PHOTOVOLTAIC ROOF MOUNT SYSTEM

CODE AND STANDARDS

THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC POWER SYSTEMS SHALL COMPLY WITH THE FOLLOWING CODES:

- 2020 NATIONAL ELECTRICAL CODE
- 2018 NORTH CAROLINA RESIDENTIAL CODE
- 2018 NORTH CAROLINA BUILDING CODE
- ALL OTHER ORDINANCE ADOPTED BY THE LOCAL GOVERNING AGENCIES

SITE NOTES / OSHA REGULATION

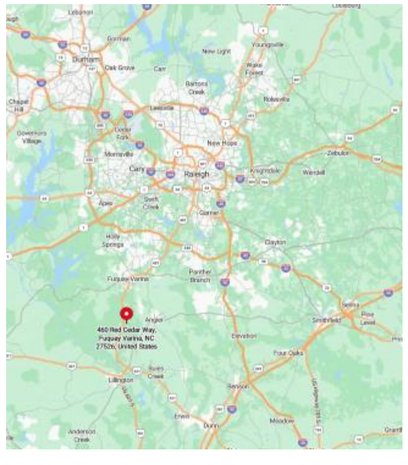
1. A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
2. THE SOLAR PV INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
3. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED AND IDENTIFIED BY RECOGNIZED ELECTRICAL TESTING LABORATORY.
4. MODULES AND SUPPORT STRUCTURES SHALL BE GROUNDED
5. SOLAR INVERTER SHALL BE LISTED TO UL1741
6. ALL CONDUCTORS SHALL BE COPPER AND SHOULD BE 75 AND 90 DEG RATED
7. REMOVAL OF AN INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR, THE PHOTOVOLTAIC SOURCE AND OUTPUT CIRCUIT GROUNDED CONDUCTORS.
8. LIVE PARTS OF PV SOURCE CIRCUITS AND PV OUTPUT CIRCUITS OVER 150V TO GROUND SHALL NOT BE ACCESSIBLE TO OTHER THAN QUALIFIED PERSONS WHILE ENERGIZED.
9. ALL PV MODULES AND ASSOCIATED EQUIPMENT AND WIRING SHALL BE PROTECTED FROM PHYSICAL DAMAGE.

SOLAR CONTRACTOR

1. MODULE CERTIFICATIONS INCLUDE UL1703, IEC61646, IEC61370.
2. IF APPLICABLE, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE MARKED GROUNDING LUG HOLES PER THE MANUFACTURERS INSTALLATION REQUIREMENTS.
3. AS INDICATED BY DESIGN, OTHER NRTL LISTED MODULE GROUNDING DEVICES MAY BE USED IN PLACE OF STANDARD GROUNDING LUGS AS SHOWN IN MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ.
4. ALL MICROINVERTERS, PHOTOVOLTAIC MODULES, AC COMBINERS, DC-AC CONVERTERS AND SOURCE CIRCUIT COMBINERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER NEC690.4(B).
5. ALL SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH LOCAL BUILDING CODE.
6. TERMINALS AND LUGS WILL BE TIGHTENED TO MANUFACTURER TORQUE SPECIFICATIONS (WHEN PROVIDED) IN ACCORDANCE WITH NEC CODE 110.14(D) ON ALL ELECTRICAL CONNECTIONS.
7. MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC UNLESS NOT AVAILABLE.

SR.#	PROJECT INFORMATION	
1	PV MODULES	26 x Canadian Solar CS6.1-54TM-450H
2	INVERTER + BATTERY	01 X POWERWALL3
3	ROOF TYPE	ASPHALT SHINGLES
4	RACKING	PSR-B84 RAILS (BLACK)
5	MOUNTING TYPE	INSTAFLASH2
6	DC SIZE	11.70 KW
7	AC SIZE	11.5 KVA

SR.#	PROJECT INFORMATION	
1	PV1	DRAWING INDEX
2	PV2	SITE LAYOUT
3	PV3	STRING MAPPING
4	PV4	ELECTRICAL ONE LINE DIAGRAM
5	PV5	DETAILED ELECTRICAL WIRING SCHEMATIC
6	PV6	PV LABELS
7	PV7	BILL OF MATERIALS
8	PV8	ATTACHMENT DETAILS



VICINITY MAP

TOP VIEW OF THE BUILDING

DESIGN CRITERIA
WIND SPEED: 120 MPH
GROUND SNOW LOAD: 15 PSF
WIND EXPOSURE FACTOR: B

UTILITY COMPANY:
DUKE ENERGY

PERMIT ISSUER (AHJ):
HARNETT COUNTY

SCOPE OF WORK
INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM.

8MSOLAR
ADVANCING ENERGY INDEPENDENCE

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Customer Signature:

Sheet Name:

Drawing Index

JOB NUMBER:

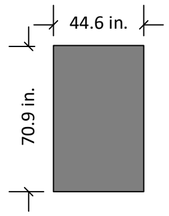
25-167-WG

Date:	**Revision:**
05/22/2025	A
Sheet Size: ANSI C 17" X 22"	**Sheet Number:** PV1

NABCEP CERTIFIED
PV Installation Professional
Ali Buttar
PVIP #031310-32

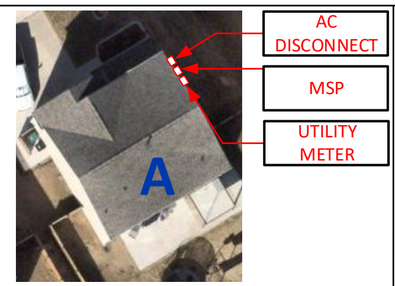
ROOF DESCRIPTION			
ROOF	PITCH	AZIMUTH	NO. OF MODULES
A	27°	149°	26
Vent	■	No vent will be covered by PV modules during the installation.	

MODULE DIMENSIONS

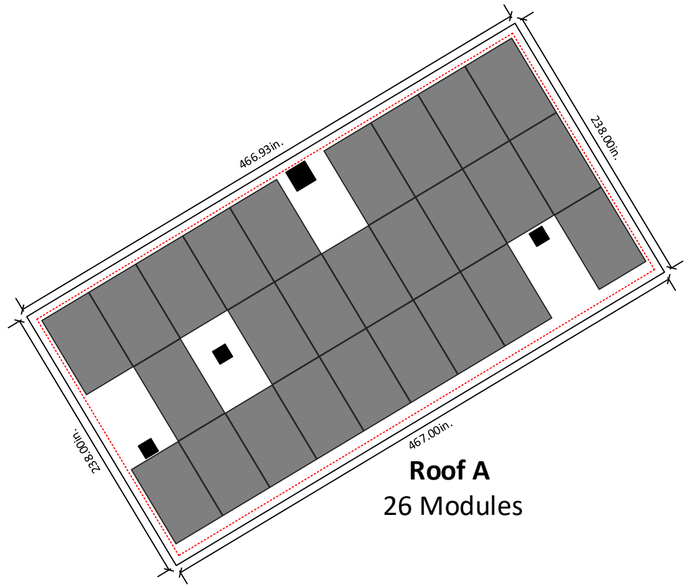


PV System Dead Load
(Panel + Racking weight) / PV System Area
(No. of panels x Weight of panel(lbs.) +Length of racking(ft.) x 1.15 lb.ft) /
(No. of panels x Height x Width) = Total psf

ROOF	A			
DEAD LOAD (PSF)	2.70			



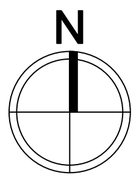
SYSTEM DETAILS
NUMBER OF PANELS : 26
PANELS MODEL : CANADIAN SOLAR CS6.1-54TM-450H450W
DC SIZE : 11.70 KW
AC SIZE : 11.5 KVA



Roof A
26 Modules

6in setback from sides of the roof

SITE LAYOUT
SCALE: 1/8" - 1'



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Sheet Name:
Site Layout

JOB NUMBER:
25-167-WG

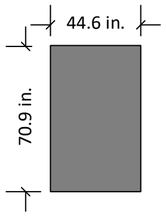
Date:	Revision:
05/22/2025	A

Sheet Size:	Sheet Number:
ANSI C 17" X 22"	PV2

NABCEP CERTIFIED
PV Installation Professional
Ali Buttar
PVIP #031310-32

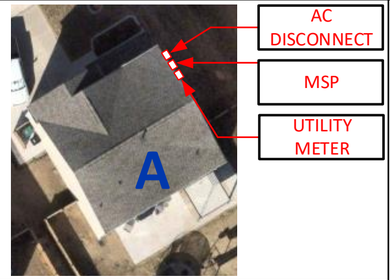
ROOF DESCRIPTION			
ROOF	PITCH	AZIMUTH	NO. OF MODULES
A	27°	149°	26
Tesla MCI (Mid Circuit Interrupter)			

MODULE DIMENSIONS

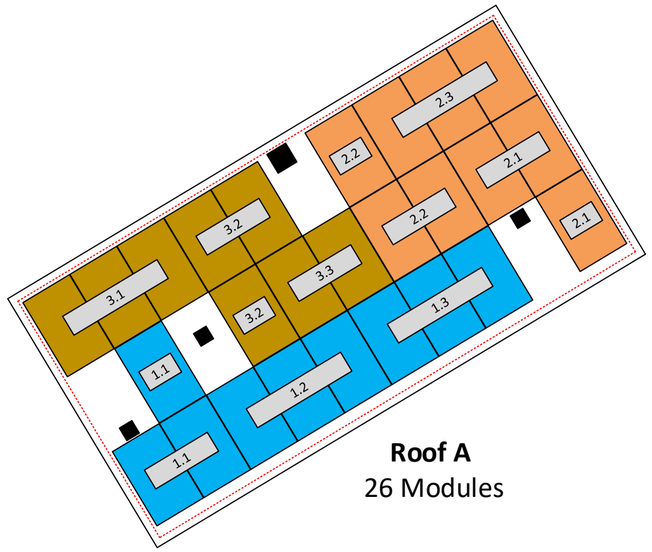


STRING LAYOUT

TESLA POWERWALL3					
Strings #	No. of Modules	Color	Strings #	No. of Modules	Color
String 1	09				
String 2	09				
String 3	08				



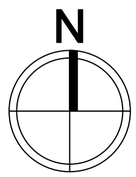
SYSTEM DETAILS
NUMBER OF PANELS : 26
PANELS MODEL : CANADIAN SOLAR CS6.1-54TM-450H450W
DC SIZE : 11.70 KW
AC SIZE : 11.5 KVA



Roof A
26 Modules

6in setback from sides of the roof

STRING MAPPING
SCALE: 1/8" - 1'



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Sheet Name:
String Mapping

JOB NUMBER:
25-167-WG

Date:	Revision:
05/22/2025	A

Sheet Size:	Sheet Number:
ANSI C 17" X 22"	PV3

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PV Installation Professional
Ali Buttar
PVIP #031310-32

STRING CALCULATION

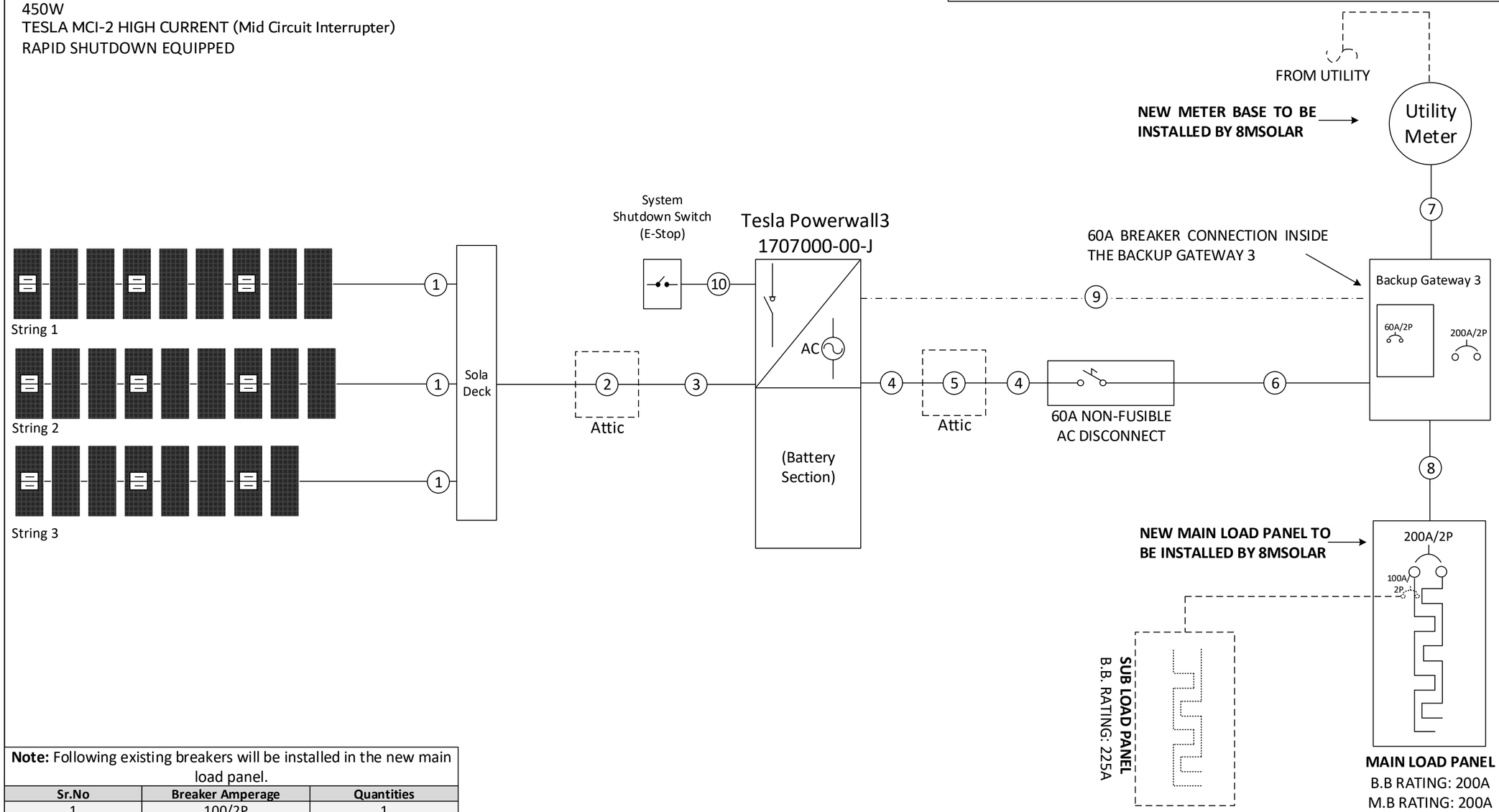
String #	No of Modules	Estimated Power	Imax	Impp	Voc	Vmpp
1,2	09	4,050 W	21.31 Adc	13.66 Adc	350.1 Vdc	550 Vdc
3	08	3,600 W	21.31 Adc	13.66 Adc	311.2 Vdc	550 Vdc

NEC Code (2020) and UL Standard Refrences

Rapid Shut Down	NEC 690.12 (A-D), UL1741	Grounding	NEC Article 250.30(A)
Disconnecting Means	NEC 690.13	Conduit Fill	NEC Table C.9, 310.15(B)(3)(a)
Feeder Sizing	NEC Table 310, 15(B)(16, 17)	Interconnection	NEC 705.12
Over current Protection	NEC 690.9		

Service Side Work: Power Drop Required

26 X CANADIAN SOLAR CS6.1-54TM-450H
450W
TESLA MCI-2 HIGH CURRENT (Mid Circuit Interrupter)
RAPID SHUTDOWN EQUIPPED



Note: Following existing breakers will be installed in the new main load panel.

Sr.No	Breaker Amperage	Quantities
1	100/2P	1
2	40/2P	1
3	35/2P	1

- System Size: 11,700W DC
- Battery Total Energy: 13.5 KWh
- (26) Canadian Solar CS6.1-54TM-450H
- (09) 1879359-15-B: Tesla MCI-2 High Current
- (01) Tesla Powerwall3 (1707000-00-J)
- Inverter Output: 48A max @ 240 VAC (each)
- 11.5 kVA AC output max

- Grounding will be done via Pegasus grounding lugs and mid-clamps to ensure the rail and panels are continuously grounded.
- Rapid Shutdown is included in the Mid Circuit Interrupter , refer to Mid Circuit Interrupter and Inverter attached datasheets.
- The load center/disconnect will be visible, lockable, accessible to utility linesmen, and properly labeled per NEC requirements. It will be located on the exterior wall next to the utility meter.
- Prepare cable in usual manner.
- Stretch tape and apply half-lapped to form void-free joint. Degree of stretch is not critical and may vary in different sections of joint to accomplish void-free application.
- Protect the joint with two half-lapped layers of any scotch vinyl plastic electrical tape.

Sr.No	#Wire	Conduit Size	Ground Wire	Amperage
1	2 x #10 PV		#10 Bare Cu	21.31
2	6 x #10 THHN Cu	3/4” LFMC	#10 Green Cu	21.31
3	6 x #10 THHN Cu	3/4” EMT	#10 Green Cu	21.31
4	3 x #6 THHN Cu	1” EMT	#6 Green Cu	60
5	3 x #6 THHN Cu	1” LFMC	#6 Green Cu	60
6	3 x #6 THHN Cu	1” LFNC	#6 Green Cu	60
7	3 x #3/0 THHN Cu	2” PVC		200
8	3 x #3/0 THHN Cu	2” PVC	#6 Green Cu	200
9	4-conductor shielded (1 twisted pair) 16 AWG			
10	2-conductor shielded (1 twisted pair) 16 AWG	1/2” LFNC		

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Sheet Name:

Electrical One Line Diagram

JOB NUMBER:

25-167-WG

Date:

05/22/2025

Revision:

A

Sheet Size:

ANSI C
17" X 22"

Sheet Number:

PV4

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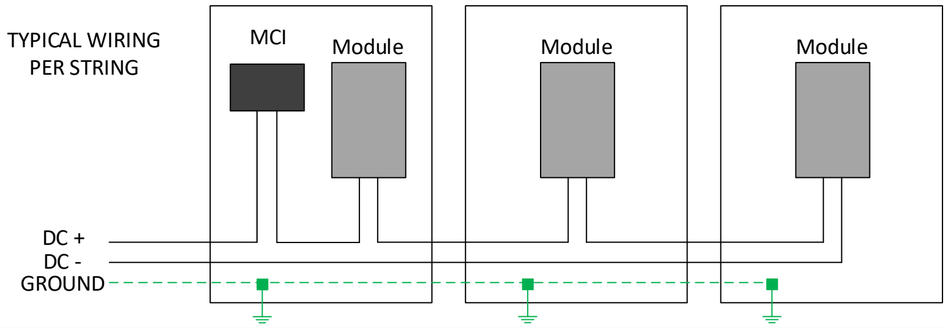
PV Installation Professional
Ali Buttar
PVIP #031310-32



Line 1	
Line 2	
Neutral	
Ground	

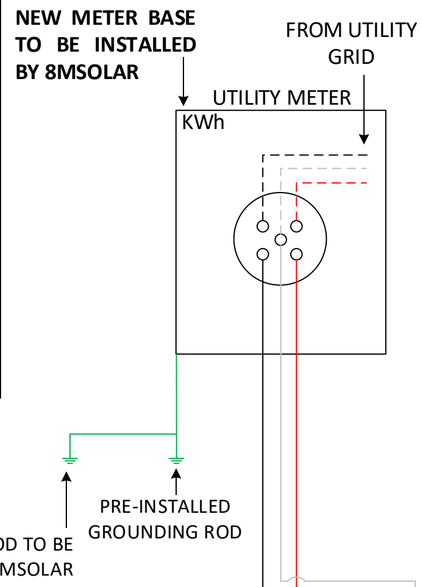
Note: Tesla MCI should be at the start or end of every string and it should be after every three panels

Note: Loads greater than 48A will not be backed by the battery and needs to managed manually.

Note: Accepted Breakers for Gateway: Eaton CSR or BW (100-200A)

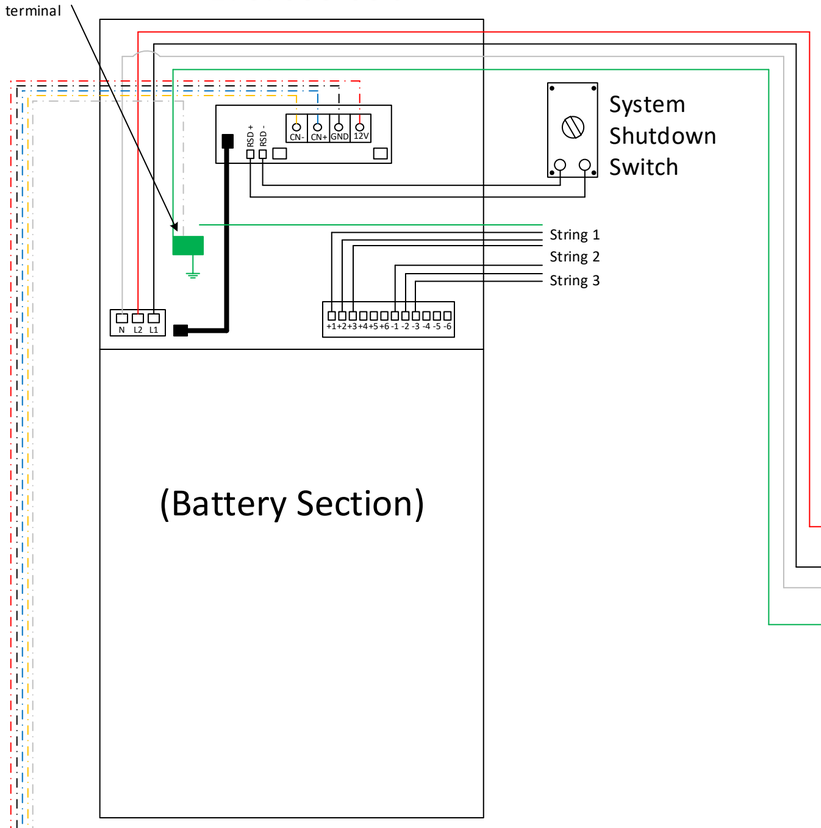
Note: Drain wire in the communication wire should be terminated at the Powerwall3 and it will not be terminated in the Backup Gateway3.

Note: Connect both grounding rods in a series connections with a bare copper keeping the minimum distance of 6ft between them

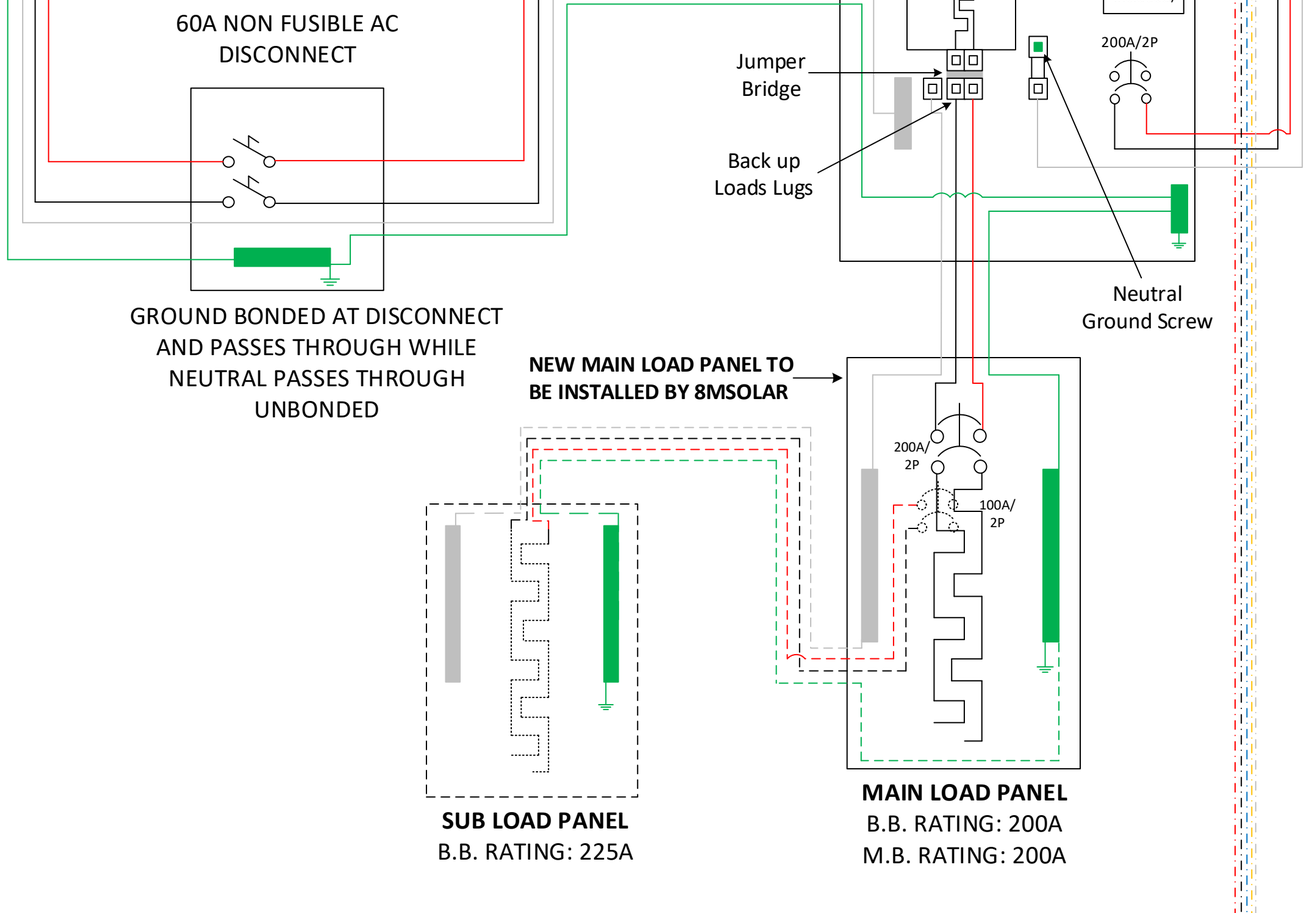


Drain wire needs to be terminated at the ground terminal

Tesla Powerwall3
1707000-00-J



(Battery Section)



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Sheet Name:

Detailed Electrical Diagram

JOB NUMBER:

25-167-WG

Date:	**Revision:**
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Sheet Size: ANSI C 17" X 22"	**Sheet Number:** PV5

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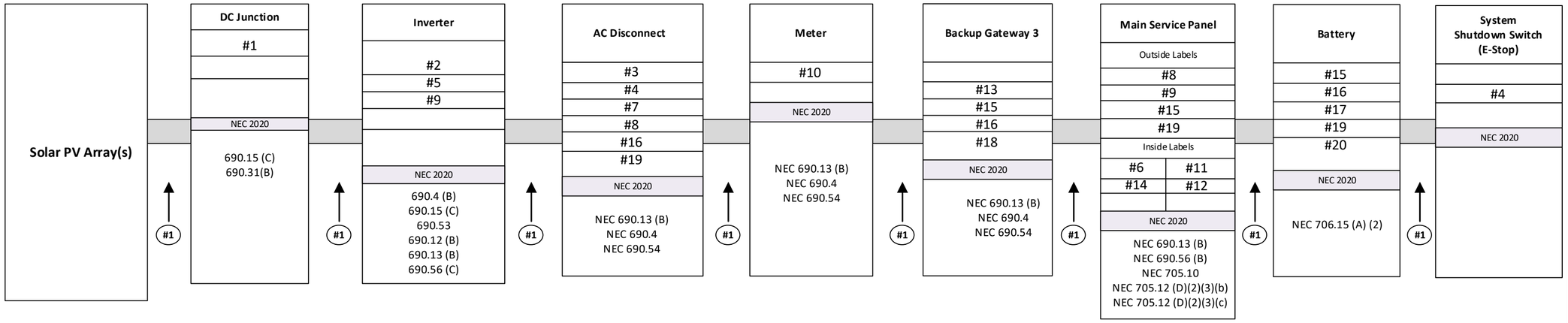
PVIP #031310-32



LABELING AND WARNING SIGNS: NEC 2020

A. PURPOSE
PROVIDE EMERGENCY RESPONDERS WITH APPROPRIATE WARNING AND GUIDANCE WITH RESPECT TO ISOLATING THE SOLAR ELECTRIC SYSTEM. THIS CAN FACILITATE IDENTIFYING ENERGIZED ELECTRICAL LINES THAT CONNECT THE SOLAR PANELS TO THE INVERTER, AS SHOULD NOT BE CUT WHEN VENTING FOR SMOKE REMOVAL.

B. MAIN SERVICE DISCONNECT:
1. RESIDENTIAL BUILDINGS- THE MARKING MAY BE PLACED WITHIN THE MAIN SERVICE DISCONNECT. THE MARKING SHALL BE PLACED ON THE OUTSIDE COVER IF THE MAIN SERVICE DISCONNECT IS OPERABLE WITH THE SERVICE PANEL CLOSED.

2. COMMERCIAL BUILDINGS- THE MARKINGS SHALL BE PLACED ADJACENT TO THE MAIN SERVICE DISCONNECTCLEARLY VISIBLE FROM THE LOCATION WHERE THE LEVER IS OPERATED

3. MARKINGS, VERBIAGE, FORMAT AND TYPE OF MATERIAL

a. VERBIAGE: CAUTION; SOLAR ELECTRIC SYSTEM CONNECTED
b. FORMAT:

(1) WHITE LETTERING ON A RED BACKGROUND
(2) MINIMUM 3/8 INCH LETTER HEIGHT
(3) ALL LETTERS SHALL BE CAPITALIZED
(4) ARIAL OR SIMILAR FONT, NON-BOLD

c. MATERIAL:

(1) REFLECTIVE, WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT (USE UL-969) AS STANDARD FOR WEATHER RATING): DURABLE ADHESIVE MATERIALS MEET THIS REQUIREMENT.

C. MARKING REQUIREMENTS ON DC CONDUIT, RACEWAYS, ENCLOSURES, CABLE ASSEMBLIES, DC COMBINERS AND JUNCTION BOXES;
1. MARKING: PLACEMENT, VERBIAGE, FORMAT AND TYPE OF MATERIAL.

a. PLACEMENT: MARKINGS SHALL BE PLACED EVERY 10 (TEN) FEET ON ALL INTERIOR AND EXTERIOR DC CONDUITS, RACEWAYS, ENCLOSURES AND CABLE ASSEMBLIES, AT TURNS ABOVE AND/OR BELOW PENETRATIONS, ALL DC COMBINERS AND JUNCTION BOXES.
b. VERBIAGE: CAUTION SOLAR CIRCUIT
c. THE FORMAT AND TYPE OF MATERIAL SHALL ADHERE TO SECTION B-3.B & C ABOVE

D. INVERTERS ARE NOT REQUIRED TO HAVE CAUTION MARKINGS

#1
WARNING:PHOTOVOLATIC POWER SOURCE

#2
PHOTOVOLTAIC
DC DISCONNECT

#3
PHOTOVOLTAIC
AC DISCONNECT

#4
RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

#5

MAXIMUM VOLTAGE	550Vdc
MAX. RATED CIRCUIT CURRENT	13.66Adc
OF THE CHARGE CONTOLLER OR DC-TO-DC CONVERTER (IF INSTALLED)	

#6
PHOTOVOLTIVC POWER SOURCE

OPERATING AC VOLTAGE	240	V
MAXIMUN OPERATING AC OUTPUT CURRENT	48	A

#7
AC DISCONNECT
PHOTOVOLTAIC SYSTEM POWER SOURCE

RATED AC OUTPUT CURRENT	48	AMPS
NOMINAL OPERATING AC VOLTAGE	240	VOLTS

#8
WARNING
ELECTRIC SHOCK HAZARD
TERMINAL ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

#9
WARNING
THREE POWER SOURCES
SOURCES: UTILITY GRID, BATTERY AND PV SOLAR ELECTRIC SYSTEM

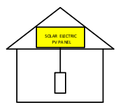
#10
WARNING
THREE POWER SOURCES
SOURCES: UTILITY GRID, BATTERY AND PV SOLAR ELECTRIC SYSTEM

#11
WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

#12
WARNING
POWER SOURCE OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

#13
WARNING
SOLAR ELECTRIC CIRCUIT BREAKER IS BACKFEED

#14
SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



#15
SOLAR AC DISCONNECT LOCATED AT NORTH-EAST SIDE WALL OF THE HOUSE BESIDE THE UTILITY METER

#16
SERIVCE DISCONNECT LOCATED IN THE BACKUP GATEWAY 3 PANEL

#17
BATTERY

#18
MAIN BATTERY SYSTEM DISCONNECT

#19
BATTERY DISCONNECT LOCATED IN THE BACKUP GATEWAY 3 PANEL

#20
ENERGY STORAGE SYSTEM DISCONNECT

NOMINAL ESS AC VOLTAGE	240V
NOMINAL ESS DC VOLTAGE	550V
AVAILABLE FAULT CURRENT DERIVED FROM THE ESS	160A
DATE CALCULATION PERFORMED	04/11/2025

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Customer Signature:

Sheet Name:

PV Labels

JOB NUMBER:

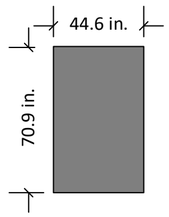
25-167-WG

Date:	Revision:
05/22/2025	A
Sheet Size: ANSI C 17" X 22"	**Sheet Number:** PV6

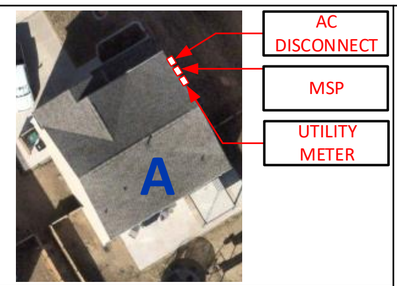
NABCEP CERTIFIED
PV Installation Professional
Ali Buttar
PVIP #031310-32

ROOF DESCRIPTION			
ROOF	PITCH	AZIMUTH	NO. OF MODULES
A	27°	149°	26

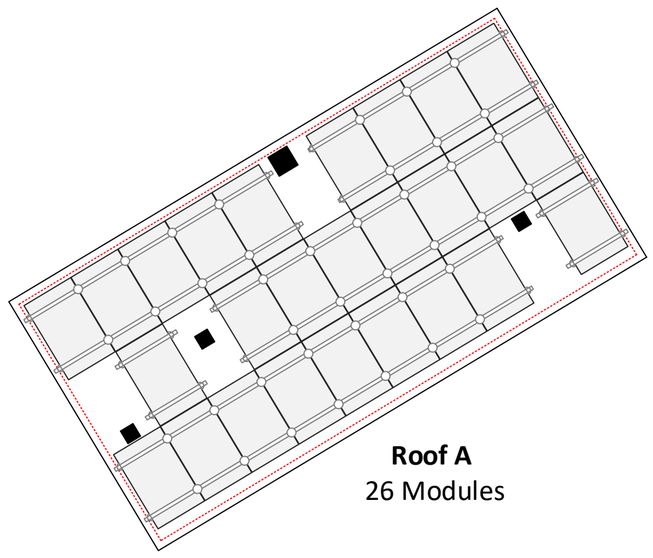
MODULE DIMENSIONS



Rails and Splices : PSR-B84 (BLACK)	Roof Attachment : Pegasus InstaFlash2
Rafter Spacing : 24 in	There is one layer of shingles Roofing material is asphalt shingles
Attachment Span: 6ft	The roof is located in 120mph wind zone



PV LABELS		
Sr. No	Code	Qty
01	02-314	12
02	03-301	01
03	03-302	01
04	02-316	02
05	03-308	01
06	03-390	01
07	03-306	01
08	05-215	02
09	05-230	02
10	03-230	01
11	05-372	01
12	05-216	01
13	05-342	01
14	07-111	01
15	8M-001	03
16	8M-002	03
17	03-395	01
18	04-304	01
19	8M-004	03
20	03-511	01



Roof A
26 Modules

6in setback from sides of the roof

RAILS AND MOUNTING SYSTEM
- 34 x PSR-B84: Pegasus Rail, Black, 84" (7 Feet)
- 22 x PSR-SPLS: Pegasus - Bonded, Structural Splice
- 40 x PSR-MCB: Pegasus - Multiclamp, Mid/End, 30 to 40 mm, Black
- 24 x PSR-HEC: Pegasus - Hidden End Clamp
- 08 x PSR-LUG: Pegasus - Grounding Lug
- 39 x PSR-WMC: Pegasus - Wire Management Clip
- 05 x PSR-CBG: Pegasus - Cable Grip
- 24 x PSR-CAP: Pegasus - End Cap
- 48 x PIF2-BDT: Pegasus InstaFlash2 – Deck or Rafter Attach – with Dovetail T-Bolt
- 288 x PF-DRW85: Pegasus Fastener - Deck-Rafter 85mm
- 52 x Heyco Wire Clips
- 05 x GEOC GC66100: SEALANT 2300 10.3OZ CLEAR (20) GEOCEL 230 TRIPOLY CLEAR
- 15 x MULTI 32.0017P0001-UR: PV MC4 MALE (10) [1000]
- 15 x MULTI 32.0016P0001-UR: PV MC4 FEMALE (10) [1000]

SOLAR MODULES
- 26 x Canadian Solar CS6.1-54TM-450H

INVERTER & SUPPORTING ITEMS
- 01 x 1707000-00-J :Tesla Powerwall3
- 09 x 1879359-15-B: Tesla MCI-2 High Current
- 01 x 1841000-01-C: Backup GateWay 3
- 01 x 1549184-00-X: 02" Conduit Hub Kit

WIRE
- 01 x WIRPV 2KVPV10STRBLK500: #10 PV WIRE BLK (Cu) 500ft

ELECTRICAL ITEMS
- 01 x BW2200: Gateway Main Breaker-Eaton BW2200
- 01 x BR260: Eaton BR 60/2
- 01 x DG222URB: 250volt/60amp/2pole non fusible disconnect (NEMA 3R)
- 01 x EATON UTRS213BE: Eaton 200A Meter Base
- 01 x HOM2040M200PRB: Homeline HOM type 200A Load Center
- 01 x EATON M22PVK01: 22.5MM PB EMG STOP W/ CONTACTOR
- 01 x Eaton M22I1PG: SFC MTG ENC Emergency Stop Enclosure
- 01 x EZSLR JB-1.2: SolaDeck

BILL OF MATERIAL
SCALE: 1/8" - 1'

N

8MSOLAR
ADVANCING ENERGY INDEPENDENCE

5112 Departure Drive,
Raleigh NC 27616
O: 919.948.6474
E: info@8msolar.com

Customer Information:

William Griffith

460 Red Cedar Way
Fuquay Varina, NC 27526

Customer Signature:

Sheet Name:

Bill of Material

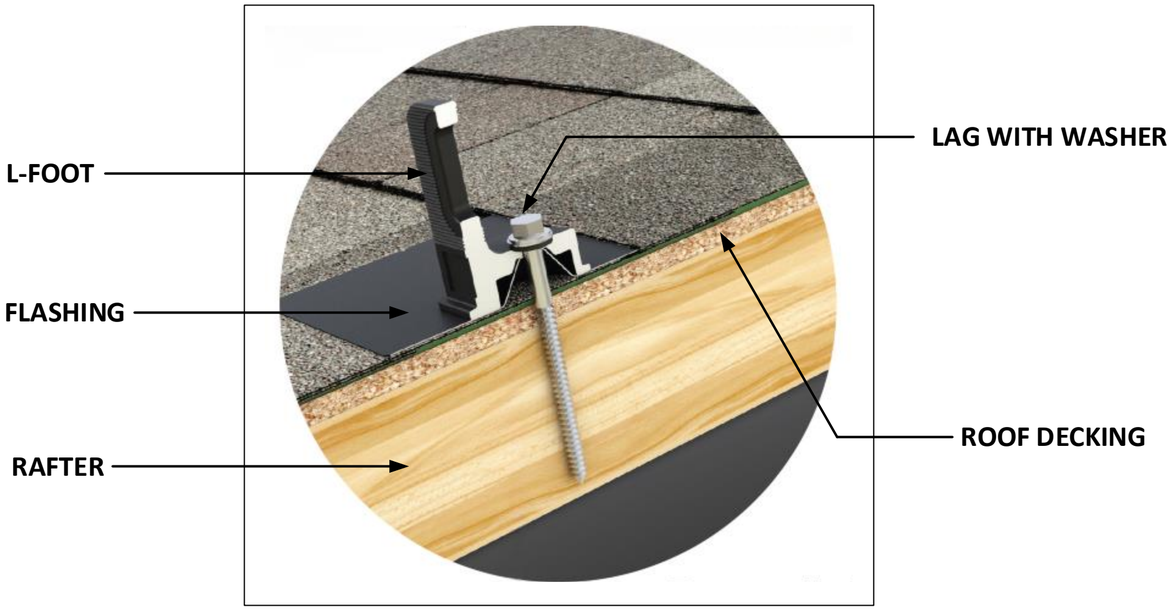
JOB NUMBER:

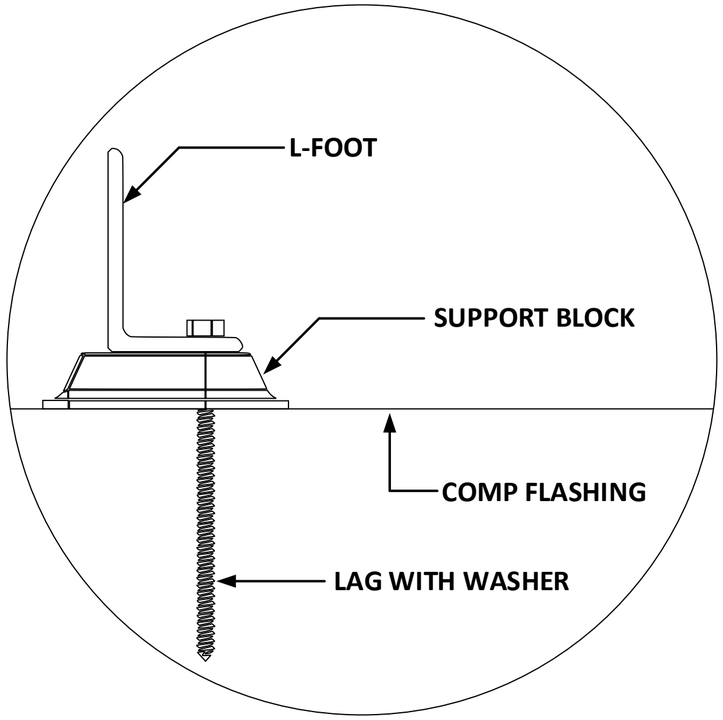
25-167-WG

Date:	Revision:
05/22/2025	A

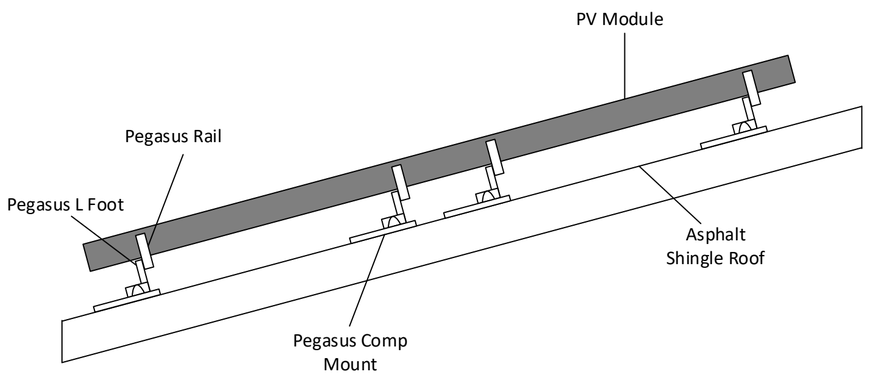
Sheet Size:	Sheet Number:
ANSI C 17" X 22"	PV7

NABCEP CERTIFIED
PV Installation Professional
Ali Buttar
PVIP #031310-32





					
Multi-Clamp	Hidden End Clamp	MLPE Mount	Dovetail T-Bolt	Ground Lug	Cable Grip
Torque Value 100 in-lbs.	Torque Value 135 in-lbs.	Torque Value 135 in-lbs.	Torque Value 300 in-lbs.	Torque Value 135 in-lbs.	Torque Value 135 in-lbs.



SIDE VIEW

PV Dead Load	
Roof A	**PV System Dead Load** **(Panel + Racking weight) / PV System Area** (26 panels x 47.2 lbs./panel + 15 ft. of racking x 1.17 lb.ft) / (26 panels x 5.65' x 3.71') = 2.70 psf

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