Historic Preservation Services
Community Development & Neighborhood Services
281 North College Avenue
P.O. Box 580
Fort Collins, CO 80522.0580

970.416.4250
preservation@fcgov.com
fcgov.com/historicpreservation

REPORT OF ALTERATIONS TO DESIGNATED RESOURCE
Site Number/Address: 211 Whedbee St.
Laurel School National Register Historic District
ISSUED: November 22, 2021

Peter Moore & Claire McCrea
211 Whedbee St.
Fort Collins, CO 80524

Dear Property Owners:

This report is to document proposed alterations to the George Denig House at 211 Whedbee Street, pursuant to Fort Collins Municipal Code Chapter 14, Article IV. A copy of this report may be forwarded to the Colorado Office of Archaeology and Historic Preservation.

The alterations include:

1. Rooftop solar installation on south roof slopes

Our staff review of the proposed work finds the alterations do meet the SOI Standards for Treatment of Historic Properties. A summary is provided below:

Applicable Code Standard	Summary of Code Requirement and Analysis (Rehabilitation)	Standard Met (Y/N)
SOI #1	*A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships;* **The property will remain in residential use.**	**Y**
SOI #2	*The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.* **While the plan could be improved by relocating some of the most forward panels to a different location, such as the gable-roof garage at the rear of the lot, the most prominent forward features of the property, including the gablets on the east façade, will remain clearly visible and prominent. The proposed project meets this Standard.**	**Y**

SOI #3	*Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.* **Solar panels are clearly distinguished as a new feature.**	**Y**
SOI #4	*Changes to a property that have acquired historic significance in their own right will be retained and preserved.*	**N/A**
SOI #5	*Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.*	**N/A**
SOI #6	*Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.*	**N/A**
SOI #7	*Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.*	**N/A**
SOI #8	*Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.*	**N/A**
SOI #9	*New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.* **While the project could be improved by relocating the most forward panels, the overall treatment meets this Standard. The panels are clearly distinguished as a new feature, are flush-mounted to be compatible with the historic roof pitch, and set back from the front of the building slightly (though it would be better to relocate some of the most forward, visible panels).**	**Y**
SOI #10	*New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.* **Solar panels are generally reversible, with minor repairs needed to the roof and its framing where anchor attachments have been made.**	**Y**

The property is expected to remain a contributing resource to the Laurel School Historic District after the project is complete.

If you have any questions regarding this review, please contact me. I may be reached at jbertolini@fcgov.com or at 970-416-4250.

Sincerely,

Jim Bertolini
Historic Preservation Planner

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APPENDIX	ARRAY WIRING BOX DATASHEET
	DISCONNECT DATASHEET
	INVERTER DATASHEET
	MOUNTING SYSTEM DATASHEET
	MOUNTING SYSTEM ENGINEERING LETTER
	UL 1703 CLASS A FIRE CERTIFICATION
	UL 2703 GROUND AND BONDING CERTIFICATION
	ANCHOR DATASHEET

PROJECT DETAILS	
PROPERTY OWNER	PETER MOORE
PROPERTY ADDRESS	211 WHEDBEE ST, FORT COLLINS, CO 80524 US
ZONING	RESIDENTIAL
USE AND OCCUPANCY CLASSIFICATION	ONE- OR TWO-FAMILY DWELLING GROUP (GROUP R3)
UTILITY COMPANY	PUBLIC SERVICE CO OF COLORADO
METER SERIAL NUMBER	15468604
ELECTRICAL CODE	2020 NEC (NFPA 70)
FIRE CODE	2018 IFC
OTHER BUILDING CODES	IBC 2018

CONTRACTOR INFORMATION	
COMPANY	SOPRIS SOLAR
ADDRESS	5609 WEST 6TH AVE, UNIT B UNIT B, LAKEWOOD, CO 80214
CONTRACTOR SIGNATURE	

1 PV-1 PLOT SCALE: NTS

2 PV-1 LOCALE SCALE: NTS

SCOPE OF WORK

THIS PROJECT INVOLVES THE INSTALLATION OF A GRID-INTERACTIVE PV SYSTEM. PV MODULES WILL BE MOUNTED USING A PREENGINEERED MOUNTING SYSTEM. THE MODULES WILL BE ELECTRICALLY CONNECTED WITH DC TO AC POWER INVERTERS AND INTERCONNECTED TO THE LOCAL UTILITY USING MEANS AND METHODS CONSISTENT WITH THE RULES ENFORCED BY THE LOCAL UTILITY AND PERMITTING JURISDICTION.

THIS DOCUMENT HAS BEEN PREPARED FOR THE PURPOSE OF DESCRIBING THE DESIGN OF A PROPOSED PV SYSTEM WITH ENOUGH DETAIL TO DEMONSTRATE COMPLIANCE WITH APPLICABLE CODES AND REGULATIONS. THE DOCUMENT SHALL NOT BE RELIED UPON AS A SUBSTITUTE FOR FOLLOWING MANUFACTURER INSTALLATION INSTRUCTIONS. THE SYSTEM SHALL COMPLY WITH ALL MANUFACTURERS LISTING AND INSTALLATION INSTRUCTIONS, AS WELL AS ALL APPLICABLE CODES. NOTHING IN THIS DOCUMENT SHALL BE INTERPRETED IN A WAY THAT OVERRIDES THEM. CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF ALL CONDITIONS, DIMENSIONS, AND DETAILS IN THIS DOCUMENT.

SYSTEM DETAILS	
DESCRIPTION	NEW GRID-INTERACTIVE PV SYSTEM WITH NO ENERGY STORAGE
DC RATING OF SYSTEM	6.00KW
AC RATING OF SYSTEM	4.35KW
AC OUTPUT CURRENT	18.1A
INVERTER(S)	15 X ENPHASE IQ7PLUS-72-2-US
MODULE	Q-CELLS Q.PEAK DUOBLK ML-G10+ 400
ARRAY WIRING	(1) BRANCH OF 7 IQ7PLUS-72-2-US MICROINVERTERS (1) BRANCH OF 8 IQ7PLUS-72-2-US MICROINVERTERS

INTERCONNECTION DETAILS	
POINT OF CONNECTION	NEW LOAD-SIDE AC CONNECTION PER NEC 705.12(B)(3)(2) AT MSP
UTILITY SERVICE	120/240V 1Φ
LOCATION	MAIN SERVICE PANEL W/TOP-FED 150A BUSBAR 150A MCB

SITE DETAILS	
ASHRAE EXTREME LOW	-23°C (-9°F)
ASHRAE 2% HIGH	32°C (90°F)
CLIMATE DATA SOURCE	FORT COLLINS(SAWRS) (KFCL)
WIND SPEED	125 MPH (ASCE7-10)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	C
GROUND SNOW LOAD	35 PSF

P-167788

GRID-TIED SOLAR POWER SYSTEM

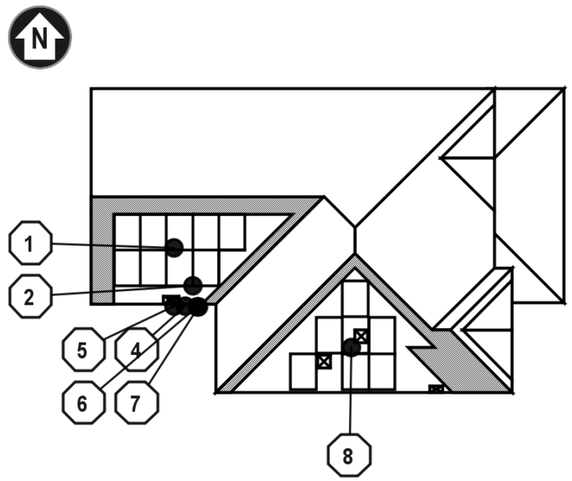
MOORE RESIDENCE
211 WHEDBEE ST
FORT COLLINS, CO 80524

PROJECT SUMMARY

DOC ID: 167788-206689-1
DATE: 11/1/21
CREATOR: D.M.
REVIEWER:

REVISIONS

PV-1



1 PV-2 SITE PLAN
SCALE: 1" = 20'

GENERAL NOTES	
1	EQUIPMENT LIKELY TO BE WORKED UPON WHILE ENERGIZED SHALL BE INSTALLED IN LOCATIONS THAT SATISFY MINIMUM WORKING CLEARANCES PER NEC 110.26.
2	CONTRACTOR SHALL USE ONLY COMPONENTS LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY FOR THE INTENDED USE.
3	CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL EQUIPMENT, CABLES, ADDITIONAL CONDUITS, RACEWAYS, AND OTHER ACCESSORIES NECESSARY FOR A COMPLETE AND OPERATIONAL PV SYSTEM.
4	ALL EMT CONDUIT FITTINGS SHALL BE LISTED AS WEATHERPROOF FITTINGS AND INSTALLED TO ENSURE A RAINTIGHT FIT, PER NEC 358.42.

1. (N) PROPOSED ROOF-MOUNTED PHOTOVOLTAIC ARRAY. 10:12 (40°) SLOPED ROOF, 9 PV MODULES (BLACK FRAME, BLACK BACKSHEET), 180° AZIMUTH
2. (N) TRANSITION BOX, OUTDOOR , OUTPUT CIRCUIT CONDUCTORS SHALL BE RUN IN EMT CONDUIT OVER ROOF NO CLOSER THAN 0.5" ABOVE ROOF SURFACE
3. ROADWAY
4. (N) VISIBLE, LOCKABLE, READILY-ACCESSIBLE AC DISCONNECT LOCATED WITHIN 10 FT OF UTILITY METER, OUTDOOR
5. (N) AC COMBINER, OUTDOOR , OUTPUT CIRCUIT CONDUCTORS SHALL BE RUN IN EMT CONDUIT OVER ROOF NO CLOSER THAN 0.5" ABOVE ROOF SURFACE
6. (E) MAIN SERVICE PANEL (MSP), OUTDOOR
7. (E) UTILITY METER, OUTDOOR
8. (N) PROPOSED ROOF-MOUNTED PHOTOVOLTAIC ARRAY. 10:12 (40°) SLOPED ROOF, 6 PV MODULES (BLACK FRAME, BLACK BACKSHEET), 180° AZIMUTH

P-167788

GRID-TIED SOLAR POWER SYSTEM

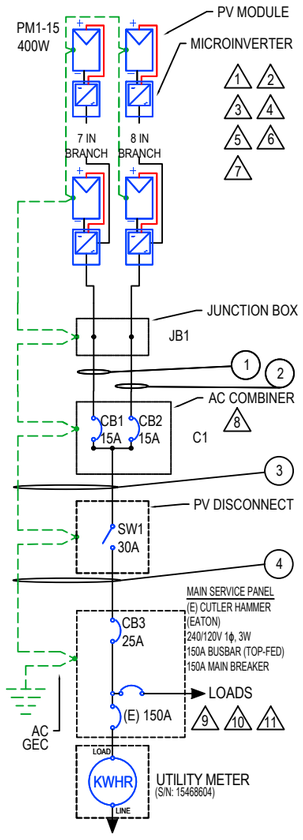
MOORE RESIDENCE
211 WHEDBEE ST
FORT COLLINS, CO 80524

SITE PLAN

DOC ID: 167788-206689-1
DATE: 11/1/21
CREATOR: D.M.
REVIEWER:

REVISIONS

PV-2



MODULES									
REF.	QTY.	MAKE AND MODEL	PMAX	PTC	ISC	IMP	VOC	VMP	TEMP. COEFF. OF VOC	FUSE RATING
PM1-15	15	Q-CELLS Q.PEAK DUOBLK ML-G10+ 400	400W	377W	11.14A	10.77A	45.3V	37.1V	-0.122V/°C (-0.27%/°C)	20A

INVERTERS								
REF.	QTY.	MAKE AND MODEL	AC VOLTAGE	GROUND	RATED POWER	MAX OUTPUT CURRENT	MAX INPUT CURRENT	MAX INPUT VOLTAGE	WEIGHTED EFFICIENCY
I1-15	15	ENPHASE IQ7PLUS-72-2-US	240V	NOT SOLIDLY GROUNDED	290W	1.2A	15.0A	60V	97.0%

DISCONNECTS				
REF.	QTY.	MAKE AND MODEL	RATED CURRENT	MAX RATED VOLTAGE
SW1	1	EATON DG221URB OR EQUIV.	30A	240VAC

OCPDS			
REF.	QTY.	RATED CURRENT	MAX VOLTAGE
CB1-2	2	15A	240VAC
CB3	1	25A	240VAC

SYSTEM SUMMARY		
	BRANCH 1	BRANCH 2
INVERTERS PER BRANCH	7	8
MAX AC CURRENT	8.47A	9.68A
MAX AC OUTPUT	2,030W	2,320W
ARRAY STC POWER	6,000W	
ARRAY PTC POWER	5,648W	
MAX AC CURRENT	18A	
MAX AC POWER OUTPUT	4,350W	
DERATED AC POWER OUTPUT	4,350W	

NOTES

1. THE DC AND AC CONNECTORS OF THE ENPHASE IQ7PLUS-72-2-US AND ARE LISTED TO MEET REQUIREMENTS AS A DISCONNECT MEANS AS ALLOWED BY NEC 690.15(C). MATING CONNECTORS SHALL COMPLY WITH NEC 690.33.
2. THE ENPHASE IQ7PLUS-72-2-US HAS A CLASS II DOUBLE-INSULATED RATING AND DOES NOT REQUIRE GROUNDING ELECTRODE CONDUCTORS (GEC) OR EQUIPMENT GROUNDING CONDUCTORS (EGC). THE RATING INCLUDES GROUND FAULT PROTECTION (GFP). TO SUPPORT GFP, USE ONLY PV MODULES EQUIPPED WITH DC CABLES LABELED PV WIRE OR PV CABLE.
3. ENPHASE SYSTEM MEETS REQUIREMENTS FOR PHOTOVOLTAIC RAPID SHUTDOWN SYSTEM (PVRSS), AS PER NEC 690.12(B)(2).
4. MICROINVERTER BRANCH CIRCUIT CONDUCTORS ARE MANUFACTURED ENPHASE Q CABLES LISTED FOR USE IN 20A OR LESS CIRCUITS OF ENPHASE IQ MICROINVERTERS. THEY ARE ROHS, OIL RESISTANT, AND UV RESISTANT. THEY CONTAIN TWO 12 AWG CONDUCTORS OF TYPE THHN/THWN-2 DRY/WET AND CERTIFIED TO UL3003 AND UL 9703.
5. DC PV CONDUCTORS ARE NOT SOLIDLY-GROUNDED. NO DC PV CONDUCTOR SHALL BE WHITE- OR GRAY-COLORED
6. ALL METAL ENCLOSURES, RACEWAYS, CABLES AND EXPOSED NONCURRENT-CARRYING METAL PARTS OF EQUIPMENT SHALL BE GROUNDED TO EARTH AS REQUIRED BY NEC 250.4(A) AND PART III OF ARTICLE 250 AND EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45. THE GROUNDING ELECTRODE SYSTEM SHALL ADHERE TO NEC 690.47(A) AND NEC 250.169. THE DC GROUNDING ELECTRODE SHALL BE SIZED ACCORDING TO NEC 250.166 AND INSTALLED IN COMPLIANCE WITH NEC 250.64.
7. MAX DC VOLTAGE OF PV MODULE IS 51.2V AT -23°C (-23°C - 25°C) X -0.122V/C + 45.3V = 51.2V).
8. AC AGGREGATION PANEL BUSBAR AND THE OVERCURRENT PROTECTION PROTECTING THE BUSBAR SHALL BE SIZED IN ACCORDANCE WITH NEC 705.12(B)(3)(3).
9. POINT-OF-CONNECTION IS ON LOAD SIDE OF SERVICE DISCONNECT, IN COMPLIANCE WITH NEC 705.12(B)(3)(2). OUTPUT IS BACKFED THROUGH BREAKER IN MAIN PANEL.
10. THE BREAKER SHALL BE LOCATED AT THE OPPOSITE END OF THE BUSBAR FROM THE MAIN BREAKER. THE BREAKER SHALL NOT BE MARKED FOR "LINE" AND "LOAD".
11. PV SYSTEM DISCONNECT SHALL BE A VISIBLE KNIFE-BLADE TYPE DISCONNECT THAT IS ACCESSIBLE AND LOCKABLE BY THE UTILITY IN ACCORDANCE WITH NEC 690.13(E). THE DISCONNECT SHALL BE LOCATED WITHIN 10 FT OF UTILITY METER AND INSTALLED IN COMPLIANCE WITH NEC 705.20 AND GROUPED AS REQUIRED BY NEC 230.72.

CONDUCTOR AND CONDUIT SCHEDULE W/ELECTRICAL CALCULATIONS

ID	TYPICAL	CONDUCTOR	CONDUIT / CABLE	CURRENT-CARRYING CONDUCTORS IN CONDUIT / CABLE	OCPD	EGC	TEMP. CORR. FACTOR	FILL FACTOR	CONT. CURRENT	MAX. CURRENT (125%)	BASE AMP.	DERATED AMP.	TERM. TEMP. RATING	AMP. @ TERM. TEMP. RATING
1	1	12 AWG THWN-2, COPPER	0.5" DIA. EMT	4	15A	12 AWG THWN-2, COPPER	0.96 (32°C)	0.8	8.47A	10.59A	30A	23.04A	90°C	30A
2	1	12 AWG THWN-2, COPPER	0.5" DIA. EMT	4	15A	12 AWG THWN-2, COPPER	0.96 (32°C)	0.8	9.68A	12.1A	30A	23.04A	90°C	30A
3	1	10 AWG THWN-2, COPPER	0.5" DIA. EMT	2	25A	10 AWG THWN-2, COPPER	0.96 (32°C)	1.0	18.15A	22.69A	40A	38.4A	75°C	35A
4	1	10 AWG THWN-2, COPPER	0.5" DIA. EMT	2	25A	10 AWG THWN-2, COPPER	0.96 (32°C)	1.0	18.15A	22.69A	40A	38.4A	75°C	35A

GENERAL ELECTRICAL NOTES

1. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
2. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.10 (D).
3. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).

GROUNDING NOTES

1. ALL EQUIPMENT SHALL BE PROPERLY GROUNDED PER THE REQUIREMENTS OF NEC ARTICLES 250 & 690
2. PV MODULES SHALL BE GROUNDED TO MOUNTING RAILS USING MODULE LUGS OR RACKING INTEGRATED GROUNDING CLAMPS AS ALLOWED BY LOCAL JURISDICTION. ALL OTHER EXPOSED METAL PARTS SHALL BE GROUNDED USING UL-LISTED LAY-IN LUGS.
3. INSTALLER SHALL CONFIRM THAT MOUNTING SYSTEM HAS BEEN EVALUATED FOR COMPLIANCE WITH UL 2703 "GROUNDING AND BONDING" WHEN USED WITH PROPOSED PV MODULE.
4. IF THE EXISTING MAIN SERVICE PANEL DOES NOT HAVE A VERIFIABLE GROUNDING ELECTRODE, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE.
5. AC SYSTEM GROUNDING ELECTRODE CONDUCTOR (GEC) SHALL BE A MINIMUM SIZE #8AWG WHEN INSULATED, #6AWG IF BARE WIRE.
6. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC ARTICLE 690.45, AND BE A MINIMUM OF #10AWG WHEN NOT EXPOSED TO DAMAGE, AND #6AWG SHALL BE USED WHEN EXPOSED TO DAMAGE
7. GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLOR CODED GREEN, OR MARKED GREEN IF #4AWG OR LARGER

1 PV-3 SINGLE-LINE DIAGRAM
SCALE: NTS

P-167788

GRID-TIED SOLAR POWER SYSTEM

MOORE RESIDENCE
211 WHEDBEE ST
FORT COLLINS, CO 80524

SINGLE-LINE DIAGRAM

PROJECT ID: 167788
DATE: 11/01/21
CREATED BY: D.M.
CHECKED BY:

REVISIONS

PV-3

C1 - AC COMBINER
(ENPHASE IQ COMBINER 3)

3

SW1 - DISCONNECT
(EATON DG221URB)

4 5 6

MSP - MAIN SERVICE PANEL
(CUTLER HAMMER (EATON))

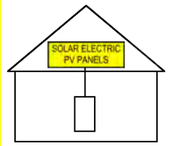
1 2 5 6 7

8

1 SEE NOTE NO. 4 (MSP)

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.



NEC690.56(C)(1) AND IFC1204.5.1,1204.5.1

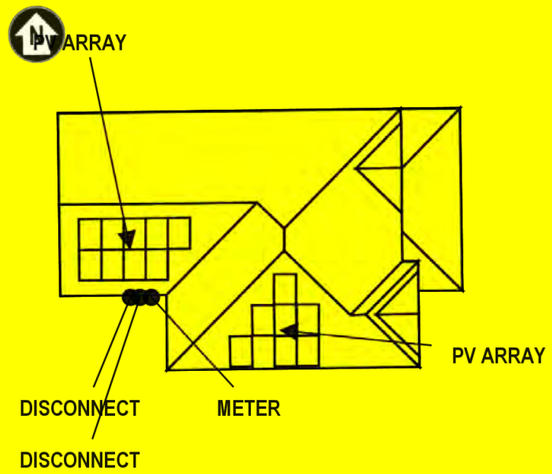
3 AC COMBINER PANEL (C1)

! WARNING !
THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE SHALL NOT EXCEED AMPACITY OF

NEC705.12(B)(3)(3)

2 POINT-OF-INTERCONNECTION OR AT MAIN SERVICE DISCONNECT (MSP)

! CAUTION: MULTIPLE SOURCES OF POWER !
POWER TO THIS BUILDING IS ALSO FROM ROOF ARRAYS WITH SAFETY DISCONNECTS AS SHOWN



INSTALLED BY SOPRIS SOLAR

NEC690.56(B),705.10

4 EACH DISCONNECTING MEANS FOR PHOTOVOLTAIC EQUIPMENT (SW1)

! WARNING !
ELECTRIC SHOCK HAZARD. TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

NEC690.13(B)

5 AC SOLAR DISCONNECT (SW1, CB3 IN MSP)

PV SYSTEM DISCONNECT

NEC690.13(B)

6 AC DISCONNECT (SW1, CB3 IN MSP)

MAXIMUM AC OPERATING CURRENT: 18.1A
MAXIMUM AC OPERATING VOLTAGE: 240V

NEC690.54

7 ANY AC ELECTRICAL PANEL THAT IS FED BY BOTH THE UTILITY AND THE PHOTOVOLTAIC SYSTEM (MSP)

! CAUTION !
MULTIPLE SOURCES OF POWER

NEC705.10

8 SOLAR BREAKER (MSP)

! WARNING !
POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE.

NEC705.12(B)(3)(2)

LABELING NOTES

1	ALL PLAQUES AND SIGNAGE REQUIRED BY 2020 NEC AND 2018 IFC WILL BE INSTALLED AS REQUIRED.
2	LABELS, WARNING(S) AND MARKING SHALL COMPLY WITH ANSI Z535.4, WHICH REQUIRES THAT DANGER, WARNING, AND CAUTION SIGNS USED THE STANDARD HEADER COLORS, HEADER TEXT, AND SAFETY ALERT SYMBOL ON EACH LABEL. THE ANSI STANDARD REQUIRES A HEADING THAT IS AT LEAST 50% TALLER THAN THE BODY TEXT, IN ACCORDANCE WITH NEC 110.21(B).
3	A PERMANENT PLAQUE OR DIRECTORY SHALL BE INSTALLED PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS IF NOT IN THE SAME LOCATION IN ACCORDANCE WITH NEC 690.56(B).
4	LABEL(S) WITH MARKING, "TURN RAPID SHUTDOWN SWITCH TO THE 'OFF' POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY," SHALL BE LOCATED WITHIN 3 FT OF SERVICE DISCONNECTING MEANS THE TITLE SHALL UTILIZE CAPITALIZED LETTERS WITH A MINIMUM HEIGHT OF 3/8" IN BLACK ON A YELLOW BACKGROUND, AND REMAINING TEXT SHALL BE CAPITALIZED WITH A MINIMUM HEIGHT OF 3/16" IN BLACK ON WHITE BACKGROUND

P-167788

GRID-TIED SOLAR POWER SYSTEM

MOORE RESIDENCE
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FORT COLLINS, CO 80524

SAFETY LABELS

DOC ID: 167788-206689-1
DATE: 11/1/21
CREATOR: D.M.
REVIEWER:

REVISIONS

PV-4

ROOF PROPERTIES	
ROOF MATERIAL	COMPOSITION SHINGLE (1 LAYER)
SLOPE	10/12 (39.8°)
MEAN ROOF HEIGHT	15.8FT
DECK SHEATHING	15/32" OSB
CONSTRUCTION	RAFTERS (4X6'S), 24IN OC

MODULE MECHANICAL PROPERTIES	
MODEL	Q-CELLS Q.PEAK DUOBLK ML-G10+ 400
DIMENSIONS (AREA)	74.0IN X 41.1IN X 1.3IN (21.1 SQ FT)
WEIGHT	48.5LB

MOUNTING SYSTEM PROPERTIES	
RAIL MODEL	UNIRAC SOLARMOUNT LIGHT
ANCHOR MODEL	UNIRAC 004085D (FLASHED), 2.5IN AIR GAP
FASTENING METHOD	3.0 INCH EMBEDMENT INTO RAFTERS WITH (1) 5/16IN DIA. FASTENER
MAX. MOUNT SPACING	48.0IN (ZONES 1, 2, AND 3)
MAX. ALLOW. CANTILEVER	15.8IN (ZONES 1, 2, AND 3)
GROUNDING AND BONDING	INTEGRAL GROUNDING CERTIFIED TO UL 2703 REQUIREMENTS

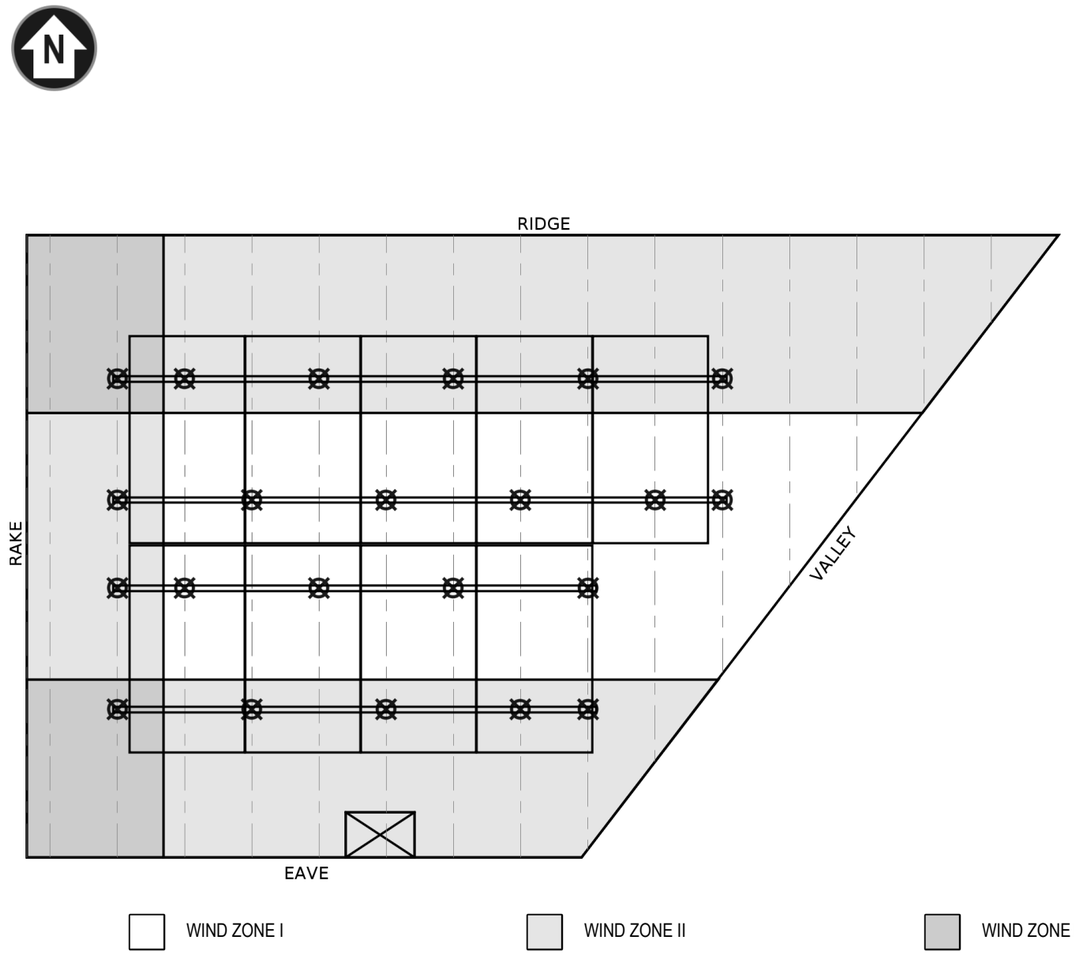
DEAD LOAD CALCULATIONS			
LOAD	QTY	LBS	TOTAL LBS
MODULES	9	48.5	436.5
MICROINVERTERS	9	1.1	9.7
LINEAR FEET OF RAIL	65 FT	0.5	32.1
ANCHORS	22	0.2	5.5
MISC. HARDWARE		3.1	3.1
TOTAL ARRAY WEIGHT			487.0 LBS
AREA NAME	QTY	SQFT	TOTAL SQFT
MODULES	9	21.1	189.9
POINT LOAD (487.0 LBS / 22 ATTACHMENTS)			22.1 LBS
DIST. LOAD (487.0 LBS / 189.9 SQFT)			2.56 PSF

NOTES	
1	RAFTER LOCATIONS ARE APPROXIMATE. ACTUAL LOCATIONS MAY DIFFER AND CONTRACTOR MAY NEED TO ADJUST MOUNT LOCATIONS. IN NO CASE SHALL THE MOUNT SPACING EXCEED "MAX. MOUNT SPACING"

Structural only

COLORADO LICENSED
VINCENT MWUMVANEZA
0056164
CIVIL
PROFESSIONAL ENGINEER

Exp. 10/31/2023



DISTANCE α IS EQUAL TO 10% OF THE BUILDING'S LEAST HORIZONTAL DIMENSION OR 40% OF THE MEAN ROOF HEIGHT, WHICHEVER IS SMALLER, BUT NOT LESS THAN 4% OF THE LEAST HORIZONTAL DIMENSION OR 3 FEET (ACSE 7-10). THESE SETBACKS ARE APPLIED TO THE BUILDING FOOTPRINT AND PROJECTED TO THE PLANES OF ROOF CORNERS, RAKES, HIPS, EAVES, MANSARDS, AND RIDGES OF ROOF FACES.

α = MAX(MIN(0.4 * MEAN ROOF HEIGHT, 0.1 * LEAST HORIZONTAL DIMENSION), 0.04 * LEAST HORIZONTAL DIMENSION, 3 FT)

4.1 FT = MAX(MIN(0.4 * 15.8 FT, 0.1 * 40.6 FT), 0.04 * 40.6 FT, 3 FT)

1 PV-5.1 ATTACHMENT PLAN (ORTHOGONAL PROJECTION)
SCALE: 1/4" = 1'

P-167788

GRID-TIED SOLAR POWER SYSTEM

MOORE RESIDENCE
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FORT COLLINS, CO 80524

ATTACHMENT PLAN

DOC ID: 167788-206689-1
DATE: 11/1/21
CREATOR: D.M.
REVIEWER:

REVISIONS

PV-5.1

ROOF PROPERTIES	
ROOF MATERIAL	COMPOSITION SHINGLE (1 LAYER)
SLOPE	10/12 (39.8°)
MEAN ROOF HEIGHT	17.5FT
DECK SHEATHING	15/32" OSB
CONSTRUCTION	RAFTERS (4X6'S), 24IN OC

MODULE MECHANICAL PROPERTIES	
MODEL	Q-CELLS Q.PEAK DUOBLK ML-G10+ 400
DIMENSIONS (AREA)	74.0IN X 41.1IN X 1.3IN (21.1 SQ FT)
WEIGHT	48.5LB

MOUNTING SYSTEM PROPERTIES	
RAIL MODEL	UNIRAC SOLARMOUNT LIGHT
ANCHOR MODEL	UNIRAC 004085D (FLASHED), 2.5IN AIR GAP
FASTENING METHOD	3.0 INCH EMBEDMENT INTO RAFTERS WITH (1) 5/16IN DIA. FASTENER
MAX. MOUNT SPACING	48.0IN (ZONES 1, 2, AND 3)
MAX. ALLOW. CANTILEVER	15.8IN (ZONES 1, 2, AND 3)
GROUNDING AND BONDING	INTEGRAL GROUNDING CERTIFIED TO UL 2703 REQUIREMENTS

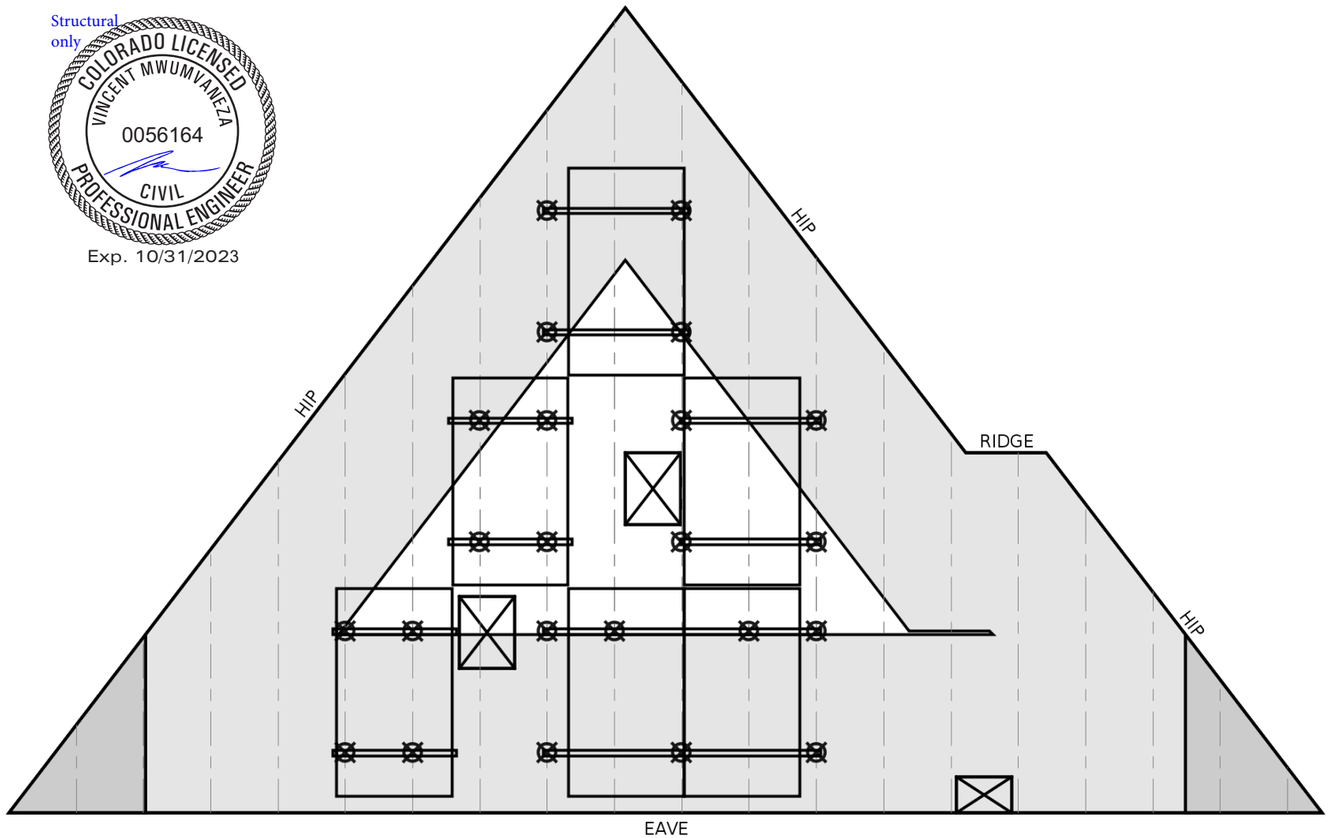
DEAD LOAD CALCULATIONS			
LOAD	QTY	LBS	TOTAL LBS
MODULES	6	48.5	291.0
MICROINVERTERS	6	1.1	6.5
LINEAR FEET OF RAIL	48 FT	0.5	23.7
ANCHORS	23	0.2	5.7
MISC. HARDWARE		3.7	3.7
TOTAL ARRAY WEIGHT			330.7 LBS
AREA NAME	QTY	SQFT	TOTAL SQFT
MODULES	6	21.1	126.6
POINT LOAD (330.7 LBS / 23 ATTACHMENTS)			14.4 LBS
DIST. LOAD (330.7 LBS / 126.6 SQFT)			2.61 PSF

NOTES	
1	RAFTER LOCATIONS ARE APPROXIMATE. ACTUAL LOCATIONS MAY DIFFER AND CONTRACTOR MAY NEED TO ADJUST MOUNT LOCATIONS. IN NO CASE SHALL THE MOUNT SPACING EXCEED "MAX. MOUNT SPACING"

Structural only

COLORADO LICENSED
VINCENT MWUMVANEZA
0056164
CIVIL
PROFESSIONAL ENGINEER

Exp. 10/31/2023



WIND ZONE I WIND ZONE II WIND ZONE III

DISTANCE α IS EQUAL TO 10% OF THE BUILDING'S LEAST HORIZONTAL DIMENSION OR 40% OF THE MEAN ROOF HEIGHT, WHICHEVER IS SMALLER, BUT NOT LESS THAN 4% OF THE LEAST HORIZONTAL DIMENSION OR 3 FEET (ACSE 7-10). THESE SETBACKS ARE APPLIED TO THE BUILDING FOOTPRINT AND PROJECTED TO THE PLANES OF ROOF CORNERS, RAKES, HIPS, EAVES, MANSARDS, AND RIDGES OF ROOF FACES.

α = MAX(MIN(0.4 * MEAN ROOF HEIGHT, 0.1 * LEAST HORIZONTAL DIMENSION), 0.04 * LEAST HORIZONTAL DIMENSION, 3 FT)

4.1 FT = MAX(MIN(0.4 * 17.5 FT, 0.1 * 40.6 FT), 0.04 * 40.6 FT, 3 FT)

P-167788

GRID-TIED SOLAR POWER SYSTEM

MOORE RESIDENCE
211 WHEDBEE ST
FORT COLLINS, CO 80524

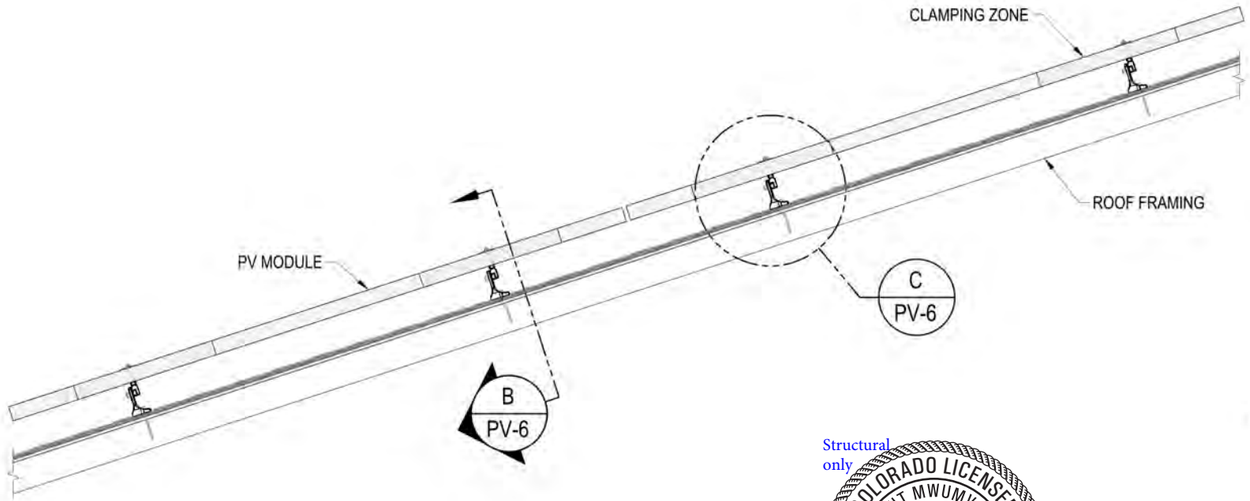
ATTACHMENT PLAN

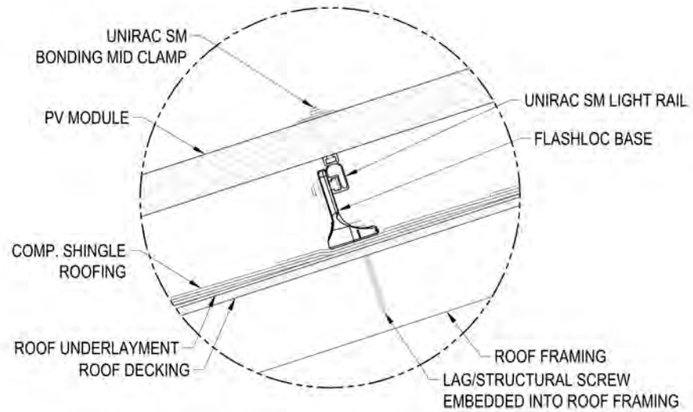
DOC ID: 167788-206689-1
DATE: 11/1/21
CREATOR: D.M.
REVIEWER:

REVISIONS

PV-5.2

MOUNTING SYSTEM NOTES	
1	FLASHING SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURERS' INSTRUCTIONS.
2	IF THERE IS ANY CONFLICT BETWEEN WHAT IS DEPICTED HERE AND INSTRUCTIONS PROVIDED BY A MANUFACTURER, THE MANUFACTURER'S INSTRUCTIONS SHALL SUPERCEDE.





Structural only

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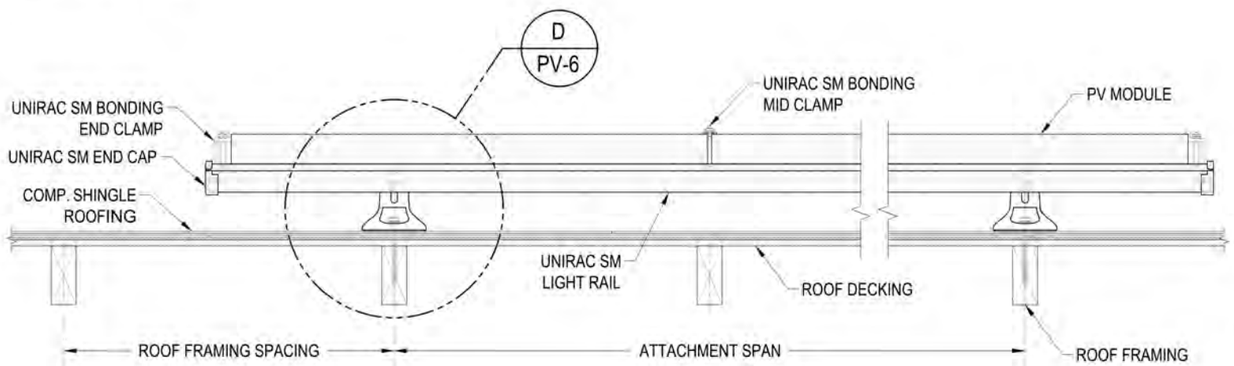
PROFESSIONAL ENGINEER

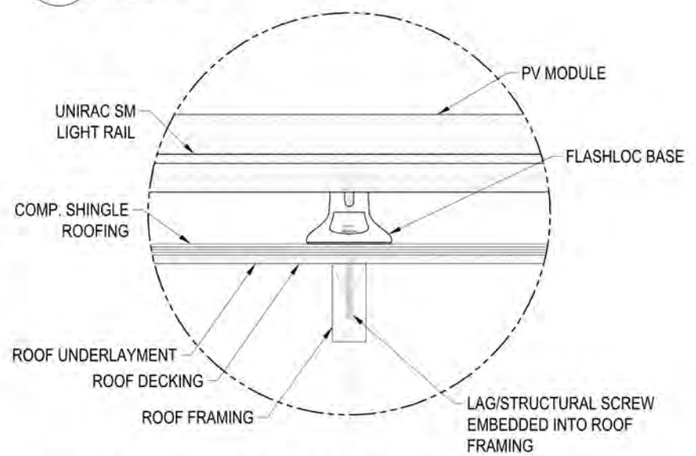
Exp. 10/31/2023

A PV-6 RACKING ELEVATION (TRANSVERSE VIEW)
SCALE: NTS



B PV-6 RACKING ELEVATION (LONGITUDINAL VIEW)
SCALE: NTS

C PV-6 ATTACHMENT DETAIL (TRANSVERSE VIEW)
SCALE: NTS



D PV-6 ATTACHMENT DETAIL (LONGITUDINAL VIEW)
SCALE: NTS

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FORT COLLINS, CO 80524

ATTACHMENT DETAILS

DOC ID: 167788-206689-1
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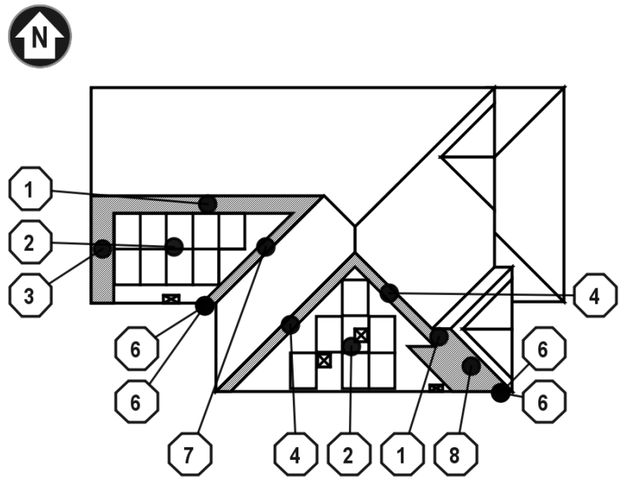
PV-6



1 FIRE SAFETY PLAN
PV-7 SCALE: 1" = 20'

GENERAL NOTES	
1	AT LEAST TWO 36"-WIDE PATHWAYS ON SEPARATE ROOF PLANES, FROM LOWEST ROOF EDGE TO RIDGE, SHALL BE PROVIDED ON ALL BUILDINGS. THERE SHALL BE AT LEAST ONE PATHWAY ON THE STREET OR DRIVEWAY SIDE OF THE ROOF. FOR EACH ROOF PLANE WITH A PV ARRAY, AT LEAST ONE SUCH PATHWAY SHALL BE PROVIDED ON THE SAME ROOF PLANE, OR ON AN ADJACENT ROOF PLANE, OR STRADDLING THE SAME AND ADJACENT ROOF PLANES. (IFC 1204.2.1.1)
2	FOR PV ARRAYS OCCUPYING 1/3 OR LESS OF THE PLAN VIEW TOTAL ROOF AREA, A MIN. 18"-WIDE SETBACK IS REQUIRED ON BOTH SIDES OF A HORIZONTAL RIDGE. (IFC 1204.2.1.2)
3	PV MODULES SHALL NOT BE INSTALLED ON THE PORTION OF A ROOF THAT IS BELOW AN EMERGENCY ESCAPE AND RESCUE OPENING. A 36"-WIDE PATHWAY SHALL BE PROVIDED TO THE EMERGENCY ESCAPE AND RESCUE OPENING. (IFC 1204.2.2)

1. 3.0 FT. WIDE SMOKE-VENTILATION SETBACK, PER IFC 1204.2.1.2
2. PV MODULES INSTALLED ON ROOF WITH UNIRAC SOLARMOUNT MOUNTING SYSTEM. THE MOUNTING SYSTEM IS UL 1703 CLASS A FIRE RATED ON A 10/12 SLOPED ROOF WHEN INSTALLED WITH TYPE 1, 2, 3, OR 10 MODULES. THE Q-CELLS Q.PEAK DUOBLK ML-G10+ 400 IS TYPE 2.
3. 3.0 FT. WIDE FIRE ACCESS PATHWAY, PER IFC 1204.2.1.1
4. 1.5 FT. WIDE FIRE ACCESS PATHWAY
5. ROADWAY
6. ROOF ACCESS POINT
7. 1.5 FT. WIDE FIRE ACCESS PATHWAY, PER IFC 1204.2.1.1
8. 6.3 FT. WIDE FIRE ACCESS PATHWAY, PER IFC 1204.2.1.1
9. TOTAL PLAN VIEW ARRAY AREA IS 261.8 SQ.FT, WHICH REPRESENTS 11.6% OF TOTAL PLAN VIEW ROOF AREA (2260.3 SQ.FT)
10. THIS SYSTEM UTILIZES MICROINVERTERS. THERE ARE NO DC CIRCUITS OUTSIDE OF THE ARRAY PERIMETER OR INSIDE THE BUILDING.
11. CABLES, WHEN RUN BETWEEN ARRAYS, SHALL BE ENCLOSED IN CONDUIT.

P-167788

GRID-TIED SOLAR POWER SYSTEM

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FIRE SAFETY PLAN

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PV-7

Q.PEAK DUO BLK ML-G9+

365-385

ENDURING HIGH PERFORMANCE

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2020

25 YR Warranty Product & Performance

Q CELLS Yield Security

BREAKING THE 20% EFFICIENCY BARRIER
Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.6%.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti LID Technology, Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminum alloy frame, certified for high snow (6000 Pa) and wind loads (4000 Pa).

A RELIABLE INVESTMENT
Inclusive 25-year product warranty and 25-year linear performance warranty[2].

STATE OF THE ART MODULE TECHNOLOGY
Q.ANTUM DUO combines cutting edge cell separation and innovative 12-busbar design with Q.ANTUM Technology.

[1] APT test conditions according to IEC/TS 62804-1:2015, method B (−1500 V, 168 h)
[2] See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

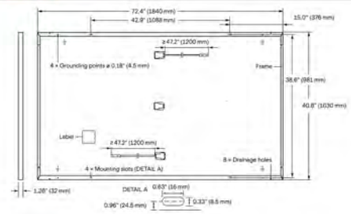
Rooftop arrays on residential buildings

Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	72.4 in × 40.6 in × 1.26 in (including frame) (1840 mm × 1030 mm × 32 mm)
Weight	43.0 lbs (19.5 kg)
Front Cover	0.11 in (2.8 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09–3.98 in × 1.26–2.36 in × 0.59–0.71 in (53–101 mm × 32–60 mm × 15–18 mm), IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥47.2 in (1200 mm), (−) ≥47.2 in (1200 mm)
Connector	Stäubli MC4; IP68

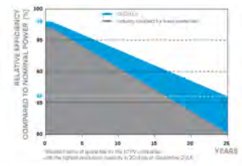


ELECTRICAL CHARACTERISTICS

POWER CLASS				365	370	375	380	385
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / −0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	365	370	375	380	385
	Short Circuit Current[1]	I_{SC}	[A]	10.40	10.44	10.47	10.50	10.53
	Open Circuit Voltage[1]	V_{OC}	[V]	44.93	44.97	45.01	45.04	45.08
	Current at MPP	I_{MPP}	[A]	9.87	9.92	9.98	10.04	10.10
	Voltage at MPP	V_{MPP}	[V]	36.99	37.28	37.57	37.85	38.13
	Efficiency[1]	η	[%]	≥19.3	≥19.5	≥19.8	≥20.1	≥20.3
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	273.3	277.1	280.8	284.6	288.3
	Short Circuit Current	I_{SC}	[A]	8.38	8.41	8.43	8.46	8.48
	Open Circuit Voltage	V_{OC}	[V]	42.37	42.41	42.44	42.48	42.51
	Current at MPP	I_{MPP}	[A]	7.76	7.81	7.86	7.91	7.96
	Voltage at MPP	V_{MPP}	[V]	35.23	35.48	35.72	35.96	36.20

[1] Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • [2] 800 W/m², NMOT, spectrum AM 1.5

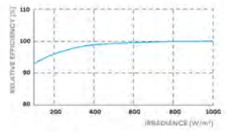
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	−0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.35	Nominal Module Operating Temperature	NMOT	[°F]	109 ± 5.4 (43 ± 3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull[3]	[lbs / ft²]	84 (4000 Pa) / 55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	−40 °F up to +185 °F (−40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]	[lbs / ft²]	125 (6000 Pa) / 84 (4000 Pa)		

[3] See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 61730, CE-compliant, IEC 61215:2016, IEC 61730:2016, U.S. Patent No. 9,893,215 (solar cells)

PACKAGING AND TRANSPORT INFORMATION

Horizontal packaging	74.4 in 1890 mm	42.5 in 1080 mm	47.6 in 1208 mm	1458 lbs 661 kg	28 pallets	53 40 HC	24 pallets	32 modules

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.
400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | **TEL** +1 949 748 59 96 | **EMAIL** inquiry@us.q-cells.com | **WEB** www.q-cells.us

P-167788

GRID-TIED SOLAR POWER SYSTEM

MOORE RESIDENCE
211 WHEDBEE ST
FORT COLLINS, CO 80524

PANEL SPEC SHEET

DOC ID: 167788-206689-1
DATE: 11/1/21
CREATOR: D.M.
REVIEWER:

REVISIONS

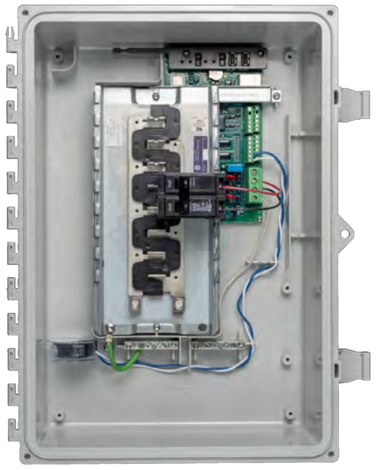
PV-8

Data Sheet
Enphase Networking

Enphase IQ Combiner 3

(X-IQ-AM1-240-3)

The **Enphase IQ Combiner 3**™ with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.



Smart

- Includes IQ Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring

Simple

- Reduced size from previous combiner
- Centered mounting brackets support single stud mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year warranty
- UL listed

LISTED

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

Enphase IQ Combiner 3

MODEL NUMBER	
IQ Combiner 3 X-IQ-AM1-240-3	IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).
ACCESSORIES and **REPLACEMENT PARTS** (not included, order separately)	
Enphase Mobile Connect™ CELLMODEM-03 (4G / 12-year data plan) CELLMODEM-01 (3G / 5-year data plan) CELLMODEM-M1 (4G based LTE-M / 5-year data plan)	Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)
Consumption Monitoring* CT CT-200-SPLIT	Split core current transformers enable whole home consumption metering (+/- 2.5%).
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220
EPLC-01	Power line carrier (communication bridge pair), quantity 2
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	65 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. continuous current rating (input from PV)	64 A
Max. total branch circuit breaker rating (input)	80A of distributed generation / 90A with IQ Envoy breaker included
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 37.5 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.06" (53.5 cm with mounting brackets).
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Cellular	Optional, CELLMODEM-01 (3G) or CELLMODEM-03 (4G) or CELLMODEM-M1 (4G based LTE-M) (not included)
COMPLIANCE	
Compliance, Combiner	UL 1741 CAN/CSA C22.2 No. 107.1 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
Compliance, IQ Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

* Consumption monitoring is required for Enphase Storage Systems.

To learn more about Enphase offerings, visit **enphase.com**

2018-09-13

ENPHASE

pe.eaton.com

Eaton general duty non-fusible safety switch

DG221URB

UPC:782113120232

Dimensions:

- **Height:** 10.81 IN
- **Length:** 6.88 IN
- **Width:** 6.38 IN

Weight:6 LB

Notes:WARNING! Switch is not approved for service entrance unless a neutral kit is installed.

Warranties:

- Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

Specifications:

- **Type:** Non-fusible, single-throw
- **Amperage Rating:** 30A
- **Enclosure:** NEMA 3R, Rainproof
- **Enclosure Material:** Painted galvanized steel
- **Fuse Configuration:** Non-fusible
- **Number Of Poles:** Two-pole
- **Number Of Wires:** Two-wire
- **Product Category:** General duty safety switch
- **Voltage Rating:** 240V

Supporting documents:

- Eatons Volume 2-Commercial Distribution
- Eaton Specification Sheet - DG221URB

Certifications:

- UL Listed

Product compliance: No Data

Data Sheet
Enphase Microinverters
Region: AMERICAS

Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready **Enphase IQ 7 Micro**™ and **Enphase IQ 7+ Micro**™ dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell and 72-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.

To learn more about Enphase offerings, visit **enphase.com**

Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)	IQ7-60-2-US / IQ7-60-B-US		IQ7PLUS-72-2-US / IQ7PLUS-72-B-US	
Commonly used module pairings[1]	235 W - 350 W +		235 W - 440 W +	
Module compatibility	60-cell PV modules only		60-cell and 72-cell PV modules	
Maximum input DC voltage	48 V		60 V	
Peak power tracking voltage	27 V - 37 V		27 V - 45 V	
Operating range	16 V - 48 V		16 V - 60 V	
Min/Max start voltage	22 V / 48 V		22 V / 60 V	
Max DC short circuit current (module Isc)	15 A		15 A	
Overvoltage class DC port	II		II	
DC port backfeed current	0 A		0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit			
OUTPUT DATA (AC)	**IQ 7 Microinverter**		**IQ 7+ Microinverter**	
Peak output power	250 VA		295 VA	
Maximum continuous output power	240 VA		290 VA	
Nominal (L-L) voltage/range[2]	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz		60 Hz	
Extended frequency range	47 - 68 Hz		47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms	
Maximum units per 20 A (L-L) branch circuit[3]	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III		III	
AC port backfeed current	0 A		0 A	
Power factor setting	1.0		1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging		0.85 leading ... 0.85 lagging	
EFFICIENCY	**@240 V**	**@208 V**	**@240 V**	**@208 V**
Peak efficiency	97.6 %	97.6 %	97.5 %	97.3 %
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %
MECHANICAL DATA				
Ambient temperature range	-40°C to +65°C			
Relative humidity range	4% to 100% (condensing)			
Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US)	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)			
Connector type (IQ7-60-B-US & IQ7PLUS-72-B-US)	Friends PV2 (MC4 intermateable). Adaptors for modules with MC4 or UTX connectors: - PV2 to MC4: order ECA-S20-S22 - PV2 to UTX: order ECA-S20-S25			
Dimensions (WxHxD)	212 mm x 175 mm x 30.2 mm (without bracket)			
Weight	1.08 kg (2.38 lbs)			
Cooling	Natural convection - No fans			
Approved for wet locations	Yes			
Pollution degree	PD3			
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure			
Environmental category / UV exposure rating	NEMA Type 6 / outdoor			
FEATURES				
Communication	Power Line Communication (PLC)			
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.			
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.			
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.			

1. No enforced DC/AC ratio. See the compatibility calculator at https://enphase.com/en-us/support/module-compatibility.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

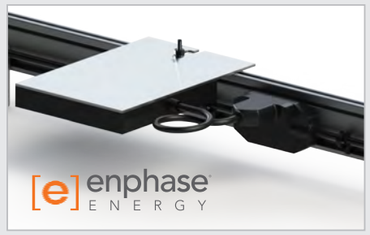
To learn more about Enphase offerings, visit **enphase.com**

2018-11-19

SM SOLARMOUNT

UNIRAC

SOLARMOUNT defined the standard in solar racking. New enhancements are designed to get installers off the roof faster than ever before. Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps to reduce costs. Utilize the microinverter mount with a wire management clip for an easier installation.



LOSE ALL OF THE COPPER & LUGS

System grounding through Enphase microinverters and trunk cables

SMALL IS THE NEXT NEW BIG THING

Light Rail is Fully Compatibility with all SM Components

ENHANCED DESIGN & LAYOUT TOOLS

Now Featuring Google Map Capabilities within U-Builder

GET OFF THE ROOF FASTER THAN EVER BEFORE

OPTIMIZED COMPONENTS • VERSATILITY • DESIGN TOOLS • QUALITY PROVIDER

SM SOLARMOUNT

UNIRAC
A HILTI GROUP COMPANY

OPTIMIZED COMPONENTS

INTEGRATED BONDING & PRE-ASSEMBLED PARTS

Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps or bonding jumpers to reduce costs. Utilize the microinverter mount with a wire management clip for an easier installation.

VERSATILITY

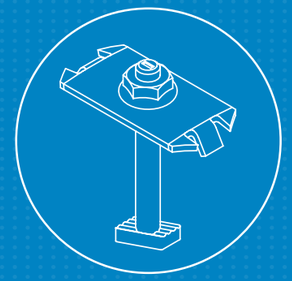
ONE PRODUCT - MANY APPLICATIONS

Quickly set modules flush to the roof or at a desired tilt angle. Change module orientation to portrait or landscape while securing a large variety of framed modules on flat, low sloped or steep pitched roofs. Available in mill, clear and dark anodized finishes to outperform your projects financial and aesthetic aspirations.

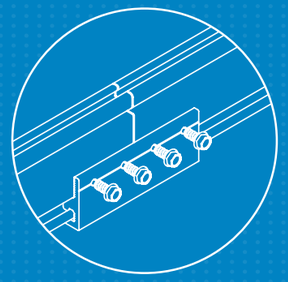
AUTOMATED DESIGN TOOL

DESIGN PLATFORM AT YOUR SERVICE

Creating a bill of materials is just a few clicks away with U-Builder, a powerful online tool that streamlines the process of designing a code compliant solar mounting system. Save time by creating a user profile, and recall preferences and projects automatically when you log in. You will enjoy the ability to share projects with customers; there's no need to print results and send to a distributor, just click and share.

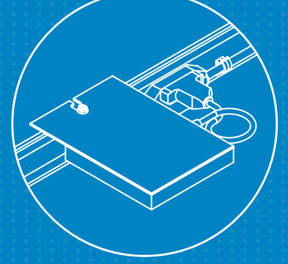


INTEGRATED BONDING MIDCLAMP



INTEGRATED BONDING SPLICE BAR

INTEGRATED BONDING L-FOOT w/ T-BOLT



INTEGRATED BONDING MICROINVERTER MOUNT w/ WIRE MANAGEMENT

LISTED **UL2703**
BONDING & GROUNDING
MECHANICAL LOADING
SYSTEM FIRE CLASSIFICATION

UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT

UNMATCHED EXPERIENCE | CERTIFIED QUALITY | ENGINEERING EXCELLENCE | BANKABLE WARRANTY | DESIGN TOOLS | PERMIT DOCUMENTATION

TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.

CERTIFIED QUALITY PROVIDER

Unirac is the only PV mounting vendor with ISO certifications for 9001:2008, 14001:2004 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

BANKABLE WARRANTY

As a Hilti Group Company, Unirac has the financial strength to back our products and reduce your risk. Have peace of mind knowing you are receiving products of exceptional quality. SOLARMOUNT is covered by a 10 year limited product warranty and a 5 year limited finish warranty.

PROTECT YOUR REPUTATION WITH QUALITY RACKING SOLUTIONS BACKED BY ENGINEERING EXCELLENCE AND A SUPERIOR SUPPLY CHAIN

PUB 16JAN04 - DIGITAL UPDATES

DOTEC CORP.

CUSTOMIZED ENGINEERING SOLUTIONS

September 21, 2016

To: Unirac, Inc.
1411 Broadway Blvd NE
Albuquerque, MN 87102-1545

Attn: Engineering Department,

Re: Engineering Certification for Unirac's SolarMount™ Design & Engineering Guide and U-Builder

DOTec Engineering has reviewed and certified Unirac's SM SolarMount™ "Design & Engineering Guide: Flush-To-Roof Design" and the "Installation Guide", including Unirac's three rail types, Solarmount Light, Solarmount Rail and Solarmount HD.

All information, data, and analysis contained within the D & E Guide and U-Builder are based on, and comply with the following:

I. ASCE/SEI 7-10 – Minimum Design Loads for Buildings and other Structures
II. 2015 International Building Code (IBC)
III. 2015 International Residential Code (IRC)
IV. Steel Construction Manual, 13th Ed., American Institute of Steel Construction
V. Aluminum Design Manual, The Aluminum Association, 2005

This certification excludes connections to the building structures and the effects on the building structure components.

This letter certifies that the structural calculations contained within Unirac's SolarMount Design & Engineering Guide and U-Builder are in compliance with the above Codes.

Please call if you have any questions or concerns.

Sincerely,

COLORADO LICENSED
DR. ILDEFONSO GONZALEZ
43996
PROFESSIONAL ENGINEER

Dr. Ildefonso " Al" Gonzalez, P.E. PhD
Colorado #43996
DOTec Engineering, Inc.
St. Charles, MO

The Chris Young Building • 424 Jefferson St • Saint Charles, MO 63301, Telephone: (636) 724-9872 • Facsimile: (636) 410-3334
www.DOTecEngineering.com

Certificate

TÜV Rheinland PTL

Certificate no. US 82160015 01

License Holder:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Manufacturing Plant:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Test report no.: USA- 31440029 005
Client Reference: Tom Young
Tested to: UL 2703:2015

Certified Product: Module Rack Mounting System
License Fee - Units

Model Designation: SolarMount (SM) 7

Max System Voltage of PV Module: 1000 VDC
Max Size of PV Module: 20.8 sq.ft. surface area
Max Overcurrent Protection Rating of PV Module:
30 A when using the qualified grounding lugs;
20 A when using the Enphase micro inverter EGC.

Fire Rating: Class A when installed with
Type 1, Type 2, Type3, or Type 10 fire rated modules.

(continued)

7

Appendix: 1,1-5

Licensed Test mark:

TÜVRheinland US

Date of Issue (day/mo/yr)
27/07/2016

Certificate

TÜV Rheinland PTL

Certificate no. US 82160015 02

License Holder:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Manufacturing Plant:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Test report no.: USA- 31440029 005
Client Reference: Tom Young
Tested to: UL 2703:2015

Certified Product: Module Rack Mounting System
License Fee - Units

(continued) 7

Modules Qualified for Mechanical Load:

	Design Load (psf) Pos	Neg	Down-Slope
Trina Solar TSM-255PA05.08	112	50	N/T
Centrosolar TP6 250 SW and E 250B	112	50	N/T
TSMC Solar TS-150C2	35	35	N/T
SunPower SPR-E20-327	112	50	N/T
Hyundai Solar HiS-M300MI & HiS-S300MI	112	50	10

Models from same series with same frame are qualified if their area is < or = qualified module area. (continued)

7

Appendix: 1,1-5

Licensed Test mark:

TÜVRheinland US

Date of Issue (day/mo/yr)
27/07/2016

TÜV Rheinland PTL, LLC, 2210 South Roosevelt Street, Tempe, Arizona 85282, Tel (480) 966-1700, Fax (775) 314-6458

Certificate

TÜV Rheinland PTL

Certificate no. US 82160015 06

License Holder:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Manufacturing Plant:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Test report no.: USA- 31440029 006 **Client Reference:** Tom Young
Tested to: UL 2703:2015

Certified Product: Module Rack Mounting System **License Fee - Units**

(continued)		7
Additional Modules Qualified for Electrical Bonding (contd.)		
Panasonic	VBHNxxxYY (YY=SA06, SA06B, SA11, SA11B, SA15, SA15B, SA16, SA16B, KA)	
Q-Cells	Q.PEAK YY xxx, Q.PEAK BLK YY xxx (YY=G3, G3.1, G4.1, G4.1/TAA)	
	Q.PEAK G4.1/MAX xxx, Q.PEAK L G4.2 xxx	
	Q.PLUS BFR YY xxx (YY=G3.1, G4.1, G4.1/MAX, G4.1/TAA)	
	Q.PLUS YY xxx (YY=G3, G4, L G4, L G4.1, L G4.2, L G4.2/TAA)	
	(continued)	
		7

Appendix: 1,1-5

Licensed Test mark:

TÜVRheinland US

Date of Issue (day/mo/yr)
02/05/2017

Certificate

TÜV Rheinland PTL

Certificate no. US 82160015 07

License Holder:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Manufacturing Plant:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Test report no.: USA- 31440029 006 **Client Reference:** Tom Young
Tested to: UL 2703:2015

Certified Product: Module Rack Mounting System **License Fee - Units**

(continued)		7
Additional Modules Qualified for Electrical Bonding (contd.)		
Q-Cells	Q.PRO BFR YY xxx (YY=G3, G4, G4.1/MAX, G4.1/TAA)	
	Q.PRO YY xxx (YY=L G2.3, G3, L G3, L G3.1, G4, L G4, L G4.1, L G4.2, L G4.2/TAA)	
	Q.PRO YY xxx (YY=L G2), 40mm frame only	
	B.LINE PLUS YY xxx (YY=BFR G4.1, L G4.2)	
	B.LINE PRO YY xxx (YY=BFR G4.1, L G4.1, L G4.2)	
Silfab	SLAxxxYY, SLGxxxYY (YY=M or P)	
SunPower	P-Series	
Trina Solar	DD05	
		7

Appendix: 1,1-5

Licensed Test mark:

TÜVRheinland US

Date of Issue (day/mo/yr)
02/05/2017

TÜV Rheinland PTL, LLC, 1107 W. Fairmont Drive, Building A, Tempe, Arizona 85282, Tel (480) 966-1700, Fax (775) 314-6458

FLASH LOC

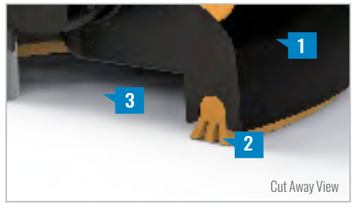
UNIRAC
BETTER SOLAR STARTS HERE

FLASHLOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. **FLASH**LOC's patented TRIPLE SEAL technology preserves the roof and protects the penetration with a permanent pressure seal. Kitted with lag bolts, sealant, and hardware for maximum convenience. Don't just divert water, **LOC it out!**

TESTED TO TAS-100
WIND DRIVEN RAIN TEST
AND UL441 RAIN TEST

PROTECT THE ROOF

Install a high-strength waterproof attachment without lifting, prying or damaging shingles.



LOC OUT WATER

With an outer shield 1 contour-conforming gasket 2 and pressurized sealant chamber 3 the Triple Seal technology delivers a 100% waterproof connection.

HIGH-SPEED INSTALL

Simply drive lag bolt and inject sealant into the port 4 to create a permanent pressure seal.

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

FLASH LOC

INSTALLATION GUIDE

UNIRAC
BETTER SOLAR STARTS HERE

PRE-INSTALL

Snap chalk lines for attachment rows. On shingle roofs, snap lines 1-3/4" below upslope edge of shingle course. Locate rafters and mark attachment locations.

At each location, drill a 7/32" pilot hole. Clean roof surface of dirt, debris, snow, and ice. Next, BACKFILL ALL PILOT HOLES WITH SEALANT.

NOTE: Space mounts per racking system install specifications.

STEP 1: SECURE

Place **FLASH**LOC over pilot hole with lag on down-slope side. Align indicator marks on sides of mount with chalk line. Pass included lag bolt and sealing washer through **FLASH**LOC into pilot hole. Drive lag bolt until mount is held firmly in place.

NOTE: The EPDM in the sealing washer will expand beyond the edge of the metal washer when proper torque is applied.

STEP 2: SEAL

Insert tip of UNIRAC provided sealant into port. Inject until sealant exits both vents.

Continue array installation, attaching rails to mounts with provided T-bolts.

NOTE: When **FLASH**LOC is installed over gap between shingle tabs or vertical joints, fill gap/joint with sealant between mount and upslope edge of shingle course.

USE ONLY UNIRAC APPROVED SEALANTS: Chemlink Duralink 50, Chemlink M-1, Geocel 4500, or Geocel S-4

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

EV ENGINEERS
projects@evengineersnet.com
http://www.evengineersnet.com
276-220-0064

10/22/2021

RE: Structural Certification for Installation of Residential Solar
PETER MOORE:211 WHEDBEE ST, FORT COLLINS,CO 80524

Attn: To Whom It May Concern

This Letter is for the existing roof framing which supports the new PV modules as well as the attachment of the PV system to existing roof framing. From the field observation report, the roof is made of Composite shingle roofing over roof plywood supported by 4X6 Rafters at 24 inches. The slope of the roof was approximated to be 40 degrees and the allowable maximum chord span is 12 feet between supports.

After review and based on our structural capacity calculation, **the existing roof framing has been determined to be adequate to support the imposed loads without structural upgrades.** Contractor shall verify that existing framing is consistent with the described above before install. Should they find any discrepancies, a written approval from SEOR is mandatory before proceeding with install. Capacity calculations were done in accordance with applicable building codes.

Design Criteria

Code	2018 International Residential Code (ASCE 7-16)				
Risk category		II	Wind Load	(component and Cladding)	
Roof Dead Load	Dr	10 psf		V	107 mph
PV Dead Load	DPV	3 psf		Exposure	C
Roof Live Load	Lr	20 psf			
Ground Snow	S	35 psf			

If you have any questions on the above, please do not hesitate to call.

Sincerely,

Vincent Mwumvaneza, P.E.
EV Engineering, LLC
projects@evengineersnet.com
http://www.evengineersnet.com

EXP:10/31/2023

EV ENGINEERS
projects@evengineersnet.com
http://www.evengineersnet.com
276-220-0064

Structural Letter for PV Installation

Date: 10/22/2021
Job Address: **211 WHEDBEE ST**
FORT COLLINS,CO 80524
Job Name: **PETER MOORE**
Job Number: **211022PM**

Scope of Work

This Letter is for the existing roof framing which supports the new PV modules as well as the attachment of the PV system to existing roof framing. All PV mounting equipment shall be designed and installed per manufacturer's approved installation specifications.

Table of Content

Engineering Calculations Summary

Code	2018 International Residential Code (ASCE 7-16)		
Risk category		II	
Roof Dead Load	Dr	10	psf
PV Dead Load	DPV	3	psf
Roof Live Load	Lr	20	psf
Ground Snow	S	35	psf
Wind Load	(component and Cladding)		
	V	107	mph
	Exposure	C	

References

2 NDS for Wood Construction

Sincerely,

Vincent Mwumvaneza, P.E.
EV Engineering, LLC
projects@evengineersnet.com
http://www.evengineersnet.com

EXP:10/31/2023

Wind Load Cont.

Risk Category =	II		
Wind Speed (3s gust), V =	**107**	**mph**	**ASCE 7-16 Figure 26.5-1B**
Exposure =	**C**		
K_{Zt} =	1.0		ASCE 7-16 Sec 26.8.2
K_Z =	0.85		ASCE 7-16 Table 26.10-1
K_d =	0.85		ASCE 7-16 Table 26.6-1
K_e =	0.84		ASCE 7-16 Table 26.9-1
$q_h = 0.00256K_zK_{zt}K_dK_eV^2$ =	17.69	psf	
Pitch =	40.0	Degrees	
γ_E =	1.5	Conservatively assuming all exposed	
γ_a =	0.8	conservatively assuming 10 ft^2 effective area	

Uplift (W)		**Zone(1,2e,2r)**	**Zone(2n)**	**Zone(3r)**	**Zone(3e)**
Fig. 30-3-2	GC_p=	-1.1	-1.1	-1.45	-1.8
Eq. 29.4-7	$P=q_h(GC_p)(\gamma_E)(\gamma_a)$=	-23.35	-23.35	-30.77	-38.20

GC_p=	0.9	Figure 30.3-2
$P=q_h(GC_p)(\gamma_E)(\gamma_a)$=	19.10	Equation 29.4-7

Rafter Attachments: 0.6D+0.6W (CD=1.6)

Connection Check

Attachement max. spacing=	4	ft	
5/16" Lag Screw Withdrawal Value=	266	lbs/in	Table 12.2A - NDS
Lag Screw Penetration	2.5	in	DFL Assumed
Prying Coefficient	1.4		
Allowable Capacity=	760	lbs	

Zone	**Trib Width**	**Area (ft)**	**Uplift (lbs)**	**Down (lbs)**	
Zone(1,2e,2r)	4	11.0	130.4	182.3	
Zone(2n)	4	11.0	130.4	182.3	
Zone(3r)	4	11.0	167.2	182.3	
Zone(3e)	4	11.0	204.0	182.3	
	Conservative Max=		204.0	<	760
			CONNECTION IS OK		

1. Pv seismic dead weight is negligible to result in significant seismic uplift, therefore the wind uplift governs
2. Embedment is measured from the top of the framing member to the tapered tip of a lag screw. Embedment in sheading or other material does not count.

Vertical Load Resisting System Design

Roof Framing Rafters

Snow Load Fully Exposed

pg=	35	psf			
C_e =	0.9				
C_t =	1.1				
I_s =	1.0				
p_f =	24	psf			
$p_{fmin.}$ =	**30.0**	psf			
p_s =	**30**	psf	CS=	0.5	30 plf

Max Length, L =	**12**	ft	(Beam maximum Allowable Span)			
Tributary Width, W_T =	**24**	in				
Dr =	**10**	psf	20	plf		
PvDL =	3	psf	6	plf		

Load Case: DL+0.75(0.6W+S)

0.75(Pnet+Ps)+ $P_{pv}\cos(\theta)+P_{DL}$=	81	plf				
M_{down}=	1467	lb-ft				
Mallowable = Sx x Fb' (wind)=	3517	lb-ft	>	1467	lb-ft	**OK**

Load Case: DL+S

Ps+ $P_{pv}\cos(\theta)+P_{DL}$=	55	plf				
M_{down}=	983	lb-ft				
Mallowable = Sx x Fb' (wind)=	2528	lb-ft	>	983	lb-ft	**OK**

Load Case: DL+0.6W

Pnet+ $P_{pv}\cos(\theta)+P_{DL}$=	70.4	plf				
Max Moment, $M_u=wL^2/8$ =	1268	lb-ft				
Mallowable = Sx x Fb' (wind)=	3517	lb-ft	>	1268	lb-ft	**OK**
Pv max Shear=	182.3	lbs				
Shear, V_u=wL/2+Pv Point Load =	338	lbs				
Max Shear, V_u=wL/2+Pv Point Load =	489	lb				

Member Capacity

DF-L No.1

4X6	Design Value	C_L	C_F	C_i	C_r	K_F	ϕ	λ	Adjusted Value
F_b =	1000 psi	1.0	1.3	1.0	1.15	2.54	0.85	0.8	1495 psi
F_v =	180 psi	N/A	N/A	1.0	N/A	2.88	0.75	0.8	180 psi
E =	1700000 psi	N/A	N/A	1.0	N/A	N/A	N/A	N/A	1700000 psi
E_{min} =	620000 psi	N/A	N/A	1.0	N/A	1.76	0.85	N/A	620000 psi

Depth, d =	5.5	in			
Width, b =	3.5	in			
Cross-Sectonal Area, A =	19.25	in^2			
Moment of Inertia, I_{xx} =	48.526	in^4			
Section Modulus, S_{xx} =	17.6458	in^3			
Allowable Moment, $M_{all} = F_b'S_{xx}$ =	2198.4	lb-ft	$DCR=M_u/M_{all}$ =	0.38 < 1	**Satisfactory**
Allowable Shear, $V_{all} = 2/3F_v'A$ =	2310.0	lb	$DCR=V_u/V_{all}$ =	0.19 < 1	**Satisfactory**

Siesmic Loads Check

Roof Dead Load	10	psf
% or Roof with Pv	5.4%	
Dpv and Racking	3	psf
Average Total Dead Load	10.2	psf
Increase in Dead Load	0.8%	**OK**

The increase in seismic Dead weight as a result of the solar system is less than 10% of the existing structure and therefore no further seismic analysis is required.

Limits of Scope of Work and Liability

We have based our structural capacity determination on information in pictures and a drawing set titled PV plans - PETER MOORE. The analysis was according to applicable building codes, professional engineering and design experience, opinions and judgments. The calculations produced for this Structure's assessment are only for the proposed solar panel installation referenced in the stamped plan set and were made according to generally recognized structural analysis standards and procedures.