

## **EE/CprE/SE 492 WEEKLY REPORT 4**

**Start Date – End Date:** 3/27-4/07

**Group number:** 27

**Project title:** 60 MW Solar Field and 34.5/115 kV Substation Design

**Client &/Advisor:** Black & Veatch advised by Ajarapu

**Team Members/Role:** Omer Karar, Madison Lakomek, Madissen Lawrence, Jacob Miller, Brooke Nelson, Ashton Randolph, Jenna Runge, Zachary Zimmerman

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### **Weekly Summary**

This week's updates include beginning on and finalizing the grounding calculations, beginning the ETAP solar and substation layout, and finalizing distances for the key plan. The grounding calculations were started and presented to our clients. The main concerns with these calculations were not having completely uniform grounding rods. The key plan was finalized with distances, potential transformers, and an access road. ETAP layout was created complete with the relaying scheme and component parameters.

### **Past week accomplishments**

- Grounding Calculations - Madissen and Jenna
  - We completed the grounding calculations based on Black and Veatch's requirements and the specs in the key plan.
  - Calculations were checked and okayed by Black and Veatch.
  - We updated the calculations to reflect the updated key plan.
  - We finished the grounding grid drawing.
- ETAP - Zach and Asthon
  - Created the layout of the PV side connecting into the substation
  - Added parameters into solar panels, inverters, CTs, circuit breakers, and transformers
  - Added Relay scheme to the substation
  - Began Arc flash study
- Key Plan - Madison & Jacob
  - Added an access road and potential transformer
  - Included all measurements based on industry standards
  - Added trenching based on connection location and OSHA distance standards
  - Added comments and labels to finalize plan
- Lightning Calculations?
  - Waiting to be sent the requirements from Black and Veatch. If not sent by the end of this week, we will send a follow up.
- AC Load Calculations
  - Waiting to be sent the requirements from Black and Veatch. If not sent by the end of this week, we will send a follow up.
- Conduit

- Began on conduit plan by adding in wiring, conduit, and trenching onto the key plan

### Pending issues

We need to complete and arc flash, load flow, and short circuit studies in ETAP. Complete the remaining drawings: three line diagram, elevations layout, and conduit plan drawing. Complete remaining calculations: AC load, lightning, cable tray fill, and substation voltage drop. We also need to start compiling our progress from this semester into a final report.

### Individual contributions

\*this should be short and concise based on past week accomplishments. Instructions say do not include group meetings

Name	Individual Contribution	Hours in the Past 2 Weeks	Hours Cumulative
Omer Karar	Researched Lightning Protection	9	22
Madison Lakomek	Key plan and conduit plan drawings	8	31
Madissen Lawrence	Worked on grounding calculations and grounding grid drawing. Also updated the website.	16	36
Brooke Nelson	Looked at conduit plan	6	25
Jacob Miller	Researched lightning protection practices + one-line edits	5	33
Ashton Randolph	ETAP simulation progress	12	31
Jenna Runge	Grounding calculations.	14	33
Zachary Zimmerman	ETAP simulation progress	12	30

### Plans for the upcoming week

(Please describe duties for the upcoming week for each member. What is(are) the task(s), Who will contribute to it? Be as concise as possible.)

**Omer Karar-** I'm working to install lightning rods on the highest point of a structure, and there should be at least one rod for every 20 feet of the roofline aside from working in conductors and how they should be installed on all roof edges connected to the lightning rods. The conductors should be run down the side of the building and connected to a grounding system, which should be installed at the structure's base.

**Madison Lakomek-** I plan on finishing the conduit plan by deciding which conduit is needed where to ensure that all the conductors and relay connections are reached

**Madissen Lawrence-** I will continue to update the website, update the grounding calc work if needed, and work on the AC load calculations.

**Brooke Nelson-** I plan on working on the AC load calculations.

**Jacob Miller-** I plan on finalizing placement of lightning protection components as well as the instrumental transformers

**Ashton Randolph-** I plan on finishing the conduction of load flow, arc flash, and short circuit studies within the ETAP software.

**Jenna Runge-** Work on the AC load calculations. Update the grounding calcs if necessary if there are any changes to the Key Plan. Start voltage drop calculations if there is time.

**Zachary Zimmerman -** Plan on finishing the conduction of load flow, arc flash, and short circuit studies within the ETAP software.

### **Summary of weekly advisor meeting**

The meeting on 03/29 we showed Professor Ajarapu our ETAP layout and shared our plan for the studies that we will be conducting. We also discussed the importance of understanding the decisions behind every calculation, drawing, and component that we have made throughout the past year. We talked about how we would portray these decisions to the Industry panel in our final presentation.

The meeting 04/06

Gave Professor Ajarapu a presentation summarizing our work from both semesters. Updated our presentation slides from last semester to include updates from our substation design to use for this presentation.