

MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION
STAFF REPORT

Address:	7334 Carroll Avenue, Takoma Park	Meeting Date:	6/14/2023
Resource:	Contributing Resource Takoma Park Historic District	Report Date:	6/7/2023
Applicant:	Rick Leonard (Margo Ricks/Solar Solutions – Agent)	Public Notice:	5/31/2023
Review:	HAWP	Tax Credit:	N/A
		Staff:	John Liebertz

Permit Number: 1029725

PROPOSAL: Installation of solar panels.

STAFF RECOMMENDATION

Staff recommends that the Historic Preservation Commission (HPC) **approve with three (3) conditions** the HAWP application with final approval of all details delegated to staff:

1. The applicant shall submit an amended roof plan that show the location of the existing chimney stack and roof-top HVAC equipment.
2. The applicant shall submit an amended drawing that confirms the location of proposed hardware on the south elevation (side) of the building near the existing utility meter.
3. The applicant shall submit all specification sheets for the combiner box and AC disconnect.

ARCHITECTURAL DESCRIPTION

SIGNIFICANCE: Contributing Resource within the Takoma Park Historic District
STYLE: Art Deco-influenced Commercial
DATE: 1930s-1940s

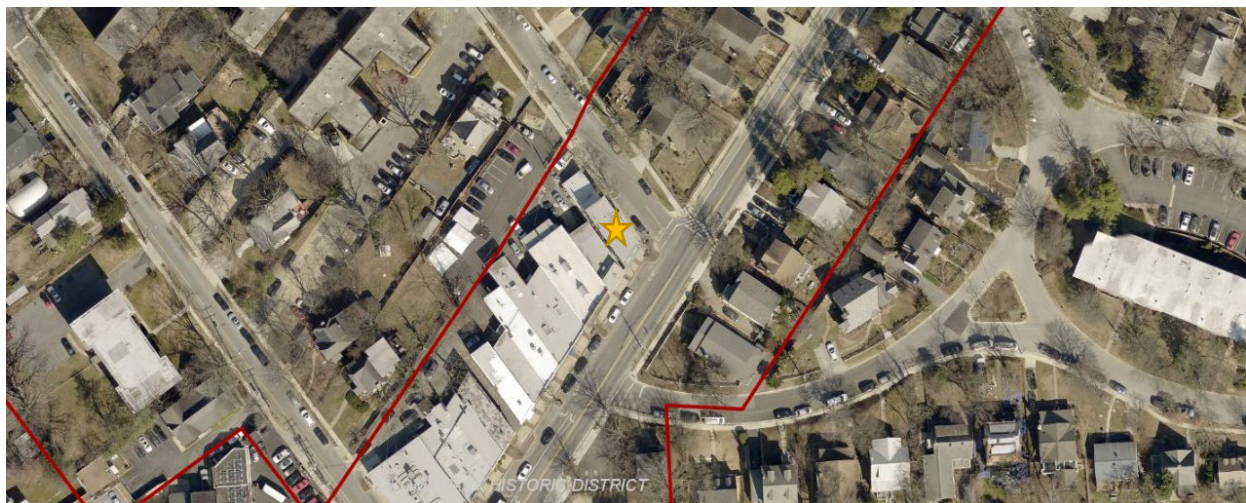


Figure 1: The subject property at 7334 Carroll Avenue (noted with the yellow star) is located at the southwest corner of the intersection of Carroll and Lee Avenues. The red outline is the boundary of the Takoma Park Master Plan Historic District.

PROPOSAL

The applicant proposes to install eighteen (18) solar panels on the flat/shed roof of the two-story, brick-clad commercial building. The solar panels are mounted to eight (8) extruded aluminum beams that would be attached to the masonry parapets via steel bent plates. All electrical equipment including the combiner box and AC disconnect would be located on the southwest corner of the building adjacent to the existing utility meter (in the alley separating the subject building from the adjacent commercial building at 7330 Carroll Avenue).

APPLICABLE GUIDELINES

The Historic Preservation Office and Historic Preservation Commission (HPC) consult several documents when reviewing alterations and new construction within the Takoma Park Historic District. These documents include the historic preservation review guidelines in the approved and adopted amendment for the *Takoma Park Historic District (Guidelines)*, *Montgomery County Code Chapter 24A (Chapter 24A)*, and the *Secretary of the Interior's Standards for Rehabilitation (Standards)*, and the HPC's *Policy No. 20-01 ADDRESSING EMERGENCY CLIMATE MOBILIZATION THROUGH THE INSTALLATION OF ROOF-MOUNTED SOLAR PANELS*. The pertinent information in these four documents is outlined below.

Takoma Park Historic District Guidelines

There are two broad planning and design concepts which apply to all categories. These are:

- The design review emphasis will be restricted to changes that are all visible from the public right-of-way, irrespective of landscaping or vegetation (it is expected that the majority of new additions will be reviewed for their impact on the overall district), and
- The importance of assuring that additions and other changes to existing structures act to reinforce and continue existing streetscape, landscape, and building patterns rather than to impair the character of the historic district.

A majority of the buildings in the Takoma Park Historic District have been assessed as being "Contributing Resources." While these buildings may not have the same level of architectural or historical significance as Outstanding Resources or may have lost some degree of integrity, collectively, they are the basic building blocks of the Takoma Park district. They are important to the overall character of the district and the streetscape due to their size, scale, and architectural qualities, rather than for their particular architectural features.

Contributing Resources should receive a more lenient level of design review than those structures that have been classified as Outstanding. This design review should emphasize the importance of the resource to the overall streetscape and its compatibility with existing patterns rather than focusing on a close scrutiny of architectural detailing. In general, however, changes to Contributing Resources should respect the predominant architectural style of the resource.

The following guidance which pertains to this project are as follows:

- All exterior alterations, including those to architectural features and details, should be generally consistent with the predominant architectural style and period of the resource and should preserve the predominant architectural features of the resource; exact replication of existing details and features is, however, not required.

- Minor alterations to areas that do not directly front on a public right-of-way such as vents, metal stovepipes, air conditioners, fences, skylights, etc. – should be allowed as a matter of course; alterations to areas that do not directly front on a public way-of-way which involve the replacement of or damaged to original ornamental or architectural features are discouraged, but may be considered and approved on a case-by-case basis.
- Alterations to features that are not visible from the public right-of-way should be allowed as a matter of course.
- All changes and additions should respect existing environmental settings, landscaping, and patterns of open space.

Montgomery County Code, Chapter 24A-8

The following guidance which pertains to this project are as follows:

- (b) The commission shall instruct the director to issue a permit, or issue a permit subject to such conditions as are found to be necessary to ensure conformity with the purposes and requirements of this chapter, if it finds that:
 - (1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or
 - (2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter;

Secretary of the Interior’s Standards for Rehabilitation

The Secretary of the Interior defines rehabilitation as “the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features, which convey its historical, cultural, or architectural values.” The applicable *Standards* are as follows:

- 2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
- 9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
- 10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Historic Preservation Commission Policy No. 20-01: Addressing Emergency Climate Mobilization Through The Installation of Roof-Mounted Solar Panels

Now, THEREFORE:

WHEREAS, Historic Area Work Permit decisions are guided by the criteria in Section 24A, The Secretary of the Interior’s Standards for Rehabilitation, and pertinent guidance from applicable master plan amendments and/or site or district-specific studies;

WHEREAS, The Secretary of the Interior’s Standards for Rehabilitation as interpreted by the National Park Service limit the placement of rooftop solar panels under Standards 2, 9, and 10 to less conspicuous locations;

WHEREAS, the County Council has established a Climate Emergency;

WHEREAS, the Historic Preservation is a body established by the County Executive and County Council;

WHEREAS, Section 24-8(b)(6) states, “In balancing the interest of the public in preserving the historic site or historic resource located within an historic district, with the interests of the public from the use and benefit of the alternative proposal, the general public welfare is better served by granting the permit;”

WHEREAS, the widespread use of solar panels, both for hot water and for electricity production, will reduce greenhouse gases in the county, in accordance with the aims of the Emergency Climate Mobilization resolution (Resolution No.: 18-974), it shall be the policy of the Historic Preservation Commission that:

1. The preferred locations for solar panel installation(s) on a designated historic site or an historic resource located within an historic district is a) on the rear of the property, b) on non-historic building additions, c) on accessory structures, or d) in ground-mounted arrays;
2. If it is not feasible to install solar panels in one of the identified preferred locations due to resource orientation or other site limitations; and,
3. The roof is determined to be neither architecturally significant, nor a character-defining feature of the resource, nor is it a slate or tile roof, that unless it can be demonstrated that the solar array will be installed without damaging the historic character of the resource or historic fabric; then
4. The public welfare is better served by approving a Historic Area Work Permit for solar panels on all visible side or front roof slopes under Section 24A-8(b)(6).
5. A Historic Area Work Permit (HAWP) is required for all work referenced in this policy.

STAFF DISCUSSION

The subject property is a Contributing Resource to the Takoma Park Historic District and features a two-story, Art Deco-influenced commercial building constructed in the 1930s or 1940s. There are no relevant Historic Area Work Permits (HAWP) associated with this property.



Figure 2: View of the façade (left) and rear (right) of the subject property at 7334 Carroll Avenue, Takoma Avenue, 2023.

Source: Montgomery Planning.



Figure 3: Aerial view, 2022.

Source: ConnectExplorer.

Staff finds that the proposed placement of the solar arrays meet the applicable guidelines and recommends approval with several conditions. The HPC and staff utilize *Policy Guidance #20-01: Solar Technology (2021)* as the baseline for their review and to articulate their findings in the review of solar technology. While the array is located on the historic commercial building, the proposal takes advantage

of the flat/shed roof and parapet walls to obscure visibility of the panels from the public rights-of-way. The array would be setback 4' from the northeast corner of the façade and rear elevation. Steel bent plates attach to the parapets and support eight (8) extruded aluminum beams that the panels would be mounted on. As a result, the panels would be only 7.2" above the parapet and would not be visible from the public rights-of-way based on the provided viewshed analysis (Figure 4). These panels would have no adverse effects to the historic resource or the character of the commercial streetscape.¹ The present or future property owners could remove the structural supports and panels in the future with no impact to the historic resource. The applicant, however, should amend the drawings to include the location of the existing chimney stack and HVAC equipment to ensure no conflicts (Figure 3).

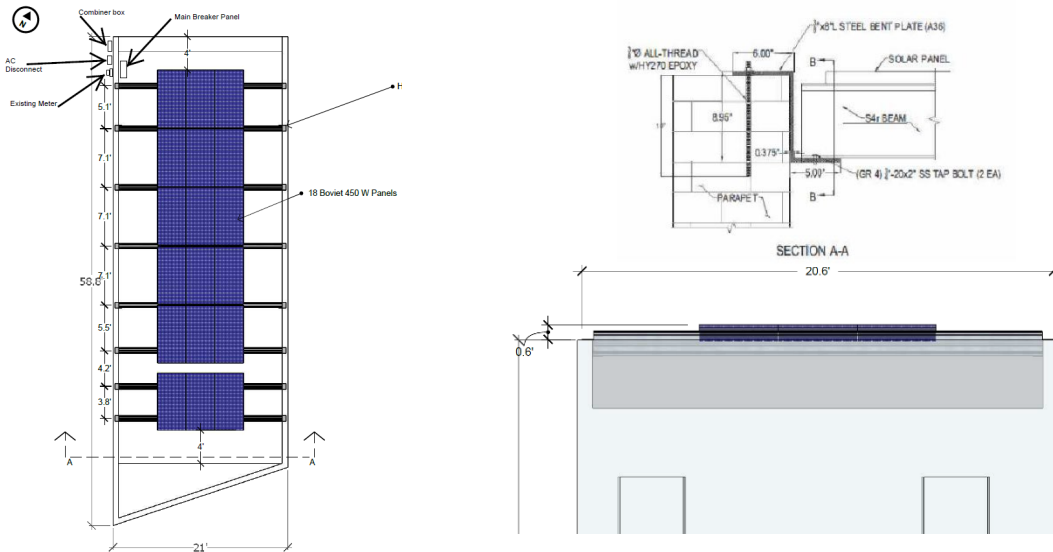


Figure 4: Solar layout (left), section showing attachment of panels to parapet (top right), and elevation (lower right) showing the height of the panels above the roof line. Source: ConnectExplorer.

Staff recommends approval for the placement of the exterior hardware and conduits associated with the solar array with conditions. *Policy Guidance #20-01: Solar Technology (2021)* states that all conduits for connections to electrical meters should be placed on the inside of the building or on a secondary elevation. The proposal has a discrepancy between Sheet A.01 and PV.01 which shows the combiner box on the rear and side elevations, respectively (Figure 5). Sheet A.01 should be amended to show the combiner box and AC disconnect on the side (south) elevation as depicted in Sheet PV.01. Specification sheets for the combiner box and AC disconnect should be included as well. Also, the applicants should submit additional details (an elevation or annotated photograph) regarding the treatment of the conduit wire with respect to the parapet. The wire should pierce the wall and not be placed over the parapet.

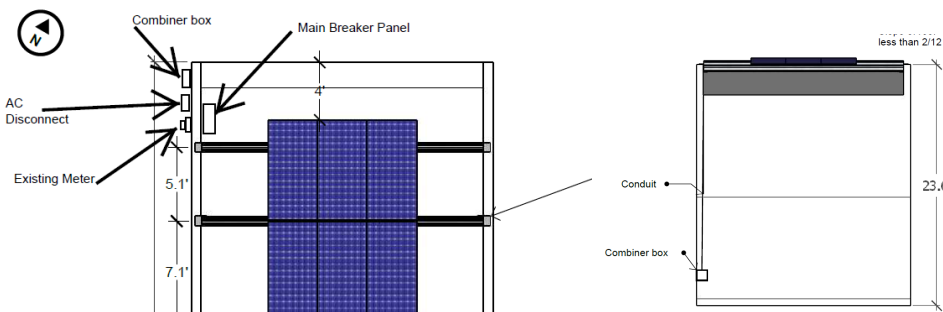


Figure 5: Detail from Sheet PV.01 (left) and A.01 (right). Staff requests clarification regarding the placement of the combiner box and conduit. Source: Applicant.

¹ Staff did not include an analysis of nearby Outstanding Resources as the proposed panels lack of visibility makes the assessment unnecessary.

After full and fair consideration of the applicant's submission, staff finds the proposal, as modified by the condition, consistent with the Criteria for Issuance in Chapter 24A-8(b), (1), (2), and (d), having found the proposal is consistent with the *Secretary of the Interior's Standards for Rehabilitation* #2, #9, and #10, and *Takoma Park Historic District Guidelines*, and the HPC's Policy No. 20-01 as outlined above.

STAFF RECOMMENDATION

Staff recommends that the Commission **approve with three (3) conditions** the HAWP application with final approval delegated to staff:

1. The applicant shall submit an amended roof plan that show the location of the existing chimney stack and roof-top HVAC equipment.
2. The applicant shall submit an amended drawing that confirms the location of proposed hardware on the south elevation (side) of the building near the existing utility meter.
3. The applicant shall submit all specification sheets for the combiner box and AC disconnect.

under the Criteria for Issuance in Chapter 24A-8(b), (1), (2), and (d), having found that the proposal, as modified by the condition, is consistent with the *Takoma Park Historic District Guidelines*, and therefore will not substantially alter the exterior features of the historic resource and is compatible in character with the district and the purposes of Chapter 24A;

and in conformance with HPC *Policy No.20-01*;

and with the *Secretary of the Interior's Standards for Rehabilitation* #2, #9, and #10.

and with the general condition that the applicant shall present an electronic set of drawings, if applicable, to Historic Preservation Commission (HPC) staff for review and stamping prior to submission for the Montgomery County Department of Permitting Services (DPS) building permits;

and with the general condition that final project design details, not specifically delineated by the Commission, shall be approved by HPC staff or brought back to the Commission as a revised HAWP application at staff's discretion;

and with the general condition that the applicant shall notify the Historic Preservation Staff if they propose to make any alterations to the approved plans. Once the work is completed the applicant will contact the staff person assigned to this application at 301-563-3400 or john.liebertz@montgomeryplanning.org to schedule a follow-up site visit.



APPLICATION FOR HISTORIC AREA WORK PERMIT
HISTORIC PRESERVATION COMMISSION
301.563.3400

FOR STAFF ONLY:
HAWP#
DATE ASSIGNED

APPLICANT:

Name:
Address:
Daytime Phone:
E-mail:
City:
Zip:
Tax Account No.:

AGENT/CONTACT (if applicable):

Name:
Address:
Daytime Phone:
E-mail:
City:
Zip:
Contractor Registration No.:

LOCATION OF BUILDING/PREMISE: MIHP # of Historic Property

Is the Property Located within an Historic District? Yes/District Name
No/Individual Site Name

Is there an Historic Preservation/Land Trust/Environmental Easement on the Property? If YES, include a map of the easement, and documentation from the Easement Holder supporting this application.

Are other Planning and/or Hearing Examiner Approvals /Reviews Required as part of this Application? (Conditional Use, Variance, Record Plat, etc.?) If YES, include information on these reviews as supplemental information.

Building Number: Street:

Town/City: Nearest Cross Street:

Lot: Block: Subdivision: Parcel:

TYPE OF WORK PROPOSED: See the checklist on Page 4 to verify that all supporting items for proposed work are submitted with this application. Incomplete Applications will not be accepted for review. Check all that apply:

- Checklist of work types: New Construction, Addition, Demolition, Grading/Excavation, Deck/Porch, Fence, Hardscape/Landscape, Roof, Shed/Garage/Accessory Structure, Solar, Tree removal/planting, Window/Door, Other.

I hereby certify that I have the authority to make the foregoing application, that the application is correct and accurate and that the construction will comply with plans reviewed and approved by all necessary agencies and hereby acknowledge and accept this to be a condition for the issuance of this permit.

Signature of owner or authorized agent

Date

HAWP APPLICATION: MAILING ADDRESSES FOR NOTIFYING
[Owner, Owner's Agent, Adjacent and Confronting Property Owners]

Owner's mailing address	Owner's Agent's mailing address
Adjacent and confronting Property Owners mailing addresses	

Description of Property: Please describe the building and surrounding environment. Include information on significant structures, landscape features, or other significant features of the property:

Description of Work Proposed: Please give an overview of the work to be undertaken:

Work Item 1: _____	
Description of Current Condition:	Proposed Work:

Work Item 2: _____	
Description of Current Condition:	Proposed Work:

Work Item 3: _____	
Description of Current Condition:	Proposed Work:

**HISTORIC AREA WORK PERMIT
CHECKLIST OF
APPLICATION REQUIREMENTS**

	Required Attachments						
Proposed Work	I. Written Description	2. Site Plan	3. Plans/ Elevations	4. Material Specifications	5. Photographs	6. Tree Survey	7. Property Owner Addresses
New Construction	*	*	*	*	*	*	*
Additions/ Alterations	*	*	*	*	*	*	*
Demolition	*	*	*		*		*
Deck/Porch	*	*	*	*	*	*	*
Fence/Wall	*	*	*	*	*	*	*
Driveway/ Parking Area	*	*		*	*	*	*
Grading/Exc avation/Land scaing	*	*		*	*	*	*
Tree Removal	*	*		*	*	*	*
Siding/ Roof Changes	*	*	*	*	*		*
Window/ Door Changes	*	*	*	*	*		*
Masonry Repair/ Repoint	*	*	*	*	*		*
Signs	*	*	*	*	*		*

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A01_Overview

A02_Line of Sight

PV01_Mount Detail

PV02_Mount Detail

PV03_Hardware Specs

E01_Electrical Diagram

E02_Electrical Calculations

E03_Electrical Labels

Scope of Work:

To install 8.10kW size of solar panels with a system height of 0.6 feet on roof of building.

Codes

156.1.2
157.1.2.4
189.1.2.4
1.1.2.4

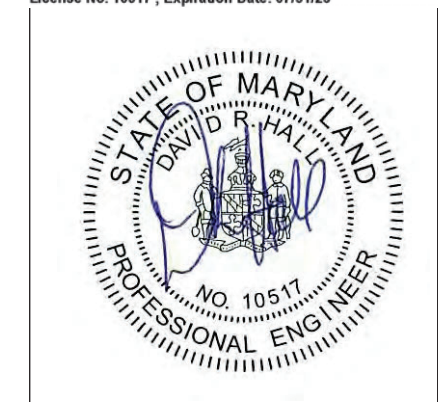
NFPA 1 . section 11.12.1.New photovoltaic systems shall be installed in accordance with Section 11.10, Section 11.12 OF NFPA 1 2018

All demolition and construction shall be made in accordance with the Montgomery County Fire Safety Code, IBC Chapter 33, and NFPA 241. Provisions shall be made to protect pedestrians and property located within close vicinity to the work area. (Note portable fire extinguishers shall be provided during construction).

CODE ANALYSIS	Existing Building		Proposed Alteration	
	IBC	NFPA	IBC	NFPA
IBC occupancy classification(s)	R-2			
Type of construction	Type III-B			
Number of stories above grade	2			
High Rise (Y/N)	N			
Covered Mall (Y/N)	N			
IBC 510 Pedestal Construction (Y/N)	N			
Fully Sprinklered (Y/N)	N			
Fire Alarm (Y/N)	Y			
Floor area of renovation	0	sq. ft		sq. ft.
Occupant load	N/A			
Energy Compliance Path	N/A			

Digitally signed
by David R. Hall
Date: 2023.03.13

17:25:23 -04'00'
Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 10517, Expiration Date: 07/31/23



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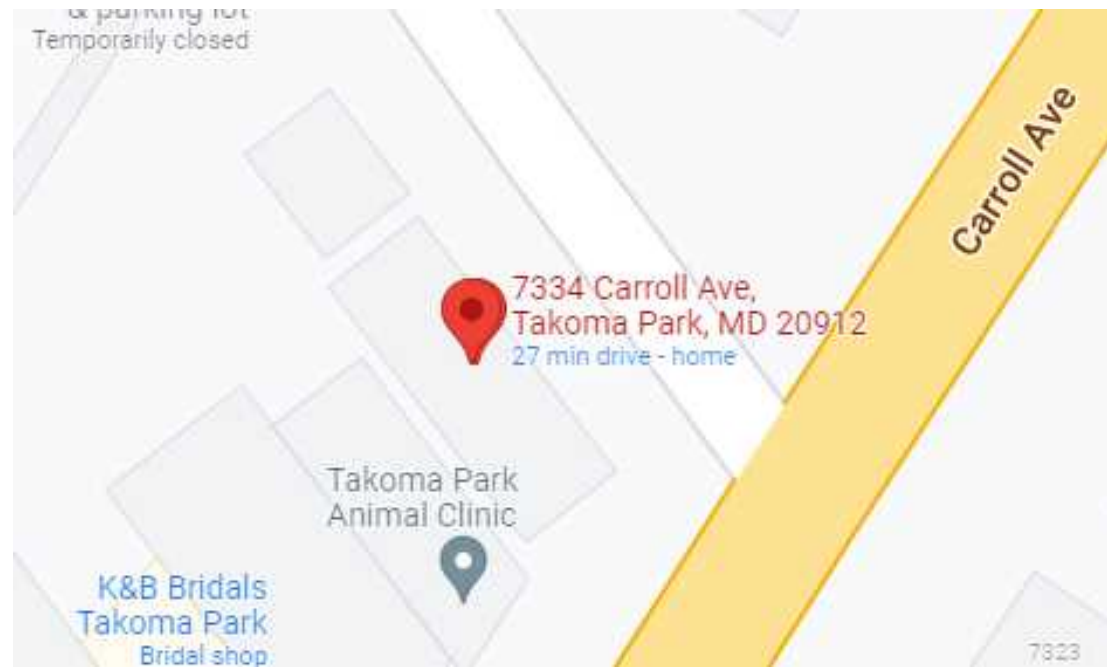
SYSTEM SIZE
3" \$+4'

ISSUE
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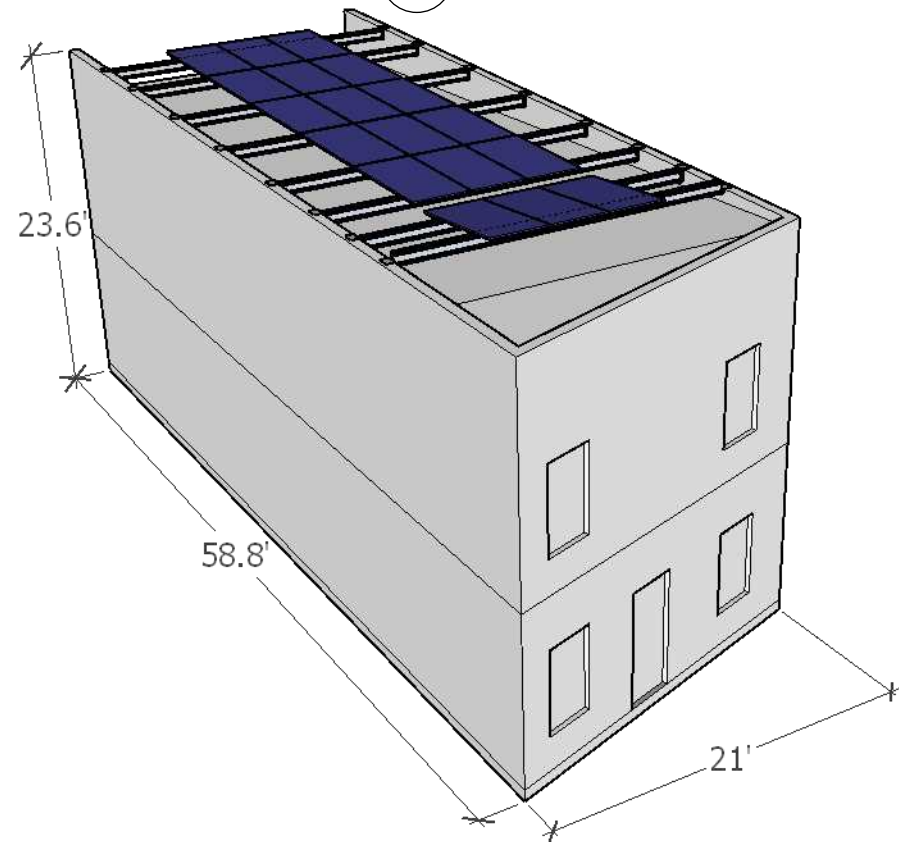
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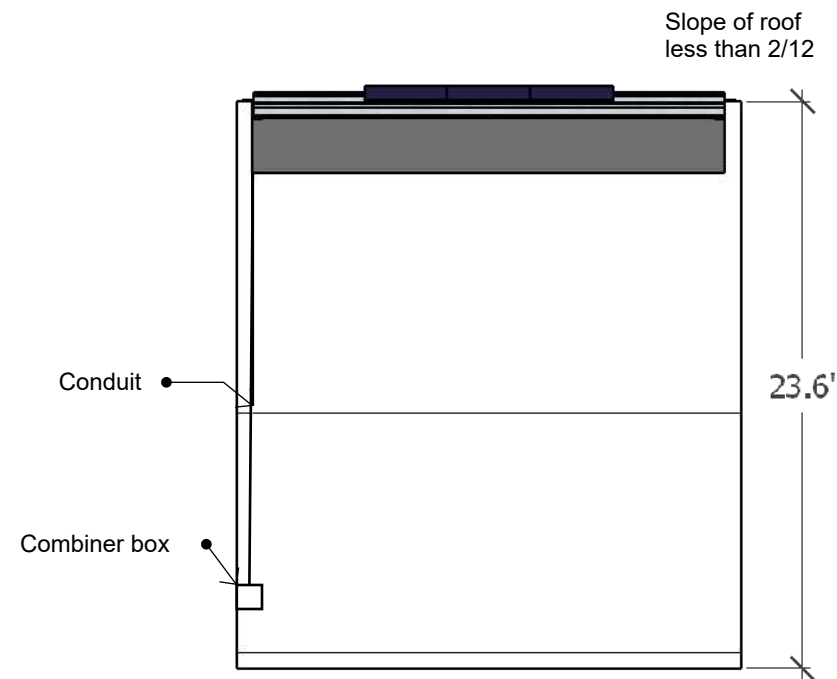


1 Site Plan
A01

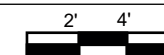


3 Proposed PV Design
A01

2 Street View of Building
A01



4 Back System Elevation
A01 Scale: 1/8" : 1'



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SOLAR SOLUTION
4700 14th ST. NW
Washington, DC 20011

Project #5124
Rick Leonard
7334 Carroll Ave,
Takoma Park, MD 20912

Overview

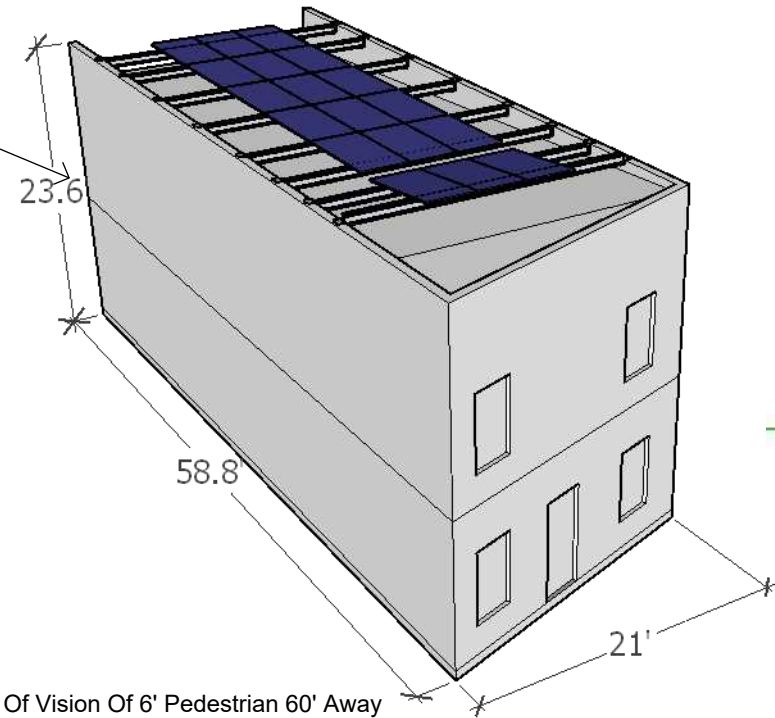
Issue Date
12.19.2022

Revisions:

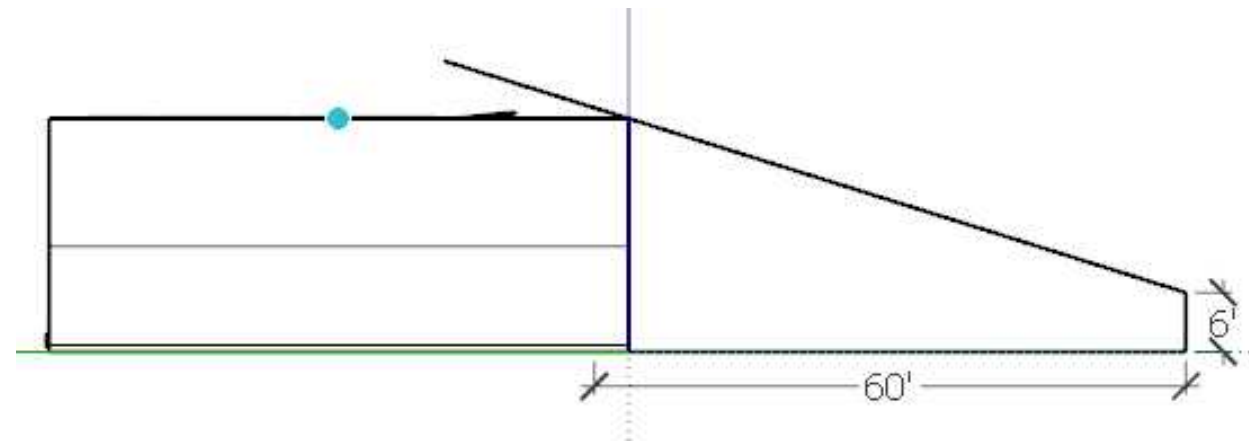
System Size:
8.10 kW



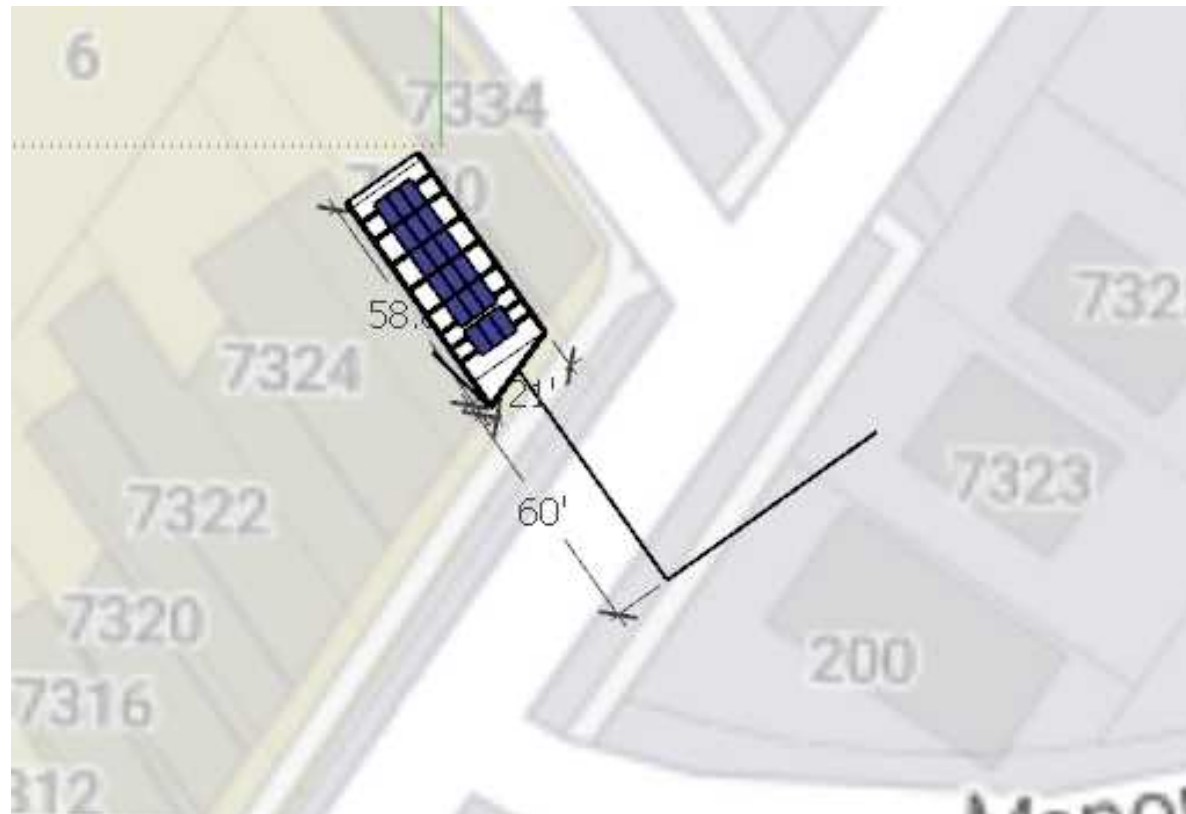
All electrical equipment will be placed on the back of the house and will not be visible from the facade



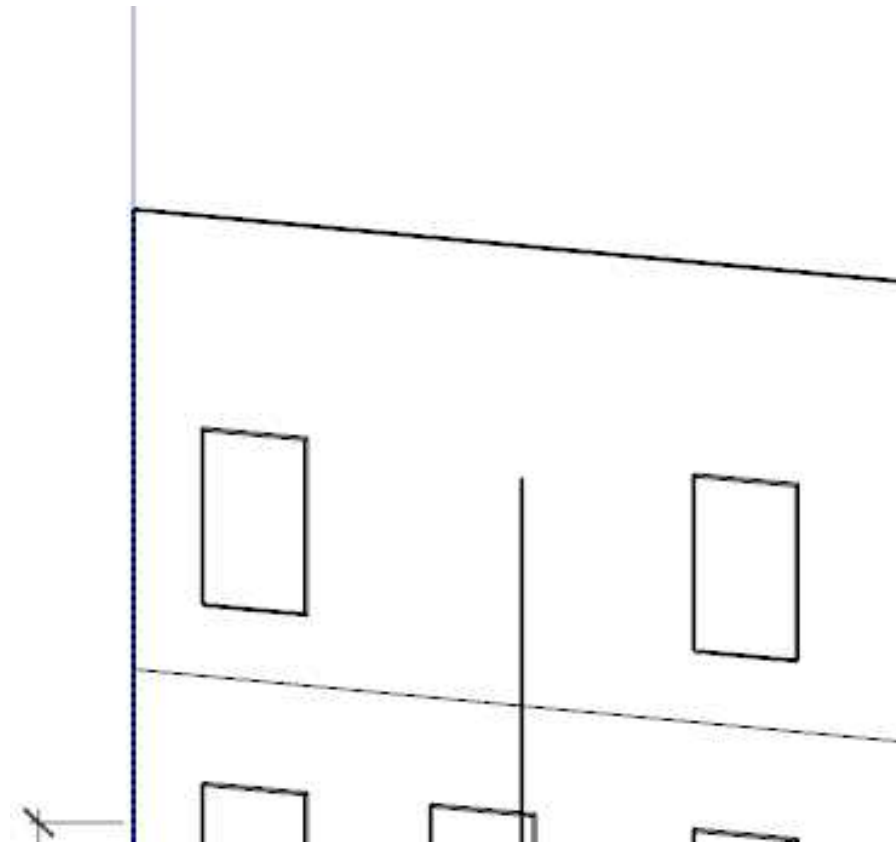
1 Line Of Vision Of 6' Pedestrian 60' Away
A02



Side view

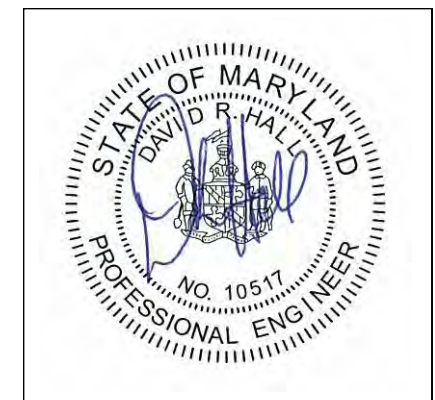


View A



View B

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SOLAR SOLUTION
4700 14th ST. NW
Washington, DC 20011

Project #5124
Rick Leonard
7334 Carroll Ave,
Takoma Park, MD 20912
20912

Line of Sight

Issue Date
12.19.2022

Revisions:

System Size:
8.10 kW

a

02

NOTE: The IQ 8 Micro, IQ 8+ Micro and the IQ 8X Micro have integrated ground and double insulation. The inverter does not require a EGC, other EGC requirements remain unchanged. The DC circuit is isolated and insulated from ground and meets the requirements of NEC 690.35.

Notes:

Modules are clamped with mid/end clamps.
#6 bare copper Ground Wire in contact with all modules and rails/beams/trays

Mid and End Clamps with integrated Grounding

10 Boviet 450 W Panels (IQ7+)

#6 Bare Copper connected to all rails/beams with Lugs. Mid and end clamps with integrated ground

Enphase Q Cable (Portrait)
Two (2) #12 AWG Wire
L1-Black
L2-Red

Junction Box

1/2" Conduit
(4) #12 AWG Conductors
(2) #10 Insulated EGC

String 1

8 Boviet 450 W Panels (IQ7+)

#6 Bare Copper connected to all rails/beams with Lugs. Mid and end clamps with integrated ground

Enphase Q Cable (Portrait)
Two (2) #12 AWG Wire
L1-Black
L2-Red

1/2" Conduit
(2) #12 AWG Conductors

String 2

Label 8 To/From Meter & Grid

Enphase IQ Combiner
40A
1PH
240VAC

#10 AWG insulated Ground (Typical)

Label 10 Label 9 Label 5

40A AC Disconnect housed inside Combiner Box Rated @80A

20A

20A

10A

Enphase Envoy Monitoring Unit

Existing 200A 3PH 208VAC

Line Side AC Disconnect is within 10' of Tap

40A OCPD AC Disconnect

Label 4

Label 10 Label 9 Label 1 Label 8

Digitally signed by David R. Hall
Date: 2023.03.13
17:26:12 -04'00'

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 10517, Expiration Date: 07/31/23

Line Side Tap Installation done inside line side of main service panel. Sufficient room for installation.

Label 7

Existing Ground

1/2" Conduit
(3) #6 AWG
#10 Insulated EGC

Load Side Existing Ground

Line Side Tap via KUP-L-TAP® (IPC) IPC-4/0-6



SOLAR SOLUTION
4700 14th ST. NW
Washington, DC 20011

Project # 5124
Rick Leonard
7334 Carroll Ave,
Takoma Park, MD 20912
20912

Electrical Diagram

Issue Date
12.19.2022

Revisions:

System Size:
8.10 kW



01

NOTE: The IQ 8 Micro, IQ 8+ Micro and the IQ 8X Micro have integrated ground and double insulation. The inverter does not require a EGC, other EGC requirements remain unchanged. The DC circuit is isolated and insulated from ground and meets the requirements of NEC 690.35.

Notes:

Modules are clamped with mid/end clamps.
#6 bare copper Ground Wire in contact with all modules and rails/beams/trays

Mid and End Clamps with integrated Grounding

10 Boviet 450 W Panels (IQ7+)

#6 Bare Copper connected to all rails/beams with Lugs. Mid and end clamps with integrated ground

Enphase Q Cable (Portrait)
Two (2) #12 AWG Wire
L1-Black
L2-Red

Junction Box

1/2" Conduit
(4) #12 AWG Conductors
(2) #10 Insulated EGC

8 Boviet 450 W Panels (IQ7+)

#6 Bare Copper connected to all rails/beams with Lugs. Mid and end clamps with integrated ground

Enphase Q Cable (Portrait)
Two (2) #12 AWG Wire
L1-Black
L2-Red

1/2" Conduit
(2) #12 AWG Conductors

Enphase IQ Combiner
40A
1PH
240VAC

#10 AWG insulated Ground (Typical)

Label 8 → To/From Meter & Grid

Label 10 Label 9 Label 5

40A AC Disconnect housed inside Combiner Box Rated @80A

Existing 200A 3PH 208VAC

Line Side

AC Disconnect is within 10' of Tap

40A OCPD AC Disconnect

Label 4

Existing Ground

1/2" Conduit
(3) #6 AWG
#10 Insulated EGC

Label 10 Label 9 Label 1 Label 8

Line Side Tap
Installation done inside line side of main service panel. Sufficient room for installation.

Label 7

Line Side Tap via KUP-L-TAP® (IPC) IPC-4/0-6

Load Side

Existing Ground

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 10517, Expiration Date: 07/31/23



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4700 14th ST. NW
Washington, DC 20011

Project #5124
Rick Leonard
7334 Carroll Ave,
Takoma Park, MD 20912
20912

Electrical Diagram

Issue Date
12.19.2022

Revisions:

System Size:
8.10 kW



CODE REFERENCE:

ART 690.8 (A)

1. The maximum current shall be the sum of parallel module rated short - circuit currents multiplied by 125%.

3. The maximum current shall be the inverter continuous output current rating.

ART 690.8(B)(1)

1. CONDUCTION MUST HAVE 30 C AMPACITY > 125% OF CONTINUOUS CURRENT PER 690.8(A)
2. CONDUCTOR MUST HAVE (AFTER CORRECTIONS FOR CONDITIONS OF USE) GREATER THAN OR EQUAL TO CONTINUOUS CURRENT PER TABLE 310.15
3. EVALUATE CONDUCTOR TEMPERATURE AT TERMINATION PER ART 110.14(C). AMPACITY OF WIRE DERATED FOR CONDITIONS OF TERMINATION MUST BE > CONTINUOUS CURRENT X 1.25.

DC CALCULATIONS

SYSTEM SIZE: 18X 450 W = 8.10kW

PV SOURCE CIRCUIT

PV MODULE ISC = 11.60 A

OF MODULES IN PARALLEL PER CIRCUIT = 1

MAX ISC = 1 X 11.60A X 1.25 = 14.5A

OCPD/Ampacity = 14.5A x 1.25 = 18A, 20A OCPD

SOURCE CIRCUIT WIRING

CONDUCTOR = COPPER #12 AWG THWN-2 90°C RATED

CORRECTION FACTORE FOR 60°C AMBIENT = 0.71

CORRECTED AMPACITY: 30 A X 0.71 X 0.8 = 17.0A > 14.5A

AC Current Calculations

Total Panels: 18 x 1.39A = 25.02

String 1: 10 x 1.39A = 13.9A

String 2: 8 x 1.39 = 11.12A

Combiner Box Home Run Current: 18 x 1.39A = 25.02A

OCPD Sizing: 40A

80% of OCPD = 40A x .8 = 32A > 25.02A

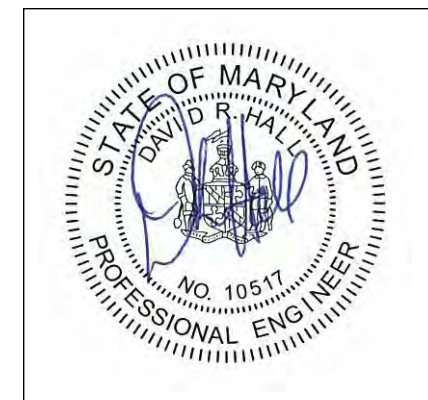
Wiring for Combiner Box: 1/2" Conduit #6 AWG & #10 Ground

Conductor for #6 AWG THWN-2 90 C Rated

Correction Factor for 45 C Ambient = 0.87

Corrected Ampacity: 75Ax0.87x0.8 = 52.2A > 25.02A

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Washington, DC 20011

Project # 5124
Rick Leonard
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20912

**Electrical
Calculations**

Issue Date
12.19.2022

Revisions:

System Size:
8.10 kW



Solar System Warning Labels Material

Vinyl Material - Flexcon DPM FWS White Vinyl

Reflective Material - Avery Dennison T-1500-A Engineering Grade Beaded Retroreflective Film

Lamination - Flexcon DPM Clear Gloss Polyester Laminate

Label 1



Location: (C)(CB)
Per code:
NEC 690.31.G.3

Label 6



Location: (AC)(POI)
Per code:
NEC 690.17.E

Label 2



Location: (DC)(INV)
Per code:
NEC 690.5 (C)

Label 7



Location: (POI)
Per code:
NEC 690.17.4

Label 3



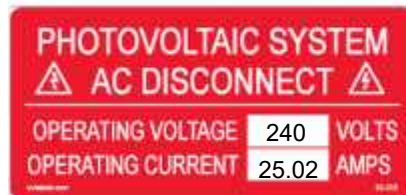
Location: (DC)(CB)
Per code:
NEC 690.17 (4)

Label 8



Location: (POI)
Per code:
NEC 690.64.B.4

Label 4



Location: (AC)(POI)
Per code:
NEC 690.54

Label 9



Location: (D)(POI)
Per code:
NEC 690.64.B.4

Label 5



Location: (AC)
Per Code:
NEC 690.52

Label 10



Location: (POI)
Per code:
NEC 690.64.B.7

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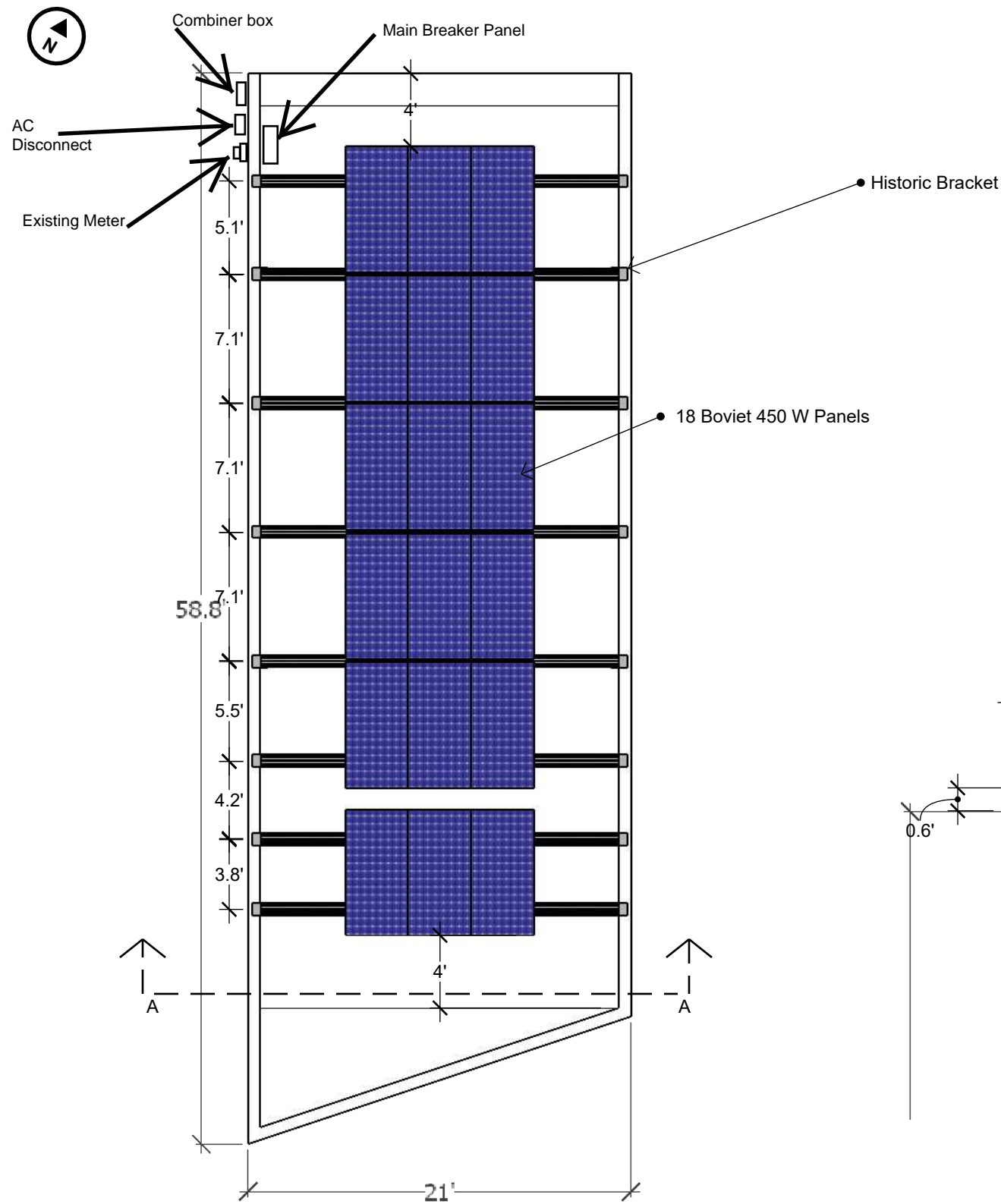
Electrical Labels

Issue Date
12.19.2022

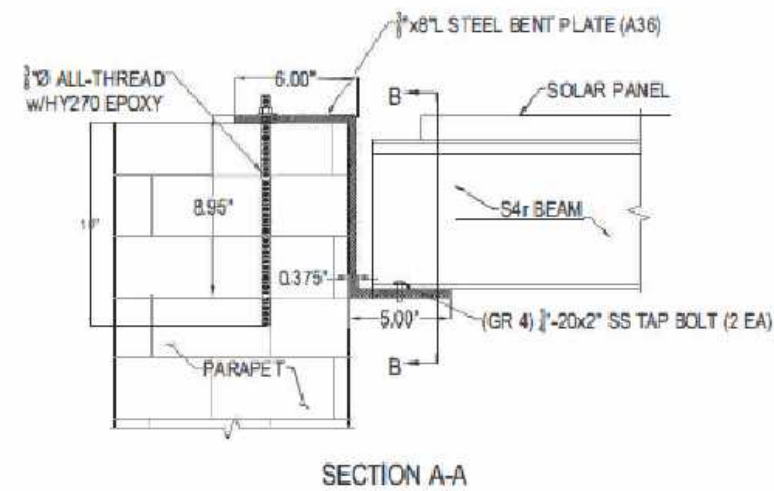
Revisions:

System Size:
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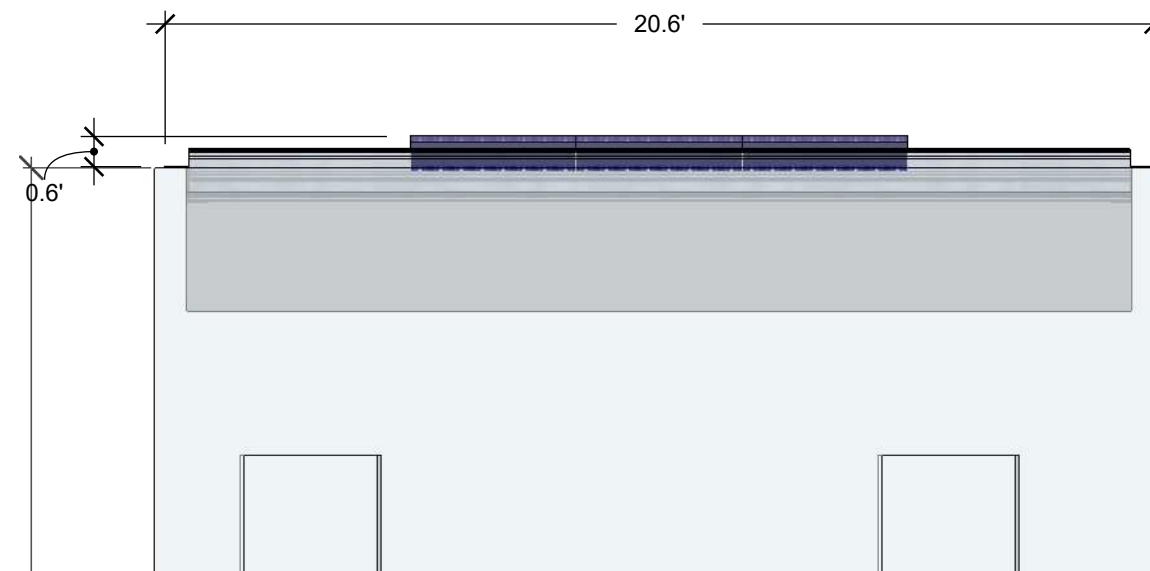




1 Roof Plan
 PV01 Scale: 1/8" = 1' 2' 4' 6'

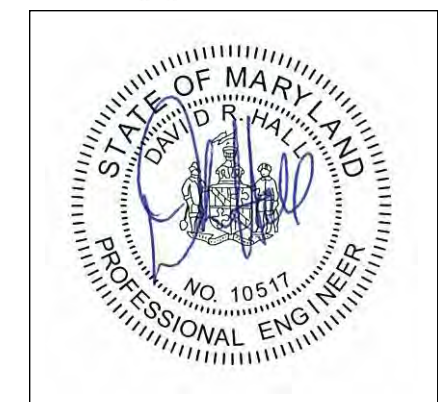


2 Mount Details
 PV01



3 Cross Section A-A
 PV01 Scale: 1/4" = 1' 2' 4' 6'

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Mount Detail

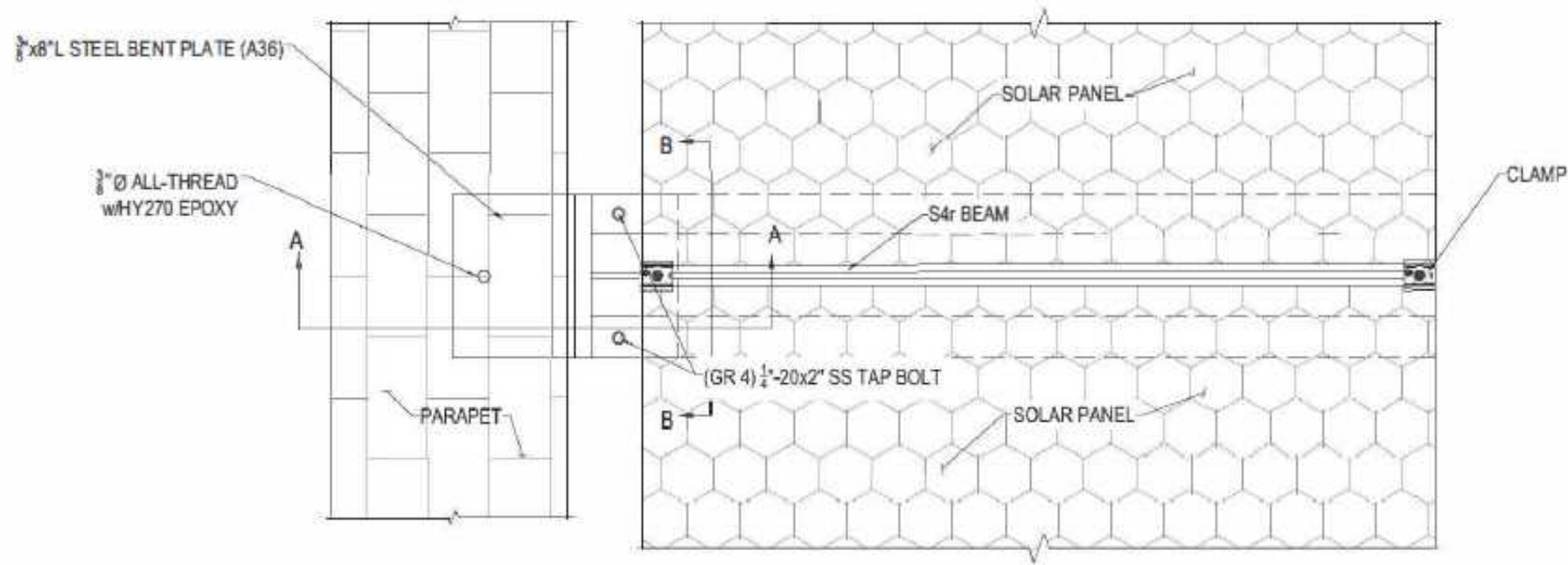
Issue Date
 12.19.2022

Revisions:

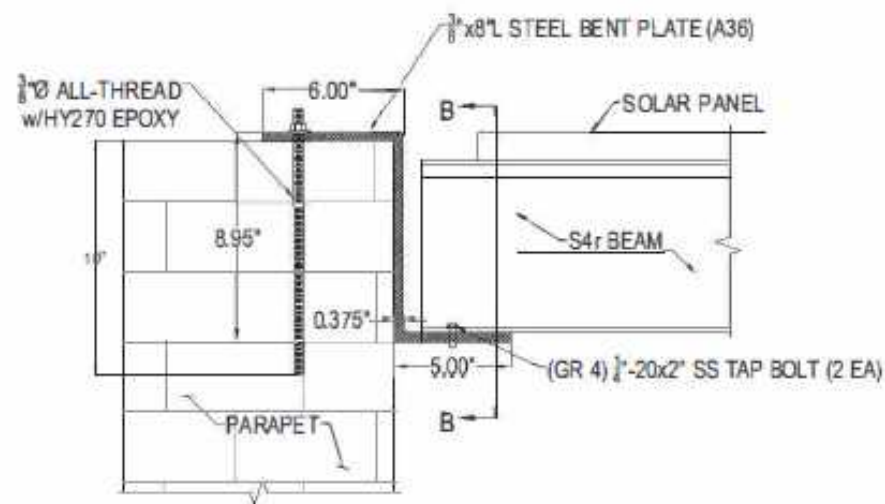
System Size:
 8.10 kW

pv

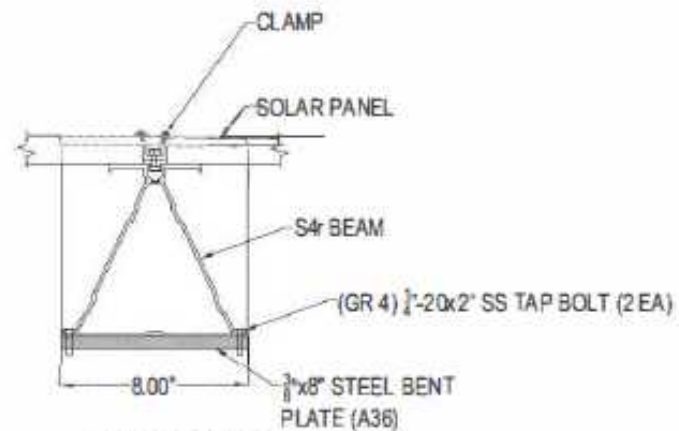
01



PLAN VIEW



SECTION A-A

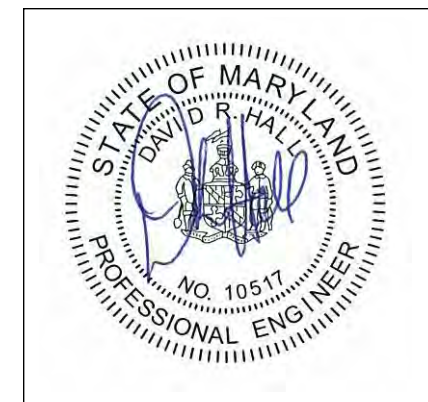


SECTION B-B

1 PARAPET CONNECTION DETAILS

Scale: 1 1/2"=1'-0"

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**Mount
Detail**

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pv



Boviet 450 W Bi

ELECTRICAL CHARACTERISTICS | STC

Maximum Power (Pmax)	440W	445W	450W
Maximum Power Current (Imp)	10.92A	10.99A	11.06A
Maximum Power Voltage (Vmp)	40.37V	40.57V	40.76V
Short Circuit Current (Isc)	11.48A	11.55A	11.60A
Open Circuit Voltage (Voc)	48.60V	48.80V	49.05V
Module Efficiency	19.7%	19.9%	20.2%
Power Tolerance	0~+5W	0~+5W	0~+5W

STC: AM1.5 Irradiance 1000W/m, 25° C

CERTIFICATES

UL 61730 | IEC 61215 | IEC 61730 | CEC Listed | CE
 ISO 9001 Quality Management System
 ISO 14001 Environmental Management System
 ISO 45001 Occupational Health and Safety Management System

*Please contact with Boviet Solar representatives for full list of certificates according to local requirements and product type

MECHANICAL CHARACTERISTICS

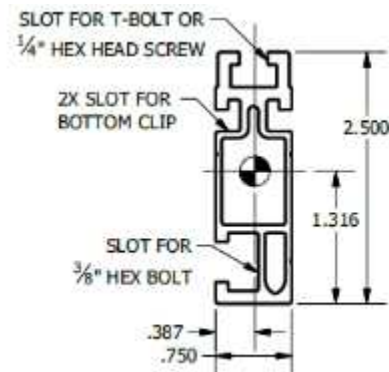
Solar Cell	Monocrystalline PERC PV Cells 166mm Cell Half-cut 9 Busbar 144 (6x24) pcs in series
Solar Modules	Bifacial 84.06 x 41.19 x 1.38 inch. Weight: 68.34 lb.



IQ7+

INPUT DATA (DC)	IQ7PLUS-72-2-US / IQ7PLUS-72-B-US
Commonly used module pairings ¹	235 W - 440 W +
Module compatibility	60-cell and 72-cell PV modules
Maximum input DC voltage	60 V
Peak power tracking voltage	27 V - 45 V
Operating range	16 V - 60 V
Min/Max start voltage	22 V / 60 V
Max DC short circuit current (module Isc)	15 A
Overvoltage class DC port	II
DC port backfeed current	0 A
PV array configuration	all DC side protection required; 1 per branch circuit

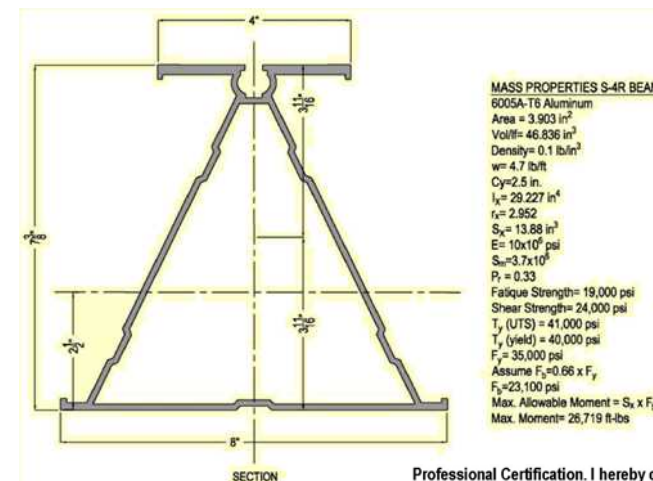
OUTPUT DATA (AC)	IQ 7+ Microinverter	
Peak output power	295 VA	
Maximum continuous output power	290 VA	
Nominal (L-L) voltage/range ²	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz	
Extended frequency range	47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms	
Maximum units per 20 A (L-L) branch circuit ³	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III	
AC port backfeed current	0 A	
Power factor setting	1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging	



The universal SolarMount rail system has three options which can be assembled into a wide variety of PV mounting structures to accommodate any job site. Unirac provides a technical support system complete with installation and codecompliance documentation.



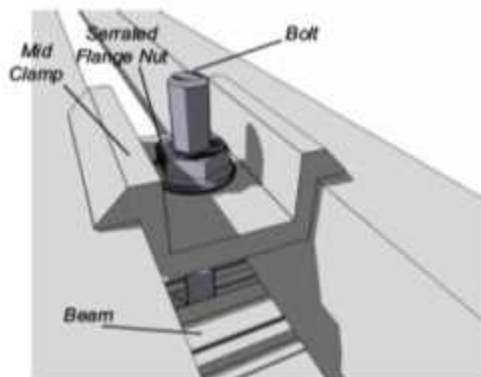
The S4 is manufactured from extruded aluminum to maximize spans while minimizing weight for improved handling. The S4 carrier has a side slot to enable the option of bottom mounting. Optimized features for large span length in Free Field systems.



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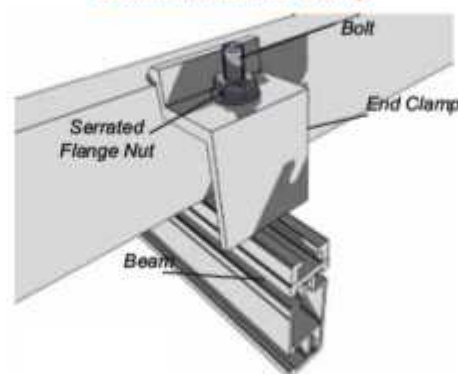
Product Certificate UL2703

SolarMount Mid Clamp



- Mid clamp material: One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- Ultimate tensile: 38ksi, Yield: 35 ksi
- Finish: Clear or Dark Anodized
- Mid clamp weight: 0.050 lbs (23g)
- Allowable and design loads are valid when components are assembled according to authorized UNIRAC documents
- Values represent the allowable and design load capacity of a single mid clamp assembly when used with a SolarMount series beam to retain a module in the direction indicated
- Assemble mid clamp with one Unirac 1/4"-20 T-bolt and one 1/4"-20 ASTM F594 serrated flange nut
- Use anti-seize and tighten to 10 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory

SolarMount End Clamp



- End clamp material: One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- Ultimate tensile: 38ksi, Yield: 35 ksi
- Finish: Clear or Dark Anodized
- End clamp weight: varies based on height: ~0.058 lbs (26g)
- Allowable and design loads are valid when components are assembled according to authorized UNIRAC documents
- Values represent the allowable and design load capacity of a single end clamp assembly when used with a SolarMount series beam to retain a module in the direction indicated
- Assemble with one Unirac 1/4"-20 T-bolt and one 1/4"-20 ASTM F594 serrated flange nut
- Use anti-seize and tighten to 10 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory
- Modules must be installed at least 1.5 in from either end of a beam



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Hardware Specifications

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pv
03