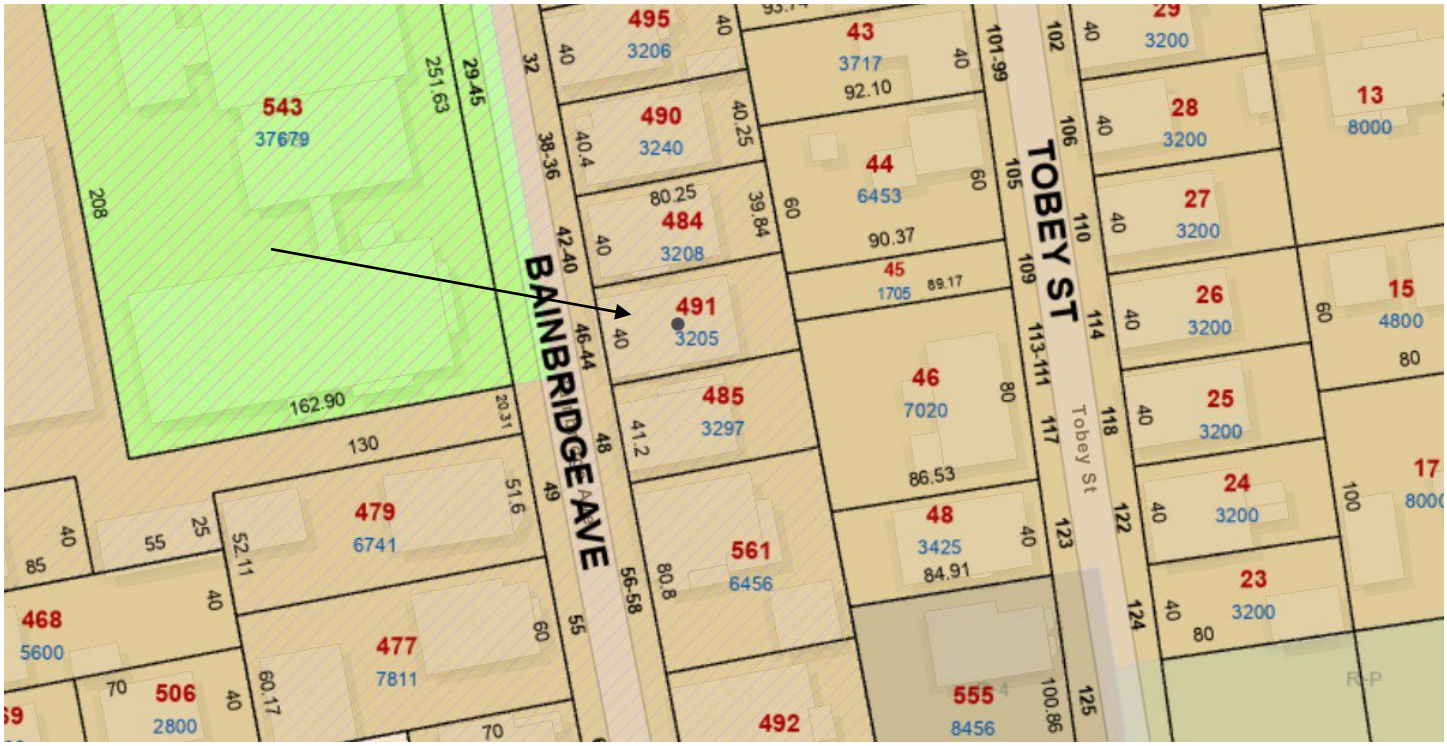
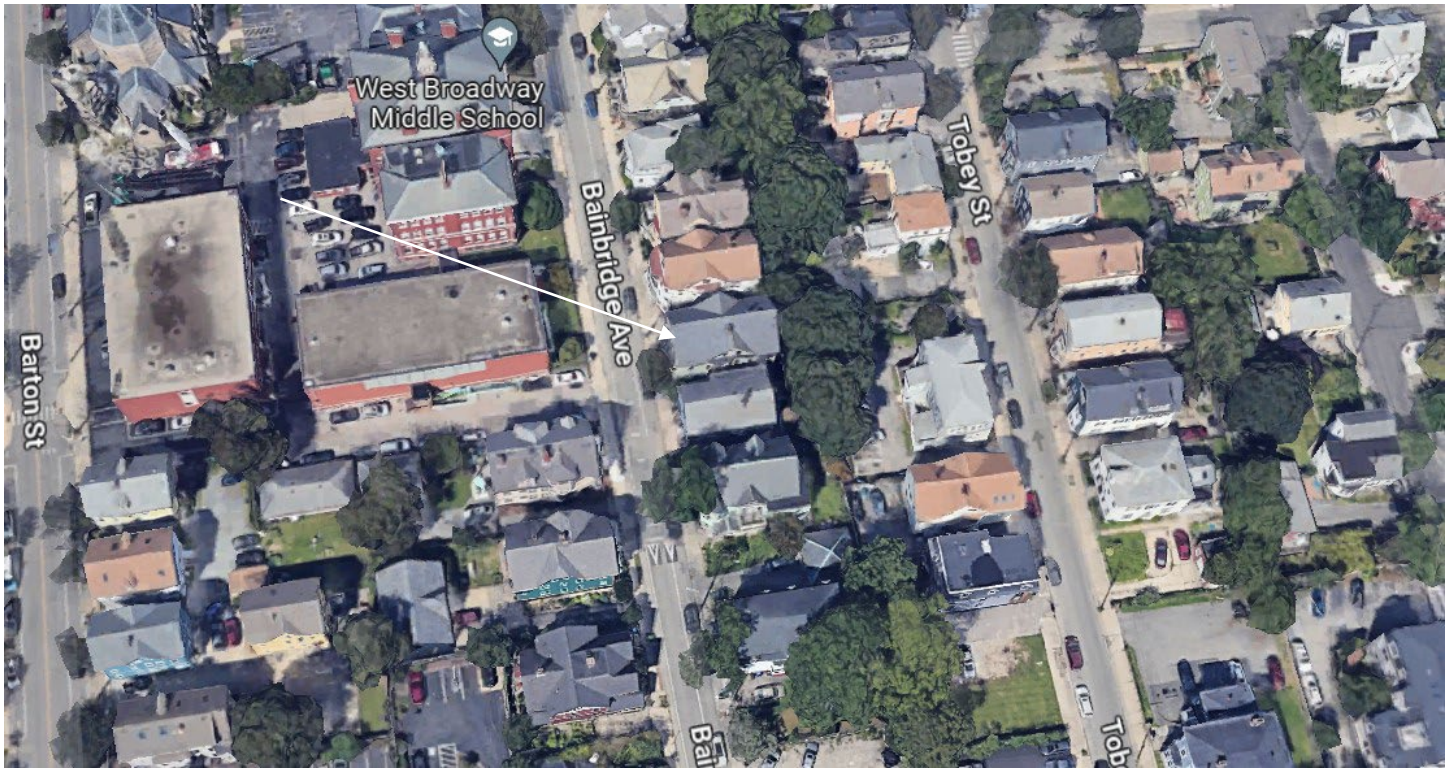
PROJECT REVIEW

1. CASE 24.073, 44 BAINBRIDGE AVENUE, House, c1900 (BROADWAY)

2½-story; cross-gable; clapboard sidehall-plan double house; with pedimented gable, 2story bay, and partially altered entry porch. CONTRIBUTING



Arrow indicates 44 Bainbridge Avenue.



Arrow indicates project location, looking north.

Applicant/ Owner: Nicholas Vockerodt, 44 Bainbridge Avenue, Providence, RI 02909
Contractor: Renewable Energy Solutions LLC, 181 Conant St, Unit 3R, Pawtucket, RI 02860

Proposal: The scope of work proposed consists of Minor Alterations and includes:

- installation of 20 solar panels to the south slope of the gable-end roof.

Issues: The following issues are relevant to this application:

- The application as submitted will not be visible from the public rights-of-way;
- The modifications as proposed meets Minor Alterations: Solar Energy Systems Guidelines, Section 2, in the following manner: Panel layout shall be sympathetic or appropriate to design and scale of building. Rectangular configurations are preferred, with ample setback from edge of roof, dormers, chimneys, etc. (2.A); Panels shall be installed parallel to the existing roof slope and matched as closely as possible to the roof plane (2.B); Panels shall be installed without destroying or replacing original or historic materials or significantly compromising or altering the building's structural integrity (2.C); Panels shall be compatible in color to existing roofing insofar as possible (2.D); Installation of panels shall be as inconspicuous as possible when viewed from public right-of-way (2.E); Installation shall be reversible. Panels shall be removed when no longer viable or functioning and roofing restored to pre-existing conditions (2.F); and,
- Plans, specifications and pictures have been submitted.

Recommendations: The staff recommends the PHDC make the following findings of fact:

a) 44 Bainbridge Avenue is a structure of historical and architectural significance that contributes to the significance of the Broadway local historic district, having been recognized as a contributing structure to the Broadway/Armory National Register Historic District;
b) The modifications as proposed meets Minor Alterations: Solar Energy Systems Guidelines, Section 2, and the application is considered complete; and,
c) The work as proposed is in accord with PHDC Standards 8 & 9 as follows: 8) the work will be done so that it does not destroy the historic character of the property or the district as they are not on the primary elevation and will not be visible from the public rights-of-way; and, 9) Whenever possible… alterations to structures shall be done in such a manner that if removed in the future, the essential form and integrity of the structure and the site will be unimpaired.

Staff recommends a motion be made stating that: The application is considered complete. 44 Bainbridge Avenue is a structure of historical and architectural significance that contributes to the significance of the Broadway local historic district, having been recognized as a contributing structure to the Broadway/Armory National Register Historic District. The Commission grants Final Approval of the proposal as submitted as the proposed alteration is appropriate having determined that the proposed alteration does not destroy the historic character of the property or the district and are historically and architecturally compatible with the property and district. The proposed alteration meets Minor Alterations: Solar Energy Systems Guidelines, Section 2, is reversible and will not have an adverse effect on the property or district as they are not on the primary elevation and will not be visible from the public rights-of-way (Standards 8 & 9), and the recommendations in the staff report, with staff to review any additional required details.

NICK VOCKERODT
NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM
DC SYSTEM SIZE (8.5 KW)

GENERAL NOTES

SCOPE OF WORK

1. THE PROJECT IS NEW PHOTOVOLTAIC SYSTEM CONSISTING OF SOLAR ARRAY(S) AND ASSOCIATED POWER CONDITIONING EQUIPMENT.
2. ALL CONSTRUCTION SHALL COMPLY WITH THE ADOPTED EDITION OF THE INTERNATIONAL BUILDING CODE AND ELECTRIC CODE AS SPECIFIED IN THE PROJECT SPECIFIC NOTES.
3. IT SHALL ALSO COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE AND LOCAL ELECTRICAL UTILITY CODES, RULES AND REGULATIONS.
4. THE SYSTEM WILL BE INTERCONNECTED TO THE ELECTRICAL UTILITY GRID IN ACCORDANCE WITH THE REQUIREMENTS OF THE ADOPTED ELECTRIC AND THE ELECTRICAL UTILITY COMPANY.
5. THE CONTRACTOR SHALL PROVIDE LABOR FOR CONSTRUCTION OF THE ARRAY AND INSTALLATION OF ALL ELECTRICAL EQUIPMENT. THE CONTRACTOR WILL PROVIDE COMPETENT SUPERVISION FOR THE WORK TO BE ACCOMPLISHED. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL BY OWNER AS REQUESTED.
6. THERE WILL BE NO SUBMISSION FOR ANY EQUIPMENT WITH THE VENDOR PART NUMBER ON THE DRAWING WITHOUT WRITTEN APPROVAL OF THE PROFESSIONAL ENGINEER. COMMON ITEMS SUCH AS CONDUITS, WIRE, FITTINGS, ETC. ARE NOT SPECIFIED BY VENDOR BUT THE SIZES CANNOT BE REDUCED.
7. THE CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS AGREE THAT IN ACCORDANCE WITH THE GENERALLY ACCEPTED CONSTRUCTION PRACTICES CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE SAFETY OF ALL PERSON AND PROPERTY, AND THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND IS NOT LIMITED TO NORMAL WORKING HOURS.
8. CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS FURTHER AGREE TO DEFEND, INDEMNIFY AND HOLD HARMLESS THE DESIGN PROFESSIONAL FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPT LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE DESIGN PERSONNEL.
9. CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS WILL BE REQUIRE TO REPAIR ANY DAMAGE DONE TO BUILDINGS, GROUNDS OR UTILITIES AT NO ADDITIONAL COST TO THE CUSTOMER. DEFECTIVE MATERIAL OR WORKMANSHIP WILL NOT BE ALLOWED ON THIS PROJECT.RESONABLE HOUSEKEEPING AND CLEAN UP SHALL BE CONDUCTED BOTH DURING THE EXECUTION OF AND AT THE CONCLUSION OF THE PROJECT.

GENERAL

1. THE ACTUAL SYSTEM EQUIPMENT SPECIFICATIONS FOR THE PHOTOVOLTAIC SYSTEM ARE INCLUDED IN THE PV SYSTEM SPECIFICATION ON THE TITLE PAGE AND THROUGHOUT THE DRAWING AS NECESSARY FOR CLARITY.IN ADDITION THE ACTUAL VENDOR SPECIFICATION DATA SHEETS WILL BE INCLUDED AS PART OF THE PERMIT SUBMITTAL.
2. ONLY NEW MATERIAL WILL BE INSTALLED AS PART OF THE PROJECT. ALL NEW INSTALLED EQUIPMENT WILL BE APPROPRIATELY LISTED AND NEMA RATED. ALL NEW EQUIPMENT SHALL HAVE PERMANENT PLASTIC ENGRAVED IDENTIFICATION TAGS INSTALLED.
3. ALL CUTTING AND PATCHING REQUIRED FOR INSTALLATION OF NEW RACEWAYS AND EQUIPMENT SHALL BE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. ALL WORK SHALL BE PERFORMED BY TRADESMAN EXPERIENCED IN WORK REQUIRED. ALL FINISHES SHALL MATCH THE EXISTING ADJACENT FINISHES. OPENING IN FIRE RATED WALLS WILL BE PATCHED IN A MANNER MAINTAINING THE ORIGINAL FIRE AND SMOKE RATING.
4. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND CANNOT SHOW EVERY CONNECTION, JUNCTION BOX, WIRE,CONDUIT, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM.
5. CONTRACTOR SHALL COORDINATE ALL POWER OUTAGES WITH THE OWNER'S REPRESENTATIVE IN ADVANCE.
6. PANEL DESIGNATIONS SHOWN ON THESE DRAWINGS ARE GIVEN FOR CLARIFICATION OF THE CIRCUITING ONLY AND MAY NOT CORRESPOND TO THE DESIGNATIONS FOUND IN THE FIELD.
7. ELECTRICAL TESTING SHALL BE IN COMPLIANCE WITH NFPA 70E

CONDUIT AND WIRE

1. ALL EXISTING CONDUIT RUNS ARE NOT SHOWN. CONTRACTOR SHALL VERIFY EXISTING CONDUIT LOCATIONS IN FIELD.
2. ALL CONDUCTORS SHALL BE INSTALLED IN A RACEWAY AS SPECIFIED IN THE DRAWINGS. THE EXCEPTION IS PV SOURCE CIRCUIT CONDUCTORS MADE OF PV WIRE CABLE. THESE CONDUCTORS MAY BE EXPOSED WITHIN THE PV ARRAY.
3. INDOOR EMT FITTINGS MAY BE COMPRESSION TYPE OR STEEL SET SCREW TYPE. OUTDOOR EMT FITTINGS MUST BE COMPRESSION RAINTIGHT TYPE.
4. A PULL ROPE SHALL BE INSTALLED IN ALL EMPTY CONDUITS.
5. CONDUCTORS MATERIAL, EITHER COPPER OR ALUMINUM IN SPECIFIED IN THE DRAWINGS. CONDUCTOR INSULATION TYPE SHALL BE THWN - 2 UNLESS OTHERWISE NOTED.

EQUIPMENT

1. ALL ELECTRICAL COMPONENTS INSTALLED OUTDOORS, EXPOSED TO WEATHER OR IN DAMP LOCATIONS SHALL BE RATED FOR NEMA 3R OR GREATER. INSTALLATION OF THESE COMPONENTS MUST COMPLY WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. ALL RACEWAYS, CABINETS, BOXES, FIXTURES SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE IN AN APPROVED MANNER.
3. AT THE COMPLETION OF THE PROJECT NEATLY TYPED ACCURATE PANEL BOARD DIRECTORIES INDICATING ALL BRANCH CIRCUITS AND SPARES WILL BE PROVIDED. ALL SPARES SHALL BE LEFT IN THE OFF POSITION.
4. ALL SAFETY SWITCHES SHALL BE HEAVY DUTY TYPE WITH COVER INTERLOCK AND HANDLE LOCK OFF PROVISIONS. SWITCHES SHALL BE MANUFACTURED BY A COMPANY CONSISTENT WITH OTHER INSTALLED EQUIPMENT WHENEVER POSSIBLE. PART NUMBERS, RATING AND FUSING SHALL BE AS SHOWN ON THE DRAWINGS.
5. CONTRACTOR SHALL ENSURE ALL CEC AND MAINTENANCE CLEARANCE REQUIREMENTS ARE MET FOR NEW EQUIPMENT AND MAINTAINED FOR EXISTING EQUIPMENT.
6. CONTRACTOR SHALL FIELD VERIFY EQUIPMENT CLEARANCE AND PLACEMENTS WHILE COORDINATING LOCATORS WITH OTHER TRADES, CONSTRUCTION MANAGERS, AND SITE SUPERVISORS PRIOR TO PURCHASING AND INSTALLING EQUIPMENT.
7. EVERY STRUCTURE AND PORTION THEREOF, INCLUDING NONSTRUCTURAL COMPONENTS THAT ARE PERMANENTLY ATTACHED TO STRUCTURES AND THEIR SUPPORTS AND ATTACHMENTS, SHALL BE DESIGNED AND CONSTRUCTED TO RESIST THE EFFECTS OF EARTHQUAKE MOTIONS IN ACCORDANCE WITH ASCE 7, EXCLUDING CHAPTER 14 AND APPENDIX 11A. THE SEISMIC DESIGN CATEGORY FOR A STRUCTURE IS PERMITTED TO BE DETERMINED IN ACCORDANCE WITH SECTION 1613 OR ASCE 7.
8. ALL CONTROLS AND SWITCHES INTENDED TO BE USED BY THE OCCUPANT OF THE ROOM OR AREA TO CONTROL LIGHTING AND RECEPTACLE OUTLETS, APPLIANCE AND COOLING, HEATING AN D VENTILATING EQUIPMENT, SHALL BE LOCATED NO MORE THAN 48 INCHES MEASURED FROM THE TOP OF THE JUNCTION OR DEVICE BOX NOR LESS THAN 15 INCHES MEASURED TO THE BOTTOM OF THE JUNCTION OR DEVICE BOX ABOVE THE FINISHED FLOOR.
9. ALL RECEPTACLE OUTLETS ON BRANCH CIRCUITS OF 30 - AMPERES OR LESS AND COMMUNICATION SYSTEM RECEPTACLES SHALL BE LOCATED NO MORE THAN 48 INCHES MEASURED FROM THE TOP OF THE RECEPTACLE OUTLET BOX OR RECEPTACLE HOUSING NOR LESS THAN 15 INCHES MEASURED TO THE BOTTOM OF THE RECEPTACLE OUTLET BOX OR RECEPTACLE HOUSING ABOVE FINISHED FLOOR.

GROUNDING

1. THE GROUNDING SYSTEM SHALL MEET THE REQUIREMENTS OF THE NEC AND THE LOCAL ADOPTED CODE. ALL ELECTRICAL EQUIPMENT AND RACEWAYS SHALL BE PROPERLY GROUNDED.
2. AN INSULATED EQUIPMENT GROUNDING CONDUCTOR, IN ACCORDANCE WITH NEC CODE , SHALL BE PROVIDED IN ALL CONDUITS WITH CURRENT CARRYING CONDUCTORS. ALL LUGS AND CONNECTORS SHALL BE RATED FOR THE CONDUCTOR MATERIAL AND THE CONDITIONS OF USE.
3. THE GROUNDING RESISTIVITY WILL BE TESTED AFTER INSTALLATION TO CONFIRM 5 OHM OR LESS RESISTANCE FROM RACKING TO GROUND. IF GROUND RESISTANCE IS GREATER THAN 5 OHMS ADDITIONAL GROUNDING WILL BE INSTALLED UNTIL RESISTANCE IS LESS THAN 5 OHMS.

WIRING DEVICES

1. RECEPTACLES SHALL BE AS DESIGNED ON THE DRAWINGS AND SHOULD BE A BRAND CONSISTENT WITH OTHERS IN THE VICINITY WHENEVER POSSIBLE.
2. ALL WIRING DEVICES SHALL BE PROVIDED WITH APPROPRIATE COVER-PLATES. ANY EMPTY BOXES SHALL HAVE BLANK COVER PLATES. COVER-PLATES SHALL BE LEXAN, PLASTIC OR STAINLESS STEEL IN FINISHED AREA. GALVANIZED COVER-PLATES MAY BE USED IN EQUIPMENT ROOMS.

LABELING AND PHASING

1. FOR LABELING USE NUMBERED UV RATED LABELS TO INDICATE STRING NUMBER.
2. AS A SUBSTITUTE FOR LABELS YELLOW TAPE MAY BE USED FOR PHASING
3. EACH METHOD DESCRIBED ABOVE WILL NEED TO BE PERFORMED ON BOTH POSITIVE AND NEGATIVE AT POINTS WHERE CONDUCTORS ARE TERMINATED

SYSTEM DETAILS

DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH NO BATTERY STORAGE
DC RATING OF SYSTEM	SYSTEM SIZE : 8.5 KW DC STC
AC RATING OF SYSTEM	5.80 KW
AC OUT. CURRENT	24.2A
NO. OF MODULES	(20) HANWHA Q CELLS Q.PEAK DUO L G8.2 425 (425W) SOLAR MODUELS
NO. OF INVERTERS	(20) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
POINT OF CONNECTION	LINE SIDE TAP IN THE MSP
ARRAY STRINGING	(2) BRANCHES OF 10 MODULES

SITE DETAILS

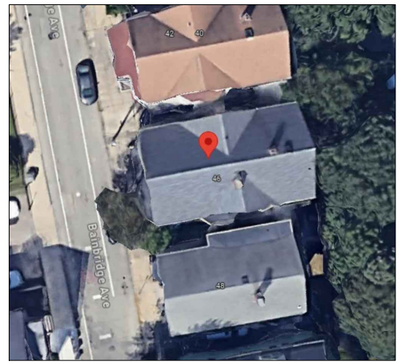
ASHRAE EXTREME LOW	+17
ASHRAE 2% HIGH	32°C
GROUND SNOW LOAD	35 PSF
WIND SPEED	125 MPH (7-16)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	B

GOVERNING CODES

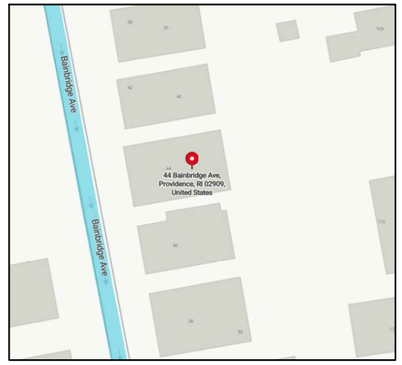
INTERNATIONAL FIRE CODE (IFC) , 2018
INTERNATIONAL BUILDING CODE (IBC) , 2018
INTERNATIONAL RESIDENTIAL CODE (IRC), 2018
NATIONAL ELECTRIC CODE, NEC 2020 CODE BOOK

SHEET INDEX

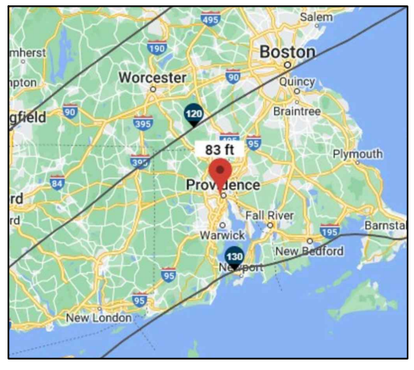
SITE MAP (N.T.S)



VICINITY MAP



WIND FLOW MAP



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PERMIT DEVELOPER

DATE	03/28/2024
DESIGNER	OKH
REVIEWER	

COVER PAGE

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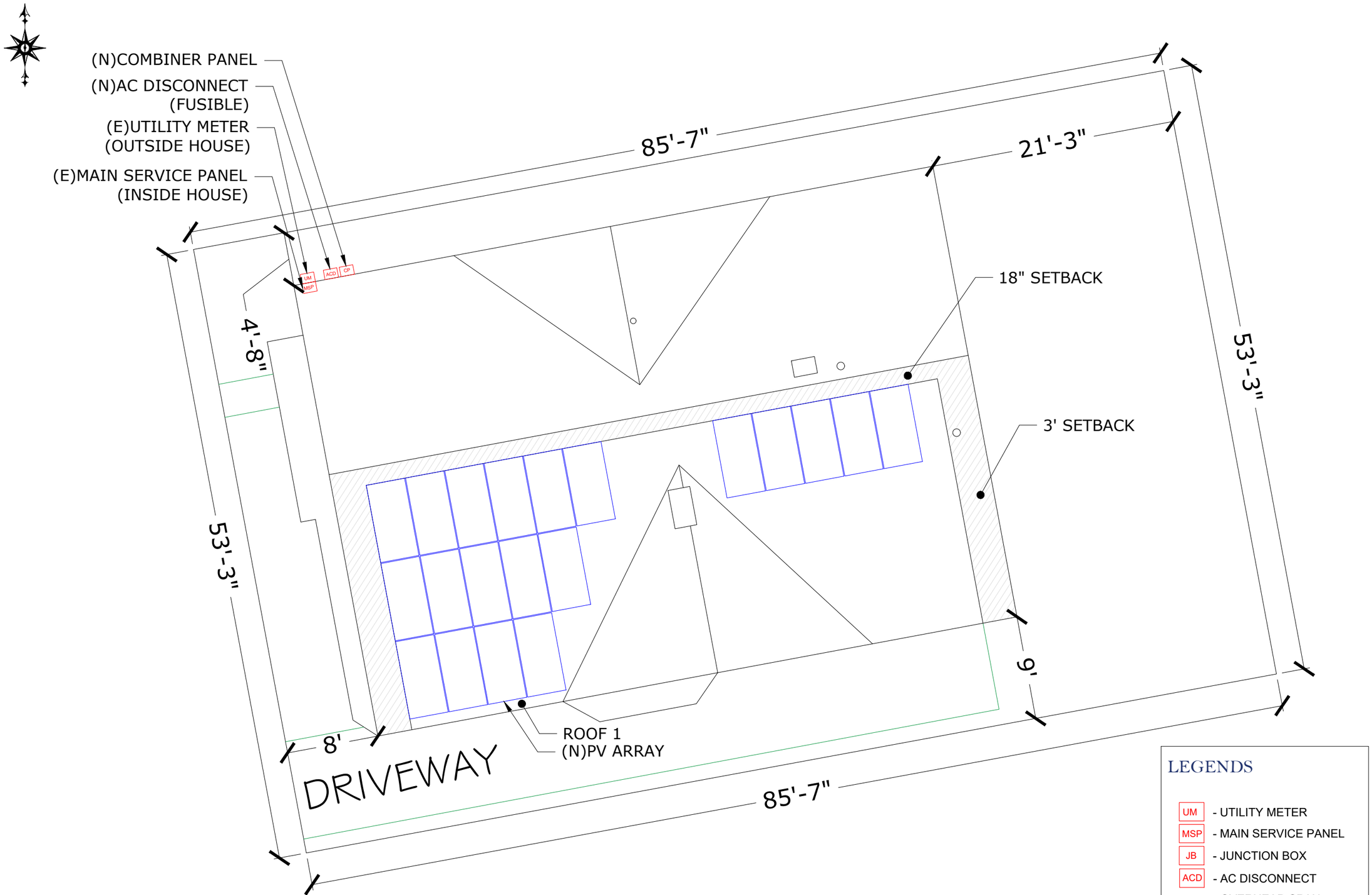

LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- JB - JUNCTION BOX
- ACD - AC DISCONNECT
- OVERHEAD SPAN
- CP - COMBINER PANEL
- ROOF OBSTRUCTION

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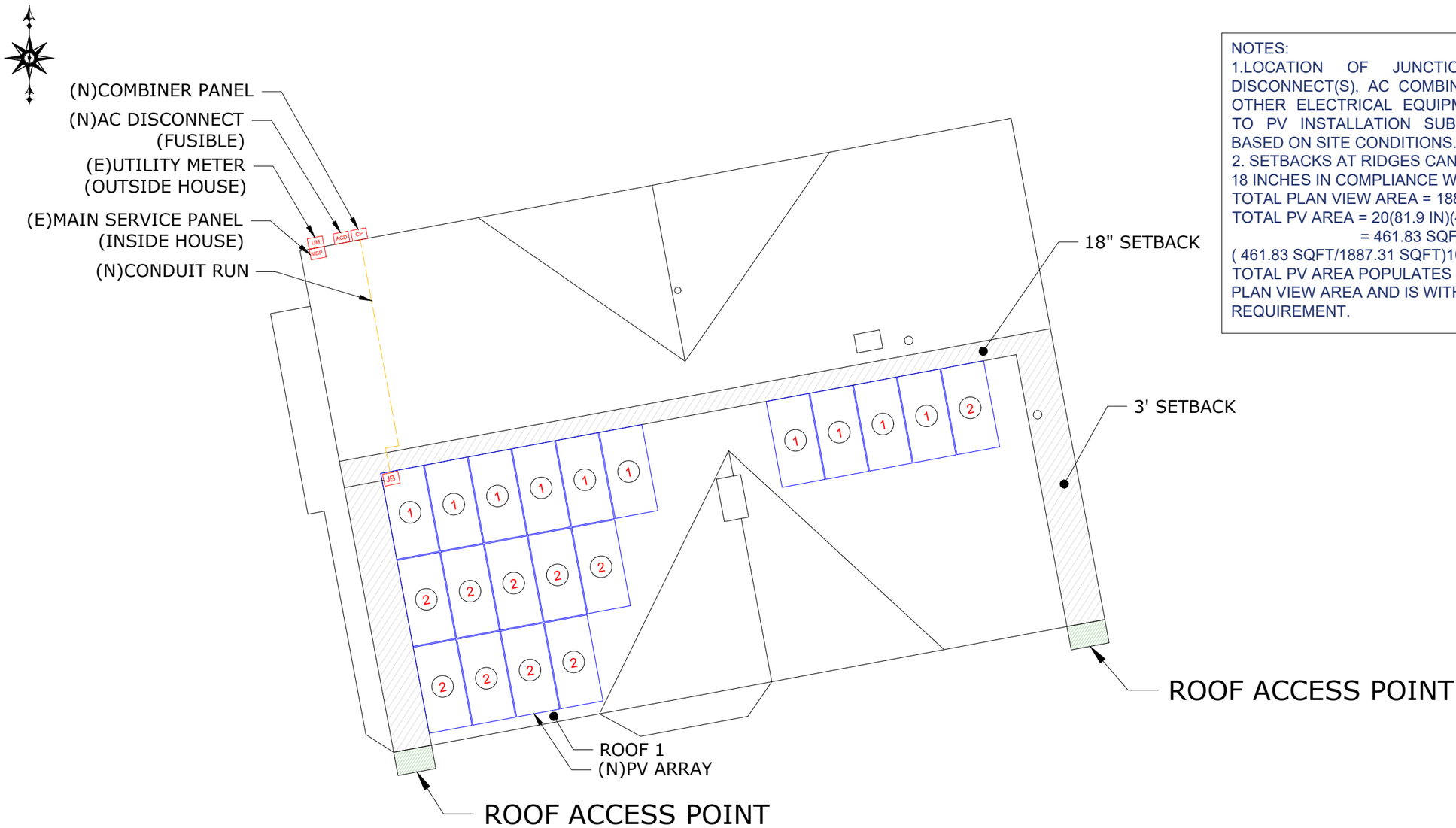
SITE PLAN

PV-2



NOTES:
1.LOCATION OF JUNCTION BOX(ES), AC DISCONNECT(S), AC COMBINER PANEL(S), AND OTHER ELECTRICAL EQUIPMENT(S) RELEVANT TO PV INSTALLATION SUBJECT TO CHANGE BASED ON SITE CONDITIONS.
2. SETBACKS AT RIDGES CAN BE REDUCED TO 18 INCHES IN COMPLIANCE WITH FBC R 324.6.2:
TOTAL PLAN VIEW AREA = 1887.31 SQFT
TOTAL PV AREA = 20(81.9 IN)(40.6 IN)/(144 IN^2)
= 461.83 SQFT
(461.83 SQFT/1887.31 SQFT)100 = 18.35 %
TOTAL PV AREA POPULATES 18.35 % OF TOTAL PLAN VIEW AREA AND IS WITHIN THE 33% REQUIREMENT.

EQUIPMENT SPECIFICATIONS

EQUIPMENT	DESCRIPTION	QUANTITY
MODULE	HANWHA Q CELLS Q.PEAK DUO L G8.2 425 (425W) SOLAR MODUELS SOLAR MODULE	**20**
INVERTER	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS	20
JUNCTION BOX	600 V,NEMA 3R UL LISTED	1
AC DISCONNECT	AC DISCONNECT 240V, 60A,FUSED WITH 40A FUSES,NEMA 3R, UL LISTED	**1**
ATTACHMENT	K2 (SPLICE FOOT X)	45

ROOF SPECIFICATIONS

ROOF MATERIAL	ASPHALT SHINGLES
ROOF CONDITION	GOOD
RAFTERS	2"X6"@16" O.C.
ATTACHMENT SPACING	48" O.C.

SYSTEM INFORMATION

DC SYSTEM SIZE	8.5 KW
AC SYSTEM SIZE	5.80 KW

ROOF INFORMATION

ROOF	QUANTITY	SLOPE	AZIMUTH
ROOF 1	20	43°	169°

LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- JB - JUNCTION BOX
- ACD - AC DISCONNECT
- CP - COMBINER PANEL
- - OVERHEAD SPAN
- (1) - STRING TAG
- - CONDUIT RUN
- - ROOF OBSTRUCTION

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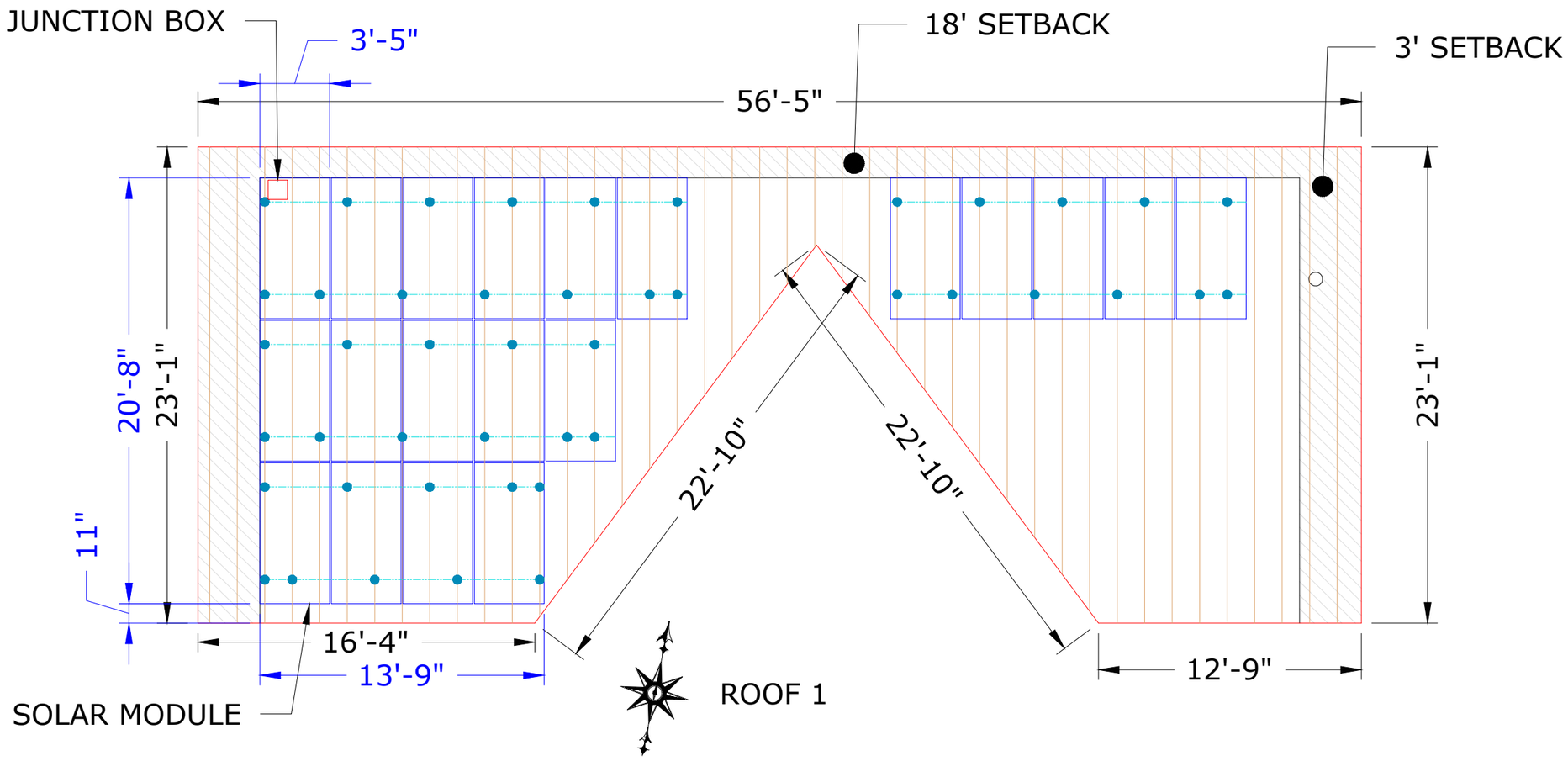
ROOF PLAN

PV-3

NOTES:
TRUSSES/RAFTERS 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"



EQUIPMENT SPECIFICATIONS		
EQUIPMENT	DESCRIPTION	QUANTITY
MODULE	HANWHA Q CELLS Q.PEAK DUO L G8.2 425 (425W) SOLAR MODUELS	20
INVERTER	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS	20
JUNCTION BOX	600 V,NEMA 3R UL LISTED	1
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ROOF SPECIFICATIONS	
ROOF MATERIAL	ASPHALT SHINGLES
ROOF CONDITION	GOOD
RAFTERS	2"X6"@16" O.C.
ATTACHMENT SPACING	48" O.C.

SYSTEM INFORMATION	
DC SYSTEM SIZE	8.5 KW
AC SYSTEM SIZE	5.80 KW

ROOF INFORMATION			
ROOF	QUANTITY	SLOPE	AZIMUTH
ROOF 1	20	43°	169°

LEGENDS

- JUNCTION BOX
- PV ROOF ATTACHMENT
- PV ROOF ATTACHMENT
- TRUSSES/RAFTERS
- RAIL
- ROOF OBSTRUCTION

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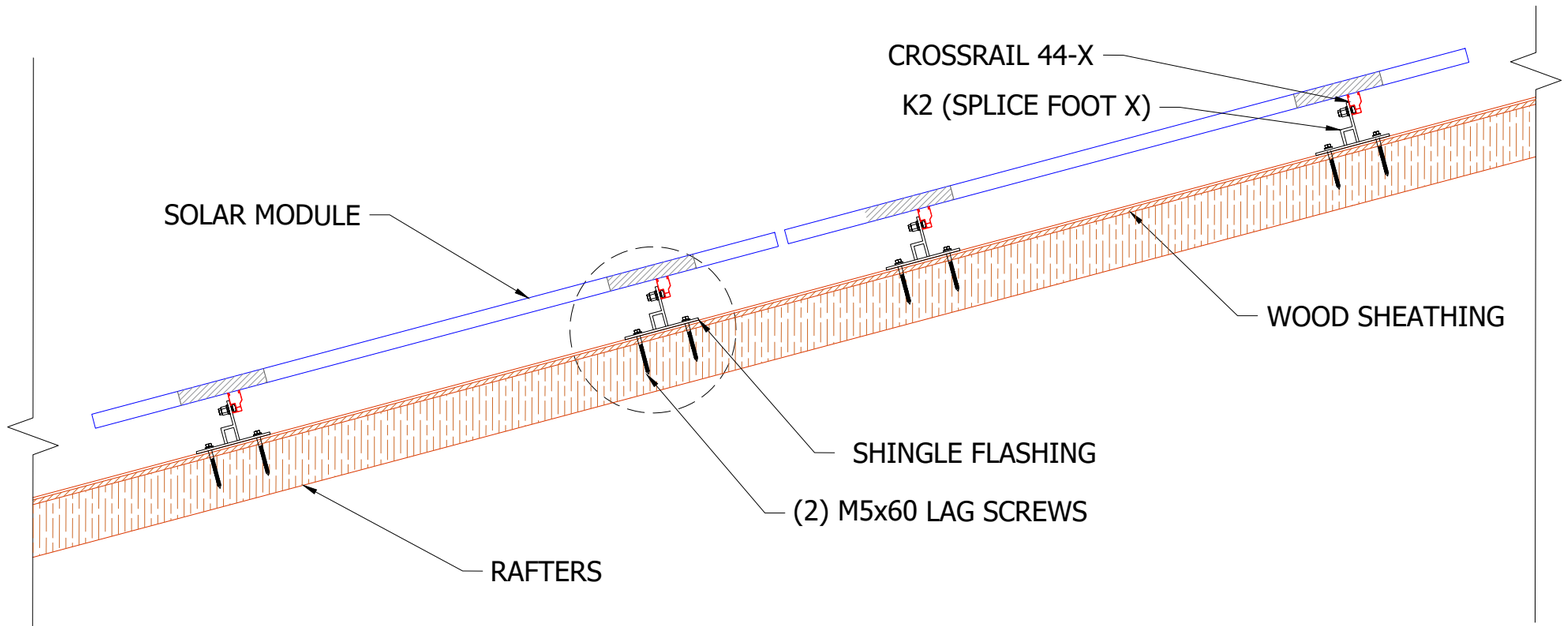
ARRAY LAYOUT

PV-4



MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 20 MODULES
MODULE TYPE = HANWHA Q CELLS Q.PEAK DUO L G8.2 425 (425W) SOLAR MODUELS
WEIGHT = 55 LBS / 25 KG.
MODULE DIMENSIONS = 81.9" X 40.6" = 23.09 SF

STRUCTURAL ATTACHMENT DETAILS

EQUIPMENT SPECIFICATIONS		
EQUIPMENT	DESCRIPTION	QUANTITY
MODULE	HANWHA Q CELLS Q.PEAK DUO L G8.2 425 (425W) SOLAR MODUELS	20
INVERTER	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS	20
JUNCTION BOX	600 V,NEMA 3R UL LISTED	1
AC DISCONNECT	AC DISCONNECT 240V, 60A,FUSED WITH 40A FUSES,NEMA 3R, UL LISTED	1
ATTACHMENT	K2 (SPLICE FOOT X)	45

ROOF SPECIFICATIONS	
ROOF MATERIAL	ASPHALT SHINGLES
ROOF CONDITION	GOOD
RAFTERS	2"X6"@16" O.C.
ATTACHMENT SPACING	48" O.C.

SYSTEM INFORMATION	
DC SYSTEM SIZE	8.5 KW
AC SYSTEM SIZE	5.80 KW

ROOF INFORMATION			
ROOF	QUANTITY	SLOPE	AZIMUTH
ROOF 1	20	43°	169°

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STRUCTURAL DETAILS

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CONDUIT SCHEDULE

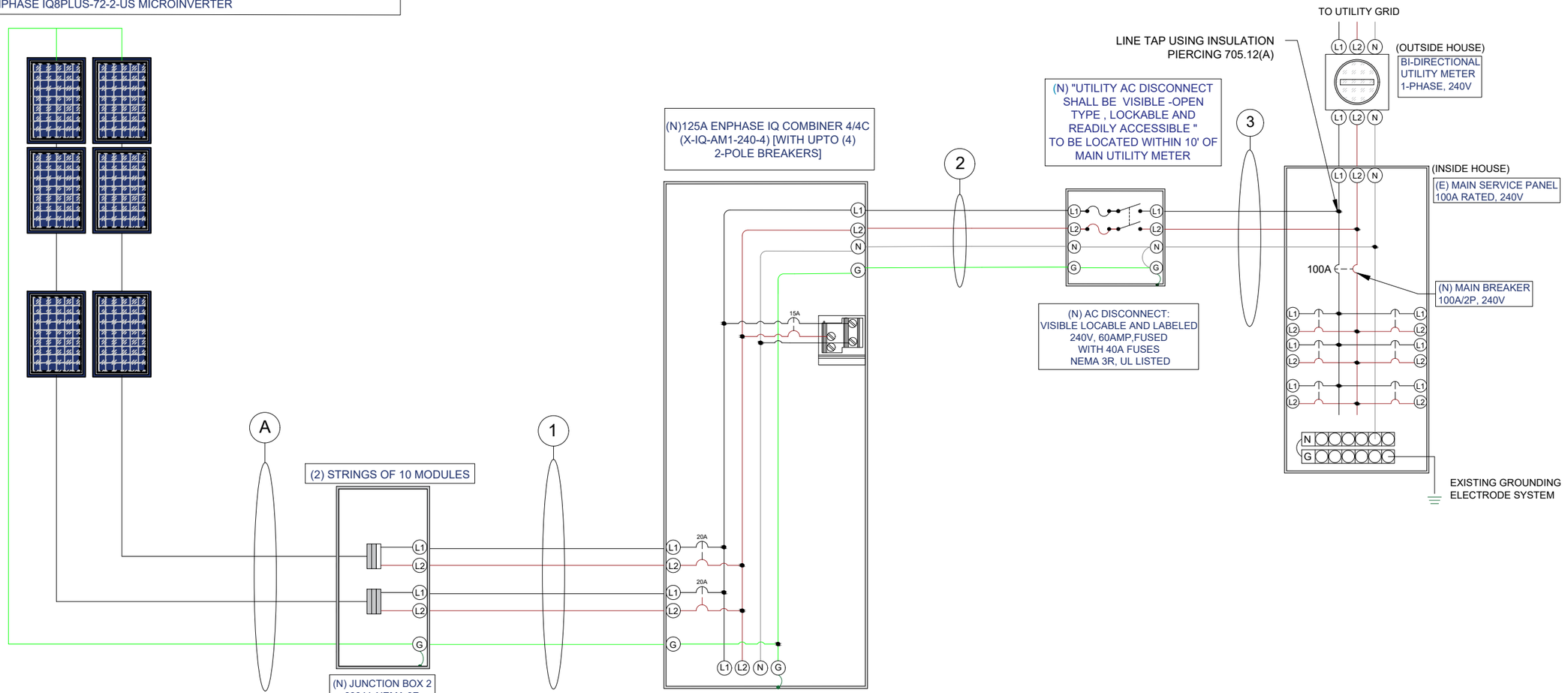
SR. NO.	DESCRIPTION	CONDUIT SIZE
A	Q CABLES, (1) #10 THWN-2 (G)	
1	(2) #10 THWN-2 (L1) ,(3) #10 THWN-2 (L2) ,(1) #10 AWG THWN-2 (G)	IN 3/4" CONDUIT RUN
2	(3) #6 THWN-2 (L1,L2,N) , (1) #10 THWN-2 (G)	IN 3/4" CONDUIT RUN
3	(3) #6 THWN-2 (L1,L2,N)	IN 3/4" CONDUIT RUN

MODULE SPECIFICATION	
MODEL NO.	HANWHA Q CELLS Q.PEAK DUO L G8.2 425 (425W) SOLAR MODUELS
PEAK POWER (Pmpp)	425W
PEAK VOLTAGE (Vmpp)	41.39V
PEAK CURRENT (Impp)	10.27A
OPEN CIRCUIT VOLTAGE (Voc)	49.09V
SHORT CIRCUIT CURRENT (Isc)	10.78A

INVERTER SPECIFICATION	
MANUFACTURER	ENPHASE
MODEL NO.	IQ8PLUS-72-2-US
MAX. DC INPUT VOLTAGE	60 V
MAX. OUTPUT POWER	290VA
MAX. AC OUTPUT VOLTAGE	240V
NOMINAL AC OUTPUT CURRENT	1.21A

ARRAY DETAILS	
DC SYSTEM SIZE	8.5 KW
AC SYSTEM SIZE	5.8 KW
TOTAL NO. OF MODULES	20
NO. OF MODULE PER STRING	2@10
NO. OF STRING	2

(20) HANWHA Q CELLS Q.PEAK DUO L G8.2 425 (425W) SOLAR MODUELS SOLAR MODULE SO WITH
(20) ENPHASE IQ8PLUS-72-2-US MICROINVERTER



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REVIEWER	

ELECTRICAL LINE DIAGRAM

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ELECTRICAL CALCULATIONS:

1. CURRENT CARRYING CONDUCTOR

(A) BEFORE IQ COMBINER PANEL :

AMBIENT TEMPERATURE - 32 °C .....NEC 310.15(B)(3)(c)
TEMPERATURE DERATE FACTOR - (0.96) .....NEC 310.15(B)(1)
GROUPING FACTOR - (0.8) .....NEC 310.15(C)(1)
CONDUCTOR AMPACITY:

= (INV O/P CURRENT) x 1.25 / A.T.F / G.F ...NEC 690.8(B)
= [(10 x 1.21x1.25) / 0.96/ 0.8]
= 19.69A
SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.16

(B) AFTER COMBINER PANEL :
TEMPERATURE DERATE FACTOR - (0.96)
GROUPING FACTOR - (1)

CONDUCTOR AMPACITY
= (TOTAL INV O/P CURRENT) x 1.25 / 0.96 / 1 ...NEC 690.8(B)
= [(20) x 1.21X 1.25] / 0.96 / 1
= 31.51 A
SELECTED CONDUCTOR - #6 THWN-2 ...NEC 310.16

(C) PV OVER CURRENT PROTECTION ...NEC 690.9(B)

= TOTAL INVERTER O/P CURRENT x 1.25 ...NEC 690.9(B)
= [(20) x 1.21X 1.25] = 30.25 A
SELECTED OCPD IS 40A

SELECTED EQUIPMENT GROUNDING CONDUCTOR (EGC) = #10 THWN-2 ...NEC 250.122(A)

GENERAL ELECTRICAL NOTES:

1. THE DC AND AC CONNECTORS OF THE ENPHASE IQ8PLUS-72-2-US MICROINVERTERS ARE LISTED TO MEET REQUIREMENTS AS A DISCONNECT MEANS AS ALLOWED BY NEC 690.15(A).
2. INVERTER BRANCH CIRCUIT CONDUCTORS ARE MANUFACTURED PV WIRE LISTED . THEY ARE ROHS, OIL RESISTANT, AND UV RESISTANT. THEY CONTAIN 10 AWG CONDUCTORS OF TYPE THHN/THWN-2 DRY/WET AND CERTIFIED TO UL3003 AND UL 9703. THE CABLE'S DOUBLE INSULATED RATING REQUIRES NO NEUTRAL OR GROUNDED CONDUCTOR.
3. ALL METAL ENCLOSURES, RACEWAYS, CABLES AND EXPOSED NON CURRENT-CARRYING METAL PARTS OF EQUIPMENT SHALL BE GROUNDED TO EARTH AS REQUIRED BY NEC 250.4(B) AND PART III OF NEC ARTICLE 250 AND EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45. THE GROUNDING ELECTRODE SYSTEM SHALL ADHERE TO 690.47(A)
4. PV SYSTEM DISCONNECT SHALL BE READILY ACCESSIBLE.
5. POINT-OF-CONNECTION SHALL BE MADE IN COMPLIANCE WITH NEC 705.12
6. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
7. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703. INVERTER CONFORM TO AND ARE LISTED UNDER UL 1741.
8. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6(C)(1) AND ARTICLE 310.10 (D).
9. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).
10. LINE SIDE TAP DISCONNECTS MUST BE LOCATED NO MORE THAN 10 FEET FROM THE TAP POINT PER NEC 690.15(A)
11. ALL DC WIRING RUNNING THROUGH THE BUILDING SHALL BE ENCLOSED IN METALLIC CONDUIT IN COMPLIANCE WITH NEC 690.31(G). THIS REQUIREMENT SHALL APPLY TO INVERTER-BASED SYSTEMS, BUT SHALL NOT APPLY TO MICROINVERTER-BASED SYSTEMS.
12. A 10 AWG CU EQUIPMENT GROUNDING CONDUCTOR SHALL BE USED TO BOND RAILS AND OTHER ROOFTOP EQUIPMENT. THIS CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE BY RUNNING UNDERNEATH THE ARRAY. IF THIS CONDUCTOR IS UNPROTECTED FROM PHYSICAL DAMAGE, THE CONDUCTOR SHALL BE INCREASED TO 6 AWG CU.

GROUNDING NOTES:

PV MODULE AND RACKING GROUNDING AS PER APPROVED INSTALLATION PRACTICE
AND IN LINE WITH MANUFACTURE'S GUIDELINES.

RES
Renewable Energy Solutions
CONTACT: (401)569-3010
181 CONANT ST,
PAWTUCKET, RI 02860.

NICK VOCKERODT
44 BAINBRIDGE AVE, PROVIDENCE, RI 02909, USA

SIGNATURE WITH SEAL

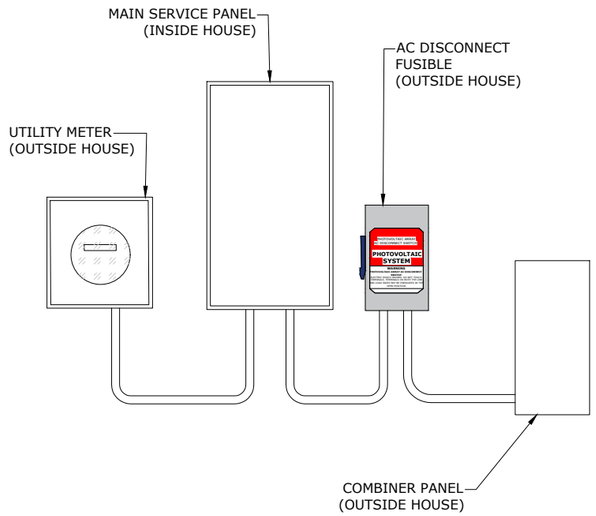
REVISIONS	REV	DESCRIPTION	DATE

PERMIT DEVELOPER	
DATE	03/28/2024
DESIGNER	OKH
REVIEWER	

ELECTRICAL CALCULATIONS

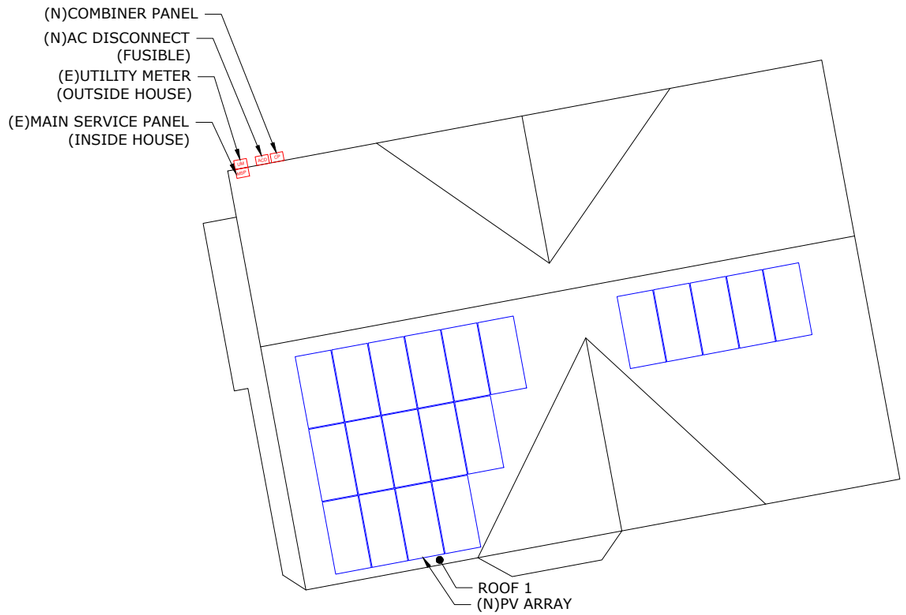
PV-7

EQUIPMENT ELEVATION VIEW



WARNING

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS LOCATED AS SHOWN



SITE ADDRESS:44 BAINBRIDGE AVE, PROVIDENCE, RI 02909, USA

CONDUIT LABELS

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

WARNING
AC VOLTAGE = 240V
MAX FUSE: 40A
AC CURRENT: 24.2A

EMERGENCY CONTACT
508-738-8112

UTILITY METER

WARNING
ELECTRIC SHOCK HAZARD
NO USER SERVICEABLE PARTS INSIDE
CONTACT AUTHORIZED SERVICE PROVIDE FOR ASSISTANCE

WARNING
ELECTRIC SHOCK HAZARD
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

LABEL

SERVICE PANEL LABEL

CAUTION
PHOTOVOLTAIC AC SOURCE

SOLAR DC DISCONNECT & INVERTER LABELS

WARNING
⚠ DUAL POWER SOURCE ⚠

NOTICE
THIS SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN ROOFTOP INVERTERS WILL DE-ENERGISE AT SERVICE PANEL OUTAGE

NOTICE
AC COMBINER AND DATA AQUISITION.
DO NOT ADD LOADS.
DO NOT TOUCH TERMINALS.
LINE AND LOAD SIDE MAY BE ENERGIZED IN OPEN POSITION.

WARNING
THIS IS MAIN 1 OF 2 WITH
MAIN 2 OF 2 LOCATED OUTSIDE

THIS SERVICE IS ALSO SERVED BY A PV SYSTEM WITH RAPID SHUTDOWN. INVERTERS LOCATED ON ROOF AUTO DE-ENERGISE WHEN SOLAR SERVICE MAIN IS IN OPEN POSITION.
THE DC CONDUCTORS OF THE PV SYSTEM ARE UNGROUNDED AND MAY BE ENEGIZED.
IF BACKFEED BREAKER PRESENT DO NOT RELOCATE THIS OVERCURRENT DEVICE.

CAUTION
DO NOT DISCONNECT UNDER LOAD

CAUTION
SOLAR CIRCUIT

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REVIEWER	

LABELS

PV-8

powered by Q.ANTUM DUO

Q.PEAK DUO L-G8.2

415-430

ENDURING HIGH PERFORMANCE

pv magazine award 2017 top innovation

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2019

Photon Q.PRO-G2 235 Best polycrystalline solar module 2014 Q CELLS 174 modules tested

Q CELLS YIELD SECURITY
- ANTI PID TECHNOLOGY (APT)
- HOT-SPOT PROTECT (HSP)
- TRACEABLE QUALITY (TRA.Q™)
- ANTI LID TECHNOLOGY (ALT)

Q.ANTUM TECHNOLOGY: LOW LEVELISED COST OF ELECTRICITY
Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 20.3%.

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

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 aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-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 commercial/industrial buildings

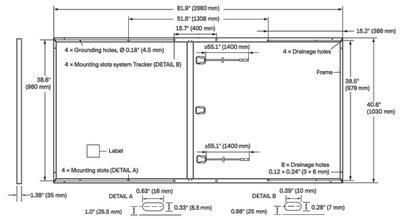
Ground-mounted solar power plants

Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	81.9 in × 40.6 in × 1.38 in (including frame) (2080 mm × 1030 mm × 35 mm)
Weight	55.1 lbs (25.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Anodized aluminum
Cell	6 × 24 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; (+) ≥55.1 in (1400 mm), (–) ≥55.1 in (1400 mm)
Connector	Stäubli MC4-Evo2, Hanwha Q CELLS HQC4, Amphenol UTX, Renhe 05-8, JMTHY JM601A; Tongling Cable01S-F, IP68 or Friends PV2e; IP67

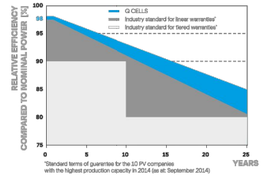


ELECTRICAL CHARACTERISTICS

POWER CLASS			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]	415	420	425	430
	Short Circuit Current[1]	I_{SC} [A]	10.69	10.74	10.78	10.83
	Open Circuit Voltage[1]	V_{OC} [V]	48.59	48.84	49.09	49.33
	Current at MPP	I_{MPP} [A]	10.18	10.22	10.27	10.31
	Voltage at MPP	V_{MPP} [V]	40.77	41.08	41.39	41.70
	Efficiency[1]	η [%]	≥19.4	≥19.6	≥19.8	≥20.1
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]						
Minimum	Power at MPP	P_{MPP} [W]	310.8	314.5	318.3	322.0
	Short Circuit Current	I_{SC} [A]	8.61	8.65	8.69	8.72
	Open Circuit Voltage	V_{OC} [V]	45.82	46.05	46.29	46.52
	Current at MPP	I_{MPP} [A]	8.01	8.05	8.08	8.12
	Voltage at MPP	V_{MPP} [V]	38.79	39.09	39.38	39.67

[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

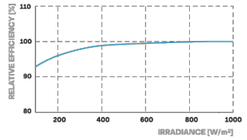
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.54% degradation per year. At least 93.1% of nominal power up to 10 years. At least 85% 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	Normal Module Operating Temperature	NMOT	[°F]	109±5.4 (43±3°C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1500 (IEC) / 1500 (UL)	Safety Class	II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 1703	C (IEC) / TYPE 1 (UL)
Max. Design Load, Push / Pull[3]	[lbs / ft²]	75 (3600 Pa) / 33 (1600 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]	113 (5400 Pa) / 50 (2400 Pa)		

[3] See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 1703, CE-compliant, IEC 61215:2016, IEC 61730:2016, Application Class II, U.S. Patent No. 9,893,215 (solar cells)

PACKAGING INFORMATION

Number of Modules per Pallet	29
Number of Pallets per 53' Trailer	26
Number of Pallets per 40' HC-Container	22
Pallet Dimensions (L × W × H)	84.6 × 45.3 × 48.0 in (2150 × 1150 × 1220 mm)
Pallet Weight	1717 lbs (779 kg)

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

RES Renewable Energy Solutions
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REVIEWER	

MODULE DATASHEET

PV-9

ENPHASE

DATA SHEET

IQ8 Series Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.

Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.

Enphase 25 year limited warranty

IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.

Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.

UL CERTIFIED SAFETY

IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

IQ8SE-DS-0001-01-EN-US-2022-03-17

* Only when installed with IQ System Controller 2, meets UL 1741. IQ8H-208V operates only in grid-tied mode.
** IQ8 Series Microinverters supports split phase, 240V. IQ8H-208 supports split phase, 208V only.

IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US[1]
Commonly used module pairings[2]	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell				
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 45
Operating range	V	25 – 48	25 – 58				
Min/max start voltage	V	30 / 48	30 / 58				
Max input DC voltage	V	50	60				
Max DC current[3] [module Isc]	A	15					
Overvoltage class DC port		II					
DC port backfeed current	mA	0					
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit					
OUTPUT DATA (AC)		**IQ8-60-2-US**	**IQ8PLUS-72-2-US**	**IQ8M-72-2-US**	**IQ8A-72-2-US**	**IQ8H-240-72-2-US**	**IQ8H-208-72-2-US[1]**
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range[4]	V	240 / 211 – 264					208 / 183 – 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz	60					
Extended frequency range	Hz	50 – 68					
AC short circuit fault current over 3 cycles	Arms	2					4.4
Max units per 20 A (L-L) branch circuit[5]		16	13	11	11	10	9
Total harmonic distortion		<5%					
Overvoltage class AC port		III					
AC port backfeed current	mA	30					
Power factor setting		1.0					
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging					
Peak efficiency	%	97.5	97.6	97.6	97.6	97.6	97.4
CEC weighted efficiency	%	97	97	97	97.5	97	97
Night-time power consumption	mW	60					
MECHANICAL DATA							
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)					
Relative humidity range		4% to 100% (condensing)					
DC Connector type		MC4					
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")					
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					
Environ. categcry / UV exposure rating		NEMA Type 6 / outdoor					
COMPLIANCE							
Certifications		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, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.					

(1) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/module-compatibility (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SE-DS-0001-01-EN-US-2022-03-17

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INVERTER DATASHEET

PV-10

Data Sheet
Enphase Networking

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C

X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters 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 Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

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

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed

UL LISTED

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

ENPHASE.

Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem 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.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS	(not included, order separately)
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	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 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 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. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" 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
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ 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) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

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

ENPHASE.

RES Renewable Energy Solutions
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SIGNATURE WITH SEAL

REVISIONS	DESCRIPTION	DATE
REV		

PERMIT DEVELOPER

DATE	03/28/2024
DESIGNER	OKH
REVIEWER	

COMBINER DATASHEET

PV-11

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Splice Foot X

Patent Pending

TECHNICAL SHEET

Item Number	Description	Part Number
1	Splice Foot X	4000113 | Splice Foot X Kit, Mill
2	K2 EverSeal-	
3	M5 x 60 lag screws	
4	T-Bolt & Hex Nut Set	

Technical Data

	Splice Foot X
Roof Type	Composition shingle
Material	Aluminum with stainless steel hardware
Finish	Mill
Roof Connection	M5 x 60 lag screws
Code Compliance	UL 2703
Compatibility	CrossRail 44-X, 48-X, 48-XL, 80

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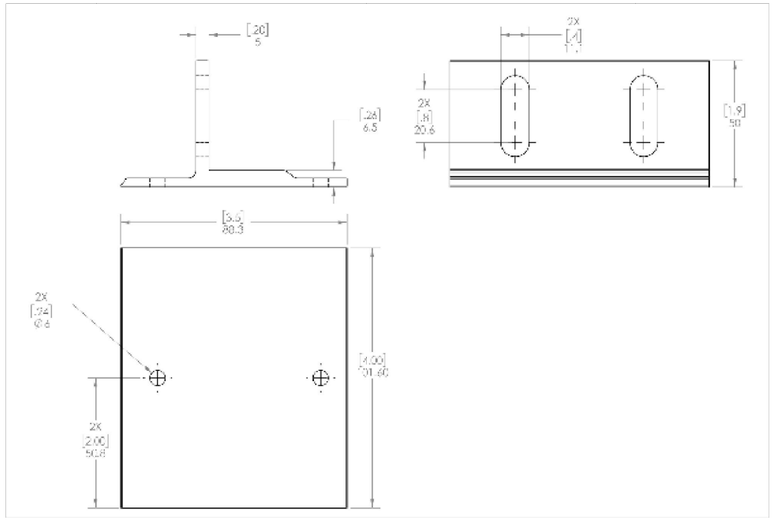
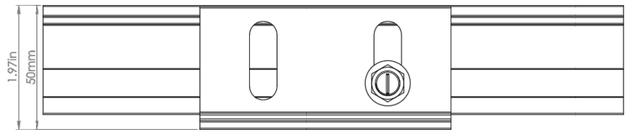
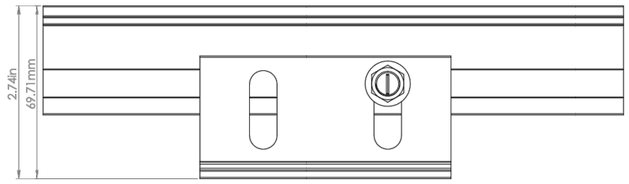
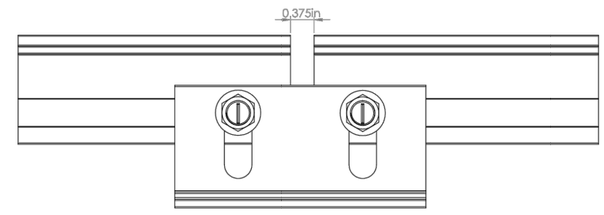
Units: [in] mm









k2-systems.com

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ATTACHMENT DATASHEET

PV-12

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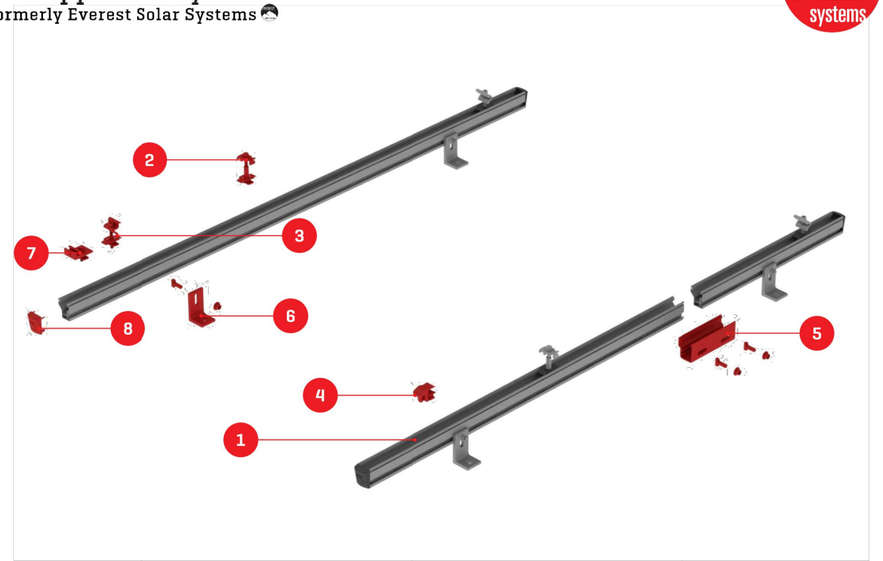

CrossRail System

TECHNICAL SHEET

Item Number	Description	Part Number
1	CrossRail 44-X (shown) all CR profiles applicable	4000019 (166" mill), 4000020 (166" dark) , 4000021 (180" mill), 4000022 (180" dark)
2	CrossRail Mid Clamp	4000601-H (mill), 4000602-H (dark)
3	CrossRail (Standard) End Clamp	4000429 (mill), 4000430 (dark)
4	Yeti Hidden End Clamp for CR	4000050-H
5	CrossRail 44-X Rail Connector (shown) CR 48-X, 48-XL Rail Connector available	4000051 (mill), 4000052 (dark)
6	L-Foot Slotted Set	4000630 (mill), 4000631 (dark)
7	Everest Ground Lug	4000006-H
8	CrossRail 44-X End Cap (shown) CrossRail 48-X, 48-XL and 80 available	4000067

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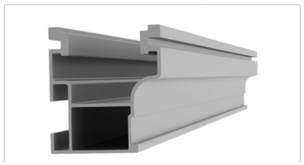
CROSSRAIL 44-X



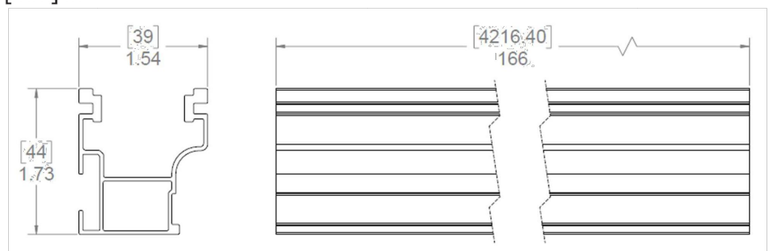
Mechanical Properties

	CrossRail 44-X
Material	6000 Series Aluminum
Ultimate Tensile Strength	37.7 ksi (260 MPa)
Yield Strength	34.8 ksi (240 MPa)
Weight	0.47 lbs/ft (0.699 kg/m)
Finish	Mill or Dark Anodized

Sectional Properties

	CrossRail 44-X
Sx	0.1490 in3 (0.3785 cm3)
Sy	0.1450 in3 (0.3683 cm3)
A (X-Section)	0.4050 in2 (1.0287 cm2

Units: [mm] in



Notes:

- Structural values and span charts determined in accordance with Aluminum Design Manual and ASCE 7-16
- UL2703 Listed System for Fire and Bonding

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REV	DESCRIPTION	DATE

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RACKING DATASHEET

PV-13