34.5/115 kV Solar Power Plant & Substation Senior Design Project

Senior Design Team 18 - May 2024

Siti Mohd Radzi, Baylor Clark, Eduardo Jimenez-Tzompaxtle, Chicheng Tang, Eli Schaffer, Liam Gossman

BLACK & VEATCH

Eli

Agenda

- Safety Moment
- ACAD Title Block
- Array Layout
  - Excel and ACAD
- Voltage Drops

Eli

Safety Moment - Enhancing Employee Safety with two-way communication

- Definition: conversation involves two parties, one sending and receiving messages.
- Purpose: Ensures information is delivered promptly through real-time information alerts, tap into emergency resources and help employee feel secure through easy access of information.
- Why is it important to have effective two-way communication?

Emergencies/issues create confusion, chaos and danger towards the organization. One-way communication and alerts caused false information. Two-way communication tool helps employees to be prepared safety precaution.

Effective system
- Confirmations - message sent and received by right POC
- Wellness checks - surveys or report about the current condition
- Conference calls - get-together between stakeholders during emergency
- Event alerts - provide information and access to necessary precaution tasks/rule.

Method to alert emergencies
- Multilingual emergency alert - more comprehensive
- Social media emergency alert - reach greater audience
- Remote alerts - send alert to device off-site
- Alerting employees in sequential order
  - alerting related groups of employees to reduce/avoid panic

What we worked on

- Finalize equipments (PV cells, Combiner Box, Inverter skids)
- Array tool and Simple Array Layout
- AutoCAD title block and sheet sets

Title Block - Iteration 1

Title Block - Iteration 1

Title Block - Iteration 1

Need to add group name and team member names

REVISIONS

NO.	DESCRIPTION	DATE

IOWA STATE UNIVERSITY COLLEGE OF ENGINEERING

4100 MARSTON HALL
533 MORRILL ROAD
AMES, IA 50011
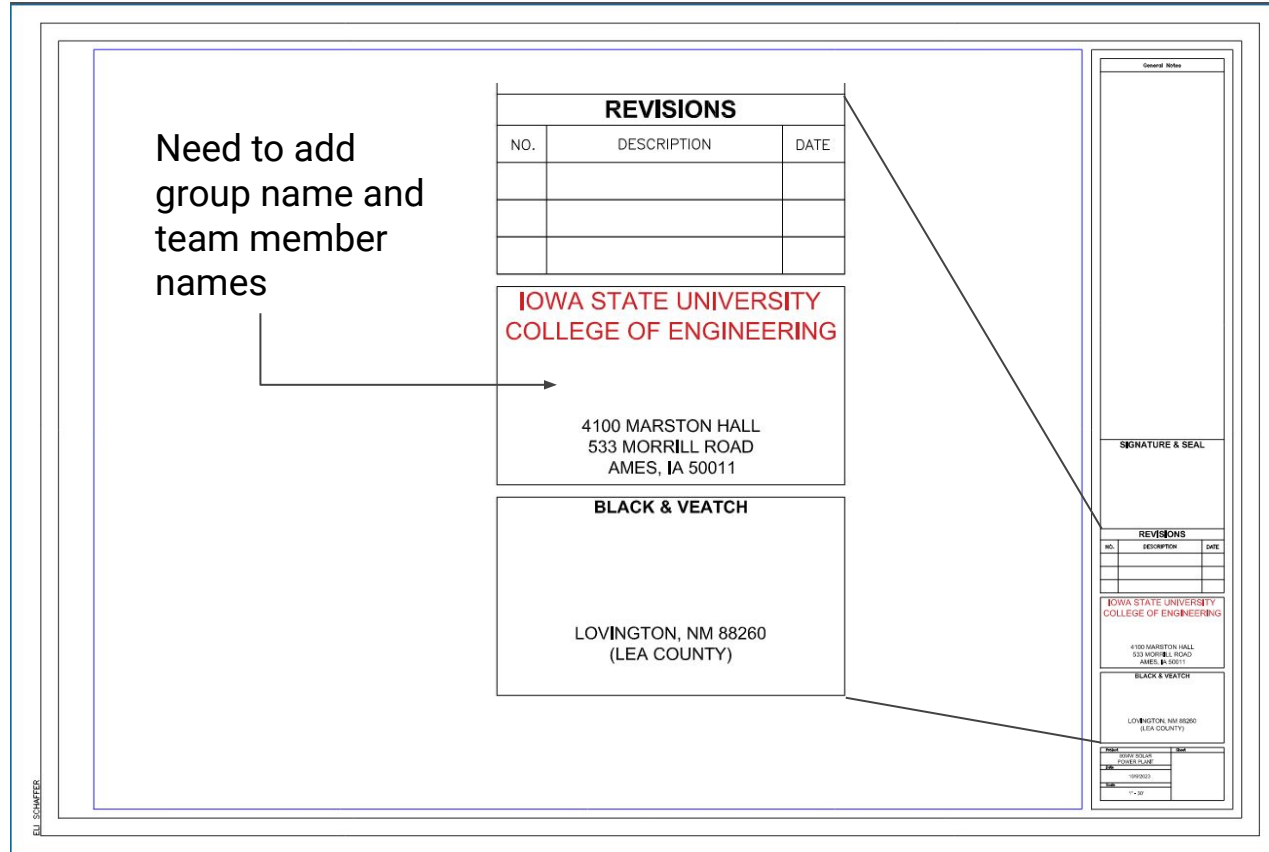
BLACK & VEATCH

LOVINGTON, NM 88260
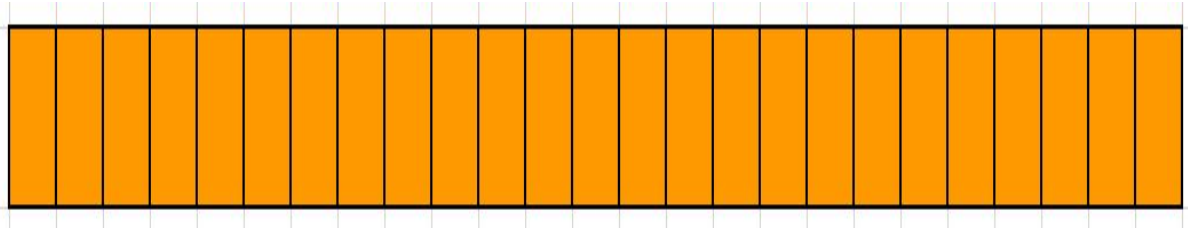(LEA COUNTY)

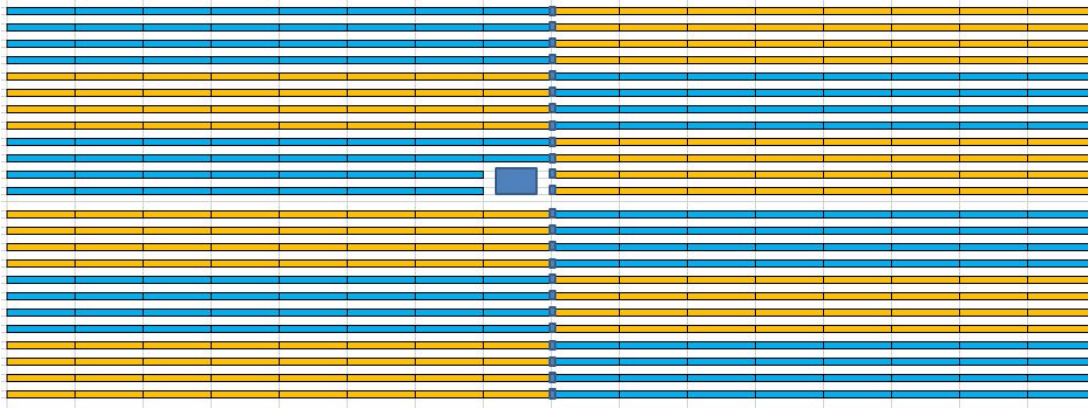# Title Block - Iteration 1

Autocad Sheet Set
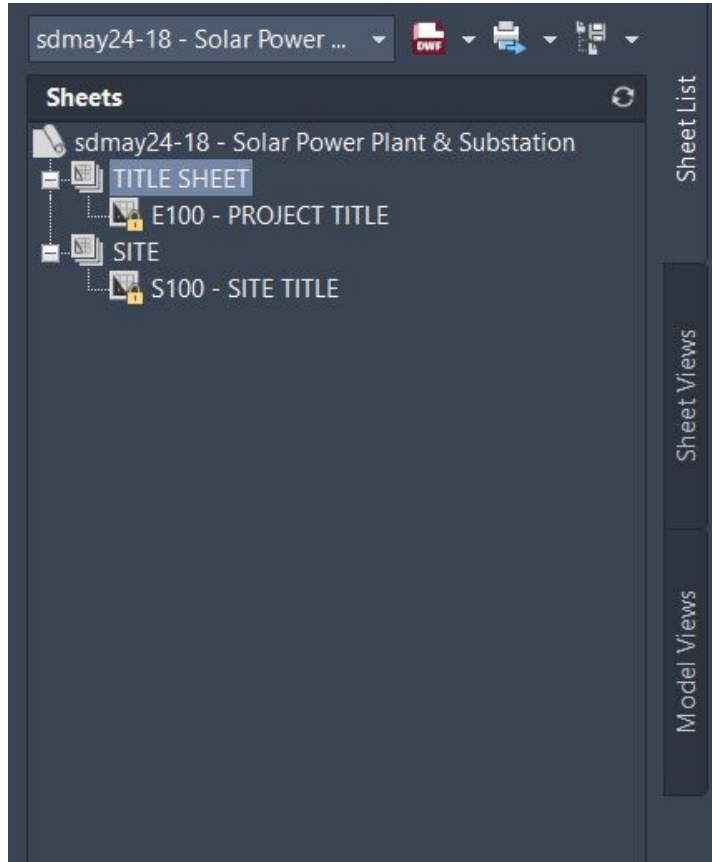
- Still working on additional sets and sheets that will be needed for final deliverables
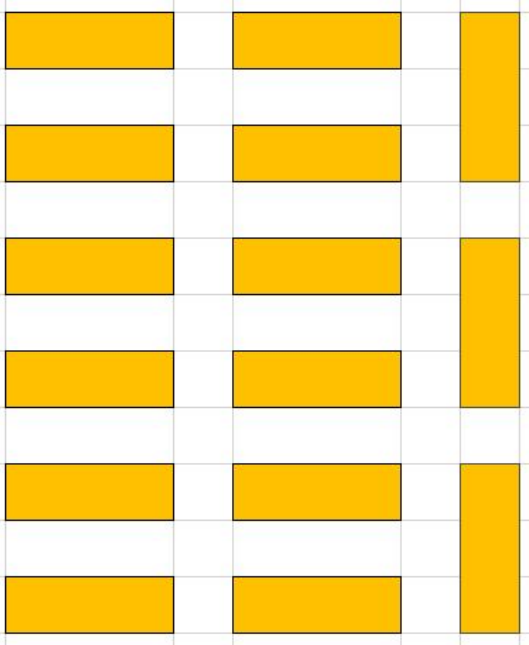
Array Layout - Excel

Design for 1 rack:
25 modules in series

Design for 1 array:
16 racks per row, 24 rows per array
2 racks removed for inverter
24 combiner boxes per array (1 per row)
15 arrays total

Array Layout - Excel

Overall Layout:
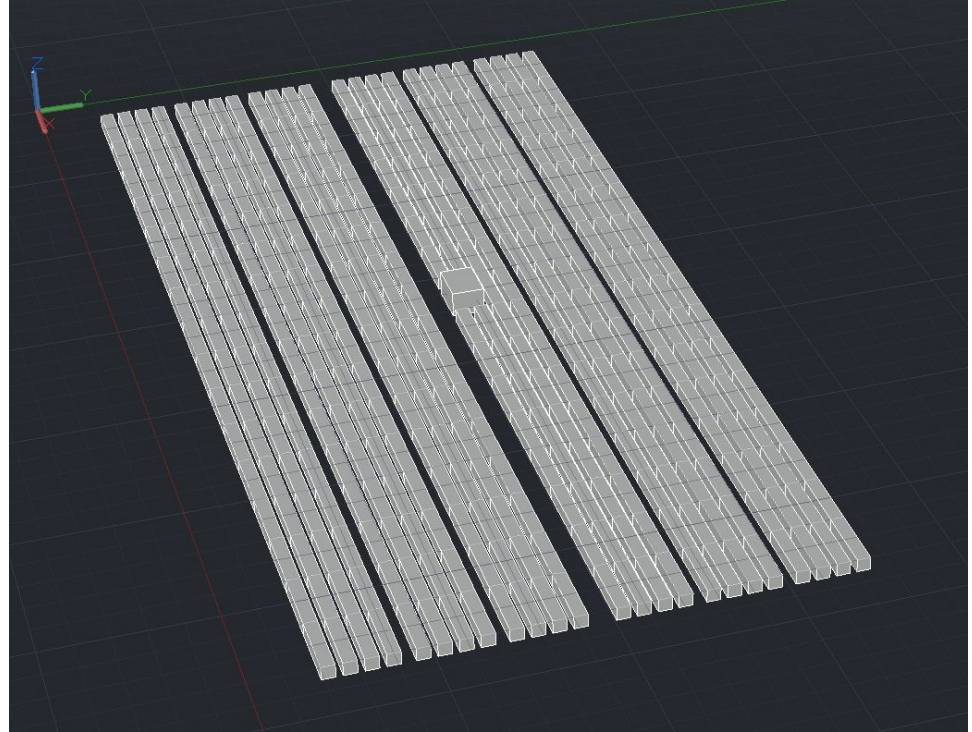
2 columns of 6 standard arrays

1 column of 3 rotated arrays

15 arrays total

Array Layout - AutoCAD

- 1 out of 15 array layout
- Simple but not the final design
- Only has panels and inverter at the moment

Voltage Drop Calcs

- DC
  - Factor affecting DC Voltage Drop
    - Wire
    - Current
- AC
  - Factor affecting AC Voltage Drop
    - Wire Resistance
    - Current magnitude and phase
    - Inductance and Capacitance
    - Frequency of the AC

$$V_d = \frac{2LR_2I}{1000}$$

Where:

V_d = voltage drop over circuit length (volts)

L = length of circuit (ft)

R_2 = resistance of conductor from Equation (ohm/kft)

I = maximum power current of circuit (amps)

Feedback and Updates

- Keep in mind we have a presentation for this semester
    - Present to BV first then to ISU
- Access space is access road
- MM and array tool, equip datasheets
-