



CERTIFICATE OF APPROPRIATENESS PLACARD

for Raleigh Historic Resources

Project Description:

Install roof solar panels; install wall-mounted solar equipment

115 N Bloodworth St

Address

Oakwood

Historic District

Historic Property

COA-0041-2024

Certificate Number

5/6/2024

Date of Issue

11/6/2024

Expiration Date

This card must be kept posted in a location within public view until all phases of the described project are complete. The work must conform with the code of the City of Raleigh and laws of the state of North Carolina. When your project is complete, you are required to ask for a final zoning inspection in a historic district area. Telephone the RHDC office at 832-7238 and commission staff will coordinate the inspection with the inspections Department. If you do not call for this final inspection, your Certificate of Appropriateness is null and void.

Signature, _____

Elin Morton Puehl

Raleigh Historic Development Commission

Pending the resolution of appeals, commencement of work is at your own risk.

Type or print the following:

Applicant name: Allen Rawls

Mailing address: 115 N Bloodworth St

City: Raleigh

State: NC

Zip code: 27601

Date: 2. April 2024

Daytime phone #:

Email address: raleigh@brownrawls.com

Applicant signature: Allen Rawls



Minor work (staff review) – one copy

Major work (COA committee review) – ten copies

Additions > 25% of building sq. footage

New buildings

Demolition of building or structure

All other

Post approval re-review of conditions of approval

Office Use Only

Transaction #: _____

File #: COA-0041-2024

Fee: _____

Amount paid: _____

Received date: _____

Received by: _____

Property street address: 115 N Bloodworth St

Historic district: Oakwood

Historic property/Landmark name (if applicable):

Owner name: Allen Rawls

Owner mailing address: 115 N Bloodworth St, Raleigh, NC 27601

For applications that require review by the COA Committee (major work), provide addressed and stamped envelopes for owners for all properties with 100 feet on all sides of the property, as well as the property owner.

Property Owner Name & Address	Property Owner Name & Address

I understand that all major work applications that require review by the Raleigh Historic Development Commission's COA Committee must be submitted by 4 p.m. on the date of the application deadline; otherwise, consideration will be delayed until the following committee meeting. An incomplete application will not be accepted.

Will you be applying for rehabilitation tax credits for this project? Yes <input type="radio"/> No <input checked="" type="radio"/>	Office Use Only Type of work: <u>87</u>
Did you consult with staff prior to filing the application? Yes <input type="radio"/> No <input checked="" type="radio"/>	

Design Guidelines: please cite the applicable sections of the design guidelines (www.rhdc.org).		
Section/Page	Topic	Brief description of work (attach additional sheets as needed).
2.10	.12	install solar panels on roof of home
2.10	.12	install solar equipment along south facade

Minor Work Approval (office use only)

Upon being signed and dated below by the Planning Director or designee, this application becomes the Minor Work Certificate of Appropriateness. It is valid until 11/06/2024.

Please post the enclosed placard form of the certificate as indicated at the bottom of the card. Issuance of a Minor Work Certificate shall not relieve the applicant, contractor, tenant, or property owner from obtaining any other permit required by City Code or any law. Minor Works are subject to an appeals period of 30 days from the date of approval.

Signature (City of Raleigh) *Erin Morte Pugh* Date 05/06/2024

2. April 2024

Raleigh Historic Development Commission,

We propose to install solar collectors upon the roof of our non-historic home at 115 N Bloodworth in the Oakwood historic district. Following the guidance of 2.10.12, the panels will be installed on the south and west facing roof segments, which are not visible from Bloodworth street frontage located east of the property. Proposed layout and manufacture specification provided.

In support of the solar system, additional equipment is to be installed on the south-facing wall beside the existing electrical panel and other utility service demarcations. In congruence with guidance 2.10.12, visibility of the space between our property and our neighbor to the south at 111 N Bloodworth, which also features both our HVAC compressors, is screened by natural plantings. Site photos provided.

This application seeks to preserve the beautiful mature canopy provided by a willow oak located towards the rear of our property, while harvesting the solar radiation that insulates the primary structure on our property.

Thank you for your consideration,

Allen Rawls
115 N Bloodworth

Regarding the panel offset from the roof and view from the street, the bottom of the roof pitch is 12' above the ground, 16' above the sidewalk, 17' above the street, and has a steep pitch. One has to be in front our southern neighbor's house to even see the roof surface. The screened plantings shield the roof and the side yard from the street. In order to see the utility demarkation equipment that already exists on the house, one has to be standing in front of our southern neighbor's house and looking across their front and side yard.

Allen Rawls
115 N Bloodworth

Due to the height of the roof vs the street, there will be a 10" setback of the flush mounted panels from the eastern edge of the roof. The existing roof ridge cap also follows this same setback and is currently not visible from the street.



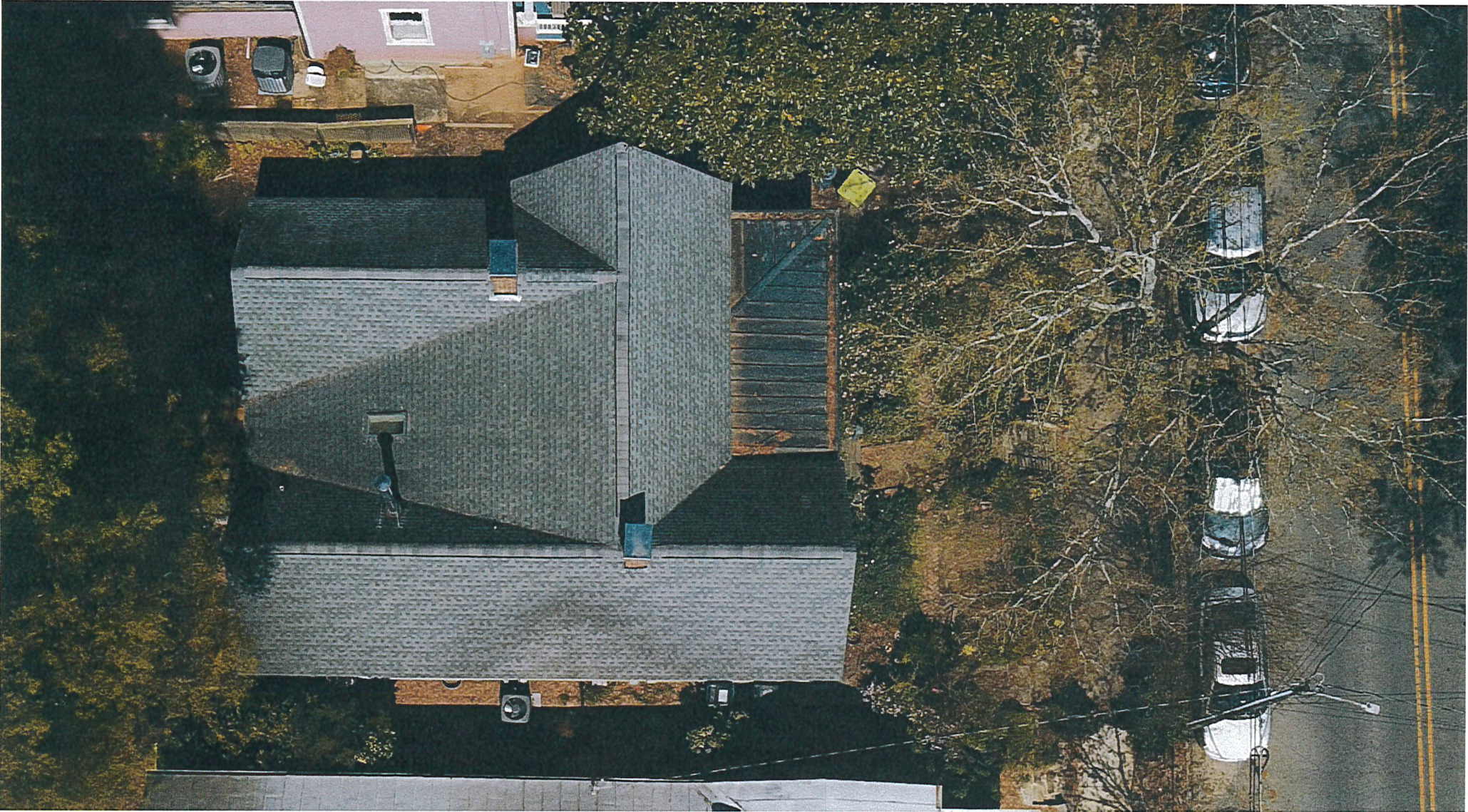
115 N Bloodworth
(looking west)



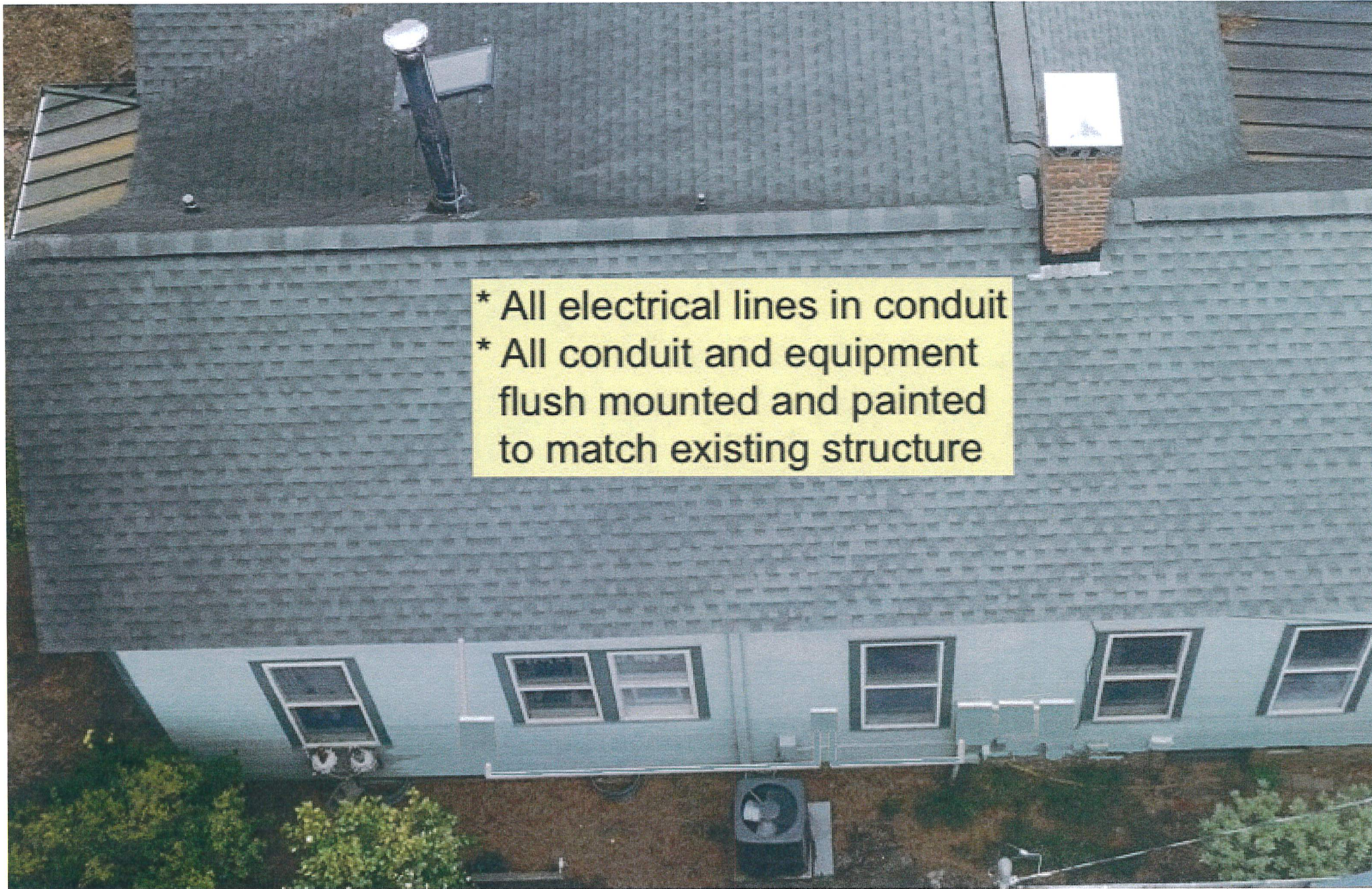
111

115





Utility Mockup



- * All electrical lines in conduit
- * All conduit and equipment flush mounted and painted to match existing structure

115 N Bloodworth

(B)

(A)

N

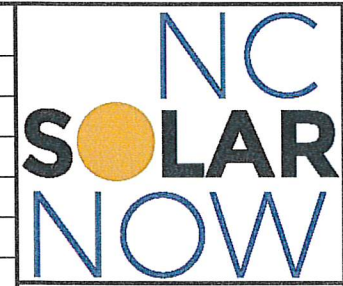
STREET



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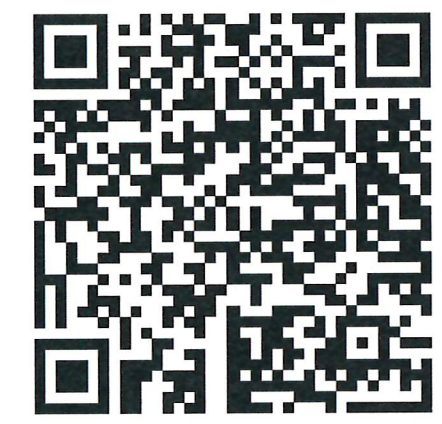
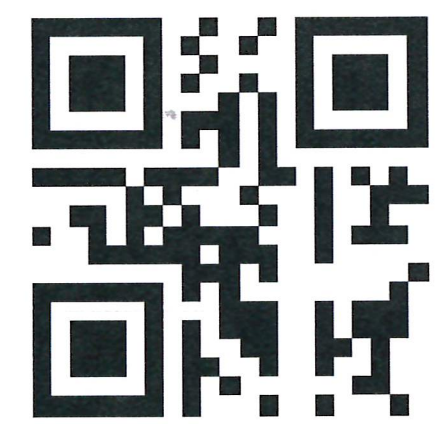
PV MATERIAL SUMMARY: DISTRIBUTOR	
Q.TRON BLK M-G2+ 425	26
MCI-1	11
MI-BHW	11
Tesla PW3 1707000-xx-y	1
Tesla BUG 1232100-00-X	1
XR-10-168B	4
XR-10-204B	9
XR10-BOSS-01-M1	6
UFO-CL-01-B1	62
UFO-STP-30MM-B1	20
XR-LUG-03-A1	7
4 IN QB1	39
QB DECK MOUNT 16317	33
GC66803 Geocel Sealant	3
SOLADECK 0799-5B	2



CLIENT INFO
 ELISABETH M BROWN
 115 N BLOODWORTH ST
 RALEIGH NC 27601

PROJECT INFO
 DC INPUT: 11.050 kW
 AC OUTPUT: 11.500 kW
 DOI INSPT. METHOD: OPTION 2

Model Energy
 300 Fayetteville St.
 #1430
 Raleigh, NC 27602
 919-274-9905
 ModelEnergy.com
 P-1194



CODE REFERENCES
 NATION ELECTRICAL CODE v. 2017
 NC FIRE PROTECTION CODE v. 2018
 NC BUILDING CODE v. 2018
 NC RESIDENTIAL CODE v. 2018
 ACSE v. 7-10

SITE CONDITIONS
 WIND SPEED: 120 MPH
 RISK CATEGORY: II
 EXPOSURE: B
 SNOW: 15 PSF

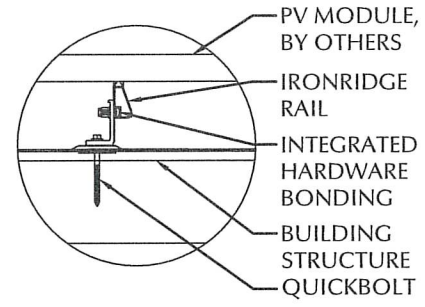
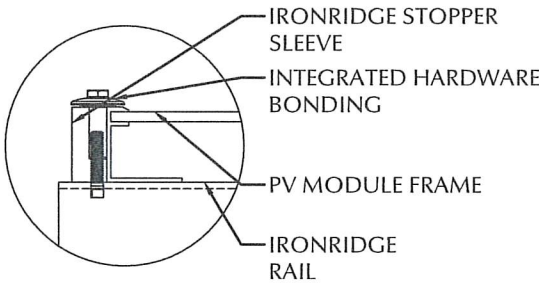
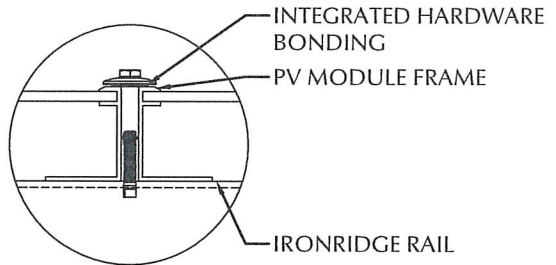
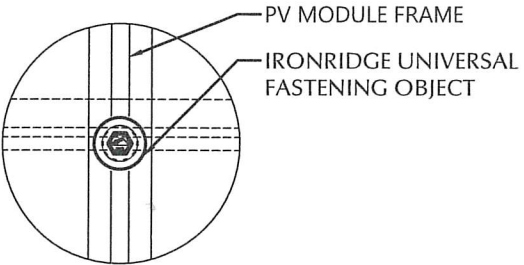
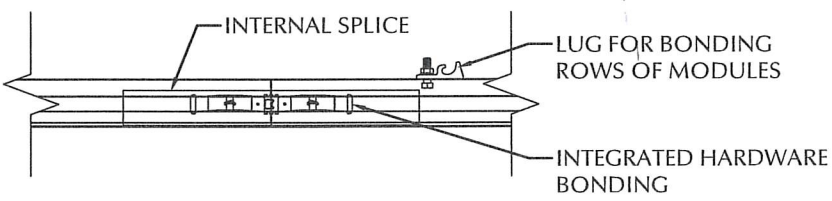
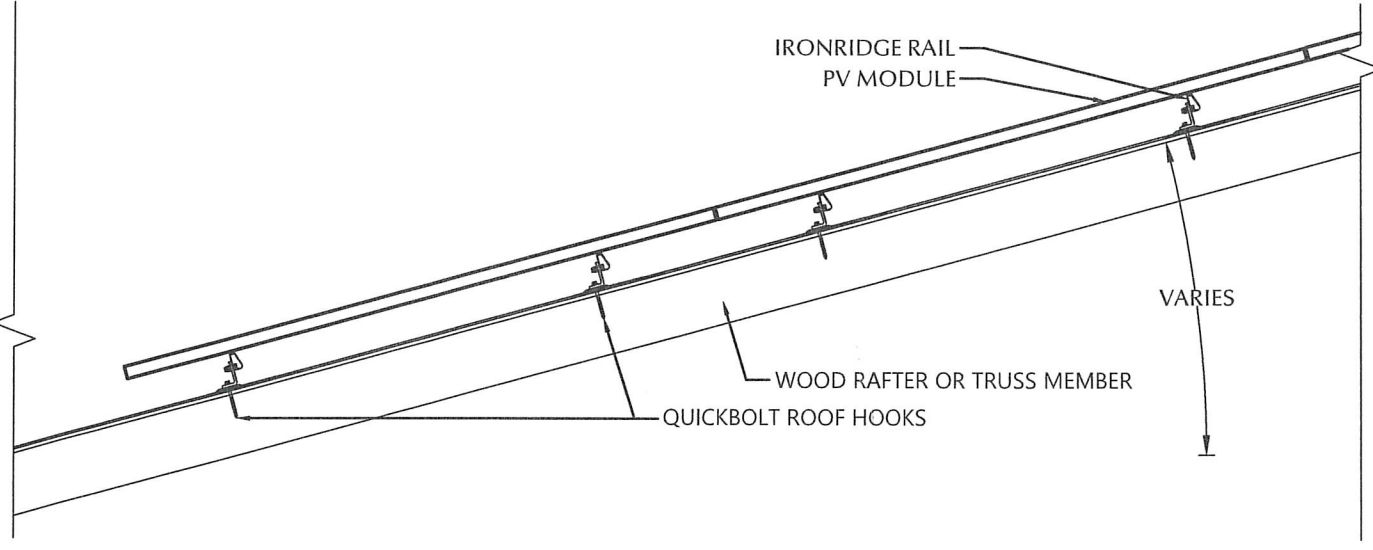
SHEET INDEX
 PV-1: COVER SHEET
 PV-2: PV STRUCTURAL
 PV-3: PV ELECTRICAL
 PV-4: PV EQUIPMENT LABELS
 PV-5: PV INSTALL GUIDE

VERSIONS		
FOR:	DESIGNER	DATE
CONSTRUCTION	MCP	4/11/2024

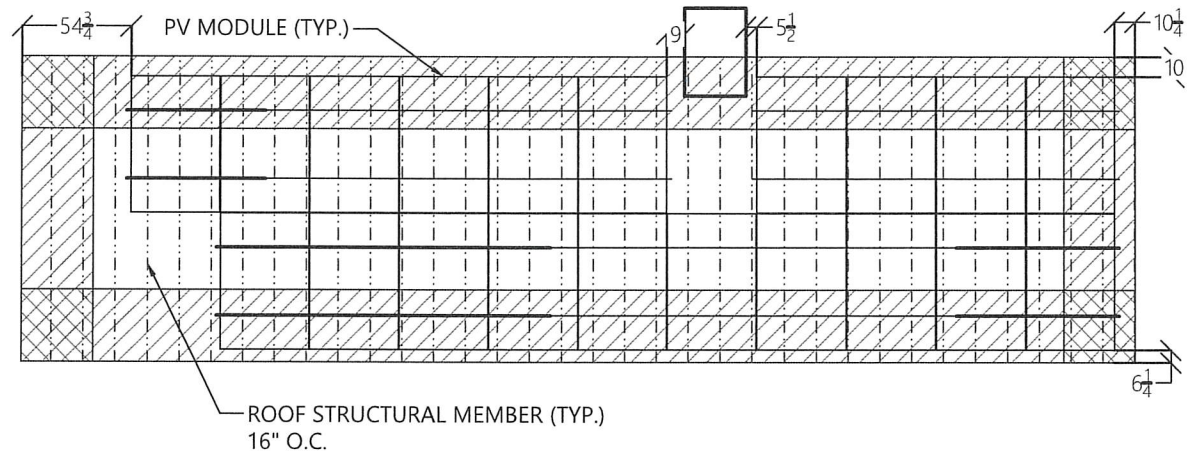
PV SYSTEM COVER PAGE

PV-1.1

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1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF ARRAY LAYOUT
1/8" = 1'-0"

STATEMENT OF STRUCTURAL COMPLIANCE

THE EXISTING ROOF STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE ADDITIONAL LOADS OF THE PROPOSED PV SYSTEM. IN ADDITION, THE RACKING AND FASTENING SYSTEM SHALL BE CAPABLE OF SECURING THE SYSTEM TO THE STRUCTURE UNDER DESIGN CONDITIONS WHEN INSTALLED PROPERLY AND IN ACCORDANCE WITH THE RACKING AND FASTENING ARRANGEMENT DETAILED WITHIN THESE DRAWINGS.

NAME: ANDREW W. KING, PE
SIGNED: *Andrew W. King*

PV MODULES	
MAKE	HANWHA
MODEL	Q.TRON BLK M-G2+ 425
WIDTH	44.60 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	46.70 LBS.
ARRAY AREA	420 SQFT.
ARRAY WEIGHT	1050 LBS.

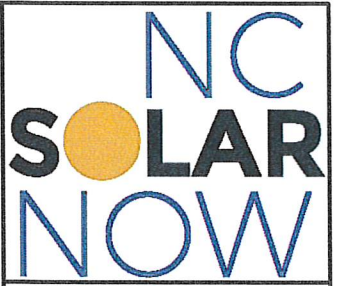
ROOF SUMMARY	
STRUCTURE:	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 6
SPACING	16 IN O.C.
EFFECTIVE SPAN	92 IN
PITCH	11/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	PLYWOOD
MATERIAL	COMPOSITE
THICKNESS	8/16 IN
WEIGHT	1.42 LBS./SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.

ROOF MOUNT SUMMARY		
MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	64 IN	16 IN
WIND ZONE 2	64 IN	16 IN
WIND ZONE 3	48 IN	16 IN

ROOF LOADING	
GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS./SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-24.6 LBS./SQFT.
UPLIFT ZONE 2	-29.0 LBS./SQFT.
UPLIFT ZONE 3	-29.0 LBS./SQFT.
DOWNWARD	23.0 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-368 LBS.
UPLIFT ZONE 2	-433 LBS.
UPLIFT ZONE 3	-325 LBS.
DOWNWARD	344 LBS.

ROOF MOUNT & FASTENER	
ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	4 IN QB1
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	QUICK SCREWS
MODEL	HANGER BOLT
MATERIAL	304 SS
SIZE	5/16-18 X 5-1/4"
GENERAL:	
WEIGHT	0.56 LBS.
FASTENERS PER MOUNT	1
MAX. PULL-OUT FORCE	960.0 LBS.
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	480.0 LBS.

MOUNTING RAILS	
MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN



CLIENT INFO
ELISABETH M BROWN
115 N BLOODWORTH ST
RALEIGH NC 27601

PROJECT INFO
DC INPUT: 11.050 kW
AC OUTPUT: 11.500 kW
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SITE CONDITIONS
WIND SPEED: 120 MPH
RISK CATEGORY: II
EXPOSURE: B
SNOW: 15 PSF

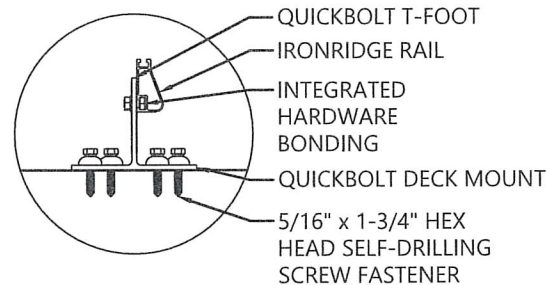
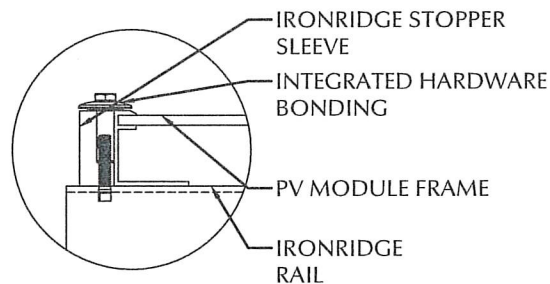
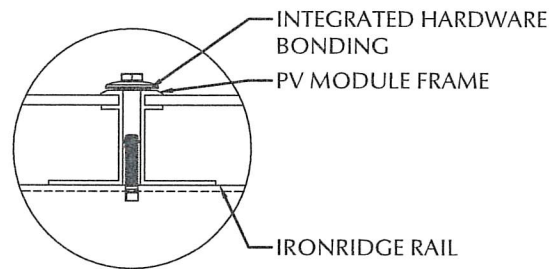
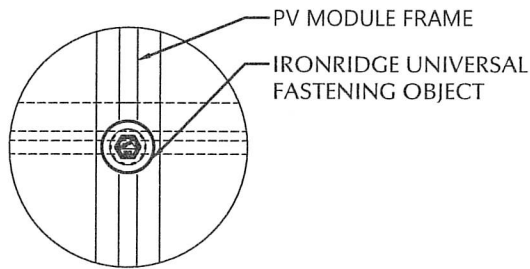
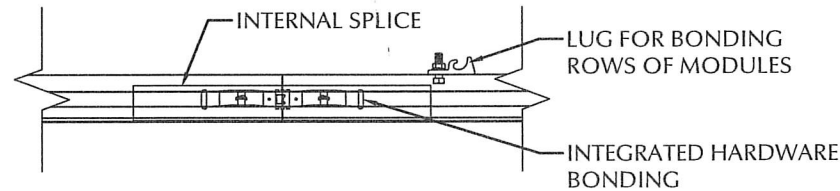
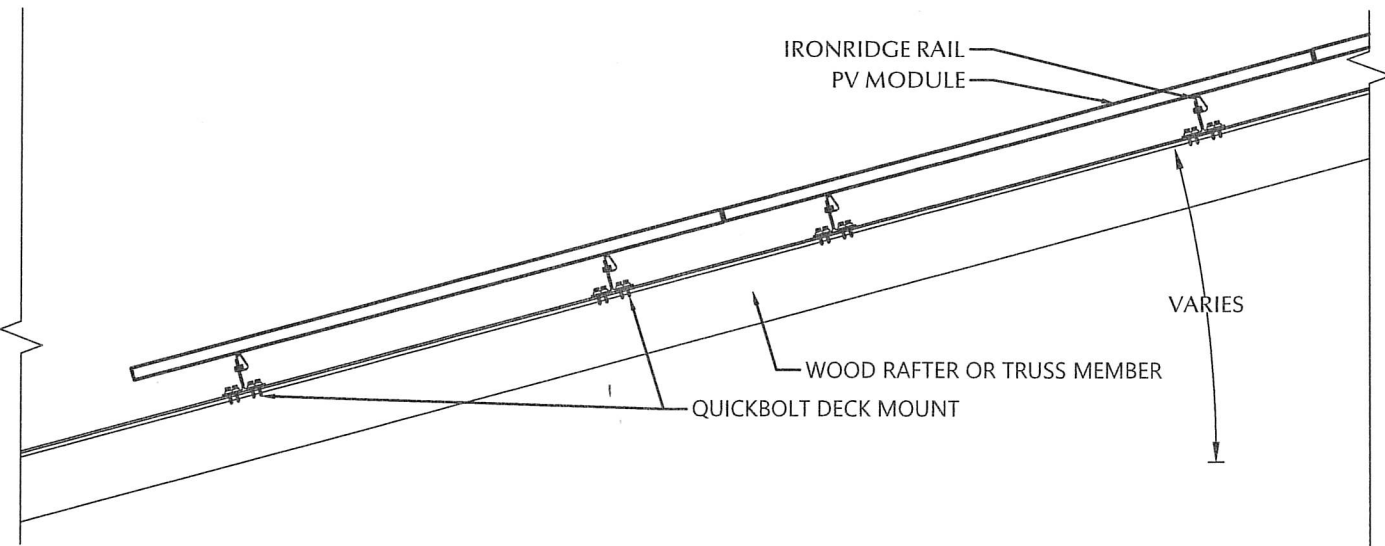
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VERSIONS		
FOR:	DESIGNER:	DATE:
CONSTRUCTION	MCP	4/11/2024

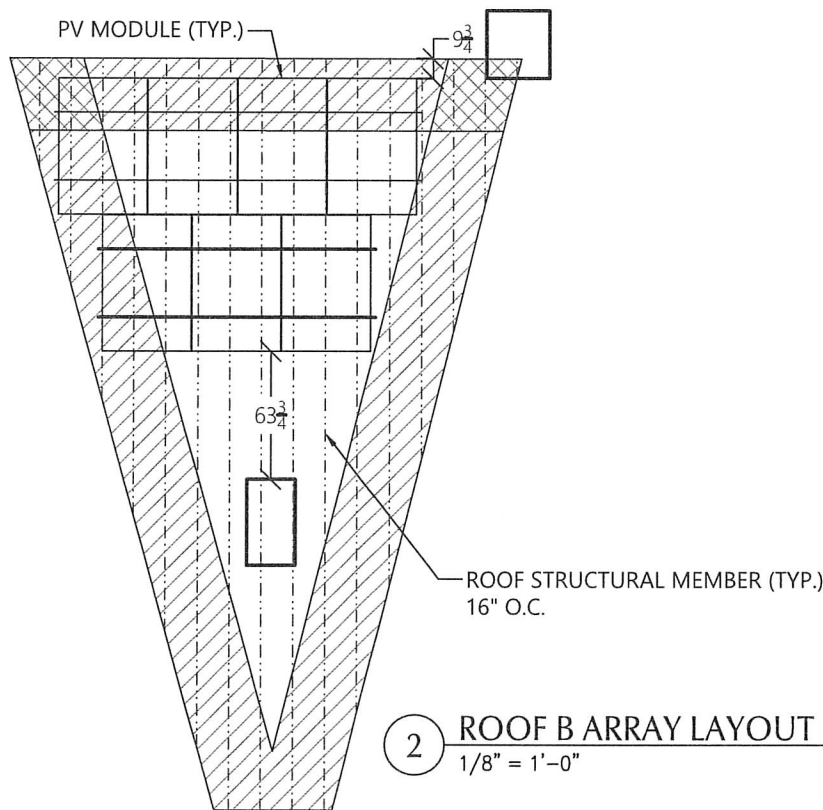
PV SYSTEM STRUCTURAL

PV-2.1

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1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF B ARRAY LAYOUT
1/8" = 1'-0"

STATEMENT OF STRUCTURAL COMPLIANCE

THE EXISTING ROOF STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE ADDITIONAL LOADS OF THE PROPOSED PV SYSTEM. IN ADDITION, THE RACKING AND FASTENING SYSTEM SHALL BE CAPABLE OF SECURING THE SYSTEM TO THE STRUCTURE UNDER DESIGN CONDITIONS WHEN INSTALLED PROPERLY AND IN ACCORDANCE WITH THE RACKING AND FASTENING ARRANGEMENT DETAILED WITHIN THESE DRAWINGS.

NAME: ANDREW W. KING, PE

SIGNED: *Andrew W. King*

PV MODULES

MAKE	HANWHA
MODEL	Q.TRON BLK M-G2+ 425
WIDTH	44.60 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	46.70 LBS.
ARRAY AREA	126 SQFT.
ARRAY WEIGHT	315 LBS.

ROOF SUMMARY

STRUCTURE:	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 6
SPACING	16 IN O.C.
EFFECTIVE SPAN	92 IN
PITCH	5/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	PURLINS
MATERIAL	WOOD
THICKNESS	2" IN
WEIGHT	1.60 LBS./SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.

ROOF MOUNT SUMMARY

MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	43 IN	17 IN
WIND ZONE 2	24 IN	9 IN
WIND ZONE 3	14 IN	5 IN

ROOF LOADING

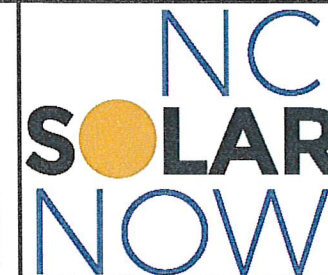
GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS./SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-23.0 LBS./SQFT.
UPLIFT ZONE 2	-38.0 LBS./SQFT.
UPLIFT ZONE 3	-57.1 LBS./SQFT.
DOWNWARD	13.6 LBS./SQFT.
FASTER LOAD:	
UPLIFT ZONE 1	-231 LBS.
UPLIFT ZONE 2	-213 LBS.
UPLIFT ZONE 3	-187 LBS.
DOWNWARD	137 LBS.

ROOF MOUNT & FASTENER

ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	QB DECK MOUNT 16317
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	QUICK SCREWS
MODEL	HEX LAG PN# 16318
MATERIAL	304 SS
SIZE	5/16" X 1-3/4"
GENERAL:	
WEIGHT	0.88 LBS.
FASTENERS PER MOUNT	4
MAX. PULL-OUT FORCE	705.0 LBS.
SAFETY FACTOR	3
DESIGN PULL-OUT FORCE	235.0 LBS.

MOUNTING RAILS

MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN



CLIENT INFO

ELISABETH M BROWN
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SITE CONDITIONS

WIND SPEED: 120 MPH
RISK CATEGORY: II
EXPOSURE: B
SNOW: 15 PSF

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VERSIONS

FOR:	DESIGNER	DATE
CONSTRUCTION	MCP	4/11/2024

PV SYSTEM STRUCTURAL

PV-2.2

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CONDUCTOR SCHEDULE

TAG	CURRENT CARRYING CONDUCTORS			GROUNDING CONDUCTORS			CONDUIT/RACEWAY			NOTES
	QTY.	SIZE	INSULATION	QTY.	SIZE	INSULATION	QTY.	SIZE	LOCATION	
C1	8	10 AWG	PV WIRE	1	6 AWG	BARE	-	-	FREE AIR	1
C2	8	10 AWG	THWN-2	1	10 AWG	THWN-2	2	3/4"	EXT/INT	2,4
C3	3	6 AWG	THWN-2	1	10 AWG	THWN-2	1	1"	EXTERIOR	2,4
C4	3	4/0 AWG ALUMINUM	XHHW	1	6 AWG	THWN-2	1	2"	EXT/INT	2,4
C5	3	4/0 AWG ALUMINUM	XHHW	-	-	-	1	2"	EXTERIOR	2,4
XC	-	-	-	-	-	-	-	-	-	3

- NOTES:
- MANUFACTURER PROVIDED, UL LISTED WIRING HARNESS FOR USE ON EXPOSED ROOFS
 - CONDUIT SIZE SHOWN IS CODE MINIMUM. LARGER SIZES ARE ALLOWED.
 - EXISTING CONDUCTORS, FIELD VERIFY
 - EQUIPMENT TERMINAL RATING SHALL BE A MINIMUM OF 75°C AT BOTH END OF CONDUCTOR

ENERGY MANAGEMENT

MAKE	TESLA
MODEL	BACKUP GATEWAY 2
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
DISCONNECT CURR.	200 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	YES
MAIN BREAKER RATING	200 AMPS

- TROUGH MAY BE USED IF NECESSARY
- INSTALL 200A EATON MAIN BREAKER THAT WILL SERVE AS THE NEW SERVICE DISCONNECT SWITCH
- INSTALL INTERNAL PANELBOARD KIT TO LAND POWERWALL 3
- INSTALL BONDING JUMPER FROM NEUTRAL TO GROUND
- FEED BACKED-UP LOADS PANEL VIA BACKUP LUGS

PV MODULE

MAKE	HANWHA
MODEL	Q.TRON BLK M-G2+ 425
NOM. POWER (PNOM)	425 WATTS
NOM. VOLT. (VMPP)	32.7 VOLTS
O.C. VOLT (VOC)	39.0 VOLTS
MAX. SYS. VOLT.	1000 VOLTS
NOM. CURR. (IMPP)	13.0 AMPS
S.C. CURR. (ISC)	13.7 AMPS
TEMP. COEF. (PMPP)	-0.30 %/C
TEMP. COEF. (Voc)	-0.24 %/C
MAX SERIES FUSE	25 AMPS
UL COMPLIANT (Y/N)	YES

MAX. DC VOLTAGE CALCULATION

$V_{OC}MAX = V_{OC} * (1 + (TMIN - TSTC) * (VTC / 100))$	
$V_{OC}MAX$	42.39
MAX STRING VOLTAGE	423.9

MIN. DC VOLTAGE CALCULATION

$V_{MP}MIN. = V_{MP} * (1 + ((Tmax + Tadd - Tstc) * (TKvmp / 100)))$	
$V_{MP}MIN.$	28.22

MAX. DC CURRENT CALCULATION

$I_{SC}MAX = I_{SC} * TCX$	
$I_{SC}MAX$ (AMPS)	17.13

MAX. PV STRING CALCULATION

MAX. MODULES PER STRING = INVERTER $V_{MAX} / V_{OC}MAX.$	
MAX. MODULES/STRING	12

MIN. PV STRING CALCULATION

MIN. MODULES PER STRING = INVERTER $V_{MIN} / V_{MP}MIN.$	
MIN. MODULES/STRING	5

NEW UTILITY METER

MAKE	MILBANK
MODEL	OUTD-LAN UAT417-XGF
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
AMP RATING	200 AMPS
UL LIST. (Y/N)	YES

- FEED EXISTING METER WITH NEW METER BASE THAT FEEDS ENERGY MANAGEMENT

MODULE OPTIMIZER

MAKE	SOLAREEDGE
MODEL	P401
DC INPUT:	
NOM. POWER	400 WATTS
VOLT. RANGE	8 to 60
MAX. CURR.	11.8 AMPS
DC OUTPUT:	
NOM. POWER	400 WATTS
MAX. VOLT.	60 VOLTS
MAX. CURR.	15 AMPS
MIN-MAX STRING	8-25 OPTIMIZERS
UL LIST. (Y/N)	YES

JUNCTION BOX

MAKE	EZ SOLAR
PROTECT. RATING	NEMA TYPE 3R
UL LIST. (Y/N)	YES

NEW BACKED-UP LOADS PANEL

MAKE	GENERIC
MODEL	N/A
ENCL. RATING	NEMA TYPE 1
VOLT. RATING	240
BUS RATING	200 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	YES
MAIN BREAKER RATING	200 AMPS

- FEED BACKED-UP LOADS PANEL VIA GATEWAY OUTPUTS
- REMOVE N/G BOND
- FEED EX. SUB PANEL VIA 90A BREAKER IN NEW BACKED UP LOADS PANEL

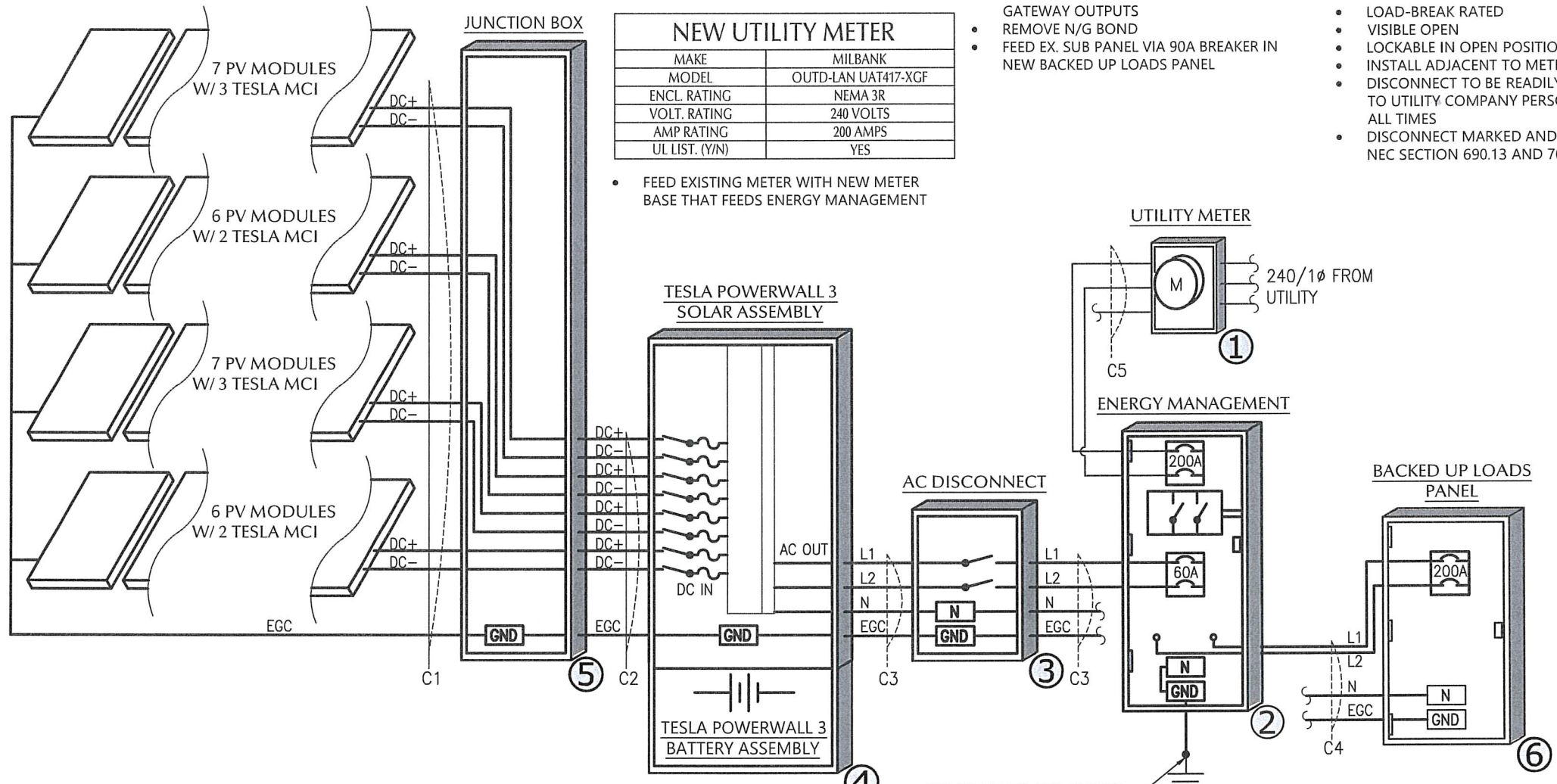
DC/AC INVERTER & BATTERY

MAKE	TESLA POWERWALL 3
MODEL	1707000-XX-Y
INVERTER INFO:	
DC INPUT:	
MAX POWER	20000 WATTS
INPUT VOLT. RANGE	60-550 VOLTS
MPPT VOLT. RANGE	150-480 VOLTS
MAX. MPPT CUR.	13 AMPS
STRING INPUTS	6 MPPTs
AC OUTPUT:	
MAX. CONT. POWER	11500 WATTS
NOM. VOLT.	240 VOLTS
MAX. CONT. CURRENT	48.00 AMPS
RAPID SHUTDOWN (Y/N)	YES
PROTECT. RATING	NEMA TYPE 3R
BATTERY INFO:	
USABLE ENERGY	13.5 kWh
NOM. VOLT.	240 VOLTS
MAX. CONT. CHARGE	5000 WATTS
UL LIST. (Y/N)	YES

AC DISCONNECT

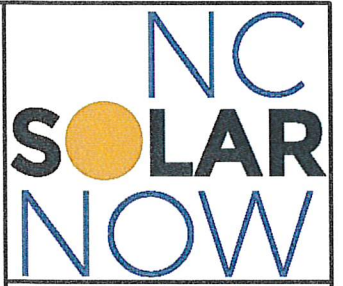
MAKE	GENERIC
MODEL	NA
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
AMP RATING	60 AMPS
UL LIST. (Y/N)	YES
FUSED (Y/N)	NO
FUSE RATING	N/A

- LOAD-BREAK RATED
- VISIBLE OPEN
- LOCKABLE IN OPEN POSITION
- INSTALL ADJACENT TO METER
- DISCONNECT TO BE READILY ACCESSIBLE TO UTILITY COMPANY PERSONNEL AT ALL TIMES
- DISCONNECT MARKED AND RATED PER NEC SECTION 690.13 AND 705.10



1 ELECTRICAL SCHEMATIC
NTS

CONNECT TO BUILDING'S EXISTING GROUNDING SYSTEM



CLIENT INFO

ELISABETH M BROWN
115 N BLOODWORTH ST
RALEIGH NC 27601

PROJECT INFO

DC INPUT: 11.050 kW
AC OUTPUT: 11.500 kW
DOI INSP. METHOD: OPTION 2

Model Energy

300 Fayetteville St.
#1430
Raleigh, NC 27602
919-274-9905
ModelEnergy.com

P-1194

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED: 120 MPH
RISK CATEGORY: II
EXPOSURE: B
SNOW: 15 PSF

SHEET INDEX

PV-1: COVER SHEET
PV-2: PV STRUCTURAL
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PV-5: PV INSTALL GUIDE

VERSIONS

FOR:	DESIGNER:	DATE:
CONSTRUCTION	MCP	4/11/2024

PV SYSTEM
ELECTRICAL

PV-3.1

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⚠ WARNING

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

② NEC 705.12 (B)(2)(3)(c)
PLACE ON METER COMBO

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

③ NEC 690.56 (C)(3)
PLACE ON RAPID SHUTDOWN SWITCH OR EQUIPMENT WITH INTEGRATED RAPID SHUTDOWN *REFLECTIVE*

PV SYSTEM DISCONNECT

③ NEC 690.13 (B)
PLACE ON PV SYSTEM DISCONNECTING MEANS.

⚠ WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

② NEC 690.13 (B)
PLACE ON PV SYSTEM DISCONNECTING MEANS.

PHOTOVOLTAIC SYSTEM AC DISCONNECT

OPERATING VOLTAGE	240	VOLTS
OPERATING CURRENT	48.0	AMPS

③ NEC 690.54
PLACE ON INTERCONNECTION DISCONNECTING MEANS

DIRECT CURRENT PHOTOVOLTAIC POWER SOURCE

MAXIMUM VOLTAGE	600	VDC
MAX CIRCUIT CURRENT	68.52	AMPS

④ NEC 690.53
PLACE ON ALL DC DISCONNECTING MEANS

⚠ WARNING

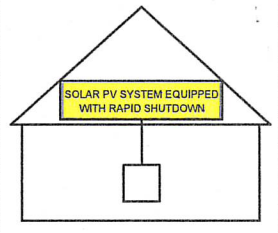
THREE POWER SOURCES

①
②
⑥ SOURCES: UTILITY GRID, BATTERY AND PV SOLAR ELECTRIC SYSTEM

NEC 705.12(B)(3)
PLACE ON ALL EQUIPMENT THAT IS SUPPLIED BY THREE POWER SOURCES

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



② NEC 690.56 (C)(1)(a)
PLACE WITHIN 3FT OF SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATIONS OF RAPID SHUTDOWN SWITCHES

WARNING:

IN THE EVENT OF A UTILITY OUTAGE, THIS PANEL IS FED FROM ENERGY STORAGE SYSTEM.

②
⑥ PLACE ON BACKED UP LOAD PANEL(S).

WARNING: PHOTOVOLTAIC POWER SOURCE

⑤ NEC 690.31 (G)(3)&(4)
PLACE ON ALL JUNCTION BOXES, EXPOSED RACEWAYS, AND OTHER WIRING METHODS EVERY 10' AND ON EVERY SECTION SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.

SERVICE DISCONNECT LOCATED:
SOUTH WALL OF RESIDENCE

BATTERY DISCONNECT LOCATED:
SOUTH WALL OF RESIDENCE

PV DISCONNECT LOCATED:
SOUTH WALL OF RESIDENCE

②③ NEC 705.10
PLACE AT SERVICE EQUIPMENT AND PV SYSTEM DISCONNECTING MEANS

LABEL NOTES

1. LABELS SHOWN ARE HALF THEIR ACTUAL REQUIRED SIZE.
2. LABEL MATERIAL SHALL BE SUITABLE FOR THE EQUIPMENT ENVIRONMENT.
3. DC CONDUIT SHALL BE MARKED WITH REQUIRED LABEL EVERY 10 FEET.
4. LABELS WILL BE APPLIED IN ACCORDANCE WITH THE NEC. SOME LABELS MAY NOT BE NECESSARY.

DC WIRING NOTES

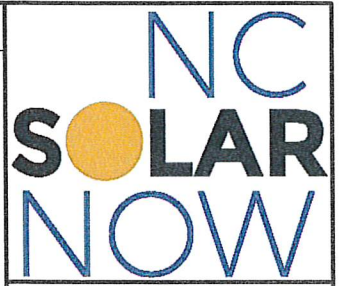
1. CONDUCTORS SHALL BE COPPER, RATED AT NOT LESS THAN 600 VOLTS FOR RESIDENTIAL CONSTRUCTION AND NOT LESS THAN 1000 VOLTS FOR COMMERCIAL CONSTRUCTION.
2. MINIMUM SIZE SHALL BE #10 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXPOSED WIRING CONDUCTOR INSULATION SHALL BE TYPE PV WIRE, USE-2, OR RHW-2 WHERE THE OUTER LAYER OF THE INSULATION IS UV, SUNLIGHT, AND MOISTURE RESISTANT.
6. EXTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THWN-2 AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT) OR RIGID POLYVINYL CHLORIDE CONDUIT(PVC). ALTERNATIVELY, METAL CLAD CABLE(MC) CAN BE USED AS WELL WHEN RATED FOR USE IN WET LOCATIONS.
7. INTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THHN-2 AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), FLEXIBLE METAL CONDUIT(FMC), OR METAL CLAD CABLE(MC).
6. USE SCHEDULE 40 PVC OUTDOORS WHERE NOT SUBJECT TO PHYSICAL DAMAGE OR BELOW FLOOR SLAB. USE SCHEDULE 80 PVC OUTDOORS WHERE SUBJECT TO PHYSICAL DAMMAGE
7. MINIMUM CONDUIT SIZE TO BE 1/2".
8. WIRING METHODS TO CONFORM TO ARTICLES 330, 334, 348, 350, 352, 356, AND 358 OF THE 2017 NEC.

AC WIRING NOTES

1. CONDUCTORS SHALL BE COPPER RATED AT NOT LESS THAN 600 VOLTS. MINIMUM SIZE SHALL BE #14 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THWN AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), RIGID POLYVINYL CHLORIDE CONDUIT(PVC), LIQUID-TIGHT FLEXIBLE METAL CONDUIT(LFMC), OR LIQUID-TIGHT FLEXIBLE NON-METALLIC CONDUIT(LFNC). ALTERNATIVELY, METAL CLAD CABLE(MC) CAN BE USED AS WELL WHEN RATED FOR USE IN WET LOCATIONS.
4. INTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THHN AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), FLEXIBLE METAL CONDUIT(FMC), METAL CLAD CABLE(MC), OR ROMEX.
5. USE SCHEDULE 40 PVC OUTDOORS WHERE NOT SUBJECT TO PHYSICAL DAMAGE OR BELOW FLOOR SLAB. USE SCHEDULE 80 PVC OUTDOORS WHERE SUBJECT TO PHYSICAL DAMMAGE
6. MINIMUM CONDUIT SIZE TO BE 1/2".
7. WIRING METHODS TO CONFORM TO ARTICLES 330, 334, 348, 350, 352, 356, AND 358 OF THE 2017 NEC.

CONSTRUCTION NOTES

1. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH THE NEC, STATE, AND LOCAL APPLICABLE CODES.
2. FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS, BEST PRACTICES, AND SPECIFICATIONS.
3. ENSURE REQUIRED MAINTENANCE ACCESS AND CLEARANCES ARE MAINTAINED.
4. WIRES SHALL BE RATED AND LABELED "SUNLIGHT RESISTANT" WHERE EXPOSED TO AMBIENT CONDITIONS.
5. FUSES 0 - 600 AMPS SHALL BE UL CLASS "RK-1" LOW PEAK DUAL ELEMENT TIME DELAY WITH 200,000 AMPERE INTERRUPTING RATING AS MANUFACTURED BY BUSSMANN, UNLESS NOTED OTHERWISE.
6. ALL TERMINALS/LUGS SHALL BE 75° RATED. ALL TERMINALS, SPlicing CONNECTORS, LUGS, ETC SHALL BE IDENTIFIED FOR USE WITH THE MATERIAL (CU/AL) OF THE CONDUCTOR AND SHALL BE PROPERLY INSTALLED.
7. PROVIDE A PULLWIRE IN ALL EMPTY CONDUITS.
8. ALL PENETRATIONS THROUGH EXTERIOR ROOFS SHALL BE FLASHED IN A WATERPROOF MANNER.
9. ALL PENETRATIONS THROUGH ATTIC FIRE BARRIERS SHALL BE SEALED WITH FIRE-BARRIER SEALANT CAULK.
10. SUPPORT ALL CONDUIT AND EQUIPMENT IN ACCORDANCE W/ NEC. ANY SUSPENDED MATERIALS SHALL BE DIRECTLY SUPPORTED BY THE BUILDING STRUCTURE.
11. METAL CONDUIT COUPLINGS CAN BE COMPRESSION TYPE, THREADED, OR BE SET-SCREW TYPE. PLASTIC CONDUIT COUPLINGS TO BE SOCKET GLUED TYPE.
12. A COMPLETE GROUNDING SYSTEM SHALL BE PRESENT OR PROVIDED AND INSTALLED IN ACCORDANCE WITH ARTICLE 250 OF THE NEC, AND AS SHOWN ON THE DRAWINGS.
13. EACH ELECTRICAL APPLIANCE SHALL BE PROVIDED WITH A NAMEPLATE GIVING THE IDENTIFYING NAME AND THE RATING IN VOLTS AND AMPERES, OR VOLTS AND WATTS. IF THE APPLIANCE IS TO BE USED ON A SPECIFIC FREQUENCY OR FREQUENCIES, IT SHALL BE SO MARKED. WHERE MOTOR OVERLOAD PROTECTION EXTERNAL TO THE APPLIANCES IS REQUIRED, THE APPLIANCE SHALL BE SO MARKED.
14. WHERE APPLICABLE, GROUNDING ELECTRODE CONDUCTOR TO BE CONTINUOUS. GROUNDING CRIMPS TO BE IRREVERSIBLE.
15. PHOTOVOLTAIC SYSTEMS SHALL BE PERMANENTLY MARKED AT VARIOUS EQUIPMENT LOCATIONS TO IDENTIFY THAT A PHOTOVOLTAIC SYSTEM IS INSTALLED AND THAT VARIOUS DANGERS ARE PRESENT.
16. EACH PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC SYSTEM DISCONNECT.
17. WHERE ALL TERMINALS OF A DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A WARNING SIGN SHALL BE MOUNTED ON OR ADJACENT TO THE DISCONNECT.
18. A PERMANENT LABEL FOR THE DIRECT-CURRENT PHOTOVOLTAIC POWER SOURCE SHALL BE PROVIDED AT THE DC DISCONNECT MEANS.
19. A PERMANENT PLAQUE OR DIRECTORY, DENOTING ALL ELECTRIC POWER SOURCES SERVING THE PREMISES, SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT LOCATIONS OF ALL POWER PRODUCTION SOURCES.
20. ALL MODULE GROUND CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH NEC SECTION 690.4 (C)
21. A NORTH CAROLINA REGISTERED DESIGN PROFESSIONAL WILL BE REQUIRED TO SEAL THE STRUCTURAL DESIGN AT THE TIME OF PERMIT APPLICATION IF ANY OF THE FOLLOWING EXIST AND ARE ATTESTED TO BY THE APPLICANT:
 - I. THE WEIGHT OF THE PV SYSTEM EXCEEDS THREE (3) POUNDS PER SQUARE FOOT(PSF)
 - II. THE ROOF POSSESSES MORE THAN ONE (1) LAYER OF ASPHALT SHINGLES
 - III. THE ROOFING MATERIAL CONSISTS OF A TYPE OTHER THAN ASPHALT SHINGLES OR METAL
 - IV. THE ROOF IS LOCATED IN A 140 MPH OR GREATER WIND ZONE



CLIENT INFO

ELISABETH M BROWN
115 N BLOODWORTH ST
RALEIGH NC 27601

PROJECT INFO

DC INPUT: 11.050 kW
AC OUTPUT: 11.500 kW
DOI INSP. METHOD: OPTION 2

Model Energy

300 Fayetteville St.
#1430
Raleigh, NC 27602
919-274-9905
ModelEnergy.com

P-1194

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	120 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

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PV-5: PV INSTALL GUIDE

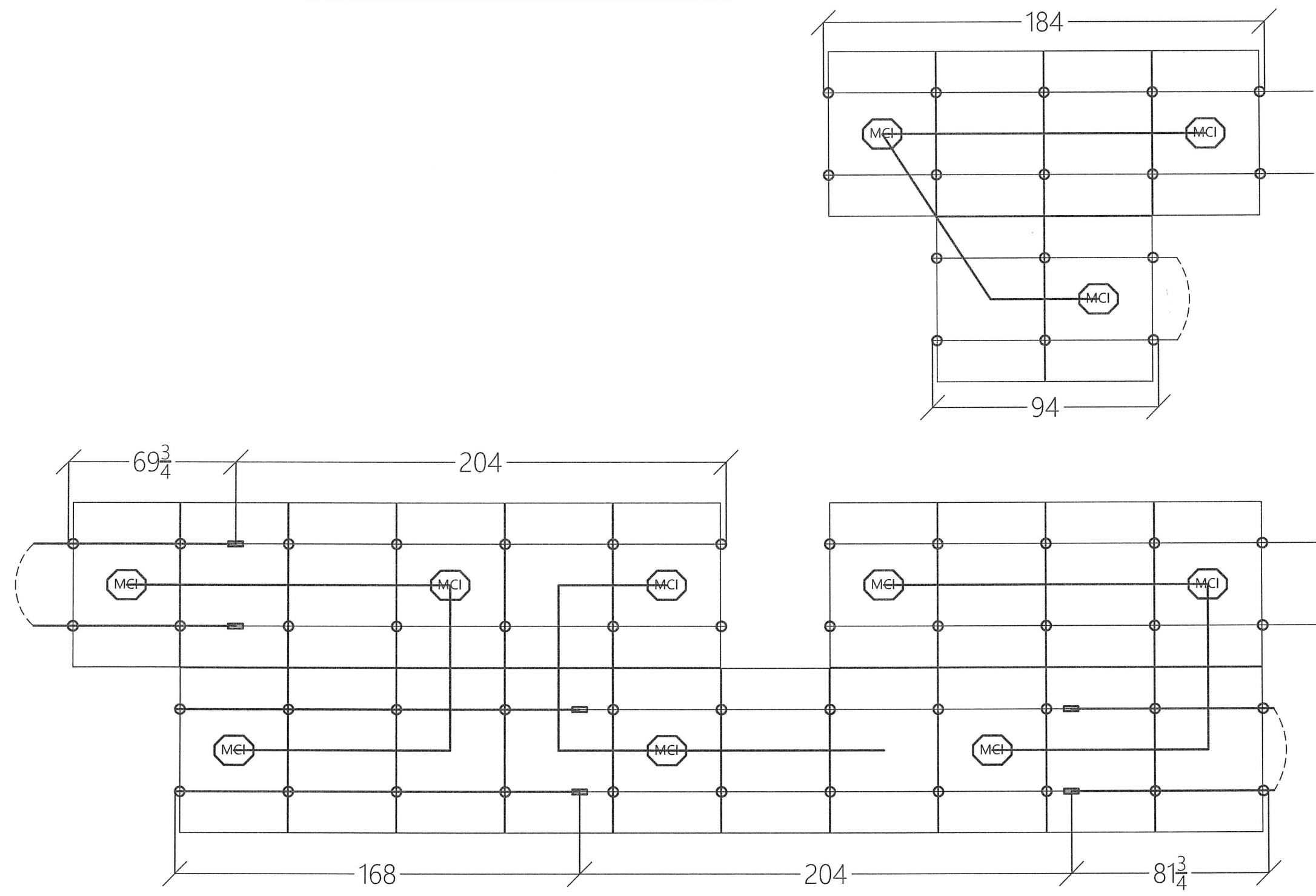
VERSIONS

FOR:	DESIGNER	DATE
CONSTRUCTION	MCP	4/11/2024

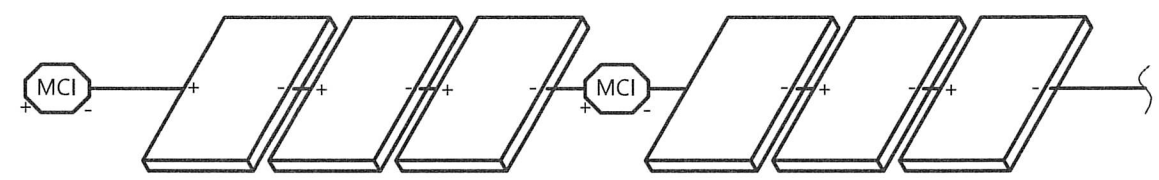
PV SYSTEM EQUIPMENT LABELS

PV-4.1

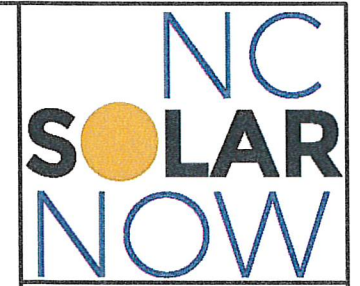
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1 ARRAY LAYOUT DETAIL
NOT TO SCALE



1 STRING WIRING + MCI DETAIL
NOT TO SCALE



CLIENT INFO
 ELISABETH M BROWN
 115 N BLOODWORTH ST
 RALEIGH NC 27601

PROJECT INFO
 DC INPUT: 11.050 kW
 AC OUTPUT: 11.500 kW
 DOI INSPT. METHOD: OPTION 2

Model Energy
 300 Fayetteville St.
 #1430
 Raleigh, NC 27602
 919-274-9905
 ModelEnergy.com
 P-1194

CODE REFERENCES
 NATION ELECTRICAL CODE v. 2017
 NC FIRE PROTECTION CODE v. 2018
 NC BUILDING CODE v. 2018
 NC RESIDENTIAL CODE v. 2018
 ACSE v. 7-10

SITE CONDITIONS
 WIND SPEED: 120 MPH
 RISK CATEGORY: II
 EXPOSURE: B
 SNOW: 15 PSF

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VERSIONS

FOR:	DESIGNER	DATE
CONSTRUCTION	MCP	4/11/2024

PV SYSTEM INSTALL GUIDE

PV-5.1

Q.TRON BLK M-G2+ SERIES



405-430Wp | 108 Cells
22.0% Maximum Module Efficiency

MODEL Q.TRON BLK M-G2+



High performance Qcells N-type solar cells

Q.ANTUM NEO Technology with optimized module layout boosts module efficiency up to 22.0%.



A reliable investment

Inclusive 25-year product warranty and 25-year linear performance warranty¹.



Enduring high performance

Long-term yield security with Anti LeTID Technology, Anti PID Technology², Hot-Spot Protect.



Extreme weather rating

High-tech aluminium alloy frame, certified for high snow (8100 Pa) and wind loads (3600 Pa).



Innovative all-weather technology

Optimal yields, whatever the weather with excellent low-light and temperature behaviour.



The most thorough testing programme in the industry

Qcells is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.

¹ See data sheet on rear for further information.

² APT test conditions according to IEC/TS 62804-1:2015, method A (-1500V, 96h)

The ideal solution for:



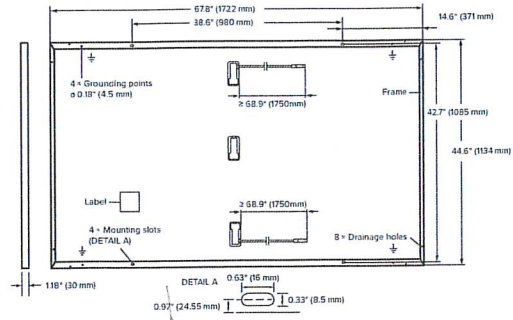
Rooftop arrays on residential buildings



Q.TRON BLK M-G2+ SERIES

Mechanical Specification

Format	67.8 in × 44.6 in × 1.18 in (including frame) (1722 mm × 1134 mm × 30 mm)
Weight	46.7 lbs (21.2 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodised aluminium
Cell	6 × 18 monocrystalline Q.ANTUM NEO 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), Protection class IP67, with bypass diodes
Cable	4 mm ² Solar cable; (+) ≥ 68.9 in (1750 mm), (-) ≥ 68.9 in (1750 mm)
Connector	Stäubli MC4; IP68

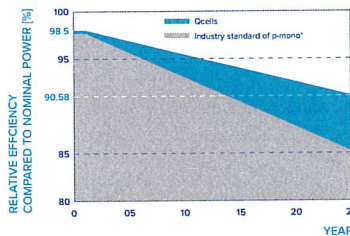


Electrical Characteristics

POWER CLASS		405	410	415	420	425	430	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5 W / -0 W)								
Minimum	Power at MPP ¹	P_{MPP} [W]	405	410	415	420	425	430
	Short Circuit Current ¹	I_{SC} [A]	13.33	13.41	13.49	13.58	13.66	13.74
	Open Circuit Voltage ¹	V_{OC} [V]	37.91	38.19	38.47	38.75	39.03	39.32
	Current at MPP	I_{MPP} [A]	12.69	12.76	12.83	12.91	12.98	13.05
	Voltage at MPP	V_{MPP} [V]	31.93	32.13	32.34	32.54	32.74	32.94
	Efficiency ¹	η [%]	≥20.7	≥21.0	≥21.3	≥21.5	≥21.8	≥22.0
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT ²								
Minimum	Power at MPP	P_{MPP} [W]	306.1	309.9	313.7	317.5	321.2	325.0
	Short Circuit Current	I_{SC} [A]	10.74	10.81	10.87	10.94	11.00	11.07
	Open Circuit Voltage	V_{OC} [V]	35.96	36.23	36.50	36.77	37.04	37.31
	Current at MPP	I_{MPP} [A]	9.98	10.04	10.10	10.15	10.21	10.27
	Voltage at MPP	V_{MPP} [V]	30.66	30.87	31.07	31.26	31.46	31.65

¹Measurement tolerances $P_{MPP} \pm 3\%$; I_{SC} ; $V_{OC} \pm 5\%$ at STC; 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • ²800 W/m², NMOT, spectrum AM 1.5

Qcells PERFORMANCE WARRANTY

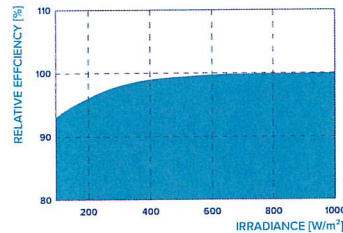


At least 98.5% of nominal power during first year. Thereafter max. 0.33% degradation per year. At least 95.53% of nominal power up to 10 years. At least 90.58% of nominal power up to 25 years.

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

^{*}Standard terms of guarantee for the 5 PV companies with the highest production capacity in 2021 (February 2021)

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]	-0.24
Temperature Coefficient of P_{MPP}	γ [%/K]	-0.30	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]	25	Fire Rating based on ANSI/UL 61730	C / TYPE 2
Max. Design Load, Push/Pull ³	[lbs / ft ²]	113 (5400 Pa)/50 (2400 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 / ft ²]	169 (8100 Pa)/75 (3600 Pa)		

³ See Installation Manual

Qualifications and Certificates

UL61730-1 & UL61730-2, CE-compliant, Quality Controlled PV - TÜV Rheinland, IEC 61215:2016, IEC 61730:2016, U.S. Patent No. 9,893,215 (solar cells).



^{*}Contact your Qcells Sales Representative for details regarding the module's eligibility to be Buy American Act (BAA) compliant.

Qcells pursues minimizing paper output in consideration of the global environment.

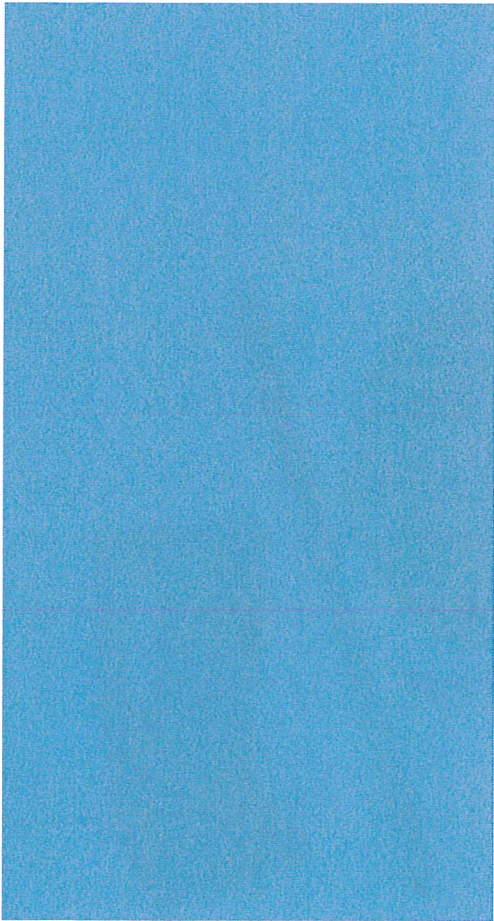
Note: Installation instructions must be followed. Contact our technical service for further information on approved installation of this product.
Hanwha Q CELLS America Inc. 400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL hqc-inquiry@qcells.com | WEB www.qcells.com

qcells

17724SS

17670, 17723

7" QUICKBOLT WITH 4" MICROFLASHING®
FOR ASPHALT SHINGLE ROOFS
PATENT # 8448407



A DIVISION OF QUICKSCREWS INTERNATIONAL CORP

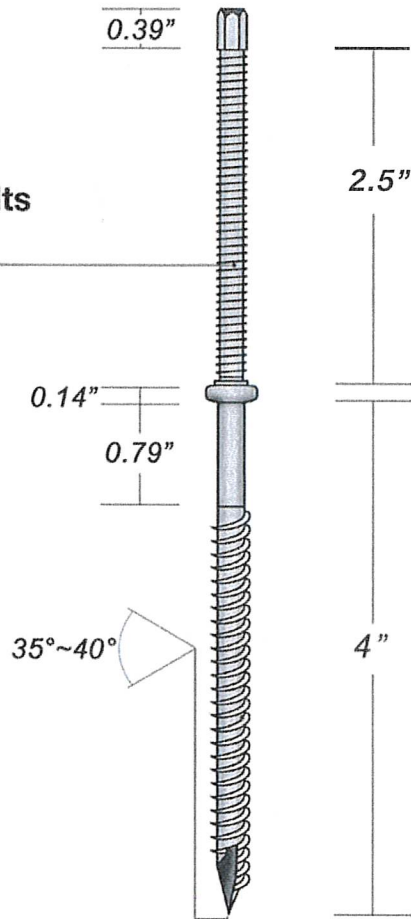
SPEC SHEET

Part #	Box Quantity
17670	7" Bolts (10)
17723	4" Microflashing® (10); 7" Bolts (10)
17724SS	4" Microflashing® (15); 7" Bolts (15); Offset L-Foot (15); 5/16" Serrated Hex Flange Nuts (30)



Part # 17670

5/16-18 X 7"
304 Stainless Steel
Removable Hanger Bolts



Part # 17659

5/16" x 4"
304 Stainless Steel
Compression Washer Black





15891SS/15891BLKSS		Customer			
4mm					
Technical requirement : The dimensions of the hooks are in accordance with the drawings. Surface smooth, without burr.					
Baiting tolerance	± 2 mm	Material:	304SS	Mapper:	
Hole tolerance	± 0.2 mm				
Hole distance tolerance	± 0.5 mm	Date:	2017. 11. 28	Auditor:	
Form tolerance	± 2 mm				
Thickness tolerance	± 0.1 mm				
Angle tolerance	± 1°				

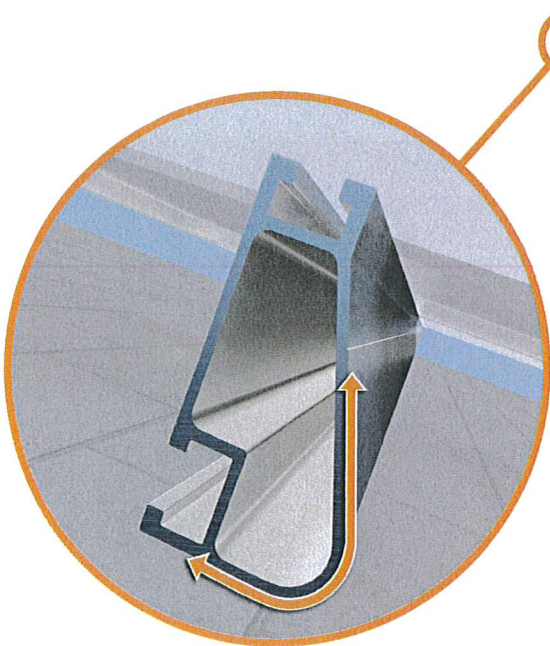
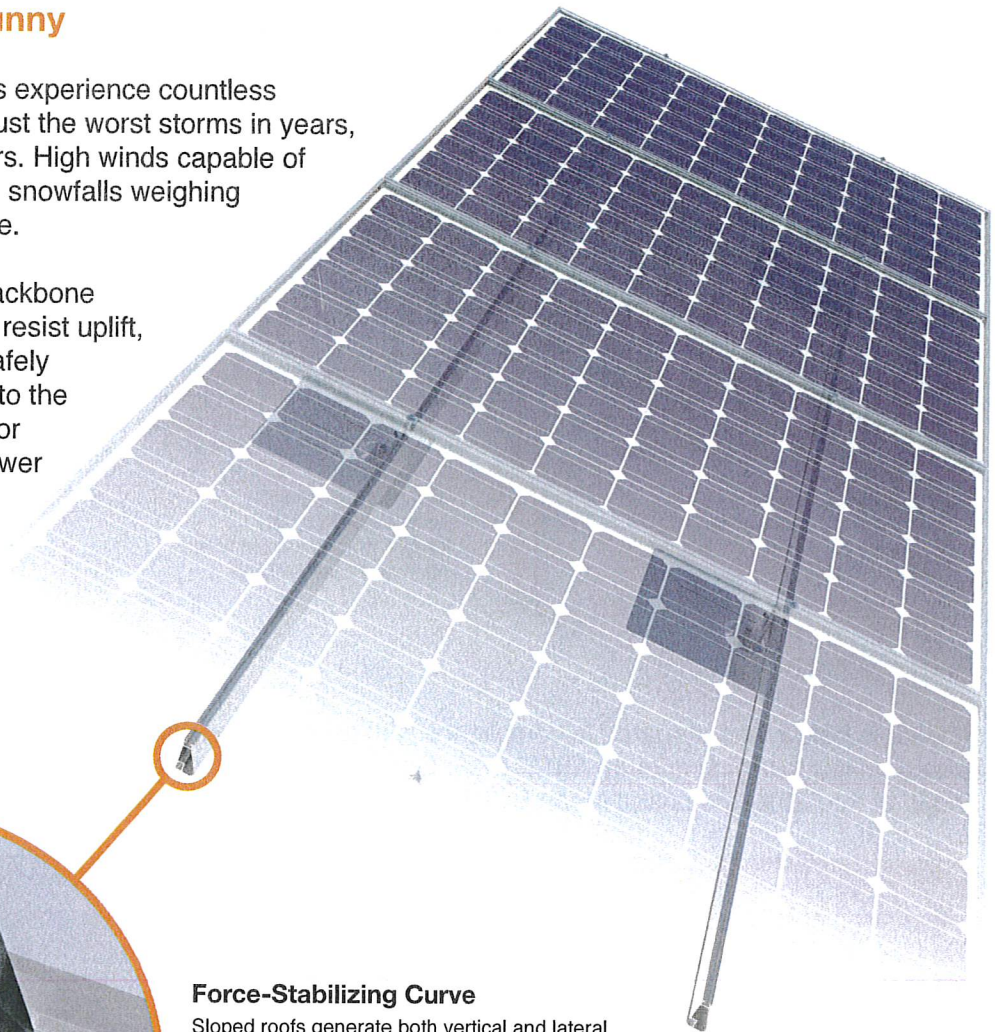


XR Rail® Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.


XR Rails® are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.




Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails® is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs




XR Rails® are compatible with FlashFoot® and other pitched roof attachments.



IronRidge® offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails® are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.




XR Rail® Family

The XR Rail® Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail® to match.



XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves spans up to 6 feet, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear & black anodized finish
- Internal splices available



XR100

XR100 is a residential and commercial mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 10 feet.

- 10' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available



XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans up to 12 feet for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The table below was prepared in compliance with applicable engineering codes and standards.* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	90	XR10		XR100		XR1000	
	120						
	140						
	160						
20	90	XR10		XR100		XR1000	
	120						
	140						
	160						
30	90	XR10		XR100		XR1000	
	160						
40	90	XR10		XR100		XR1000	
	160						
80	160						
120	160						

*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.