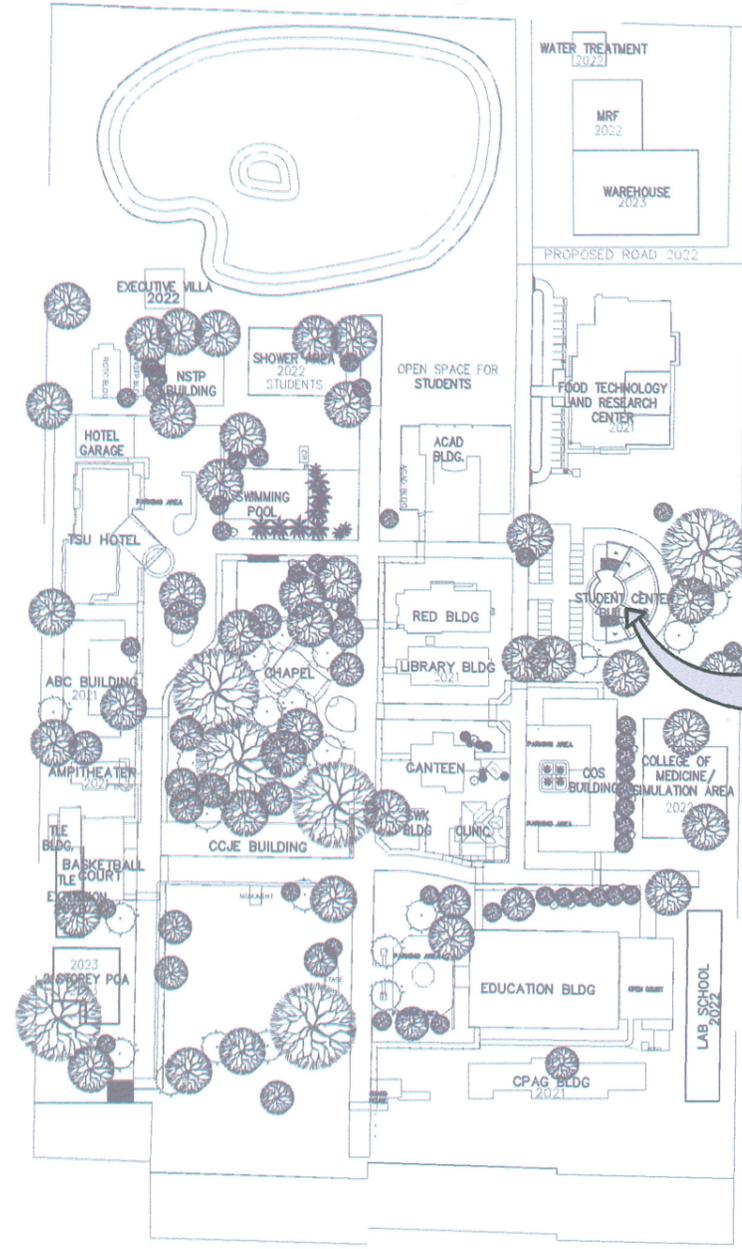




THE SITE

VICINITY MAP
SCALE: NTS



STUDENT CENTER BUILDING

LUCINDA EXTENSION CAMPUS
SCALE: NTS



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Facilities Development and Management Office
Romulo Boulevard, Tarlac City, Philippines 2300

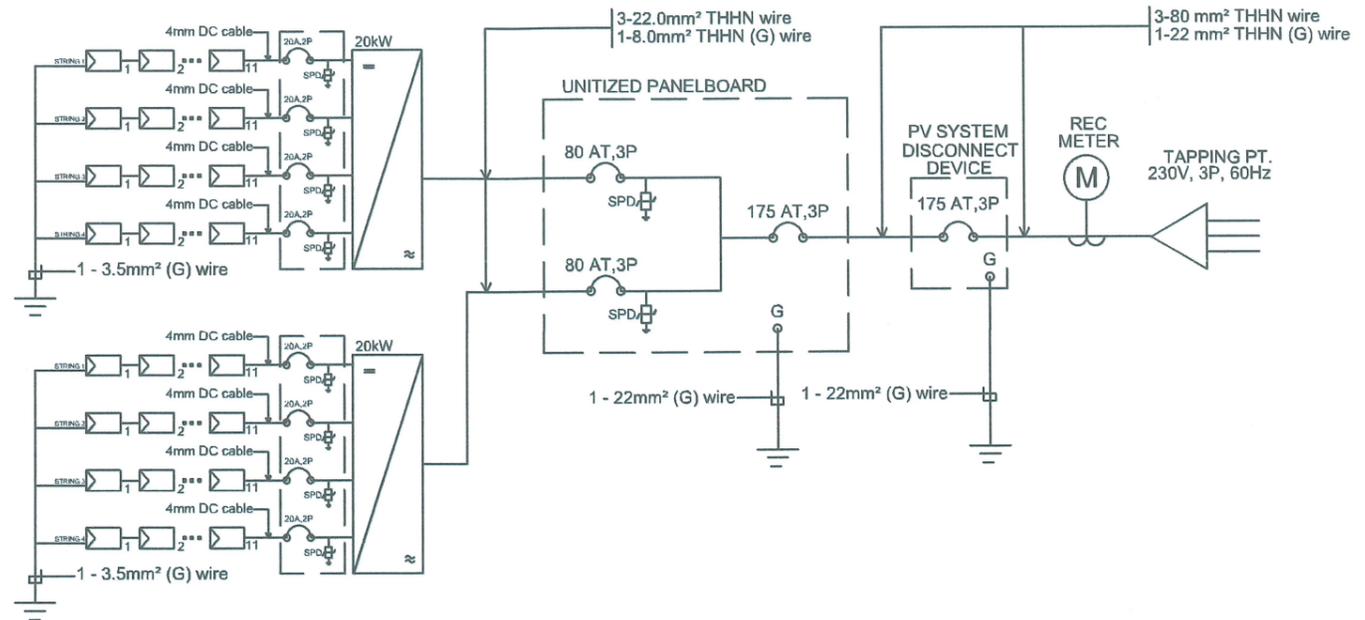
PROJECT TITLE: INSTALLATION OF SOLAR HARVESTING SYSTEM AT LUCINDA EXTENSION CAMPUS (STUDENT CENTER AND CFTR BUILDING)	PREPARED BY:	CHECKED BY:	CERTIFIED BY:	REQUESTING OFFICE:	RECOMMENDING APPROVAL:	APPROVED:	SHEET CONTENTS:	SHEET NO:
	PROJECT LOCATION: TSU LUCINDA EXTENSION CAMPUS	ENGR. MISAEL REIGH MIEL V. CABANSAG ELECTRICAL ENGINEER, OFDM	AR. CHERRY L. FABIANES HEAD, OFDM-PDU	AR. ARLEN M. GUIEB DIRECTOR, OFDM	DR. GLADIE NATHERINE G. CABANIZAS DIRECTOR, OSAS	ATTY. GHEROLD C. BENITEZ VP FOR ADMINISTRATION	DR. ARNOLD E. VELASCO PRESIDENT	AS SHOWN DATE: 2025

GENERAL NOTES AND SPECIFICATIONS

- ALL WORKS SHALL COMPLY WITH THE APPROVED EDITION OF THE LATEST PHILIPPINE ELECTRICAL CODE, WITH THE RULES AND REGULATIONS OF THE NATIONAL AND LOCAL AUTHORITY CONCERNED IN THE ENFORCEMENT OF THE UTILITY COMPANY CONCERNED.
- ALL ELECTRICAL WORKS HEREIN SHALL BE DONE UNDER THE DIRECT SUPERVISION OF A DULY QUALIFIED REGISTERED ELECTRICAL ENGINEER OR REGISTERED MASTER ELECTRICIAN.
- SERVICE VOLTAGE SHALL BE 230VOLTS, 3- PHASE, 60Hz. A.C.
- ALL MATERIALS PRIOR TO INSTALLATION, FABRICATION OR ORDER CONTRACTOR SHALL SECURE APPROVAL FROM DESIGN ENGINEER OR PROJECT MANAGER BASED ON MATERIAL STANDARD SPECIFICATION. ALL MATERIALS SHALL BE BRAND NEW AND DELIVERED TO SITE WITH THEIR ORIGINAL PACKAGING.
- ALL WIRES SHALL BE COPPER WITH 99.9% CONDUCTIVITY, SOFT-DRAWN AND ANNEALED.
- ALL WIRES SHALL BE COLOR CODED AS FOLLOWS:
 DC + - RED LINE2 - YELLOW
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- 1.5 METER SHOULD BE THE SPACING FROM ONE CONDUIT SUPPORT TO ANOTHER SUPPORT BY MEANS OF C-CHANNEL CLAMPS OR BY U-BOLT.
- WHENEVER REQUIRED AND NECESSARY PVC PULL BOXES AND JUNCTION BOXES SHALL BE INSTALLED AT CONVENIENT SPACE AND LOCATION.
- UPON COMPLETION OF ELECTRICAL CONSTRUCTION WORK, THE FOLLOWING TESTS SHALL BE PERFORMED BY THE CONTRACTOR INCLUSIVE OF THE INSTALLATION TO BE REPORTED IN DETAILS ON FORMS APPROVED BY THE OWNER'S REPRESENTATIVE.

- A. INSTALLATION RESISTANCE TEST B. GROUND RESISTANCE TEST
 C. OPERATIONAL TEST D. SYSTEM TEST AND ACCEPTANCE

SINGLE LINE DIAGRAM



LOAD SCHEDULE

DC SCHEDULE OF LOADS

STRING	NO. OF MODULES PER STRING	TOTAL VOLTAGE (V)	CURRENT (A)	CB RATING	WIRE SIZE	CONDUIT
INV 1 - STR. 1	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm² DC cable	100mm x 100mm Cable Tray
INV 1 - STR. 2	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm² DC cable	100mm x 100mm Cable Tray
INV 1 - STR. 3	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm² DC cable	100mm x 100mm Cable Tray
INV 1 - STR. 4	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm² DC cable	100mm x 100mm Cable Tray
INV 2 - STR. 1	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm² DC cable	100mm x 100mm Cable Tray
INV 2 - STR. 2	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm² DC cable	100mm x 100mm Cable Tray
INV 2 - STR. 3	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm² DC cable	100mm x 100mm Cable Tray
INV 2 - STR. 4	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm² DC cable	100mm x 100mm Cable Tray

AC SCHEDULE OF LOADS

CKT. NO.	LOAD DESCRIPTION	VOLTAGE (V)	Capacity (VA)	CURRENT				CB RATING			WIRE SIZE	CONDUIT
				AB	BC	AC	ABC	AT	AF	P		
1	20kW GRID TIED INV.	230 V	20000 W				78.44A	80A	100AF	3	3 - 22.0mm² THHN + 1 - 8.0mm² (G) wire	100mm x 100mm Cable Tray
2	20kW GRID TIED INV.	230 V	20000 W				78.44A	80A	100AF	3	3 - 22.0mm² THHN + 1 - 8.0mm² (G) wire	100mm x 100mm Cable Tray



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PROJECT TITLE: INSTALLATION OF SOLAR HARVESTING SYSTEM AT LUCINDA EXTENSION CAMPUS (STUDENT CENTER AND CFTR BUILDING)	PREPARED BY: ENGR. MISAEL REIGH MIEL V. CABANSAG ELECTRICAL ENGINEER, OFDM	CHECKED BY: AR. CHERRY L. FABIANES HEAD, OFDM-PDU	CERTIFIED BY: AR. ARLEN M. GUIEB DIRECTOR, OFDM	REQUESTING OFFICE: DR. GLADIE NATHERINE G. CABANIZAS DIRECTOR, OSAS	RECOMMENDING APPROVAL: ATTY. GHEROLD C. BENITEZ FOR ADMINISTRATION	APPROVED: DR. ARNOLD E. VELASCO PRESIDENT	SHEET CONTENTS: AS SHOWN DATE: 2025	SHEET NO.: 2 PAGE NO.: 02/14
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DESIGN PARAMETERS AND CALCULATIONS

INVERTER PARAMETERS:

INPUT (DC)
 MAX DC POWER: 30000W
 MAX INPUT VOLTAGE: 800V
 RATED INPUT VOLTAGE: 360V
 MAX INPUT CURRENT PER STRING: 26A
 NUMBER OF INDEPENDENT MPP: 4

SOLAR PANEL PARAMETERS:

RATED MAX POWER at STC: 550W
 OPEN CIRCUIT VOLTAGE: 49.62V
 MAXIMUM POWER VOLTAGE: 40.90V
 SHORT CIRCUIT CURRENT: 14.03A
 MAXIMUM POWER CURRENT: 13.45A

RAPID SHUTDOWN DEVICE PARAMETERS:

RATED MAX POWER : 700W

OUTPUT (AC)

RATED POWER: 20000W
 MAX APPARENT POWER: 22000VA
 NOMINAL AC VOLTAGE / RANGE: 230V
 RATED POWER FREQUENCY / RANGE: 60Hz
 MAX OUTPUT CURRENT: 58A
 POWER FACTOR AT RATED POWER: 0.8 leading-0.8 lagging
 FEED IN PHASES: 3

DC SIDE DESIGN ANALYSIS

$$\text{Total No. of Solar Panels} = \frac{\text{Plant Capacity}}{\text{Solar Power Module Rating}} = \frac{48400W}{550W} = 88 \text{ pcs. Solar Modules rated @ 550W each}$$

$$\text{Total No. of Inverters} = \frac{\text{Plant Capacity}}{\text{Inverter Max. Power}} = \frac{48400W}{20000W} = 2.42 \text{ - 2 Inverters}$$

Number of Panels per String = 11

Voltage per String = No. of Panels x Open Ckt Voltage = 11 x 49.62V = 545.82 V

Ampere Rating at DC Side: $I_s = 14.03 \text{ A}$

DC Cable: 4mm² THHN Cu. WIRE & 3.5mm² THHN WIRE for GRND WIRE IN CABLE TRAY

VOLTAGE DROP FOR DC SIDE

$$V_d = \frac{2 \times L \times I \times R}{1000 \text{ ft}} = \frac{2 \times 100 \text{ ft.} \times 13.45 \text{ A} \times 1.931 \text{ ohms}}{1000 \text{ ft}}$$

$$V_d = 5.1944 \text{ V}$$

$$= \frac{V_d}{(\text{no. of panel per strings}) \times V_{oc}} \times 100$$

$$= \frac{5.1944 \text{ V}}{11 \times 49.62 \text{ V}} \times 100 = 0.95\%$$

AC SIDE DESIGN ANALYSIS

FOR INVERTERS

Demand Load in Amperes:

$$\frac{\text{Max. AC Output Power}}{\sqrt{3} \times \text{nominal AC Voltage} \times \text{Power Factor}} = \frac{20000w}{\sqrt{3} \times 230 \times .8} = 62.76 \text{ A}$$

CIRCUIT BREAKER RATING: Use 80AT/100AF, 230V, 3P Circuit Breaker

SUB FEEDER: 3 - 22.0mm² THHN Cu. WIRE & 1 - 8.0mm² THHN WIRE for GROUND WIRE IN 100mm x 100mm Cable Tray

FOR MAIN BREAKER

Demand Load in Amperes:

$$\frac{\text{Max. AC Output Power}}{\sqrt{3} \times \text{nominal AC Voltage} \times \text{Power Factor}} = \frac{40000w}{\sqrt{3} \times 230 \times .8} = 125.515 \text{ A}$$

CIRCUIT BREAKER RATING: Use 175AT, 230V, 3P Circuit Breaker

MAIN FEEDER: 3 - 80mm² THHN Cu. WIRE & 1 - 22mm² THHN WIRE for GROUND WIRE IN 100mm x 100mm Cable Tray and 2" Ø RSC PIPE (FOR EXPOSED) and 2" Ø PVC PIPE IN CONCRETE ENCASMENT (FOR UNDERGROUND)

SHORT CIRCUIT CALCULATION



SHORT CIRCUIT LEVEL FOR UTILITY ASSUMED AS 1000MVA

3 - 50 KVA TRANSFORMER, 13.8/0.23, 3Ø, 60HZ

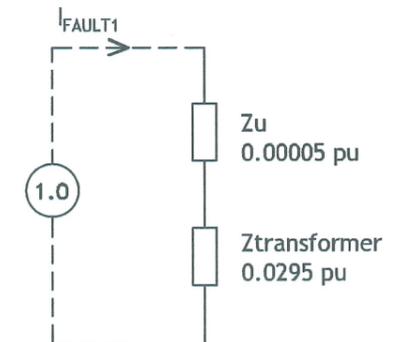
BASE MVA : 0.15 MVA
 BASE V: 230 V

$$Z_{utility} = 0.15 / 1,000 = 0.00015 \text{ pu}$$

$$Z_{transformer} = 2.95/100 = 0.0295 \text{ pu}$$

$$Z_{total} = 0.00015 + 0.0295 = 0.02965 \text{ pu}$$

NOTE: IMPEDANCE OF THE CONDUCTOR IS ASSUME AS NEGLIGIBLE.



FAULT 1

$$I_{sc} = (1 / Z_{total}) \times [\text{KVA base} / (1.732 \times 230)]$$

$$= (1 / 0.02965) \times [150 \times 10^3 / (1.732 \times 230)]$$

$$= 12.7 \text{ kAIC}$$

SAY: 13 KAIC

VOLTAGE DROP FOR AC SIDE

$$V_d = \frac{1.732 \times L \times I \times Z}{305 \text{ m}} = \frac{1.732 \times 72 \text{ m} \times 125.515 \times 0.094 \text{ ohms}}{305 \text{ m}}$$

$$V_d = 4.82 \text{ V}$$

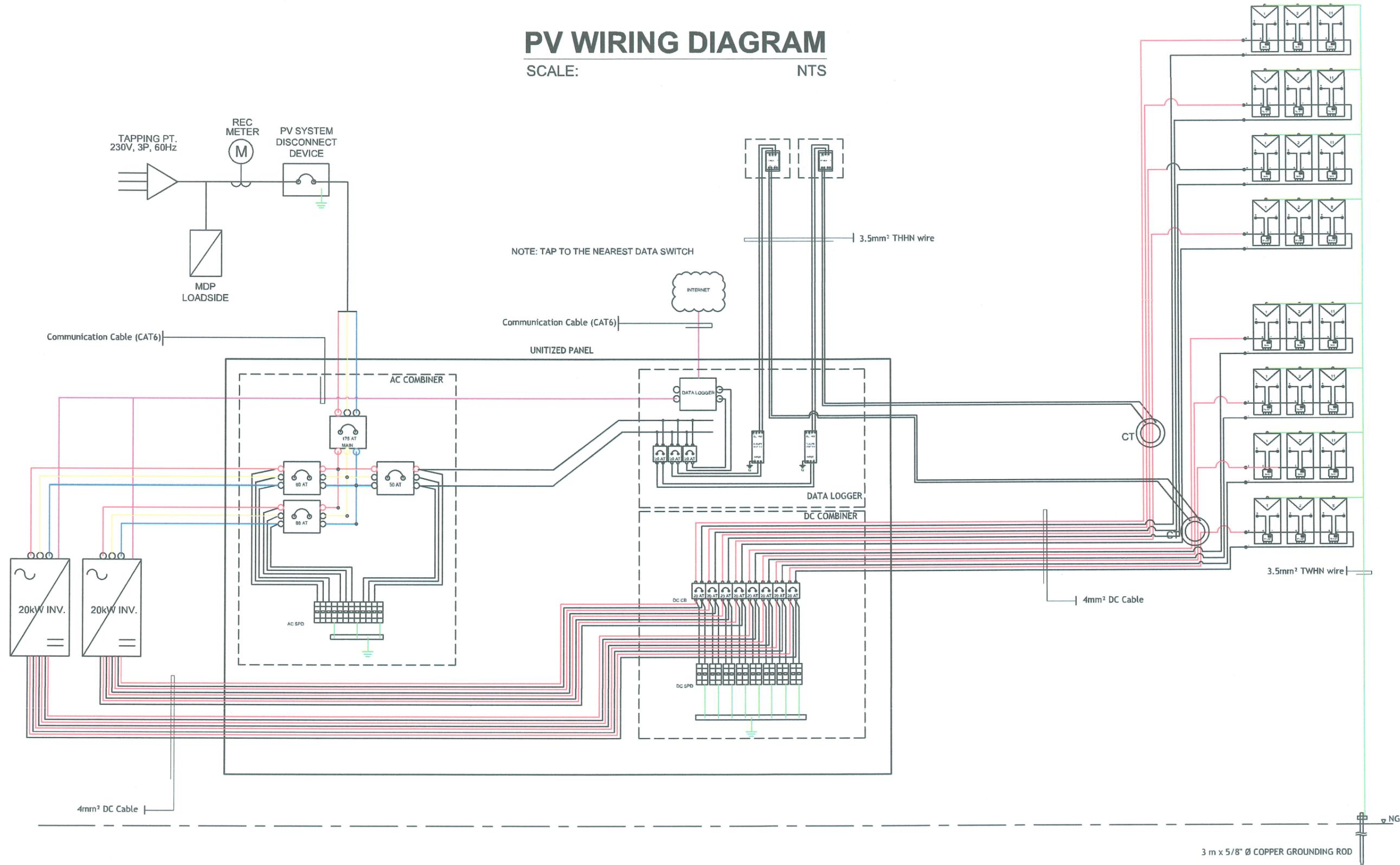
$$= \frac{V_d}{\text{Nominal voltage}} \times 100$$

$$= \frac{4.82 \text{ V}}{230 \text{ V}} \times 100 = 2.1\%$$

 TARLAC STATE UNIVERSITY Facilities Development and Management Office <small>Romulo Boulevard, Tarlac City, Philippines 2300</small>	PROJECT TITLE:	PREPARED BY:	CHECKED BY:	CERTIFIED BY:	REQUESTING OFFICE:	RECOMMENDING APPROVAL:	APPROVED:	SHEET CONTENTS:	SHEET NO.:	
	INSTALLATION OF SOLAR HARVESTING SYSTEM AT LUCINDA EXTENSION CAMPUS (STUDENT CENTER AND CFTR BUILDING)		ENGR. MISAEL REIGH MIEL V. CABANSAG <small>ELECTRICAL ENGINEER, OFDM</small>	AR. CHERRY L. FABIANES <small>HEAD, OFDM-PDU</small>	AR. ARLEN M. GUIEB <small>DIRECTOR, OFDM</small>	DR. GLADIE NATHERINE G. CABANIZAS <small>DIRECTOR, OSAS</small>	ATTY. GHEROLD C. BENITEZ <small>VP FOR ADMINISTRATION</small>	DR. ARNOLD E. VELASCO <small>PRESIDENT</small>	AS SHOWN	3
	PROJECT LOCATION: TSU LUCINDA EXTENSION CAMPUS								DATE: 2025	PAGE NO: 03/14

PV WIRING DIAGRAM

SCALE: NTS



PROJECT TITLE:
 INSTALLATION OF SOLAR HARVESTING SYSTEM AT LUCINDA
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 PROJECT LOCATION:
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PREPARED BY:

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REQUESTING OFFICE:

 DR. GLADIE NATHERINE G. CABANIZAS
 DIRECTOR, DSAS

RECOMMENDING APPROVAL:

 ATTY. GHEROLD C. BENITEZ
 PR FOR ADMINISTRATION

APPROVED:

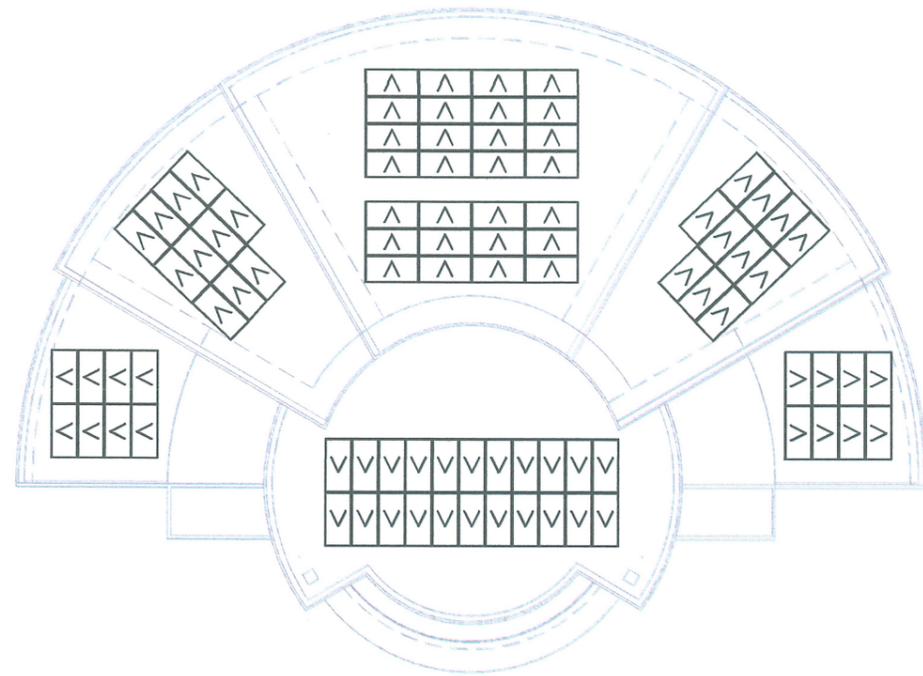
 DR. ARNOLD E. VELASCO
 RESIDENT

SHEET CONTENTS:
 AS SHOWN
 DATE: 2025

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 4
 PAGE NO.:
 04/14

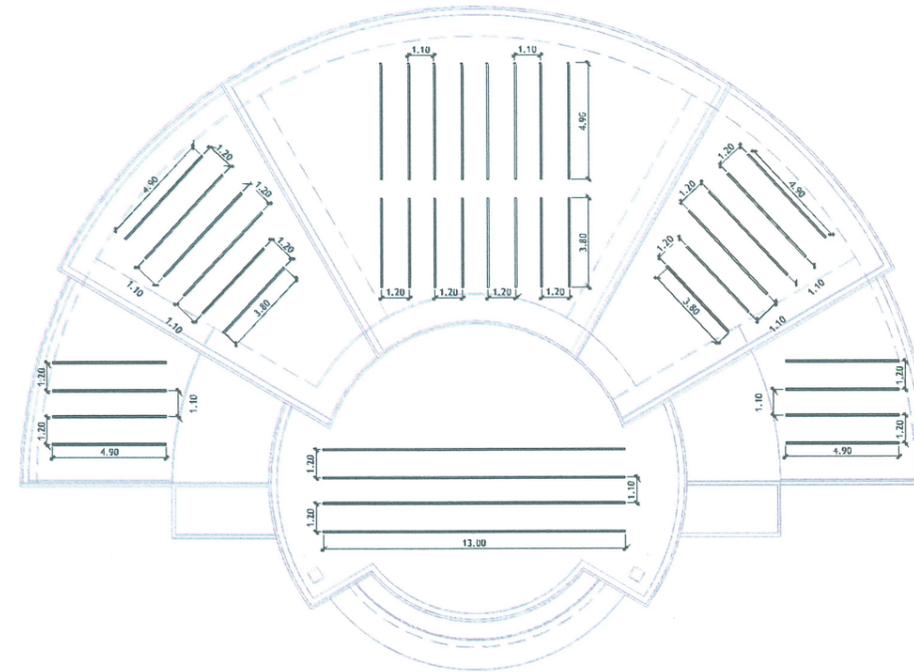
LEGEND

-  SOLAR PANEL RAILINGS
-  SOLAR PANEL
-  100 X 100 mm GALVANIZED CABLE TRAY



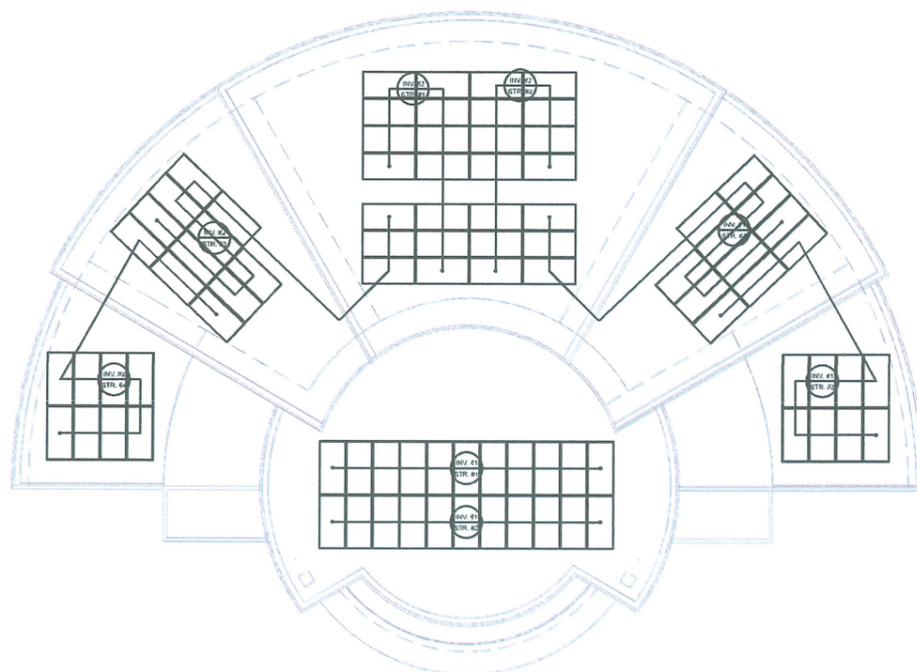
PV ROOF PLAN LAYOUT

SCALE: 1:300M



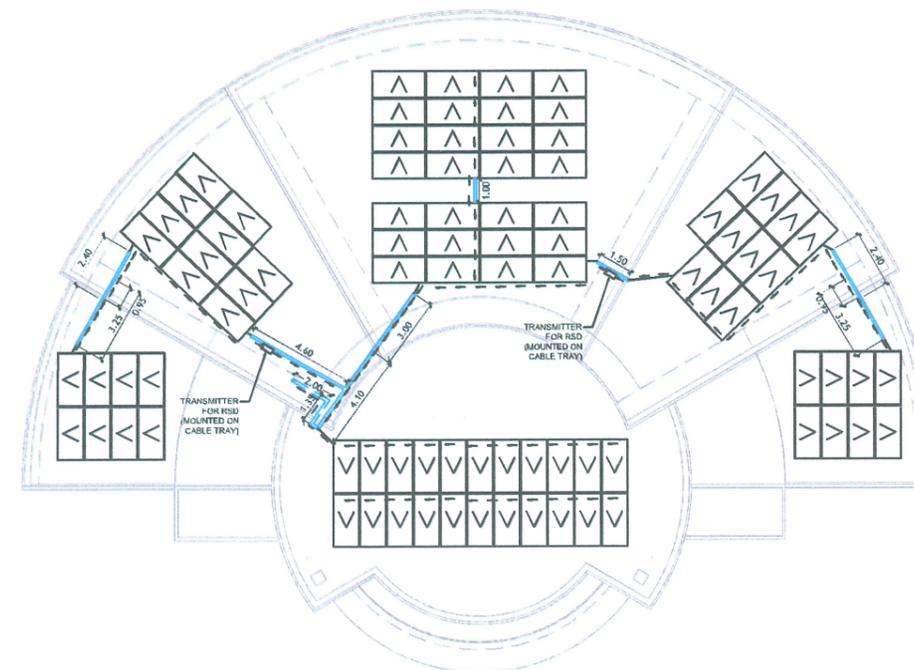
MOUNTING STRUCTURE LAYOUT

SCALE: 1:300M



PANEL DISTRIBUTION LAYOUT

SCALE: 1:300M



ROOF PLAN DC CABLE TRAY LAYOUT

SCALE: 1:300M



PROJECT TITLE:
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PROJECT LOCATION:
TSU LUCINDA EXTENSION CAMPUS

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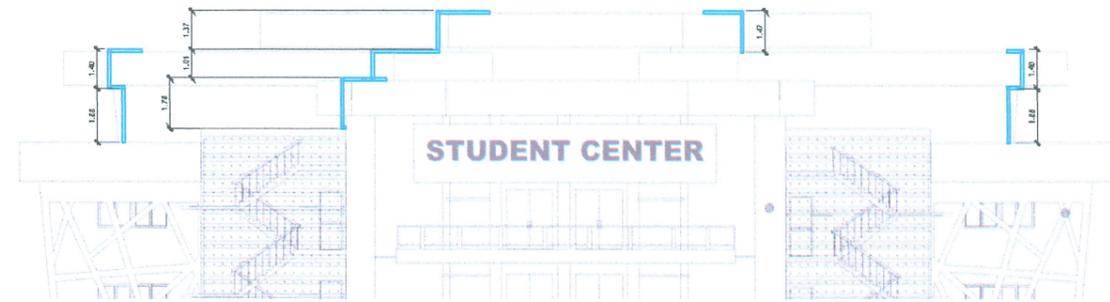
RECOMMENDING APPROVAL:

ATTY. GHEROLD C. BENITEZ
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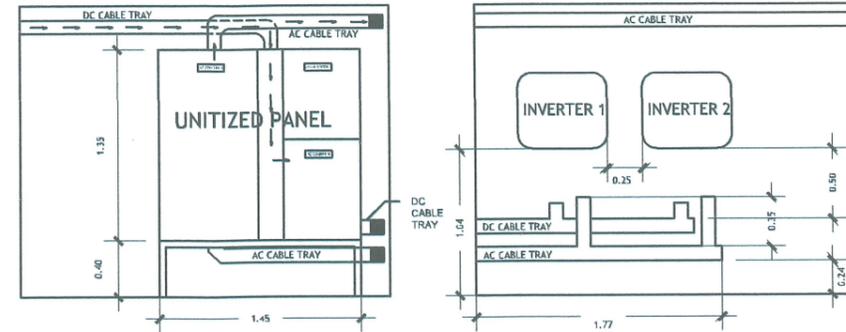
DR. ARNOLD E. VELASCO
PRESIDENT

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DATE: 2025	PAGE NO:
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FRONT ELEVATION DC CABLE TRAY LAYOUT

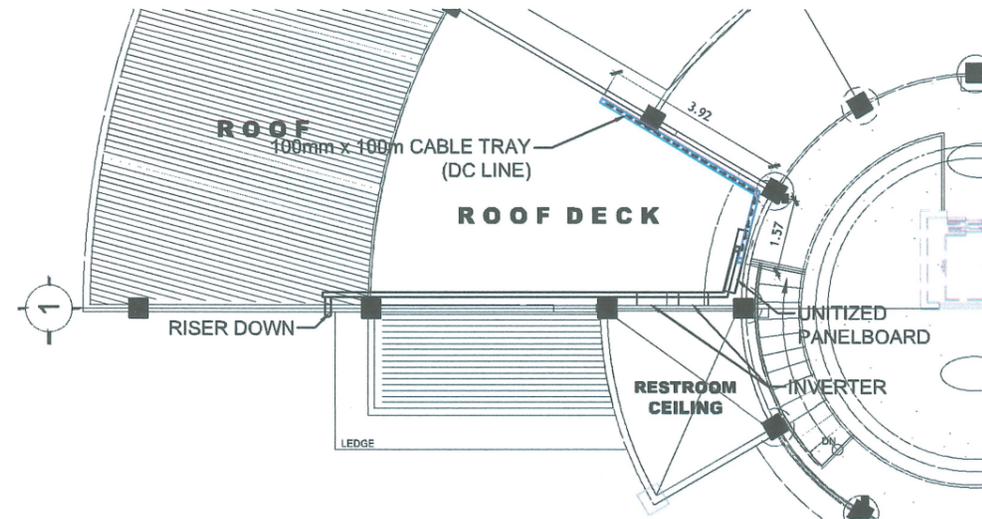
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EQUIPMENT LAYOUT

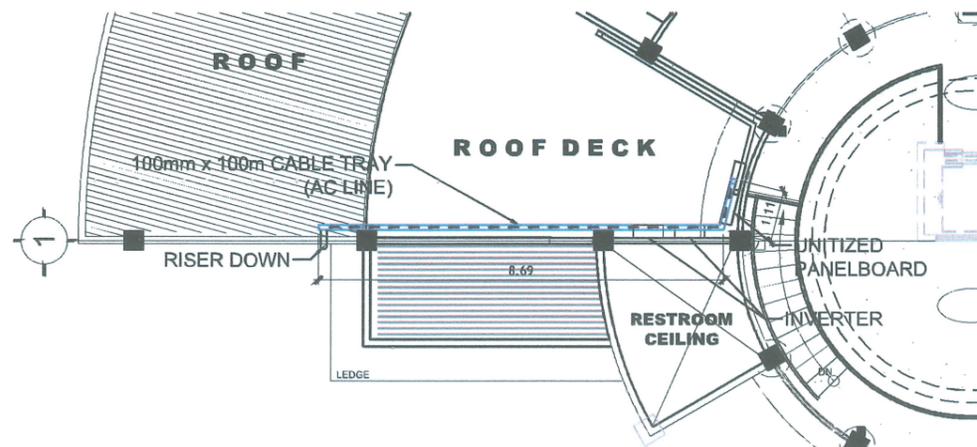
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LEGEND
 100 X 100 mm GALVANIZED CABLE TRAY



ROOF DECK DC CABLE TRAY LAYOUT

SCALE: 1:150M

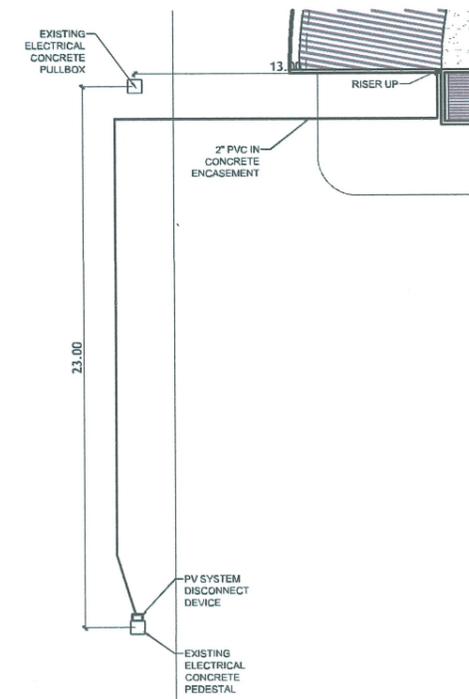


ROOF DECK AC CABLE TRAY LAYOUT

SCALE: 1:250M



FRONT ELEVATION



SITE DEVELOPMENT

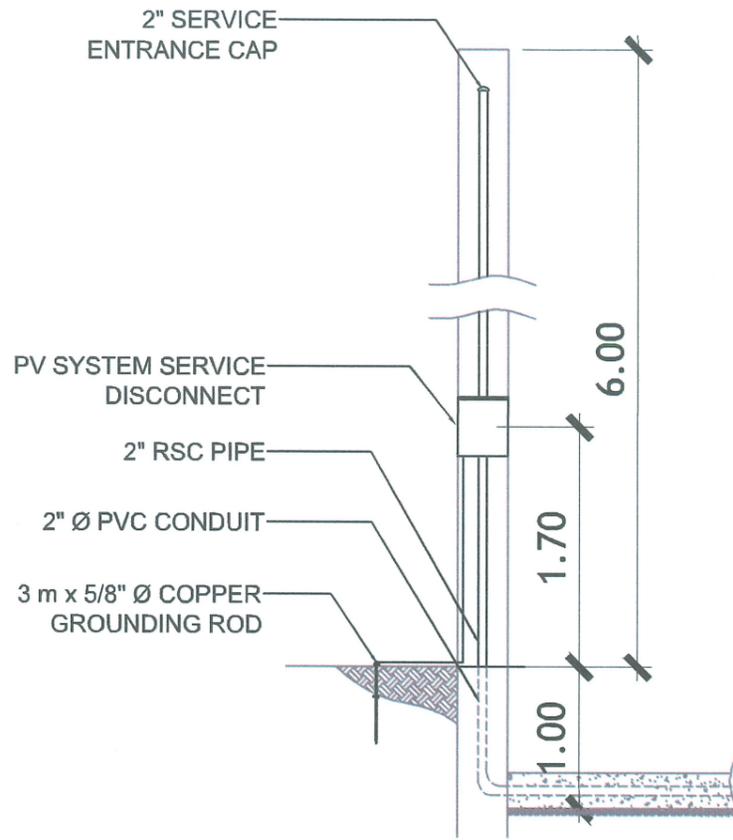
AC MAIN LINE LAYOUT

SCALE: 1:250M

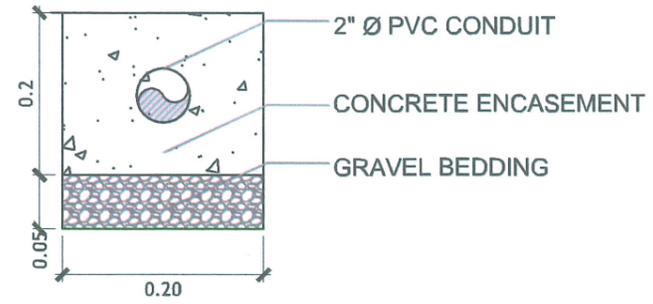


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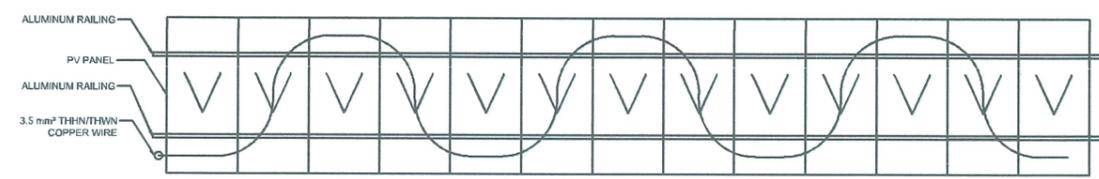


PV SYSTEM DISCONNECT DEVICE
SCALE: NTS

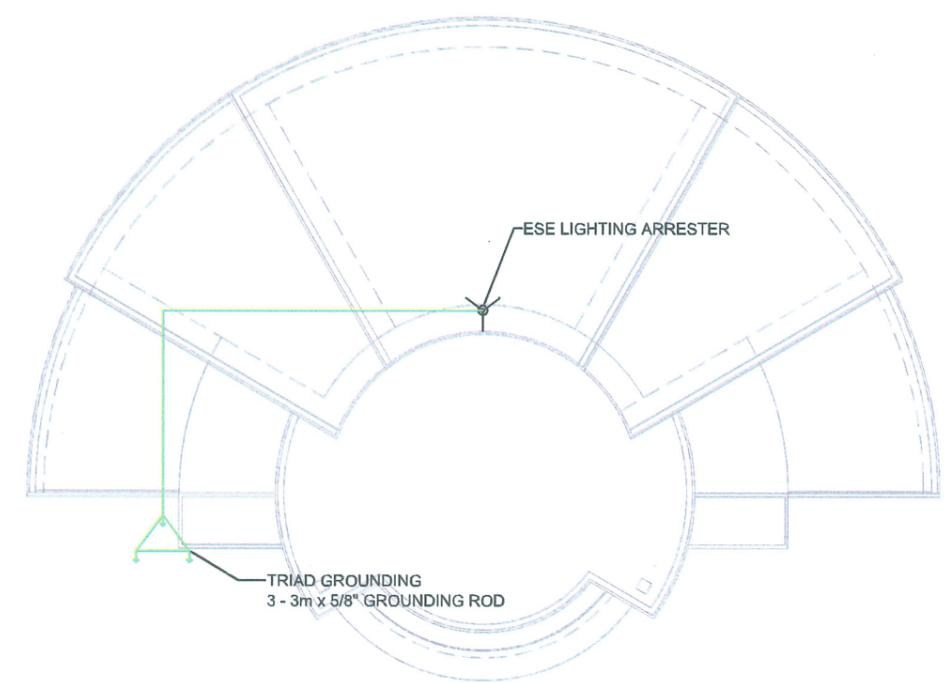


CONCRETE ENCASEMENT DETAIL
SCALE: 1:10MTS

- NOTES FOR GROUNDING SYSTEM:
1. ALL PV PANEL GROUNDING SHALL BE CONNECTED TO THE GROUNDING ROD.
 2. PV PANEL GROUNDING AND LIGHTNING LAYOUT SHALL HAVE SEPARATE GROUNDING ROD.
 3. GROUNDING RESISTANCE FOR LIGHTNING TERMINAL VALUE SHALL BE 5 OHMS OR LESS.



PV PANEL GROUNDING DETAIL
SCALE: NTS



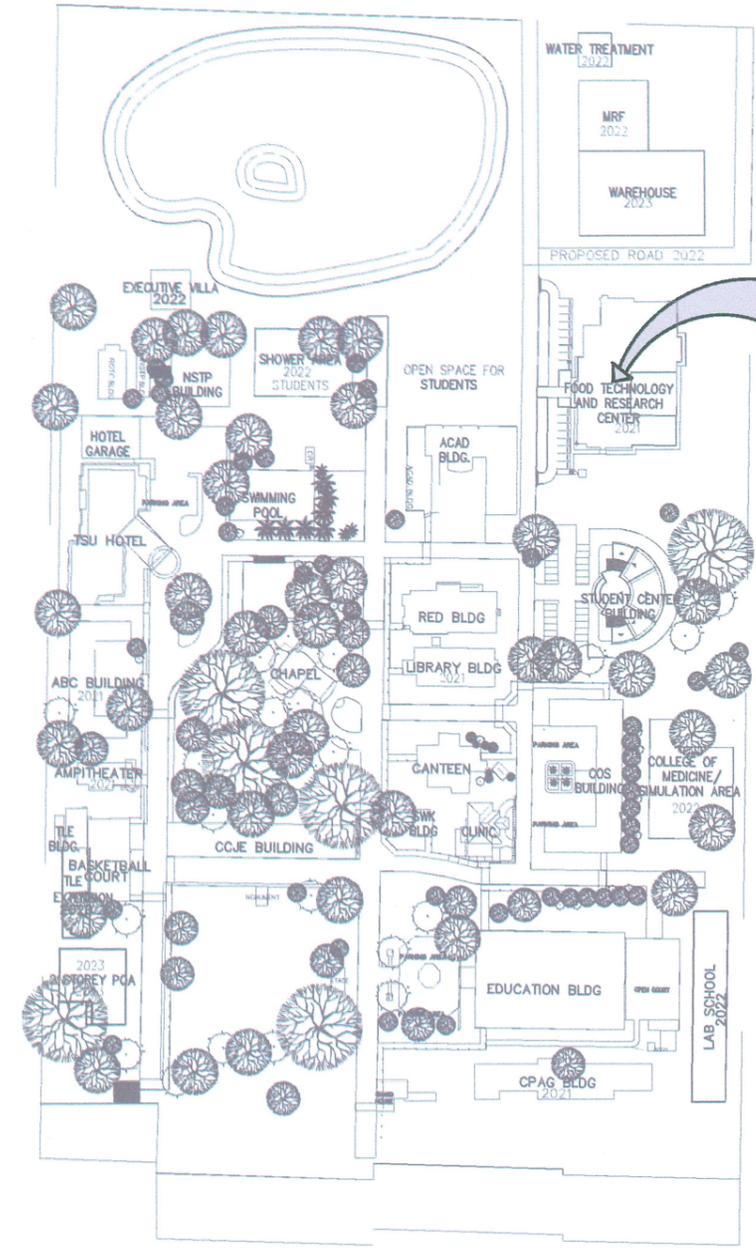
LIGHTNING TERMINAL LAYOUT
SCALE: 1:300MTS



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													DATE:	2025			



THE SITE



CENTER FOR FOOD TECHNOLOGY AND RESEARCH BUILDING

VICINITY MAP
SCALE: NTS

LUCINDA EXTENSION CAMPUS
SCALE: NTS

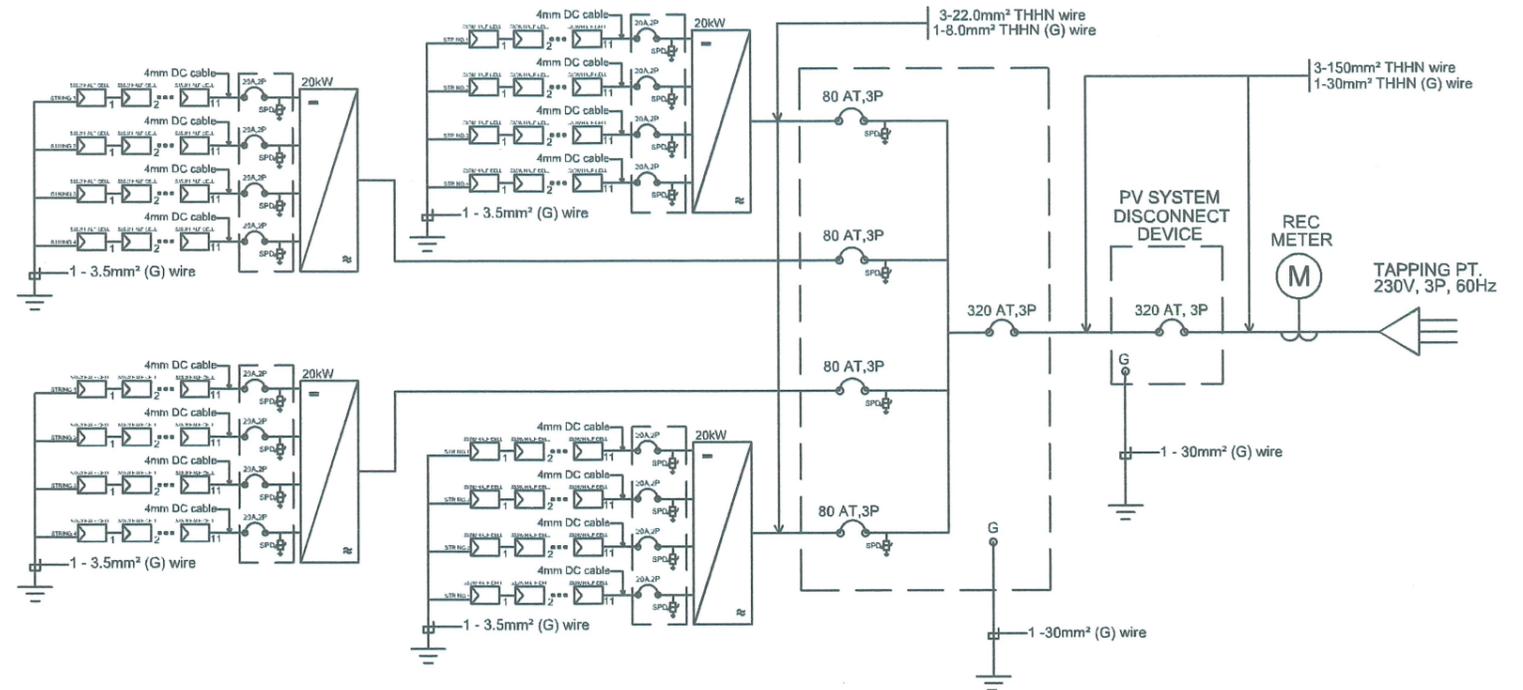
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	PROJECT LOCATION:	TSU LUCINDA EXTENSION CAMPUS						DATE: 2025	08/14

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- 1.5 METER SHOULD BE THE SPACING FROM ONE CONDUIT SUPPORT TO ANOTHER SUPPORT BY MEANS OF C-CHANNEL CLAMPS OR BY U-BOLT.
- WHENEVER REQUIRED AND NECESSARY PVC PULL BOXES AND JUNCTION BOXES SHALL BE INSTALLED AT CONVENIENT SPACE AND LOCATION.
- UPON COMPLETION OF ELECTRICAL CONSTRUCTION WORK, THE FOLLOWING TESTS SHALL BE PERFORMED BY THE CONTRACTOR INCLUSIVE OF THE INSTALLATION TO BE REPORTED IN DETAILS ON FORMS APPROVED BY THE OWNER'S REPRESENTATIVE.

- A. INSTALLATION RESISTANCE TEST B. GROUND RESISTANCE TEST
C. OPERATIONAL TEST D. SYSTEM TEST AND ACCEPTANCE

SINGLE LINE DIAGRAM



LOAD SCHEDULE

DC SCHEDULE OF LOADS

STRING	NO. OF MODULES PER STRING	TOTAL VOLTAGE (V)	CURRENT (A)	CB RATING	WIRE SIZE	CONDUIT
INV 1- STR. 1	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 1- STR. 2	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 1 - STR. 3	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 1 - STR. 4	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 2 - STR. 1	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 2 - STR. 2	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 2 - STR. 3	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 2 - STR. 4	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 3 - STR. 1	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 3 - STR. 2	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 3 - STR. 3	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 3 - STR. 4	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 4 - STR. 1	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 4 - STR. 2	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 4 - STR. 3	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray
INV 4 - STR. 4	11	446.82 V	13.45 A	20A, 2P, 1000V	4mm ² DC cable	100mm x 100mm Cable Tray

AC SCHEDULE OF LOADS

CKT. NO.	LOAD DESCRIPTION	VOLTAGE (V)	Capacity (VA)	CURRENT			CB RATING			WIRE SIZE	CONDUIT	
				AB	BC	AC	AT	AF	P			
1	20kW GRID TIED INV.	230 V	20000 W				78.44A	80A	100AF	3	3 - 22.0mm ² THHN + 1 - 8.0mm ² (G) wire	100mm x 100mm Cable Tray
2	20kW GRID TIED INV.	230 V	20000 W				78.44A	80A	100AF	3	3 - 22.0mm ² THHN + 1 - 8.0mm ² (G) wire	100mm x 100mm Cable Tray
3	20kW GRID TIED INV.	230 V	20000 W				78.44A	80A	100AF	3	3 - 22.0mm ² THHN + 1 - 8.0mm ² (G) wire	100mm x 100mm Cable Tray
4	20kW GRID TIED INV.	230 V	20000 W				78.44A	80A	100AF	3	3 - 22.0mm ² THHN + 1 - 8.0mm ² (G) wire	100mm x 100mm Cable Tray



TARLAC STATE UNIVERSITY
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Romulo Boulevard, Tarlac City, Philippines 2300

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PROJECT LOCATION:
TSU LUCINDA EXTENSION CAMPUS

PREPARED BY:

ENGR. MISAEL REIGH MIEL V. CABANSAG
ELECTRICAL ENGINEER, OFDM

CHECKED BY:

AR. CHERRY L. FABIANES
HEAD, OFDM-PDU

CERTIFIED BY:

AR. ARLEN M. GUIEB
DIRECTOR, OFDM

REQUESTING OFFICE:

DR. LEA B. MILAN
DIRECTOR, CFTR

RECOMMENDING APPROVAL:

ATTY. GHEROLD C. BENITEZ
VP FOR ADMINISTRATION

APPROVED:

DR. ARNOLD E. VELASCO
PRESIDENT

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DESIGN PARAMETERS AND CALCULATIONS

INVERTER PARAMETERS:

INPUT (DC)
 MAX DC POWER: 30000W
 MAX INPUT VOLTAGE: 800V
 RATED INPUT VOLTAGE: 360V
 MAX INPUT CURRENT PER STRING: 26A
 NUMBER OF INDEPENDENT MPP: 4

SOLAR PANEL PARAMETERS:

RATED MAX POWER at STC: 550W
 OPEN CIRCUIT VOLTAGE: 49.62V
 MAXIMUM POWER VOLTAGE: 40.90V
 SHORT CIRCUIT CURRENT: 14.03A
 MAXIMUM POWER CURRENT: 13.45A

RAPID SHUTDOWN DEVICE PARAMETERS:

RATED MAX POWER: 700W

OUTPUT (AC)

RATED POWER: 20000W
 MAX APPARENT POWER: 22000VA
 NOMINAL AC VOLTAGE / RANGE: 230V
 RATED POWER FREQUENCY / RANGE: 60Hz
 MAX OUTPUT CURRENT: 58A
 POWER FACTOR AT RATED POWER: 0.8 leading-0.8 lagging
 FEED IN PHASES: 3

DC SIDE DESIGN ANALYSIS

$$\text{Total No. of Solar Panels} = \frac{\text{Plant Capacity}}{\text{Solar Power Module Rating}} = \frac{96800W}{550W} = 176 \text{ pcs. Solar Modules rated @ 550W each}$$

$$\text{Total No. of Inverters} = \frac{\text{Plant Capacity}}{\text{Inverter Max. Power}} = \frac{96800W}{20000W} = 4.84 \approx 4 \text{ Inverter}$$

Number of Panels per String = 11

Voltage per String = No. of Panels x Open Ckt Voltage = 11 x 49.62V = 545.82 V

Ampere Rating at DC Side: $I_s = 14.03 \text{ A}$

DC Cable: 4mm² THHN Cu. WIRE & 3.5mm² THHN WIRE for GRND WIRE IN CABLE TRAY

VOLTAGE DROP FOR DC SIDE

$$V_d = \frac{2 \times L \times I \times R}{1000 \text{ ft}} = \frac{2 \times 300 \text{ ft.} \times 13.45 \text{ A} \times 1.931 \text{ ohms}}{1000 \text{ ft}}$$

$$V_d = 15.58 \text{ V}$$

$$= \frac{V_d}{(\text{no. of panel per strings}) \times V_{oc}} \times 100$$

$$= \frac{15.58 \text{ V}}{11 \times 49.62 \text{ V}} \times 100 = 2.86 \%$$

AC SIDE DESIGN ANALYSIS

FOR INVERTERS

$$\text{Demand Load in Amperes: } \frac{\text{Max. AC Output Power}}{\sqrt{3} \times \text{nominal AC Voltage} \times \text{Power Factor}} = \frac{20000w}{\sqrt{3} \times 230 \times .8} = 62.76 \text{ A}$$

CIRCUIT BREAKER RATING: Use 80AT/100AF, 230V, 3P Circuit Breaker

SUB FEEDER: 3 - 22.0mm² THHN Cu. WIRE & 1 - 8.0mm² THHN WIRE for GROUND WIRE IN 100mm x 100mm Cable Tray

FOR MAIN BREAKER

$$\text{Demand Load in Amperes: } \frac{\text{Max. AC Output Power}}{\sqrt{3} \times \text{nominal AC Voltage} \times \text{Power Factor}} = \frac{80000w}{\sqrt{3} \times 230 \times .8} = 251.03 \text{ A}$$

CIRCUIT BREAKER RATING: Use 320AT/1000AF, 230V, 3P Circuit Breaker

MAIN FEEDER: 3 - 150mm² THHN Cu. WIRE & 1 - 30mm² THHN WIRE for GROUND WIRE IN 3" Ø RSC Pipe

VOLTAGE DROP FOR AC SIDE

$$V_d = \frac{1.732 \times L \times I \times Z}{305 \text{ m}} = \frac{1.732 \times 30 \text{ m} \times 251.03 \times 0.065 \text{ ohms}}{305 \text{ m}}$$

$$V_d = 2.78 \text{ V}$$

$$= \frac{V_d}{\text{Nominal voltage}} \times 100$$

$$= \frac{2.78 \text{ V}}{230 \text{ V}} \times 100 = 1.21 \%$$

SHORT CIRCUIT CALCULATION



SHORT CIRCUIT LEVEL FOR UTILITY ASSUMED AS 1000MVA

3 - 167 KVA TRANSFORMER, 13.8/0.23, 3Ø, 60HZ

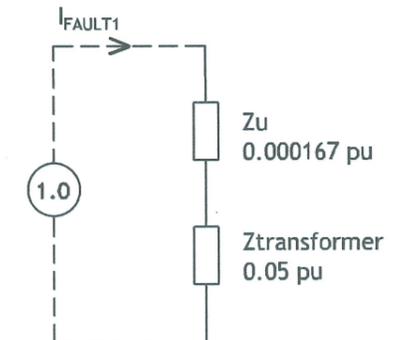
BASE MVA : 0.501 MVA
 BASE V: 230 V

$$Z_{utility} = 501 / 1,000 = 0.000501 \text{ pu}$$

$$Z_{transformer} = 5/100 = 0.05 \text{ pu}$$

$$Z_{total} = 0.000501 + 0.05 = 0.050501 \text{ pu}$$

NOTE: IMPEDANCE OF THE CONDUCTOR IS ASSUME AS NEGLIGIBLE.



FAULT 1

$$I_{sc} = (1 / Z_{total}) \times [\text{KVA base} / (1.732 \times 230)]$$

$$= (1 / 0.050501) \times [501 \times 10^3 / (1.732 \times 230)]$$

$$= 24.903 \text{ kAIC}$$

SAY: 25 KAIC

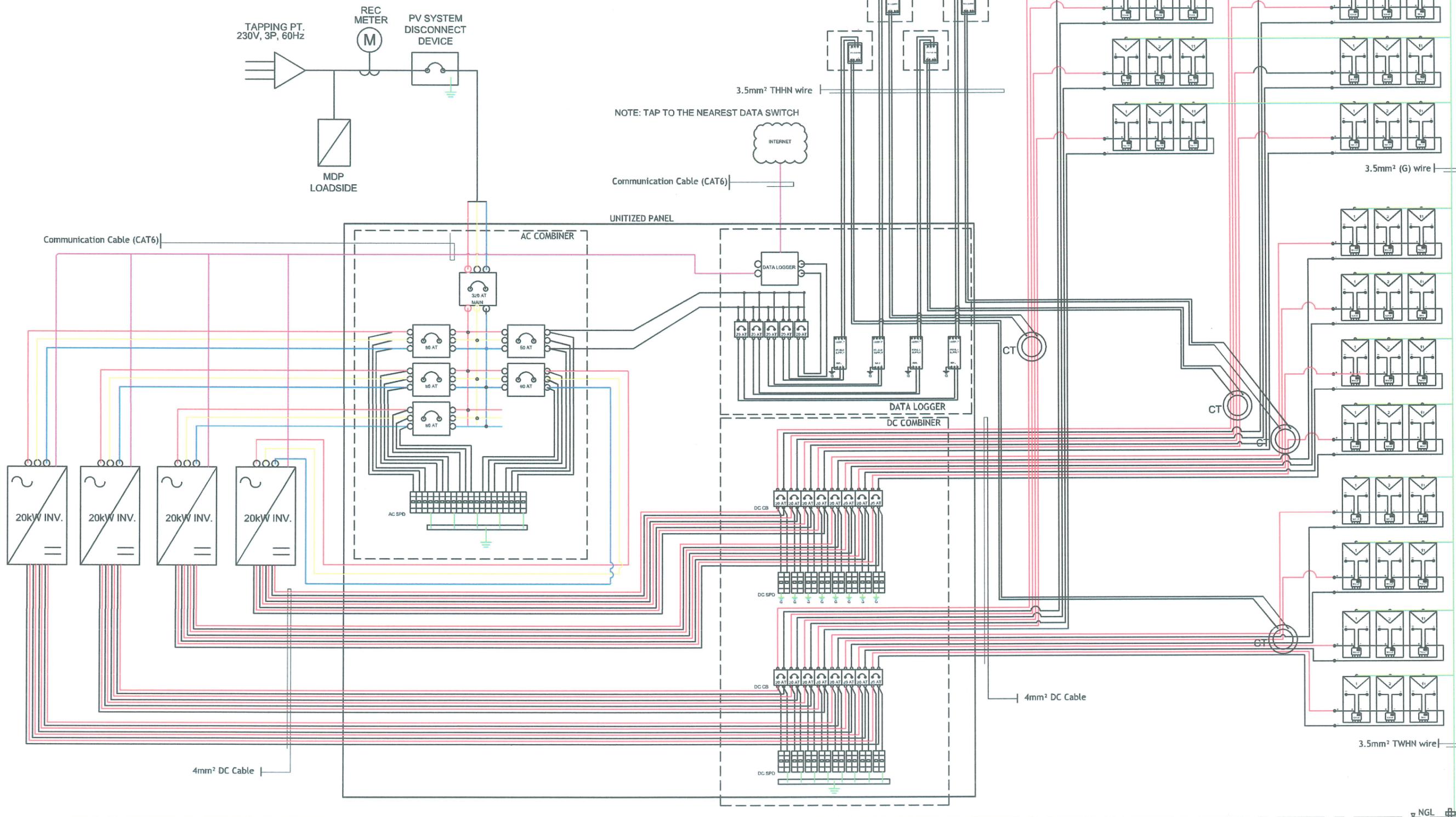


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PV WIRING DIAGRAM

SCALE: NTS

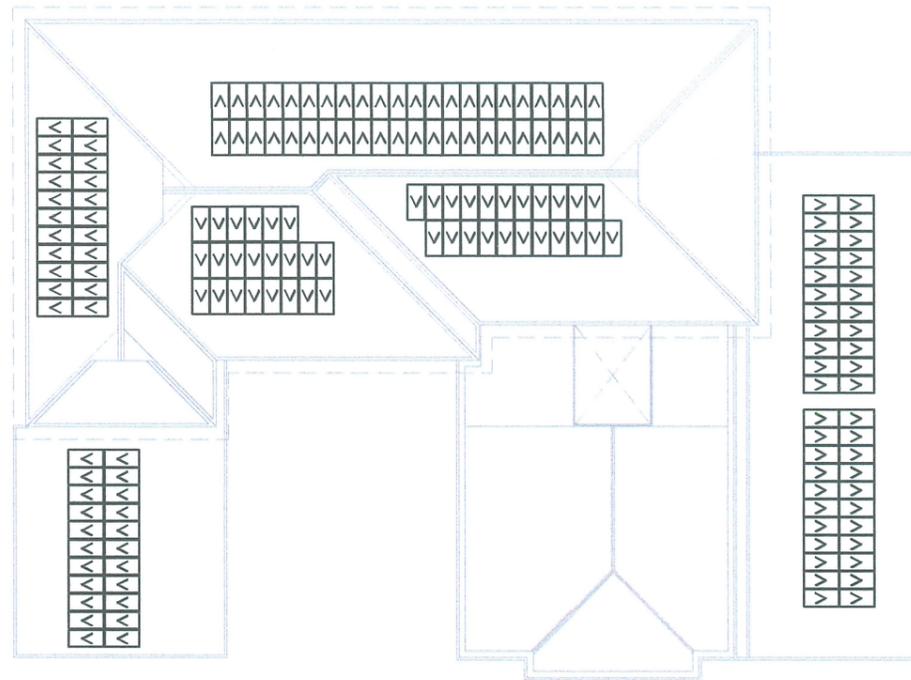


3 m x 5/8" Ø COPPER GROUNDING ROD

 TARLAC STATE UNIVERSITY Facilities Development and Management Office Romulo Boulevard, Tarlac City, Philippines 2300	PROJECT TITLE:	PREPARED BY:	CHECKED BY:	CERTIFIED BY:	REQUESTING OFFICE:	RECOMMENDING APPROVAL:	APPROVED:	SHEET CONTENTS:	SHEET NO:
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	PROJECT LOCATION:	TSU LUCINDA EXTENSION CAMPUS		DATE: 2025	11/14				

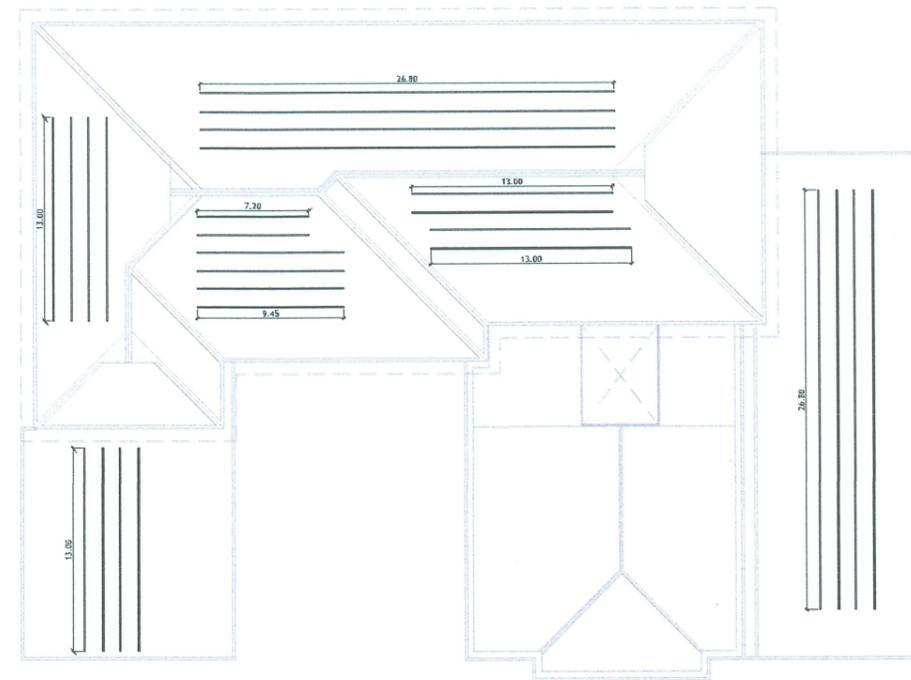
LEGEND

-  SOLAR PANEL RAILINGS
-  SOLAR PANEL
-  100 X 100 mm GALVANIZED CABLE TRAY



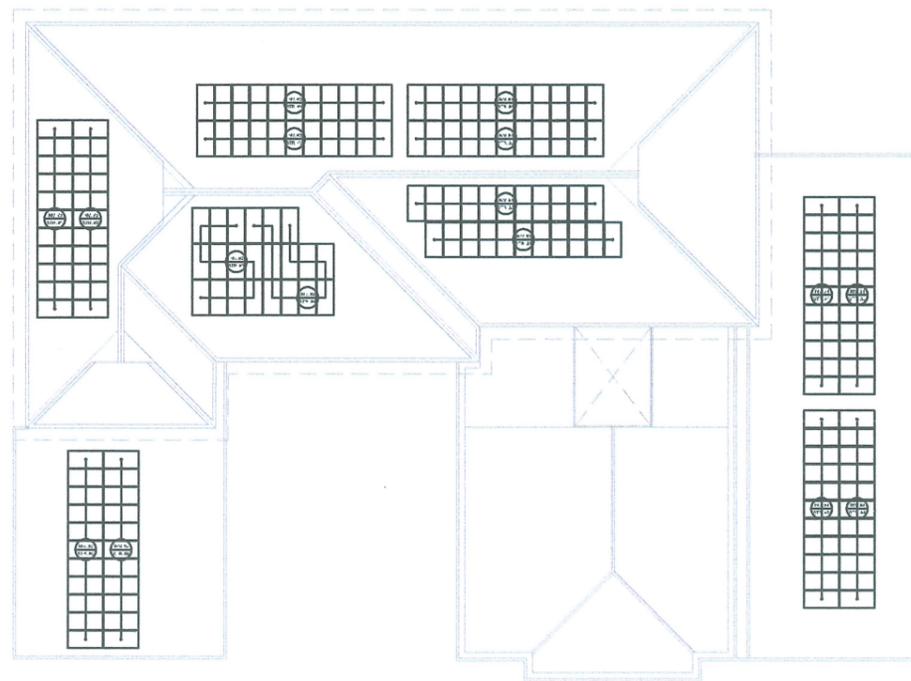
PV ROOF PLAN LAYOUT

SCALE: 1:450M



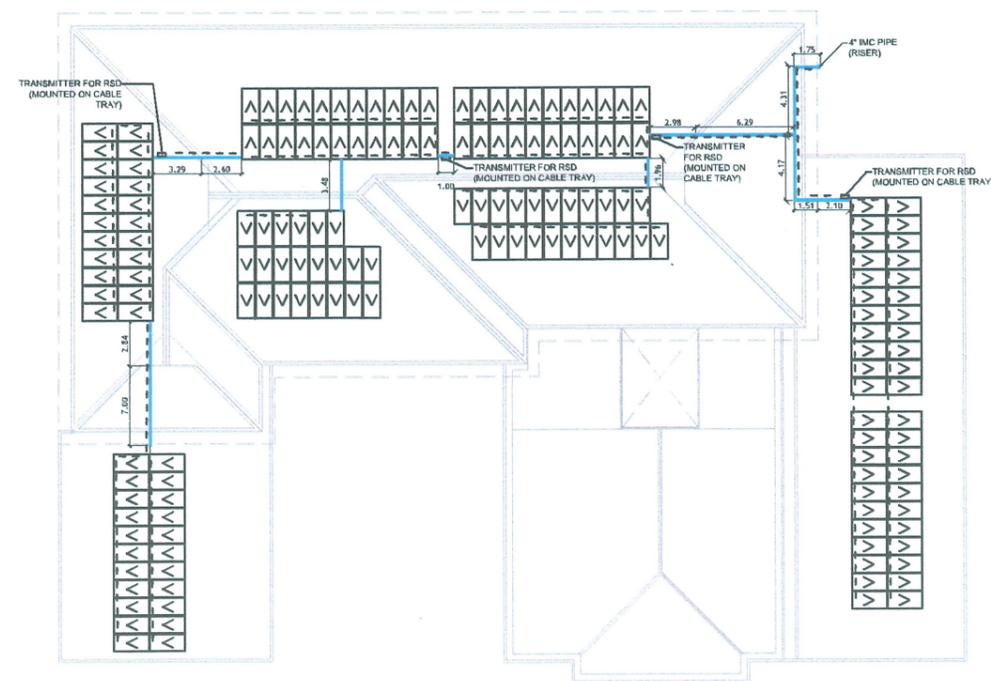
MOUNTING STRUCTURE LAYOUT

SCALE: 1:450M



PANEL DISTRIBUTION LAYOUT

SCALE: 1:450M



ROOF PLAN DC CABLE TRAY LAYOUT

SCALE: 1:450M



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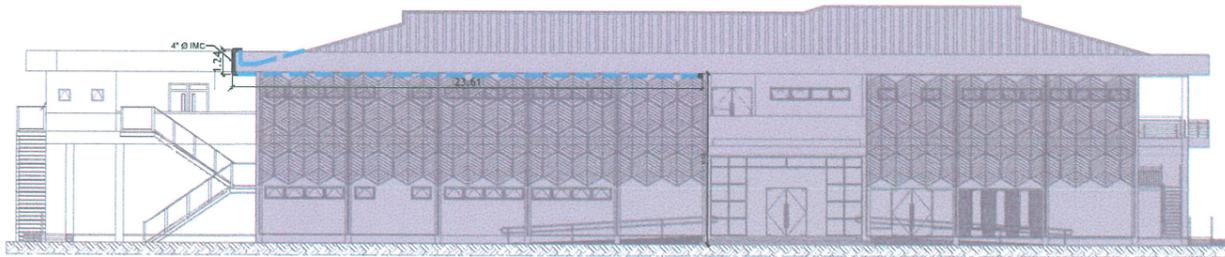
DR. ARNOLD E. VELASCO
PRESIDENT

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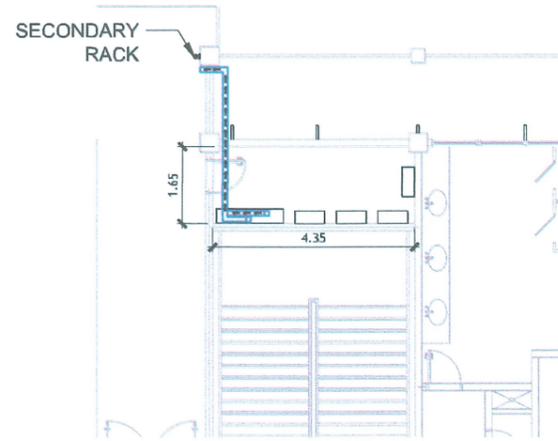
LEGEND

100 X 100 mm GALVANIZED CABLE TRAY

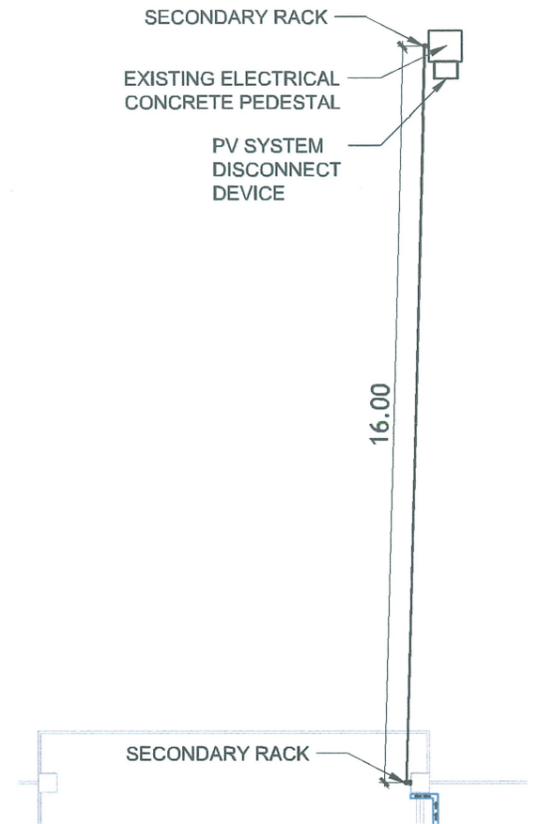


FRONT ELEVATION DC CABLE LAYOUT

SCALE: 1:350M

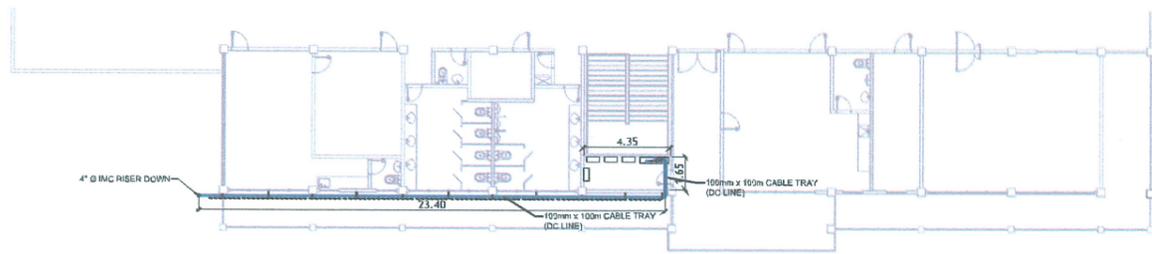


SECOND FLOOR



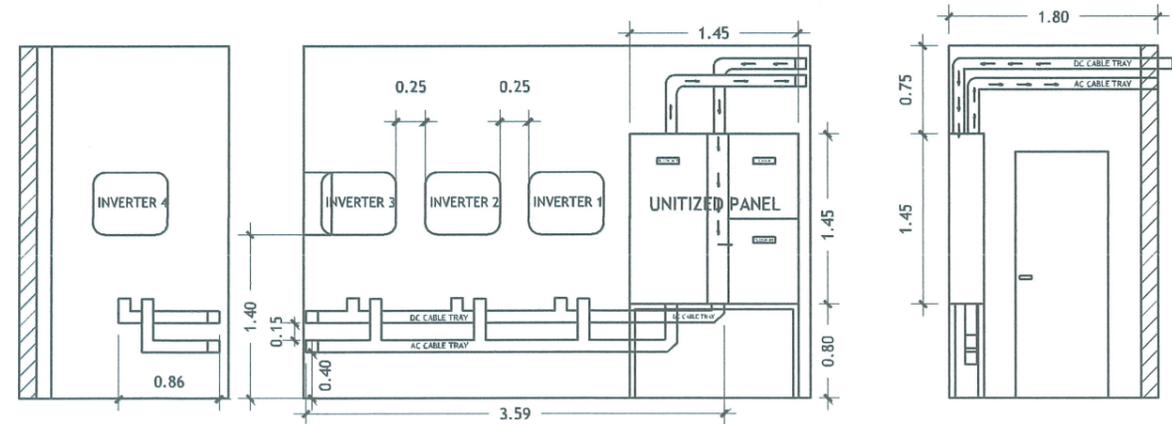
AC CABLE LAYOUT

SCALE: 1:150 MTS



SECOND FLOOR PLAN DC CABLE LAYOUT

SCALE: 1:350M

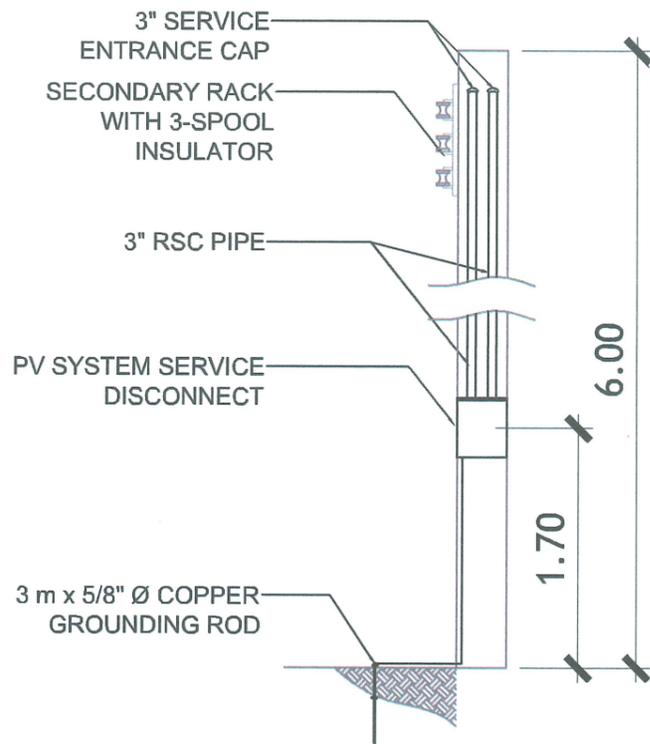


EQUIPMENT LAYOUT

SCALE: 1:60MTS



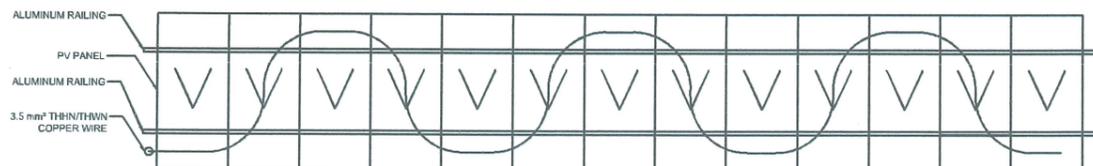
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PV SYSTEM DISCONNECT DEVICE

SCALE:

NTS



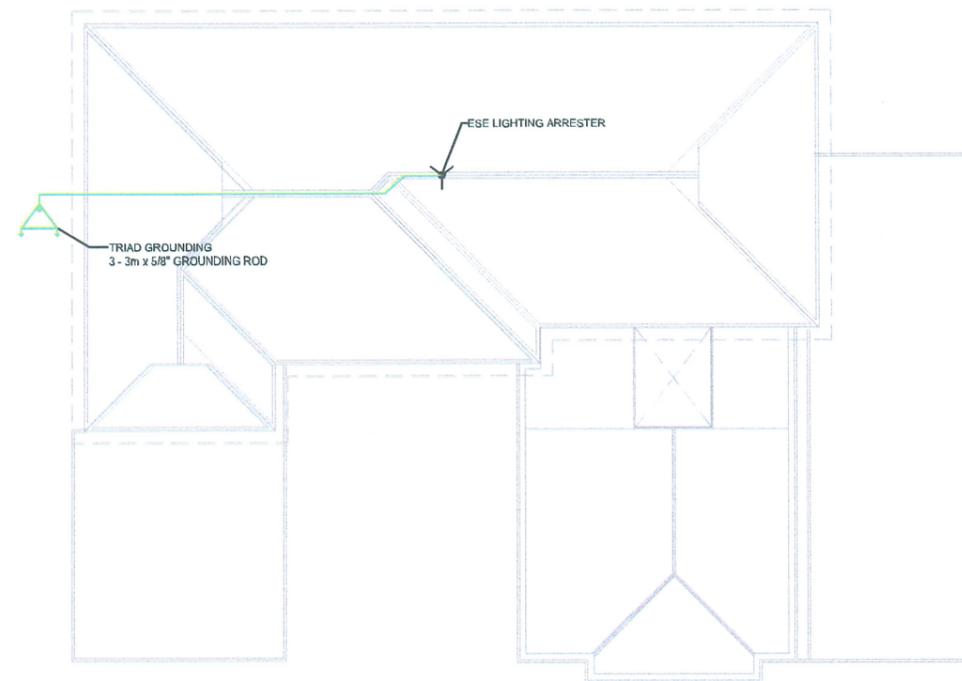
PV PANEL GROUNDING DETAIL

SCALE:

NTS

NOTES FOR GROUNDING SYSTEM:

1. ALL PV PANEL GROUNDING SHALL BE CONNECTED TO THE GROUNDING ROD.
2. PV PANEL GROUNDING AND LIGHTNING LAYOUT SHALL HAVE SEPARATE GROUNDING ROD.
3. GROUNDING RESISTANCE FOR LIGHTNING TERMINAL VALUE SHALL BE 5 OHMS OR LESS.



LIGHTNING TERMINAL LAYOUT

SCALE:

1:450MTS

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