water supply sizing, drainage layout, and fixture selection, all while considering local codes and sustainable water use strategies.

The pictures within this page are examples of the Electrical and Power plans that I used for my calculations and modeling. Within the project, we used a complete construction set, where we had to identify building needs based on line diagrams and take-offs of designed systems.

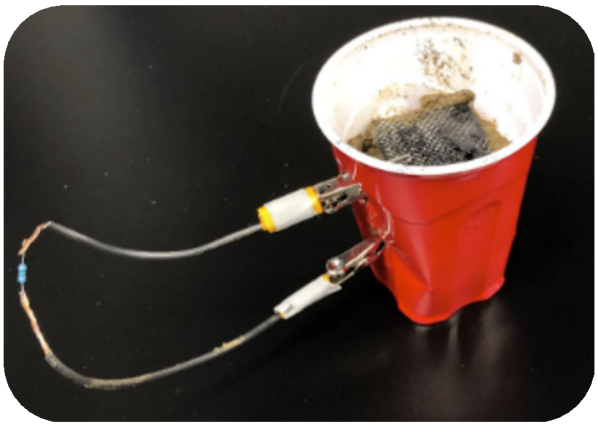
My MEP experience extends beyond academics into hands-on work with electrical estimating teams, where I interpreted drawings, panel schedules, and specs to quantify materials and labor. I've worked directly in building models using Revit and AutoCAD, developing a strong understanding of how systems interact and where to look for potential clashes—like above-ceiling spaces or utility rooms. This experience taught me how to trace electrical feeds, locate mechanical shafts, and review system layers for coordination. Together, my coursework and field exposure have given me a practical understanding of MEP systems from design through implementation.



MICROBIAL FUEL CELL RESEARCH - ENGINEERS WITHOUT BORDERS

Project Manager & Lead Researcher

The purpose of this project was to research the capabilities of MFCs and evaluate their effectiveness for implementation in a community abroad. The research focused on the end user—communities lacking significant resources. As such, the experiments centered around low-cost materials and simple assembly. I was responsible for leading the lab group, designing prototypes, developing lab protocols, and promoting the research to sponsors and faculty.



- Creation and implementation of experimentation protocols:
  - Relationship between energy production and distance between anode and cathode.
  - Biomaterial sourcing.
  - Resistor's effect on longevity to test how load can curate biomatter activity.
- Scholarly lab reporting portraying research results
- Experimented with algae-based bioelectricity, exploring its potential as an alternative energy source.
- Utilized both 3D-printed and handmade designs to construct fuel cells using basic, cost-effective materials.
- Navigated complex COVID-19 regulations to maintain efficient and safe lab/research team practices.

Microbial Fuel Cell Experiment #1 Report: Distance Between Anode and Cathode
University of Delaware Engineers Without Borders
Michael Spehalski and Allie Platchek
5/28/2021

Introduction:

This report documents the experimentation of the distance between anode and cathode inside a small scale Microbial Fuel Cell (Figure 1). The Microbial Fuel Cells (MFCs) used in this experiment were assembled on May 12th, 2021 in Dupont Hall by Michael Spehalski and Allie Platchek. The procedure for the experiment can be found in Appendix A.

Figure 1: Picture of assembled MFCs used for this experiment (more pictures can be found in Appendix B).

Results and Conclusions:

Only two of the three MFCs saw voltage change over the twelve day trial period, being the medium and long MFCs. The short MFC experienced no voltage increase and stayed at a constant voltage of zero. The other two MFCs saw a steady increase in voltage over the period of six days, until a sharp decline to zero for the six days following. The MFC most successful at creating the greatest voltage was the large MFC, reaching a high of 44 mV. Results can be seen in Figure 2.

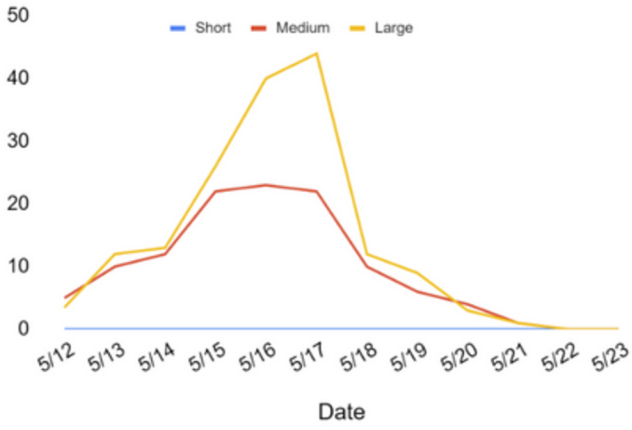


Figure 1. (From left to right) Excerpt from a lab report documenting a MFC experiment. This image represents a small portion of the full report, which includes detailed methodology, data analysis, experimental results, and conclusions related to the impact of anode-cathode distance on MFC performance alongside example graphing.

PERSONAL PROJECTS

These projects were inspired through my professional and educational experience and serve as examples of my passion to innovate and drive new solutions.

LEED AI – Intelligent Green Building Assistant

To enhance accessibility to LEED (Leadership in Energy and Environmental Design) guidelines, I worked on training an AI model using Odin AI to answer user questions related to the U.S. Green Building Council's (USGBC) standards.

Project Insights & Key Learnings:

AI Model Training:

- Organized and structured LEED-related information to ensure accurate AI responses.
- Learned that well-organized, simplified data improves AI comprehension and retrieval accuracy and how to break down information for the model to be processed more efficiently.

User Interaction & Output:

- Users could submit LEED-related queries via an integrated web interface.
- The AI would generate clear, reference-backed responses, allowing users to access additional resources for deeper insights.
- This project demonstrated how AI can simplify complex sustainability standards, making LEED certification knowledge more accessible for architects, engineers, and developers.

Automating Due Diligence Reporting for Land Development Projects

While experimenting with Octoparse and UI.Vision, I identified an opportunity to transform a previously tedious process for land development engineers into an automated, streamlined workflow. The goal is to decrease the hours it takes for due diligence reporting to save engineer time and optimize overhead cost, thus optimizing profits.

Process & Implementation:

Automating Public GIS Data Extraction:

- Developed a system to navigate public GIS databases efficiently.
- Extracts key land development information such as utility providers, wetlands, protected areas, contaminated sites, environmental risks, and other critical data.

Enhanced Data Visualization:

- The application captures screenshots to display GIS information clearly to ensure accurate reporting with visual references for cross validation.
- Create structured reports for easy interpretation by engineers or clients.

Automated Quantity Takeoffs for Construction Management

To streamline a tedious and time-consuming process in the construction management niche, I developed an AI-powered automated takeoff system using a combination of emerging AI technology, macros, and Microsoft Power Automate.

Workflow & Implementation:

User Prompt Integration:

- The user submits a request to count a specific symbol or component on construction plans.
- Automated Symbol Recognition:
- The system analyzes the given blueprint, identifies the requested symbol, and counts occurrences.
- Once processed, the system automatically emails the results back to the user.

This solution was specifically made for field work, where a field engineer or contractor is in need of a quick and rough number. An example where this would be effective is when a contractor needs a rapid estimate of materials, such as the number of electrical outlets, light fixtures, or structural components on a blueprint. Instead of manually counting, which can be error-prone and time-consuming, the automated takeoff system quickly processes the request for quicker in-field decision making.

PERSONAL PROJECTS

Lead Generation for Civil Engineering Projects

Using Octoparse, I developed a streamlined methodology to mine hundreds of properties to automate the lead generation funnel for civil engineering projects. The goal of this project was to develop a system that could increase the size of the lead funnel and create more opportunities with new clients.

Process Overview:

Inspection Analysis & Lead Qualification:

- Identified properties with a history of failed inspections (e.g., violations of costly regulations like ADA compliance).
- Extracted inspection reports to pinpoint failed codes that would require land development services (grading, stormwater management, etc.).

Data Cleaning & Refinement:

- Only focused on properties that accrued high value violations with approaching inspection due dates (long history of repeated violations preferred).
- Focused on properties where compliance issues indicated significant redevelopment opportunities.
- Retrieved owner contact information, addresses, violation information, inspection dates, and other critical data.

Drone-Based Light Mapping for Sustainable Architecture

This idea was born from the challenge of accurately calculating light levels across different parts of a building, specifically in tall structures. Light impacts occupant comfort and heat generation, influencing energy efficiency and building performance - which are areas of high interest for the United States Green Building Council's Leadership in Energy and Environmental Design principles.

The concept involves developing a drone equipped with light sensors to measure the intensity of sunlight on various building surfaces. This data would enable architects and engineers to:

- Optimize building designs to maximize natural lighting while minimizing overheating.
- Reduce the urban heat island effect by identifying areas prone to excessive heat retention.
- Recommend better material choices based on real-world light exposure data.

By integrating sensor-driven insights, this tool would enhance sustainable building practices, allowing structures to work more efficiently with their environment rather than against it. This project remained in preliminary research.