ISSUE: Certificate of Appropriateness for alterations

APPLICANT: Janine H. Coward

LOCATION: Old and Historic Alexandria District
323 South Saint Asaph Street

ZONE: RM/Townhouse Zone

STAFF RECOMMENDATION

Staff recommends approval of the Certificate of Appropriateness for alterations, with the following conditions:

1. The solar panels are only installed on roofs #3 and #4, not #1 or #2.
2. The solar panels must match the adjacent roof surface in color and be installed between the ribs.

GENERAL NOTES TO THE APPLICANT

1. APPEAL OF DECISION: In accordance with the Zoning Ordinance, if the Board of Architectural Review denies or approves an application in whole or in part, the applicant or opponent may appeal the Board's decision to City Council on or before 14 days after the decision of the Board.

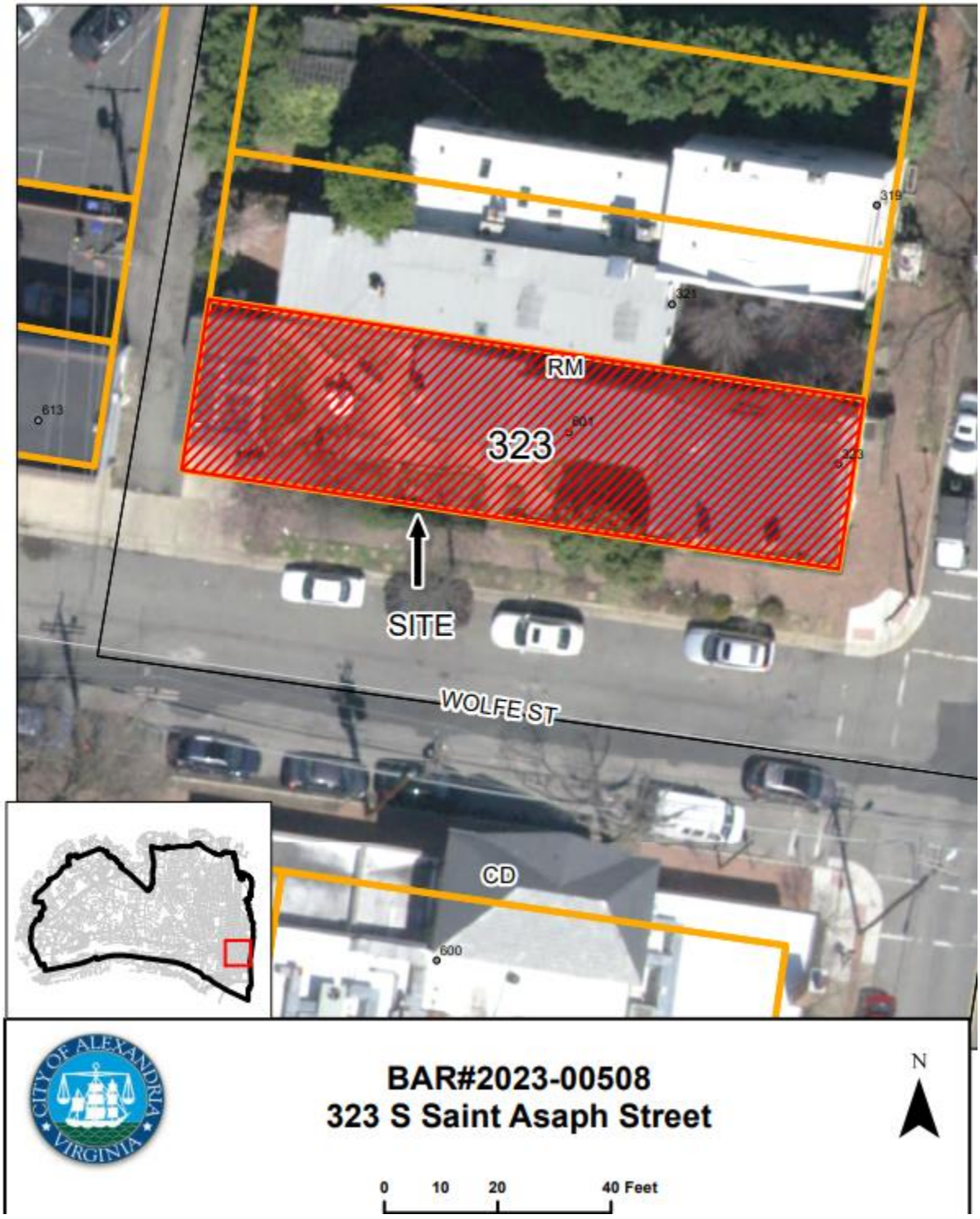
2. COMPLIANCE WITH BAR POLICIES: All materials must comply with the BAR's adopted policies unless otherwise specifically approved.

3. BUILDING PERMITS: Most projects approved by the Board of Architectural Review require the issuance of one or more construction permits by Department of Code Administration (including signs). The applicant is responsible for obtaining all necessary construction permits after receiving Board of Architectural Review approval. Contact Code Administration, Room 4200, City Hall, 703-746-4200 for further information.

4. ISSUANCE OF CERTIFICATES OF APPROPRIATENESS AND PERMITS TO DEMOLISH: Applicants must obtain a copy of the Certificate of Appropriateness or Permit to Demolish PRIOR to applying for a building permit. Contact BAR Staff, Room 2100, City Hall, 703-746-3833, or preservation@alexandriava.gov for further information.

5. EXPIRATION OF APPROVALS NOTE: In accordance with Sections 10-106(B), 10-206(B) and 10-307 of the Zoning Ordinance, any Board of Architectural Review approval will expire 12 months from the date of issuance if the work is not commenced and diligently and substantially pursued by the end of that 12-month period.

6. HISTORIC PROPERTY TAX CREDITS: Applicants performing extensive, certified rehabilitations of historic properties may separately be eligible for state and/or federal tax credits. Consult with the Virginia Department of Historic Resources (VDHR) prior to initiating any work to determine whether the proposed project may qualify for such credits.


RM
323
SITE
WOLFE ST
CD
319
321
613
601
223
600
BAR#2023-00508
323 S Saint Asaph Street
N
0 10 20 40 Feet

I. APPLICANT'S PROPOSAL

The applicant requests a Certificate of Appropriateness for alterations to install 26 roof mounted solar panels at 323 South Saint Asaph Street.

Site context
The structure is bounded by South Saint Asaph Street to the east, Wolfe Street to the south, a private alley to the west, and 321 South Saint Asaph to the north. The different massings on the structure have different roof styles but they are all sloped to some degree. Therefore, the proposed solar panels will be visible from both South Saint Asaph and Wolfe Streets.

II. HISTORY

The structure at 323 South Saint Asaph Street consists of a central massing and several additions that were built throughout various time periods. According to an April 6, 1958 article of the *Washington Evening Star*, "The central section of this house dates from about 1780, with both the front and rear sections added later." Real estate assessment records date this property to 1790. It is thus likely that the central section was constructed in the **late 1700s**. According to past BAR minutes, a rear addition was constructed in **1810**. According to Ethelyn Cox in her book *Historic Alexandria, Virginia, Street by Street: A Survey of Existing Early Buildings*, a structure at this address was listed among the "Building Improvements" in the Alexandria Gazette of April 3, 1852, and was built as a large frame building by George Seaton, who bought the lot from John Roberts in 1851 for $250. Thus, the two and a half story frame dwelling (the front massing facing South Saint Asaph Street) was likely built in **1852**.

On May 7, **1986**, the Board approved another addition, with the condition that the siding be wood (BAR86-43). On November 1, 1989, the Board approved the demolition of a metal and concrete garage which dated from 1921. At the same hearing, the Board approved a new one and a half story detached garage/greenhouse at the rear of the property (BAR89-191 & BAR89-192).

Previous BAR Approvals

7/11/56	White aluminum siding on exterior walls
6/8/60	White aluminum siding on exterior walls
10/12/60	White asbestos clapboard siding on north wall
12/20/72	Aluminum siding on garage, replace garage door, roof replacement
BAR86-43	Addition and alterations
BAR89-191	Demolition of garage and construction of new garage

III. ANALYSIS

The applicant proposes to install 26 roof mounted solar panels on three of the massings, in line with the existing roof lines and pitch (Figure 1). The panels will be Vertex S backsheet monocrystalline modules. All the massings on the structure have a standing seam metal roof. The front (east) massing facing South Saint Asaph Street is a gable roof with a high slope (Figure 2),

while the central and west massings facing Wolfe Street have flounder roofs with a lower slope (Figure 3).

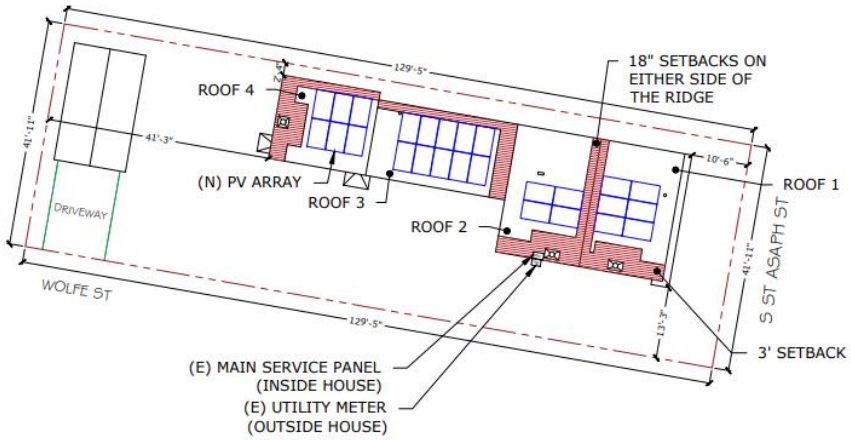


Figure 1. Locations of proposed solar panels.

Figure 2 (left). The 1852 massing facing South Saint Asaph Street, with a gable roof.
Figure 3 (right). The late 1700s and 1986 massings facing Wolfe Street, with flounder roofs.

The *Design Guidelines* state that "…on historic structures, inappropriately mounted solar energy systems may detract from the historic architectural character…these features should be balanced with the historic architectural character of the individual structure and the district as a whole."

Additionally, according to the *Design Guidelines*, "solar panels should not damage historic building materials." Because the roofs are standing seam metal, Staff is not concerned about damage to the roof. However, the solar panels on the high sloped gable roof of the 1852 massing will be highly visible from the public right of way, as it is located on a prominent corner. Staff is concerned that installing solar panels on these surfaces (roof 1 and roof 2 of the application materials) would inappropriately detract from the historic integrity of the structure. Staff does not have an issue with solar panels on the central and west massing (roofs 3 and 4) because they are low-sloped and not as visible.

Staff therefore recommends approval of the Certificate of Appropriateness for alterations, with the following conditions:

1. The solar panels are only installed on roofs #3 and #4, not #1 or #2.
2. The solar panels must match the adjacent roof surface in color and be installed between the ribs.

STAFF
Brendan Harris, Historic Preservation Planner, Planning & Zoning
Tony LaColla, AICP, Land Use Services Division Chief, Planning & Zoning

III. CITY DEPARTMENT COMMENTS

Legend: C- code requirement R- recommendation S- suggestion F- finding

Zoning
C-1 Proposed roof flush mounted solar panels will comply with zoning.

Code Administration
C-1 A building permit is required for review.

Transportation and Environmental Services
R-1 The building permit must be approved and issued prior to the issuance of any permit for demolition, if a separate demolition permit is required. (T&ES)

R-2 Applicant shall be responsible for repairs to the adjacent city right-of-way if damaged during construction activity. (T&ES)

R-3 No permanent structure may be constructed over any existing private and/or public utility easements. It is the responsibility of the applicant to identify any and all existing easements on the plan. (T&ES)

F-1 After review of the information provided, an approved grading plan is not required at this time. Please note that if any changes are made to the plan it is suggested that T&ES be included in the review. (T&ES)

F-2 If the alley located at the rear of the parcel is to be used at any point of the construction

process the following will be required:

For a Public Alley - The applicant shall contact T&ES, Construction Permitting & Inspections at (703) 746-4035 to discuss any permits and accommodation requirements that will be required.

For a Private Alley - The applicant must provide proof, in the form of an affidavit at a minimum, from owner of the alley granting permission of use. (T&ES)

C-1 The applicant shall comply with the City of Alexandria's Solid Waste Control, Title 5, Chapter 1, which sets forth the requirements for the recycling of materials (Sec. 5-1-99). (T&ES)

C-2 The applicant shall comply with the City of Alexandria's Noise Control Code, Title 11, Chapter 5, which sets the maximum permissible noise level as measured at the property line. (T&ES)

C-3 Roof, surface and sub-surface drains be connected to the public storm sewer system, if available, by continuous underground pipe. Where storm sewer is not available applicant must provide a design to mitigate impact of stormwater drainage onto adjacent properties and to the satisfaction of the Director of Transportation & Environmental Services. (Sec.5-6-224) (T&ES)

C-4 All secondary utilities serving this site shall be placed underground. (Sec. 5-3-3) (T&ES)

C-5 Any work within the right-of-way requires a separate permit from T&ES. (Sec. 5-2) (T&ES)

C-6 All improvements to the city right-of-way such as curbing, sidewalk, driveway aprons, etc. must be city standard design. (Sec. 5-2-1) (T&ES)

Alexandria Archaeology

F-1 No archaeological oversight is required for this project.

V. ATTACHMENTS

1 – Application Materials
2 – Supplemental Materials

BAR CASE# _____
(OFFICE USE ONLY)

ADDRESS OF PROJECT: 323 S Saint Asaph Street, Alexandria, VA 22314

DISTRICT: ■ **Old & Historic Alexandria** ☐ **Parker – Gray** ☐ **100 Year Old Building**

TAX MAP AND PARCEL: 074.04-03-10 **ZONING:** RM

APPLICATION FOR: *(Please check all that apply)*

■ CERTIFICATE OF APPROPRIATENESS

☐ PERMIT TO MOVE, REMOVE, ENCAPSULATE OR DEMOLISH
(Required if more than 25 square feet of a structure is to be demolished/impacted)

☐ WAIVER OF VISION CLEARANCE REQUIREMENT and/or YARD REQUIREMENTS IN A VISION CLEARANCE AREA (Section 7-802, Alexandria 1992 Zoning Ordinance)

☐ WAIVER OF ROOFTOP HVAC SCREENING REQUIREMENT
(Section 6-403(B)(3), Alexandria 1992 Zoning Ordinance)

Applicant: ☐ Property Owner ■ Business *(Please provide business name & contact person)*

Name: Solar Energy World - Brian Milligan

Address: 14880 Sweitzer Lane

City: Laurel State: MD Zip: 20707

Phone: 410-579-2009 E-mail : permitting@solarenergyworld.com

Authorized Agent *(if applicable)*: ☐ Attorney ☐ Architect ☒ Contractor

Name: Brian Milligan Phone: 410-220-4738

E-mail: permitting@solarenergyworld.com

Legal Property Owner:

Name: Janine H Coward

Address: 323 S Saint Asaph Street

City: Alexandria State: VA Zip: 22314

Phone: (703) 407-5061 E-mail: rhodo12@aol.com

BAR CASE# _____
(OFFICE USE ONLY)

NATURE OF PROPOSED WORK: *Please check all that apply*

☐ NEW CONSTRUCTION
☒ EXTERIOR ALTERATION: *Please check all that apply.*
- ☐ awning
- ☐ doors
- ☐ lighting
- ☐ fence, gate or garden wall
- ☐ windows
- ☐ pergola/trellis
- ☐ HVAC equipment
- ☐ siding
- ☐ painting unpainted masonry
- ☐ shutters
- ☐ shed
- ■ other install roof mounted solar panels

☐ ADDITION
☐ DEMOLITION/ENCAPSULATION
☐ SIGNAGE

DESCRIPTION OF PROPOSED WORK: *Please describe the proposed work in detail (Additional pages may be attached).*

Install (26) roof mounted solar panels in line with the existing roof line & pitch, 10.14kW

SUBMITTAL REQUIREMENTS:

☐ Check this box if there is a homeowner's association for this property. If so, you must attach a copy of the letter approving the project.

Items listed below comprise the **minimum supporting materials** for BAR applications. Staff may request additional information during application review. Please refer to the relevant section of the *Design Guidelines* for further information on appropriate treatments.

Applicants must use the checklist below to ensure the application is complete. Include all information and material that are necessary to thoroughly describe the project. Incomplete applications will delay the docketing of the application for review. Pre-application meetings are required for all proposed additions. All applicants are encouraged to meet with staff prior to submission of a completed application.

Demolition/Encapsulation : *All applicants requesting 25 square feet or more of demolition/encapsulation must complete this section. Check N/A if an item in this section does not apply to your project.*

	N/A	
☐	☐	Survey plat showing the extent of the proposed demolition/encapsulation.
☐	☐	Existing elevation drawings clearly showing all elements proposed for demolition/encapsulation.
☐	☐	Clear and labeled photographs of all elevations of the building if the entire structure is proposed to be demolished.
☐	☐	Description of the reason for demolition/encapsulation.
☐	☐	Description of the alternatives to demolition/encapsulation and why such alternatives are not considered feasible.

BAR CASE# _____

(OFFICE USE ONLY)

Additions & New Construction: *Drawings must be to scale and should not exceed 11" x 17" unless approved by staff. Check N/A if an item in this section does not apply to your project.*

	N/A	
☐	☐	Scaled survey plat showing dimensions of lot and location of existing building and other structures on the lot, location of proposed structure or addition, dimensions of existing structure(s), proposed addition or new construction, and all exterior, ground and roof mounted equipment.
☐	☐	FAR & Open Space calculation form.
☐	☐	Clear and labeled photographs of the site, surrounding properties and existing structures, if applicable.
☐	☐	Existing elevations must be scaled and include dimensions.
☐	☐	Proposed elevations must be scaled and include dimensions. Include the relationship to adjacent structures in plan and elevations.
☐	☐	Materials and colors to be used must be specified and delineated on the drawings. Actual samples may be provided or required.
☐	☐	Manufacturer's specifications for materials to include, but not limited to: roofing, siding, windows, doors, lighting, fencing, HVAC equipment and walls.
☐	☐	For development site plan projects, a model showing mass relationships to adjacent properties and structures.

Signs & Awnings: *One sign per building under one square foot does not require BAR approval unless illuminated. All other signs including window signs require BAR approval. Check N/A if an item in this section does not apply to your project.*

	N/A	
☐	☐	Linear feet of building: Front:_____ Secondary front (if corner lot):_____.
☐	☐	Square feet of existing signs to remain:_____.
☐	☐	Photograph of building showing existing conditions.
☐	☐	Dimensioned drawings of proposed sign identifying materials, color, lettering style and text.
☐	☐	Location of sign (show exact location on building including the height above sidewalk).
☐	☐	Means of attachment (drawing or manufacturer's cut sheet of bracket if applicable).
☐	☐	Description of lighting (if applicable). Include manufacturer's cut sheet for any new lighting fixtures and information detailing how it will be attached to the building's facade.

Alterations: *Check N/A if an item in this section does not apply to your project.*

	N/A	
☐	☐	Clear and labeled photographs of the site, especially the area being impacted by the alterations, all sides of the building and any pertinent details.
☐	☐	Manufacturer's specifications for materials to include, but not limited to: roofing, siding, windows, doors, lighting, fencing, HVAC equipment and walls.
☐	☐	Drawings accurately representing the changes to the proposed structure, including materials and overall dimensions. Drawings must be to scale.
☐	☐	An official survey plat showing the proposed locations of HVAC units, fences, and sheds.
☐	☐	Historic elevations or photographs should accompany any request to return a structure to an earlier appearance.

BAR CASE# _____

(OFFICE USE ONLY)

ALL APPLICATIONS: *Please read and check that you have read and understand the following items:*

☒ I understand that after reviewing the proposed alterations, BAR staff will invoice the appropriate filing fee in APEX. The application will not be processed until the fee is paid online.

☒ I understand the notice requirements and will return a copy of the three respective notice forms to BAR staff at least five days prior to the hearing. If I am unsure to whom I should send notice I will contact Planning and Zoning staff for assistance in identifying adjacent parcels.

☒ I, the applicant, or an authorized representative will be present at the public hearing.

☒ I understand that any revisions to this initial application submission (including applications deferred for restudy) must be accompanied by the BAR Supplemental form and revised materials.

The undersigned hereby attests that all of the information herein provided including the site plan, building elevations, prospective drawings of the project, and written descriptive information are true, correct and accurate. The undersigned further understands that, should such information be found incorrect, any action taken by the Board based on such information may be invalidated. The undersigned also hereby grants the City of Alexandria permission to post placard notice as required by Article XI, Division A, Section 11-301(B) of the 1992 Alexandria City Zoning Ordinance, on the property which is the subject of this application. The undersigned also hereby authorizes the City staff and members of the BAR to inspect this site as necessary in the course of research and evaluating the application. The applicant, if other than the property owner, also attests that he/she has obtained permission from the property owner to make this application.

APPLICANT OR AUTHORIZED AGENT:

Signature: Brian Milligan

Printed Name: Brian Milligan

Date: 11/16/2023

OWNERSHIP AND DISCLOSURE STATEMENT
Use additional sheets if necessary

1. Applicant. State the name, address and percent of ownership of any person or entity owning an interest in the applicant, unless the entity is a corporation or partnership, in which case identify each owner of more than three percent. The term ownership interest shall include any legal or equitable interest held at the time of the application in the real property which is the subject of the application.

Name	Address	Percent of Ownership
1. John R Ferguson	323 S St. Asaph Street, Alexandria, VA 22314	100
2. Janine H Coward	323 S St. Asaph Street, Alexandria, VA 22314	100
3.		

2. Property. State the name, address and percent of ownership of any person or entity owning an interest in the property located at 323 S St. Asaph Street, Alexandria, VA 22314 (address), unless the entity is a corporation or partnership, in which case identify each owner of more than three percent. The term ownership interest shall include any legal or equitable interest held at the time of the application in the real property which is the subject of the application.

Name	Address	Percent of Ownership
1.	N/A	
2.		
3.		

3. Business or Financial Relationships. Each person or entity listed above (1 and 2), with an ownership interest in the applicant or in the subject property is required to disclose **any** business or financial relationship, as defined by Section 11-350 of the Zoning Ordinance, existing at the time of this application, or within the 12-month period prior to the submission of this application with any member of the Alexandria City Council, Planning Commission, Board of Zoning Appeals or either Boards of Architectural Review.

Name of person or entity	Relationship as defined by Section 11-350 of the Zoning Ordinance	Member of the Approving Body (i.e. City Council, Planning Commission, etc.)
1.	N/A	
2.		
3.		

NOTE: Business or financial relationships of the type described in Sec. 11-350 that arise after the filing of this application and before each public hearing must be disclosed prior to the public hearings.

As the applicant or the applicant's authorized agent, I hereby attest to the best of my ability that the information provided above is true and correct.

11/16/2023	Brian Milligan	Brian Milligan
Date	Printed Name	Signature


323

323

321


2 HR FEE
PARKING
64608

IQ8+
METAL STANDING SEAM
SPRINKLER SYSTEM

JANINE HARRIS RESIDENCE
NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM
DC SYSTEM SIZE (10.140 KW)

SYSTEM DETAILS

DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH NO BATTERY STORAGE
DC RATING OF SYSTEM	SYSTEM SIZE :10.140 KW DC STC
AC RATING OF SYSTEM	7.540 KW
AC OUTPUT CURRENT	31.46 A
NO. OF MODULES	(26) TRINA SOLAR TSM-DE09C.07 (390W) SOLAR MODULES
NO. OF INVERTERS	(26) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
POINT OF INTERCONNECTION	LINE SIDE TAP IN THE MSP
ARRAY STRINGING	(2) BRANCHED CIRCUITS OF 13 MODULES
UTILITY	DOMINION
AHJ	ALEXANDRIA

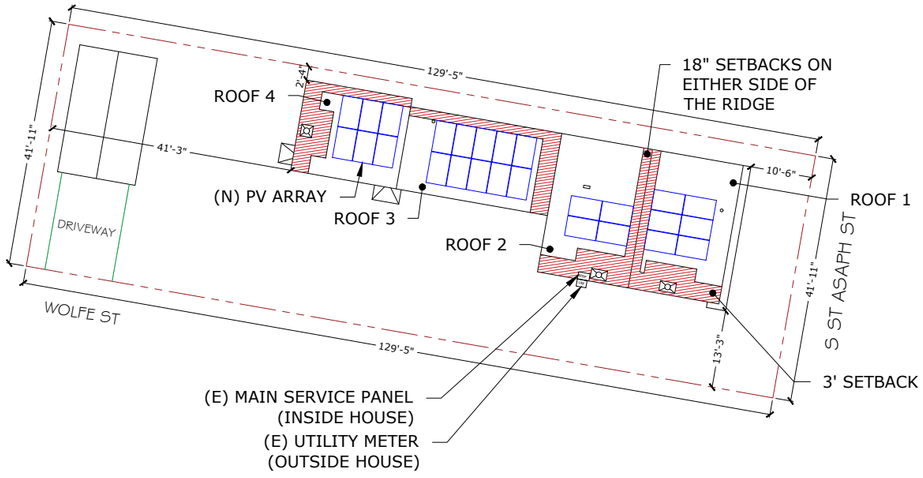
SITE DETAILS

ASHRAE EXTREME LOW	-12°C
ASHRAE 2% HIGH	34°C
GROUND SNOW LOAD	30 PSF
WIND SPEED	115MPH (ASCE 7-16)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	B

GOVERNING CODES

INTERNATIONAL BUILDING CODE (IBC) 2018
INTERNATIONAL FIRE CODE (IFC) 2018
INTERNATIONAL RESIDENTIAL CODE (IRC) 2018
NATIONAL ELECTRICAL CODE (NEC) 2017

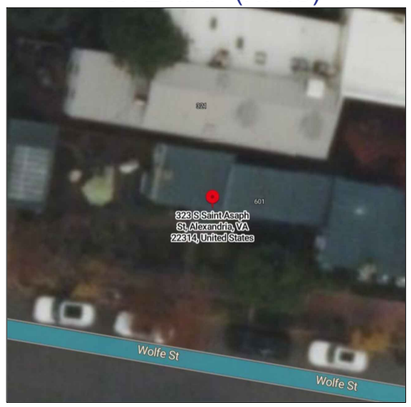
SHEET INDEX



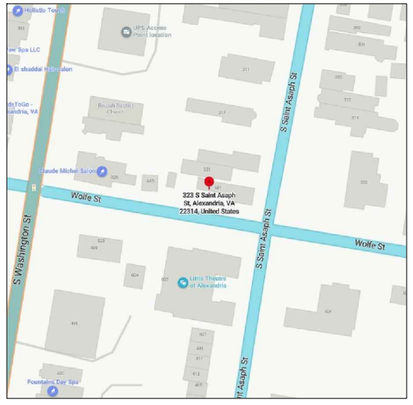
NOTES:

1. THE SYSTEM SHALL INCLUDE [26] TRINA SOLAR TSM-DE09C.07 (390W) SOLAR MODULES
2. SNAPNRACK STANDING SEAM CLAMP WILL BE INSTALLED IN ACCORDANCE WITH SNAPNRACK INSTALLATION MANUAL
3. REFER TO STRUCTURAL DRAWING FOR SECTIONS MARKED AND ADDITIONAL NOTES

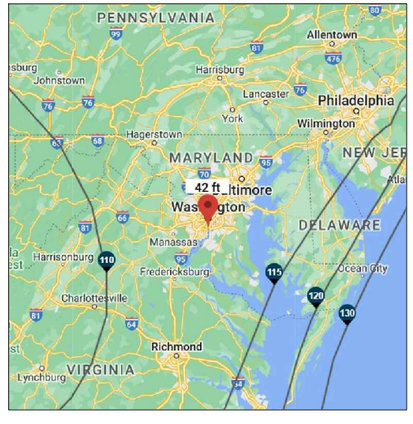
SITE MAP (N.T.S)



VICINITY MAP



WIND FLOW MAP



SolarEnergyWorld
Because Tomorrow Matters

SOLAR ENERGY WORLD
LLC. 5681 MAIN STREET
ELKRIDGE, MD 21075
(888) 497-3233

Signature with Seal

COMMONWEALTH OF VIRGINIA
VINCENT MWIKYANZA
Lic. No. 0402062279
PROFESSIONAL ENGINEER

Signed: 11/02/2023

JANINE HARRIS
VA 15795

323 S SAINT ASAPH ST,
ALEXANDRIA, VA 22314

PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME
SITE MAP & VICINITY MAP

SHEET NUMBER
A-00

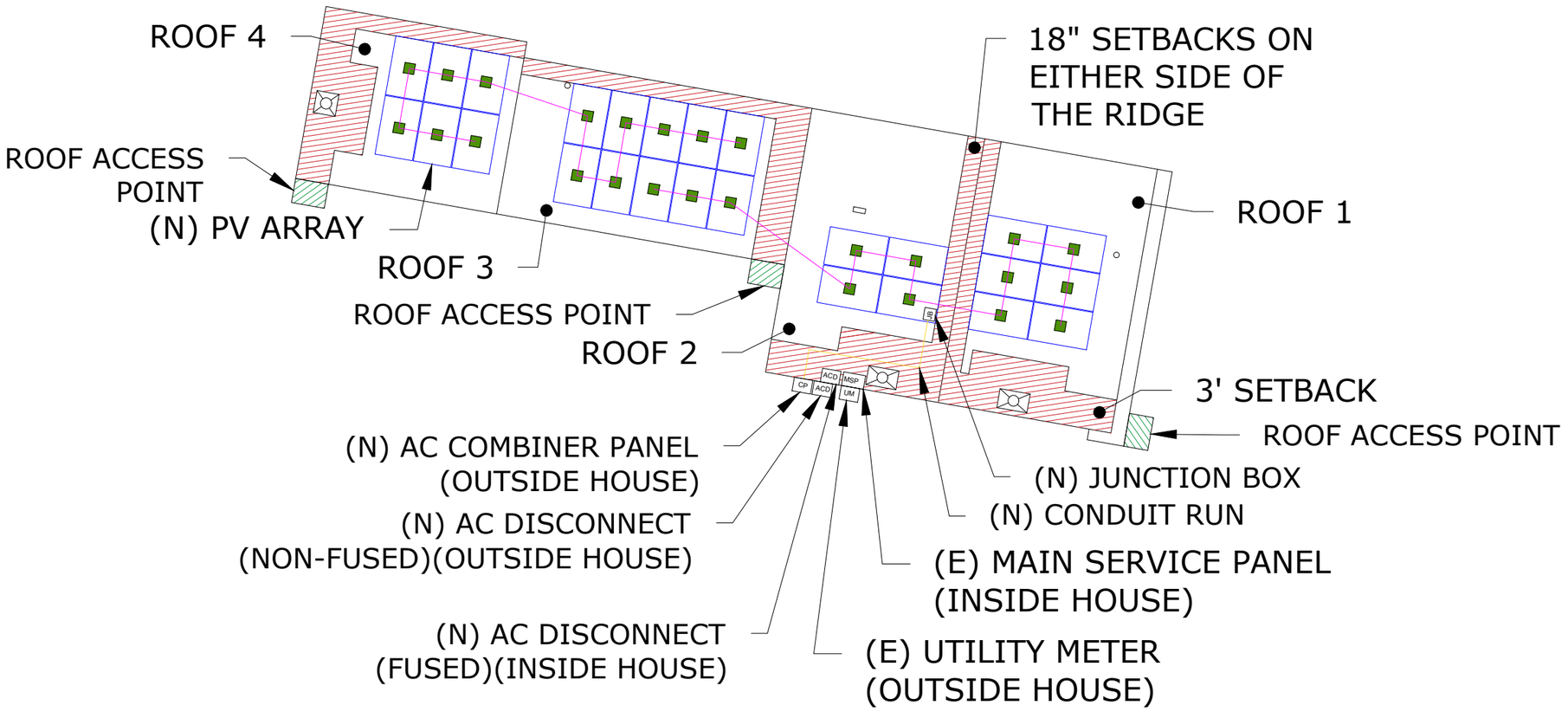
MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 26 MODULES
MODULE TYPE = TRINA SOLAR TSM-DE09C.07 (390W) SOLAR MODULES
WEIGHT = 46.3 LBS / 21.0 KG.
MODULE DIMENSIONS = 69.06"X43.15" = 20.69 SF

NUMBER OF INVERTER = 26 MICROINVERTERS
INVERTER TYPE = ENPHASE IQ8PLUS-72-2-US MICROINVERTERS

DC SYSTEM SIZE: 10.140 KW
AC SYSTEM SIZE: 7.540 KW

NOTES:
1. LOCATION OF JUNCTION BOX(ES), AC DISCONNECTS(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 IBC 2018:
TOTAL PLAN VIEW AREA = 1521SQFT
TOTAL PV AREA = 26(69.06IN)(43.15 IN)/(144 IN^2)
= 538.04 SQFT
(538.04 SQFT/1521 SQFT)100 = 35.37%
TOTAL PV AREA POPULATES 35.37% OF TOTAL PLAN VIEW AREA AND IS NOT WITHIN THE 33% REQUIREMENT.



LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- JB - JUNCTION BOX
- ACD - AC DISCONNECT
- CP - COMBINER PANEL
- FIRE SETBACK
- MICROINVERTER
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- CONDUIT
- STRING

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LLC. 5681 MAIN STREET
ELKRIDGE, MD 21075
(888) 497-3233

Signature with Seal

COMMONWEALTH OF VIRGINIA
VINCENT MWIRIVANEZA
Lic. No. 0402062279
PROFESSIONAL ENGINEER

Signed: 11/02/2023

JANINE HARRIS
VA 15795

323 S SAINT ASAPH ST,
ALEXANDRIA, VA 22314

PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME
ROOF PLAN & MODULES

SHEET NUMBER
A-01

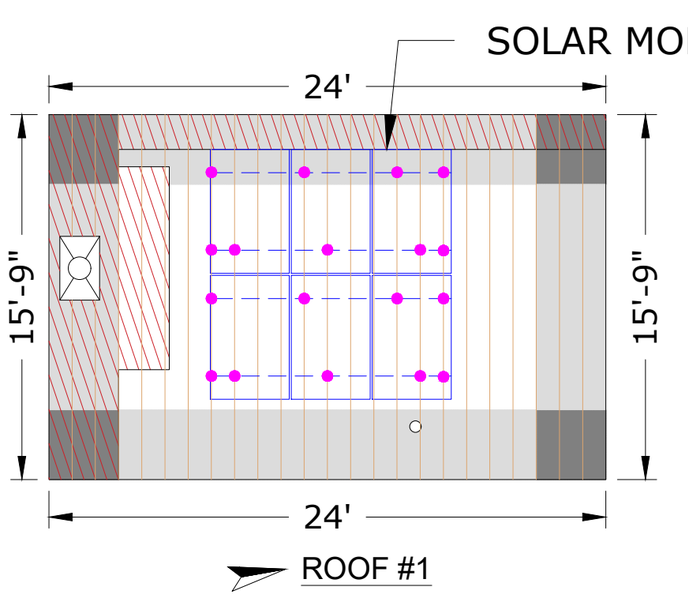
ROOF DESCRIPTION:

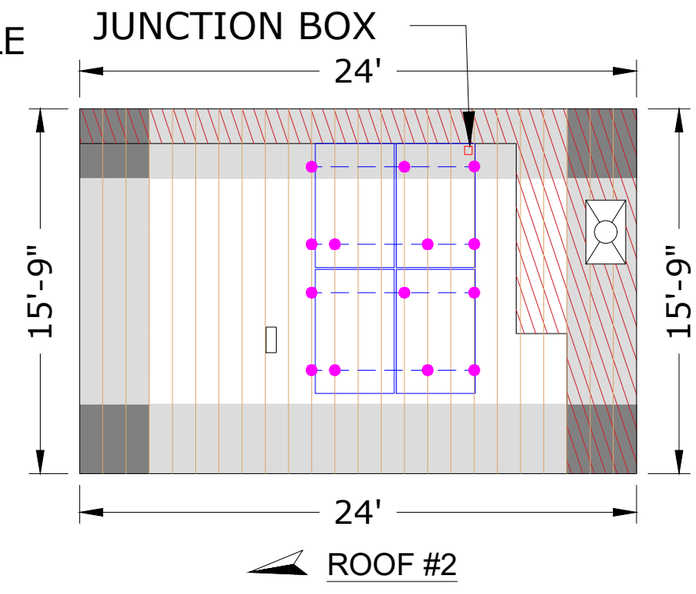
(ROOF #1)
MODULES - 6
ROOF TILT - 35°
ROOF AZIMUTH - 100°
SEAMS SIZE - @12" O.C.

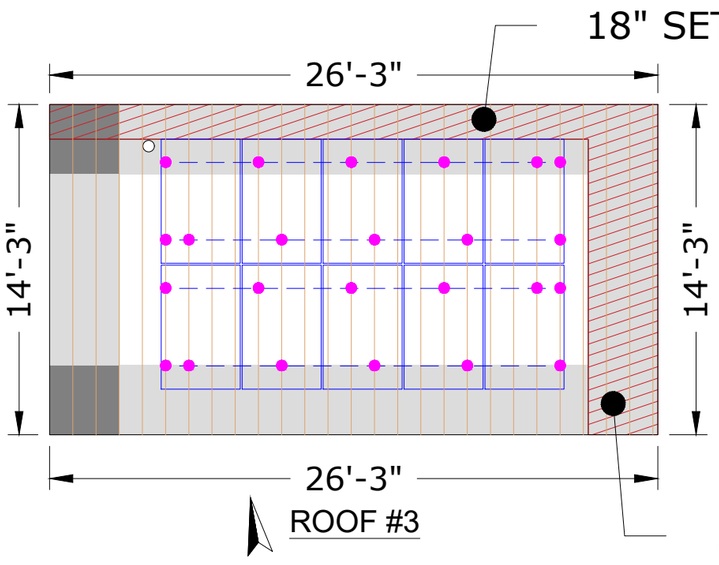
(ROOF #2)
MODULES - 4
ROOF TILT - 32°
ROOF AZIMUTH - 280°
SEAMS SIZE - @12" O.C.

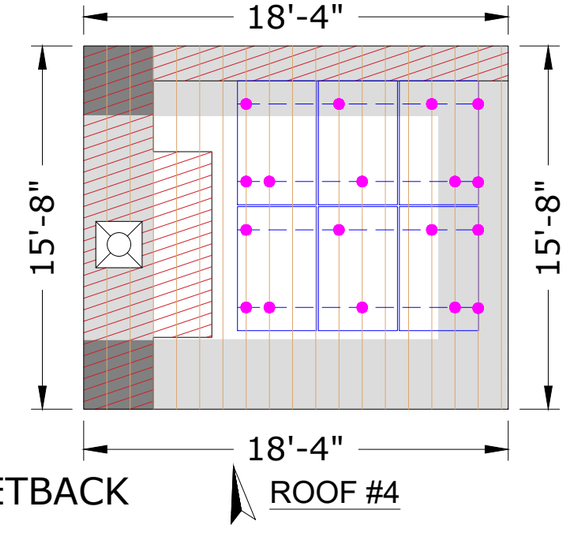
(ROOF #3)
MODULES -10
ROOF TILT - 16°
ROOF AZIMUTH - 191°
SEAMS SIZE - @12" O.C.

(ROOF #4)
MODULES -6
ROOF TILT - 19°
ROOF AZIMUTH - 191°
SEAMS SIZE -@12" O.C.









LEGENDS
- FIRE SETBACK
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- PV ROOF ATTACHMENT
- CLAMPS
- RAFTERS / TRUSSES
- WIND ZONE I
- WIND ZONE II
- WIND ZONE III

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Signature with Seal

COMMONWEALTH OF VIRGINIA
VINCENT MWIRIVANEZA
Lic. No. 0402062279
PROFESSIONAL ENGINEER

Signed: 11/02/2023

JANINE HARRIS
VA 15795

323 S SAINT ASAPH ST,
ALEXANDRIA, VA 22314

PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

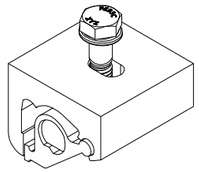
SHEET NAME
ARRAY LAYOUT

SHEET NUMBER
S-01

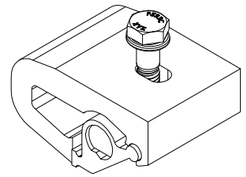
PHOTOVOLTAIC MODULE GENERAL NOTES:

1. APPLICABLE CODE: INTERNATIONAL RESIDENTIAL CODE 2018
   MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES
2. BOLT DIAMETER AND EMBEDMENT LENGTHS ARE DESIGNED PER NDS REQUIREMENTS.
3. ALL WIND DESIGN CRITERIA AND PARAMETERS ARE FOR HIP AND GABLE RESIDENTIAL ROOFS, CONSIDERING FROM A 7° TO A MAXIMUM 45° (2/12 TO A MAXIMUM 9/12 PITCH) ROOF IN SCHEDULE. ALL RESIDENTIAL ROOFS SHALL NOT EXCEED 30'-0" MEAN ROOF HEIGHT.
4. ROOF SEALANTS SHALL CONFORM TO ASTM C920 AND ASTM 6511.
5. THIS SHEET REFLECTS STRUCTURAL CONNECTIONS ONLY. REFER TO MANUFACTURERS' MANUAL FOR ALL ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND SOLAR SPECS.
6. ALL ALUMINUM COMPONENTS SHALL BE ANODIZED ALUMINUM 6105-T5 UNLESS OTHERWISE NOTED.
7. LAG BOLTS SHALL BE ASTM A276 STAINLESS STEEL UNLESS OTHERWISE NOTED.
8. ALL RAILING AND MODULES SHALL BE INSTALLED PER MANUFACTURERS' INSTRUCTIONS.
9. I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE WITH INTERNATIONAL RESIDENTIAL CODE 2018 AND INTERNATIONAL BUILDING CODE 2018. BUILDING STRUCTURE WILL SAFELY ACCOMMODATE CALCULATED WIND LATERAL AND UPLIFT FORCES, AND EQUIPMENT DEAD LOADS.

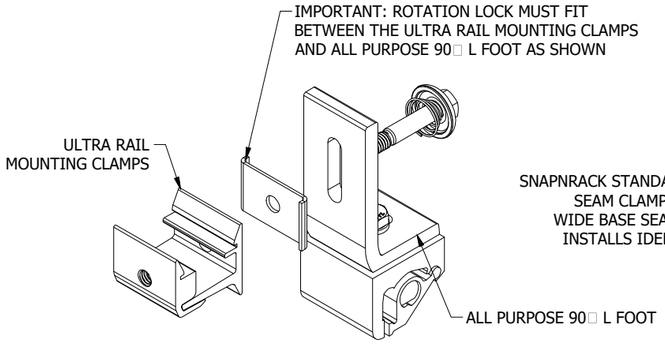
SNAPNRACK RACK OFFERS A STANDARD AND WIDE BASE SEAM CLAMP TO FIT A VARIETY OF SEAM ROOF PROFILES. PLEASE REFER TO SNAPNRACK'S "SEAM CLAMP TESTING - APPROVED PROFILE LIST" FOR EACH SEAM CLAMP'S APPROVED PROFILES



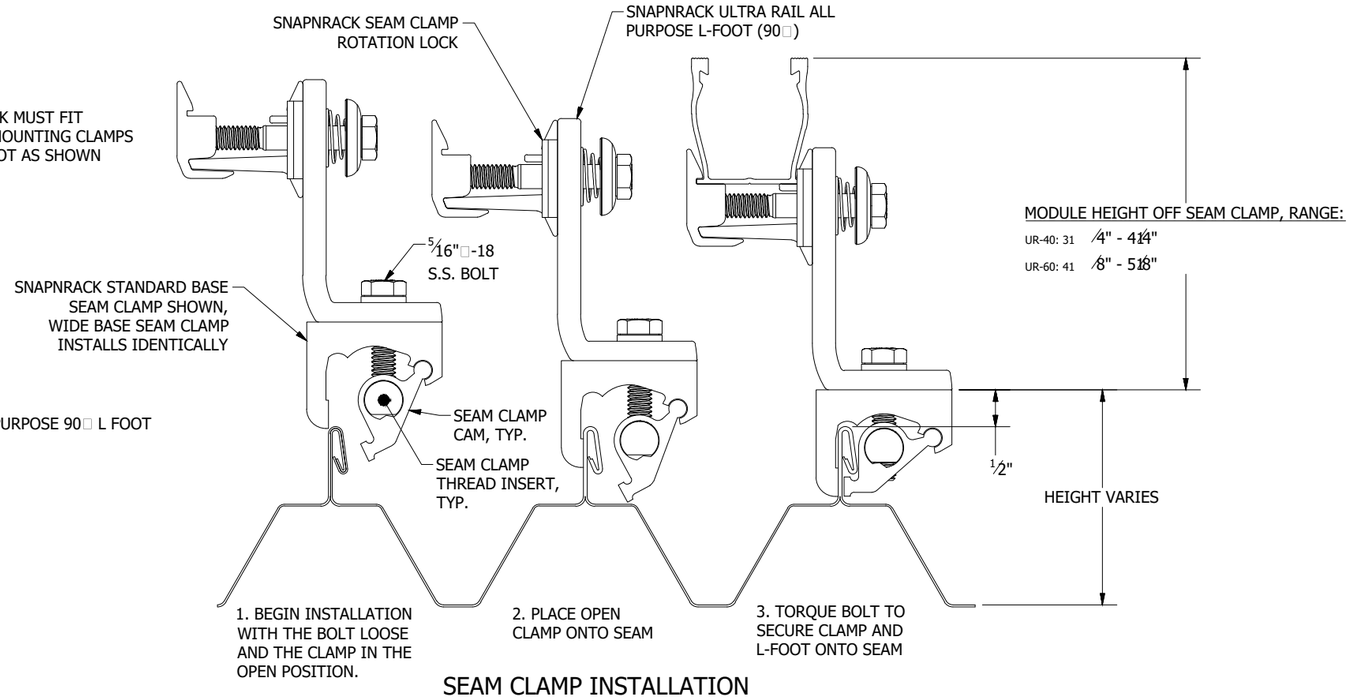
STANDARD BASE SEAM CLAMP



WIDE BASE SEAM CLAMP



ROTATION LOCK ASSEMBLY



SEAM CLAMP INSTALLATION

STRUCTURAL ATTACHMENT DETAILS FOR METAL ROOF

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PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME
STRUCTURAL ATTACHMENT DETAILS

SHEET NUMBER
S-02

MODULE SPECIFICATION	
MANUFACTURER	TRINA SOLAR
MODEL NO	TRINA SOLAR TSM-DE09C.07 (390W) SOLAR MODULES
OPEN CIRCUIT VOLTAGE (Voc)	40.8V
SHORT CIRCUIT CURRENT(Isc)	12.14A
RATED VOLTAGE (Vmpp)	33.8V
RATED CURRENT (Impp)	11.54A

MICRO INVERTER SPECIFICATION	
MANUFACTURER	ENPHASE
MODEL NO.	IQ8PLUS-72-2-US MICROINVERTERS
MAX. OUTPUT POWER	290 W
MAX. AC OUTPUT VOLTAGE	240V
AC OUTPUT CURRENT	1.21 A

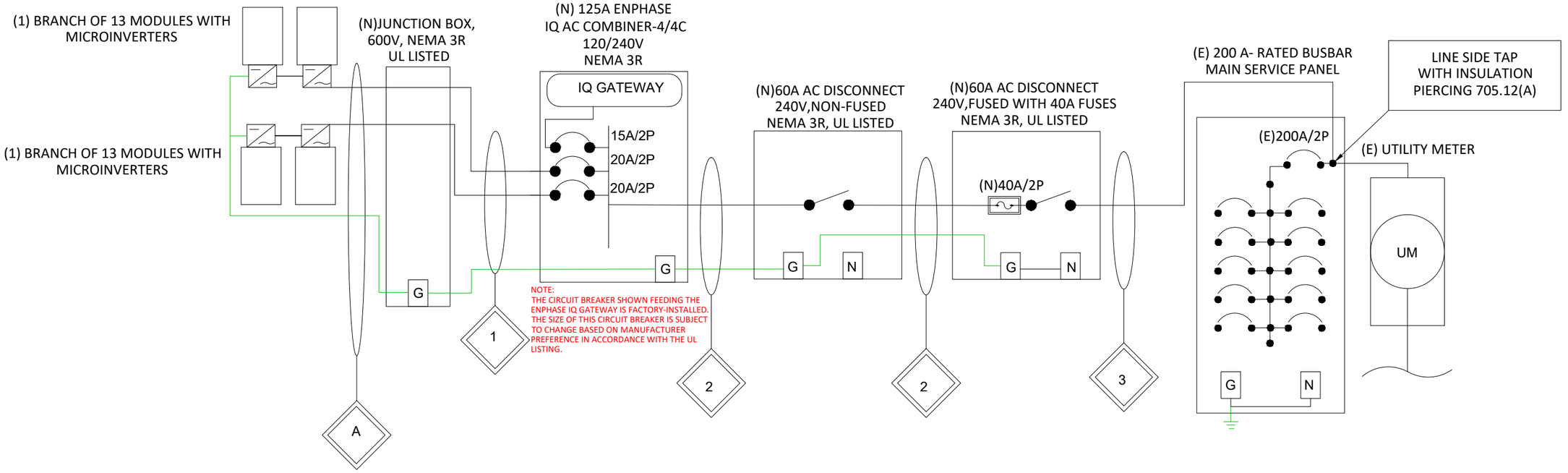
ARRAY DETAILS	
DC SYSTEM SIZE	10.140 KW
AC SYSTEM SIZE	7.540 KW
TOTAL NO. OF MODULES	26
NO. OF MODULE PER STRING	2@13
NO. OF STRING	2

NOTE:
1. SUBJECT PV SYSTEMS HAS BEEN DESIGNED TO MEET THE REQUIREMENTS OF THE NEC 2017, NFPA 70. INCLUDING MAXIMUM NUMBER OF MODULE STRINGS, MAXIMUM NUMBER OF MODULES PER STRING, MAXIMUM OUTPUT, MODULE MANUFACTURER AND MODEL NUMBER, INVERTER MANUFACTURER AND MODEL NUMBER, AS APPLICABLE.
2. PROVIDE TAP BOX IN COMPLIANCE WITH 312.8 IF PANEL GUTTER SPACE IS INADEQUATE.

NOTE: CONDUIT RUN AS PER NEC 2017

CONDUIT SCHEDULE

SR. NO.	DESCRIPTION	CONDUIT SIZE
A	ENPHASE Q-CABLES	N/A FREE AIR
1	(2) #10 AWG THWN-2 CU (L1), (2) #10 AWG THWN-2 CU (L2), (1)#10AWG THWN-2 CU (G)	IN 3/4" EMT CONDUIT
2	(3) #8 AWG THWN-2 CU (L1,L2,N) , (1) #10 AWG THWN-2 CU (G)	IN 3/4" EMT CONDUIT
3	(3) #6 AWG THWN-2 CU (L1,L2,N)	IN 3/4" EMT CONDUIT



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PERMIT DEVELOPER	
DATE	11/01/2023
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REVIEWER	

SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET NUMBER
E-01

ELECTRICAL CALCULATIONS:

1. CURRENT CARRYING CONDUCTOR

(A) BEFORE IQ COMBINER PANEL

AMBIENT TEMPERATURE - = 34°C ...NEC 310.15(B)(3)(c)
TEMPERATURE DERATE FACTOR - 0.96 ...NEC 310.15(B)(2)(a)
GROUPING FACTOR -0.8...NEC 310.15(B)(3)(a)

CONDUCTOR AMPACITY
= (INV O/P CURRENT) x 1.25 / A.T.F / G.F ...NEC 690.8(B)
= [(13x 1.21) x 1.25] / 0.96 / 0.8
= 25.602 A
SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.15(B)(16)

(B) AFTER IQ 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)
= [(26x 1.21) x 1.25] / 0.96 / 1
= 40.963A
SELECTED CONDUCTOR - #8 THWN-2 ...NEC 310.15(B)(16)

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

= TOTAL INVERTER O/P CURRENT x 1.25
= (26 x 1.21) x 1.25 = 39.33 A
SELECTED OCPD = 40 A

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. 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 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 NONCURRENT-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. OPTIMIZERS 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).

GROUNDING NOTES:

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

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PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME
WIRING CALCULATIONS

SHEET NUMBER
E-02

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

LABEL LOCATION:
AC DISCONNECT, POINT OF INTERCONNECTION,
COMBINER PANEL
(PER CODE: NEC 690.13(B) & NEC 706.15 (C)(4))

WARNING PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
CONDUIT RUNWAY
(PER CODE: NEC 690.31(D)(2))

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
MAIN SERVICE DISCONNECT
(NEC 705.12(C) & NEC 690.59)

ADHESIVE FASTENED SIGNS:

·ANSI Z535.4-2011 PRODUCT SAFETY SIGNS AND LABELS, PROVIDES GUIDELINES FOR SUITABLE FONT SIZES, WORDS, COLORS, SYMBOLS, AND LOCATION REQUIREMENTS FOR LABELS. NEC 110.21(B)(1)
·THE LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21(B)(3)
·ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT. IFC 605.11.1.3

PHOTOVOLTAIC SYSTEM AC DISCONNECT
RATED AC OPERATING CURRENT 31.46 AMPS
AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION:
AC DISCONNECT, INVERTER
(PER CODE: NEC 690.54)

WARNING
INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
POINT OF INTERCONNECTION, MAIN SERVICE DISCONNECT
(PER CODE: NEC 705.12 (B)(2)(c))
[Not required if panelboard is rated not less than sum of ampere ratings of all overcurrent devices supplying it]

EMERGENCY CONTACT
(888) 497-3233

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

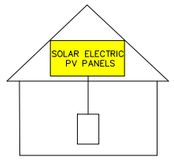
LABEL LOCATION:
AC DISCONNECT, DC DISCONNECT, POINT OF INTERCONNECTION
(PER CODE: NEC 690.56(C)(3))

⚠ WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE

⚠ WARNING
DEDICATED SOLAR PANELS DO
NOT CONNECT ANY OTHER LOADS

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUTDOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN ARRAY



IFC 605.11.3.1(1) & 690.56(C)(1)(a) Label for PV Systems that Shut down the array and the conductors leaving the array

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PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME
SYSTEM LABELLING

SHEET NUMBER
E-03

Mono Multi Solutions

Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

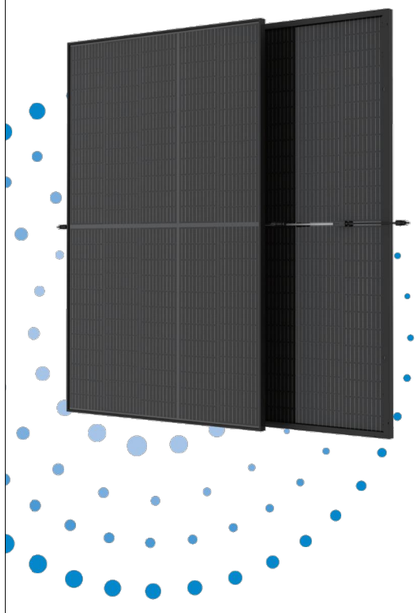
PRODUCT: TSM-DE09C.07

PRODUCT RANGE: 380-405W

405W MAXIMUM POWER OUTPUT

0~+5W POSITIVE POWER TOLERANCE

21.1% MAXIMUM EFFICIENCY



High value

- More productivity from same roof size.
- Outstanding visual appearance.
- Leading 210mm cell technology.

Small in size, big on power

- Small format module allow greater energy generation in limited space.
- Up to 405W, 21.1% module efficiency with high density interconnect technology.
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current.
- Reduce installation cost with higher power bin and efficiency.
- Boost performance in warm weather with lower temperature coefficient (-0.34%) and operating temperature.

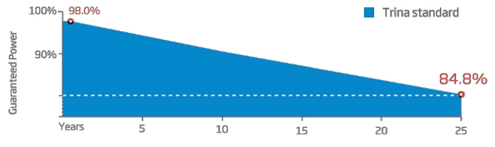
Universal solution for residential and C&I rooftops

- Designed for compatibility with existing mainstream optimizers, inverters and mounting systems.
- Perfect size and low weight makes handling and transportation easier and more cost-effective.
- Diverse installation solutions for flexibility in system deployment

High Reliability

- 25 year product warranty.
- 25 year performance warranty with lowest degradation.
- Minimized micro-cracks with innovative non-destructive cutting technology.
- Ensured PID resistance through cell process and module material control.
- Mechanical performance up to +6000 Pa and-4000 Pa negative load

Trina Solar's Backsheet Performance Warranty



Comprehensive Products and System Certificates

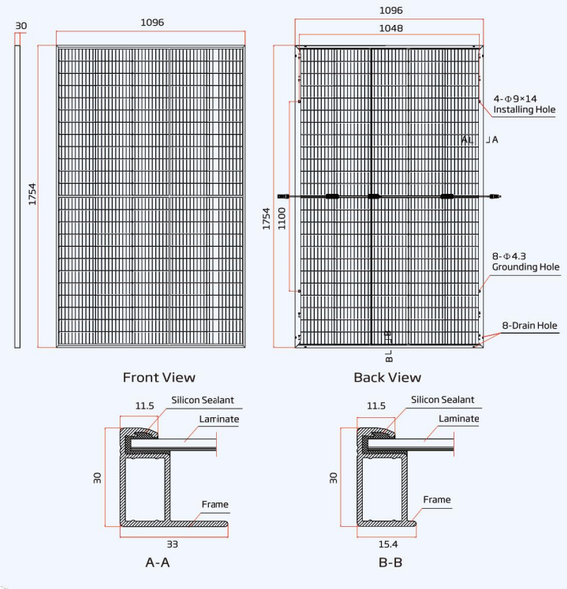
IEC61215/IEC61730/IEC61701/IEC62716/UL61730
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
ISO45001: Occupational Health and Safety Management System

Trinasolar

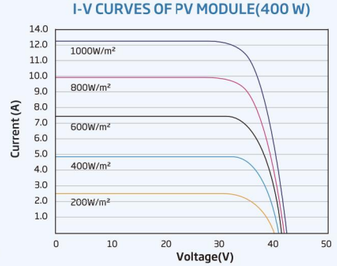
Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

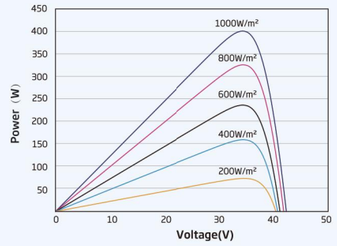
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(400 W)



P-V CURVES OF PV MODULE(400W)



ELECTRICAL DATA (STC)

Peak Power Watts-PMAX (Wp)*	380	385	390	395	400	405
Power Tolerance-PMAX (W)	0~+5					
Maximum Power Voltage-VMPP (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current-IMPP (A)	11.38	11.46	11.54	11.62	11.70	11.77
Open Circuit Voltage-VOC (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current-ISC (A)	12.00	12.07	12.14	12.21	12.28	12.34
Module Efficiency η m (%)	19.8	20.0	20.3	20.5	20.8	21.1

STC: Irradiance 1000W/m2, Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power -PMAX (Wp)	407	412	417	423	428	433
Maximum Power Voltage-VMPP (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current-IMPP (A)	12.19	12.26	12.34	12.44	12.51	12.59
Open Circuit Voltage-VOC (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current-ISC (A)	12.92	13.00	13.08	13.20	13.25	13.36
Irradiance ratio (rear/front)	10%					

Power Bifaciality:70±5%.

ELECTRICAL DATA (NOCT)

Maximum Power-PMAX (Wp)	286	290	294	298	302	305
Maximum Power Voltage-VMPP (V)	31.4	31.6	31.8	31.9	32.1	32.4
Maximum Power Current-IMPP (A)	9.12	9.18	9.24	9.32	9.38	9.42
Open Circuit Voltage-VOC (V)	38.0	38.2	38.4	38.6	38.8	38.9
Short Circuit Current-ISC (A)	9.67	9.73	9.78	9.84	9.90	9.94

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	120 cells
Module Dimensions	1754×1096×30 mm (69.06×43.15×1.18 inches)
Weight	21.0 kg (46.3 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Backsheet	Transparent backsheet
Frame	30mm(1.18 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), Portrait: 350/280 mm(13.78/11.02 inches) Landscape: N 1100 mm/P 1100 mm (43.31/43.31 inches)
Connector	MC4 EVO2 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT(Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of PMAX	- 0.34%/°C
Temperature Coefficient of VOC	- 0.25%/°C
Temperature Coefficient of ISC	0.04%/°C

MAXIMUMRATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
	1500V DC (UL)
Max Series Fuse Rating	25A

WARRANTY

25 year Product Workmanship Warranty
25 year Power Warranty
2% first year degradation
0.55% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGUREATION

Modules per box: 36 pieces
Modules per 40' container: 828 pieces

Trinasolar

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

Version number: TSM_NA_2022_A

www.trinasolar.com

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PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME

MODULE DATASHEET

SHEET NUMBER

DS-01

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. category / 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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JANINE HARRIS
VA 15795

323 S SAINT ASAPH ST,
ALEXANDRIA, VA 22314

PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME

MICROINVERTER DATASHEET

SHEET NUMBER

DS-02

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**

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ALEXANDRIA, VA 22314

PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

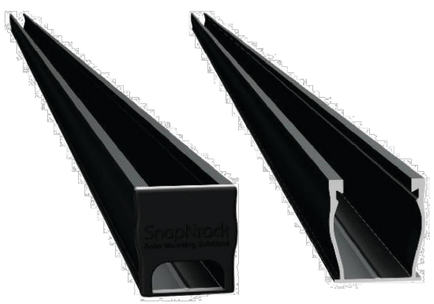
SHEET NAME
COMBINER DATASHEET

SHEET NUMBER
DS-03

SnapNrack™
Solar Mounting Solutions

UR-40
UR-60

Ultra Rail



The Ultimate Value in Rooftop Solar

- Industry leading Wire Management Solutions
- Mounts available for all roof types
- Single Tool Installation
- All SnapNrack Module Clamps & Accessories are compatible with both rail profiles

Start Installing Ultra Rail Today

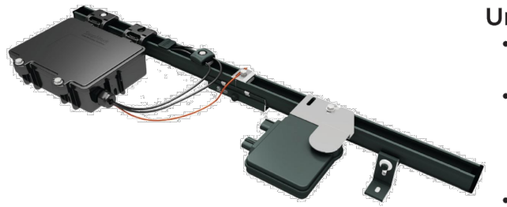
RESOURCES	snapnrack.com/resources
DESIGN	snapnrack.com/configurator
WHERE TO BUY	snapnrack.com/where-to-buy

SnapNrack Ultra Rail System

A sleek, straightforward rail solution for mounting solar modules on all roof types. Ultra Rail features two rail profiles; UR-40 is a lightweight rail profile that is suitable for most geographic regions and maintains all the great features of SnapNrack rail, while UR-60 is a heavier duty rail profile that provides a larger rail channel and increased span capabilities. Both are compatible with all existing mounts, module clamps, and accessories for ease of install.

The Entire System is a Snap to Install

- New Ultra Rail Mounts include snap-in brackets for attaching rail
- Compatible with all the SnapNrack Mid Clamps and End Clamps customers love
- Universal End Clamps and snap-in End Caps provide a clean look to the array edge



Unparalleled Wire Management

- Open rail channel provides room for running wires resulting in a long-lasting quality install
- Industry best wire management offering includes Junction Boxes, Universal Wire Clamps, MLPE Attachment Kits, and Conduit Clamps
- System is fully bonded and listed to UL 2703 Standard

Heavy Duty UR-60 Rail

- UR-60 rail profile provides increased span capabilities for high wind speeds and snow loads
- Taller, stronger rail profile includes profile-specific rail splice and end cap
- All existing mounts, module clamps, and accessories are retained for the same great install experience

Quality. Innovative. Superior.

SnapNrack Solar Mounting Solutions are engineered to optimize material use and labor resources and improve overall installation quality and safety.

877-732-2860 **www.snapnrack.com** **contact@snapnrack.com**

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ALEXANDRIA, VA 22314

PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME
RACKING DATASHEET

SHEET NUMBER
DS-04

THE ULTRA RAIL CAMMING SEAM CLAMP IS A NON ROOF PENETRATING ATTACHMENT FOR SEAM ROOFS

REFER TO SNAPNRACK ENGINEERING CHARTS FOR APPLICABLE RAIL SPANS. "BIN" NUMBER ON CHART SHOULD MATCH "BIN" NUMBER ON THIS DRAWING

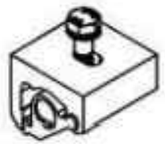
CAMMING SEAM CLAMPS ARE SPECIFIED WITH A BLACK OXIDE S.S. BOLT, IT IS IMPORTANT TO USE THE PROVIDED BOLT

REFER TO SNAPNRACK INSTALLATION MANUAL FOR 5/16"Ø HARDWARE TORQUE SPECIFICATIONS

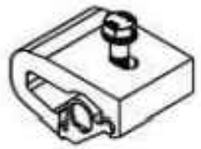
RAIL CAN BE MOUNTED ON EITHER SIDE OF THE L-FOOT

FOR LEVELING DETAILS, REFER TO SNAPNRACK DETAIL DRAWING "SNR-DC-00332 ULTRA RAIL, COMPONENT DETAIL, LEVELING EXTENSION KIT"

SNAPNRACK RACK OFFERS A STANDARD AND WIDE BASE SEAM CLAMP TO FIT A VARIETY OF SEAM ROOF PROFILES. PLEASE REFER TO SNAPNRACK'S "SEAM CLAMP TESTING - APPROVED PROFILE LIST" FOR EACH SEAM CLAMP'S APPROVED PROFILES



STANDARD BASE SEAM CLAMP

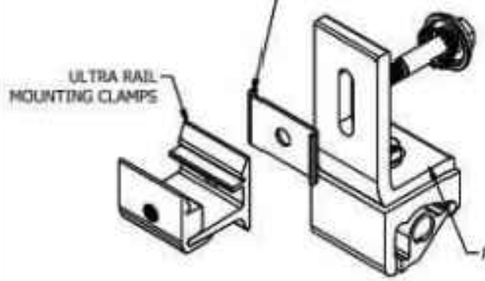


WIDE BASE SEAM CLAMP

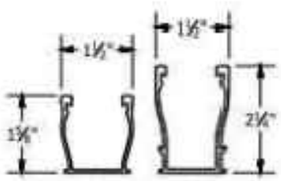
BIN: 1

REVISION:

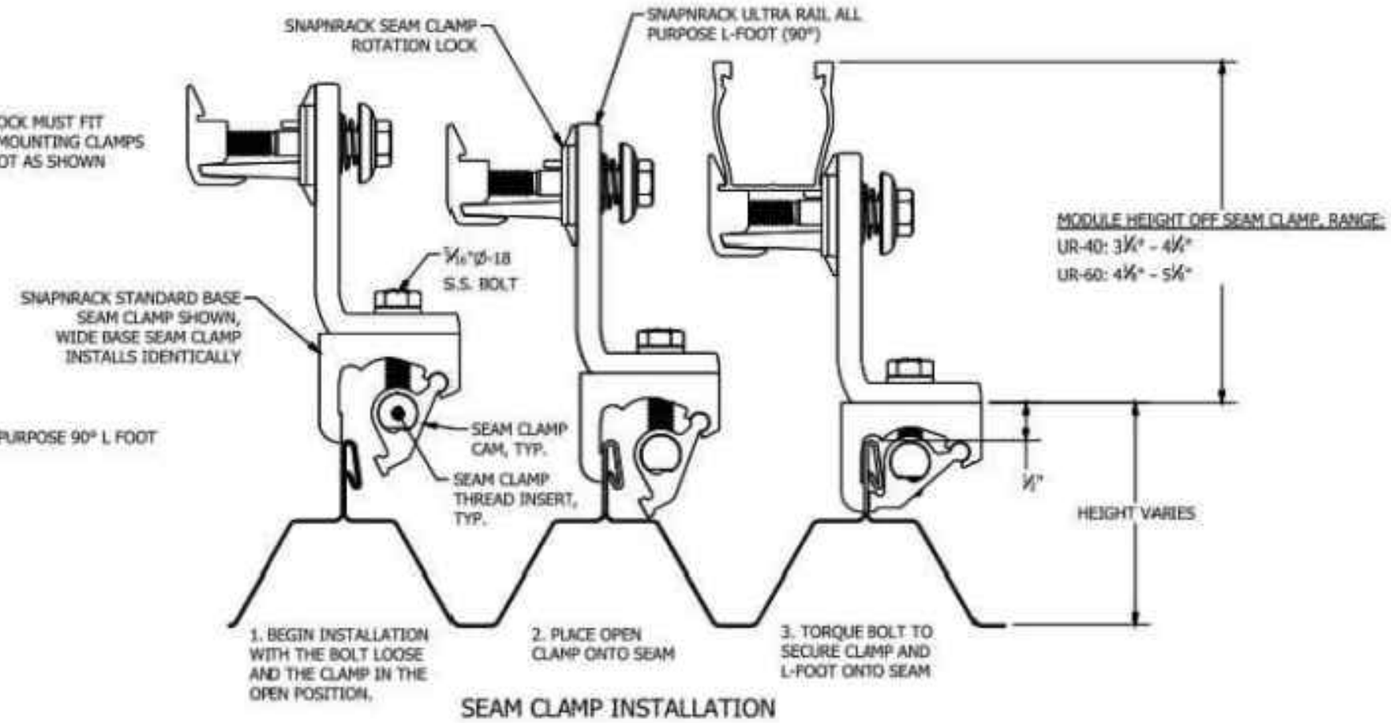
#	5/7/2019	NEW DETAIL	MSA



ROTATION LOCK ASSEMBLY



UR-40 RAIL | UR-60 RAIL
FOR USE WITH SNAPNRACK ULTRA SERIES RAILS



SEAM CLAMP INSTALLATION

SnapNrack Solar Mounting Solutions	Sunrun South LLC	DESIGNER: G.MCHPEETERS DRAFTER: M.AFFENTRANGER APPROVED BY: B.PETERSON	SCALE: DNS DATE: 5/7/2019	DRAWING NUMBER: SNR-DC-00342	DESCRIPTION: ULTRA RAIL, ATTACHMENT DETAIL, SEAM CLAMP	REV: 1

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Signature with Seal

JANINE HARRIS
VA 15795

323 S SAINT ASAPH ST,
ALEXANDRIA, VA 22314

PERMIT DEVELOPER	
DATE	11/01/2023
DESIGNER	OLK
REVIEWER	

SHEET NAME
ATTACHMENT DATASHEET

SHEET NUMBER
DS-05

11/2/2023

RE: Structural Certification for Installation of Residential Solar
JANINE HARRIS VA 15795:323 S SAINT ASAPH ST, ALEXANDRIA, VA 22314

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 Metal roofing over roof plywood supported by 2X4 Trusses at 24 inches. The slope of the roof was approximated to be 16, 19, 32 and 35 degrees.

After review of the field observation data 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 Virginia Residential Code				
Risk category		II	Wind Load	(component and Cladding)	
Roof Dead Load	Dr	10 psf		V	115 mph
PV Dead Load	DPV	3 psf		Exposure	B
Roof Live Load	Lr	20 psf			
Ground Snow	S	30 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

Signed: 11/02/2023

Structural Letter for PV Installation

Date:	11/2/2023
Job Address:	**323 S SAINT ASAPH ST**
	ALEXANDRIA, VA 22314
Job Name:	**JANINE HARRIS VA 15795**
Job Number:	**231102JH**

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 Virginia Residential Code		
Risk category		II	
Roof Dead Load	Dr	10	psf
PV Dead Load	DPV	3	psf
Roof Live Load	Lr	20	psf
Ground Snow	S	30	psf
Wind Load	(component and Cladding)		
	V	115	mph
	Exposure	B	

References

NDS for Wood Construction

Sincerely,

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

Signed: 11/02/2023

Wind Load Cont.

Risk Category =	II		
V=	**115**	**mph**	**ASCE 7-16 Figure 26.5-1B**
Exposure =	**B**		
K_{Zt} =	1.0		ASCE 7-16 Sec 26.8.2
K_Z =	0.57		ASCE 7-16 Table 26.10-1
K_d =	0.85		ASCE 7-16 Table 26.6-1
K_e =	1.00		ASCE 7-16 Table 26.9-1
$q_h = 0.00256K_zK_{zt}K_dK_eV^2$=	16.38	psf	
Pitch =	16.0	Degrees	
γ_E=	1.5		
γ_a=	0.8		

	Uplift (W)	**Zone(1)**	**Zone(2r)**	**Zone(2e)**	**Zone(3)**
Fig. 30-3-2	GC_p=	-2.1	-2.6	-2.7	-2.7
Eq. 29.4-7	$P=q_h(GC_p)(\gamma_E)(\gamma_a)$=	-41.27	-51.10	-53.07	-53.07

GC_p=	0.3	Figure 30.3-2
$P=q_h(GC_p)(\gamma_E)(\gamma_a)$=	3.02	Equation 29.4-7

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

Connection Check

Attachement max. spacing=	4	ft	
S-5 Ultimate Withdrawal Value)=	900	lbs	Manufacturer Test

Allowable Capacity= 300 lbs

Zone	**Trib Width**	**Area (ft)**	**Uplift (lbs)**	**Down (lbs)**	
Zone(1)	4	11.0	149.7	66.2	
Zone(2r)	4	11.0	183.0	66.2	
Zone(2e)	4	11.0	189.6	66.2	
Zone(3)	4	11.0	189.6	66.2	
	Conservative Max=		189.6	<	300
			CONNECTION IS OK		

1. Pv seismic dead weight is negligible to result in significant seismic uplift, therefore the wind uplift governs

Vertical Load Resisting System Design

Roof Framing **Trusses**

Snow Load Fully Exposed

	pg=	30	psf	C_t =	1.1			
	C_e =	0.9		I_s =	1.0	**p_s =**	**19**	psf
	p_f =	21	psf	**$p_{fmin.}$ =**	**20.8**	psf	37.42	plf
	Max Length, L =		**7.0**	ft				
	Tributary Width, W_T =		**24**	in				
	RLL =		**20**	psf	38.45	plf		
	Dr =		**10**	psf	20	plf		
	PvDL =		3	psf	6	plf		
Load Case: DL	w=		26	plf				
	M=		98	lb-ft				
	Mallowable = Sx x Fb'=		347	lb-ft	>	98	lb-ft	**OK**
Load Case: DL+RLL	DL+Lr=		58	plf				
	M_{down}=		220	lb-ft				
	Mallowable = Sx x Fb'=		482	lb-ft	>	220	lb-ft	**OK**
Load Case: DL+S	DL+S=		63	plf				
	M_{down}=		239	lb-ft				
	Mallowable = Sx x Fb'=		443	lb-ft	>	239	lb-ft	**OK**
Load Case: DL+0.6W	w=		29.6	plf				
	M_u=		112	lb-ft				
	Mallowable = Sx x Fb' (wind)=		616	lb-ft	>	112	lb-ft	**OK**
Load Case: 0.6DL+0.6W	w=		22.2	plf				
	M_u=		83	lb-ft				
	Mallowable = Sx x Fb' (wind)=		616	lb-ft	>	83	lb-ft	**OK**
DL+0.45W+0.75(RLL or S)			59	plf				
	M_{down}=		222	lb-ft				
	Mallowable = Sx x Fb'=		616	lb-ft	>	222	lb-ft	**OK**

Member Capacity

SPF #1/#2

2X4	Design Value	C_L	C_F	C_i	C_r				Adjusted Value
F_b =	875 psi	1.0	1.5	1.0	1.15				1509 psi
F_v =	135 psi	N/A	N/A	1.0	N/A				135 psi
E =	1400000 psi	N/A	N/A	1.0	N/A				1400000 psi

Depth, d =	3.5	in			
Width, b =	1.5	in			
Cross-Sectonal Area, A =	5.25	in^2			
Moment of Inertia, I_{xx} =	5.35938	in^4			
Section Modulus, S_{xx} =	3.0625	in^3			
Allowable Moment, $M_{all} = F_b'S_{xx}$ =	385.2	lb-ft	DCR=M_u/M_{all} =	0.54 < 1	**Satisfactory**
Allowable Shear, $V_{all} = 2/3F_v'A$ =	472.5	lb	DCR=V_u/V_{all} =	0.17 < 1	**Satisfactory**

Siesmic Loads Check

Roof Dead Load	10	psf
% or Roof with Pv	35.4%	
Dpv and Racking	3	psf
Average Total Dead Load	11.1	psf
Increase in Dead Load	4.8%	**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 - JANINE HARRIS VA 15795. 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.