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Scope of Work:

To install 4.76 kW size of solar panels with a system height of .8 feet on roof of building.

Codes

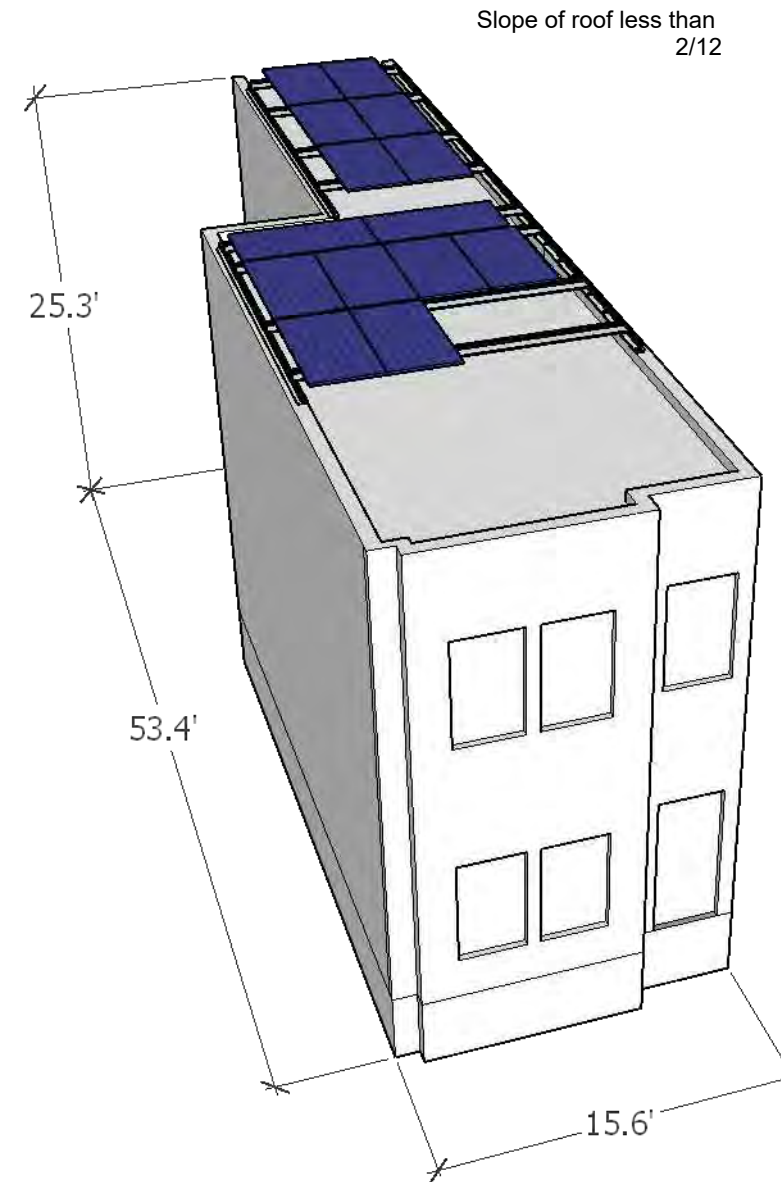
- FIRE CODE 2013. SECTION 605.11
- STUCTURAL PLANS CERTIFIED AS PROVIDED IN SECTION 106.1.4.1 OF THE D.C. CONSTRUCTION CODES.
- NEC 2011
- IBC 2012
- 2012 IRC



1 Satellite View of Building
A01



1 Street View of Building
A01



2 Proposed PV Design
A01

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

Project # -
Eoin Healy
3316 Reservoir Rd NW,
Washington, DC 20007

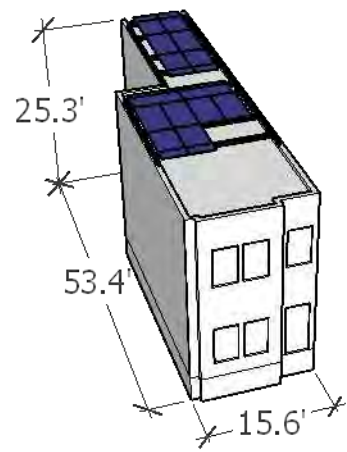
Overview

Issue Date
09.23.2019

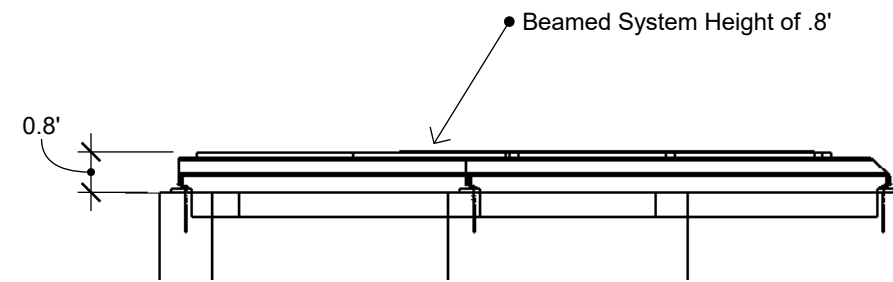
Revisions:

System Size:
4.76 kW



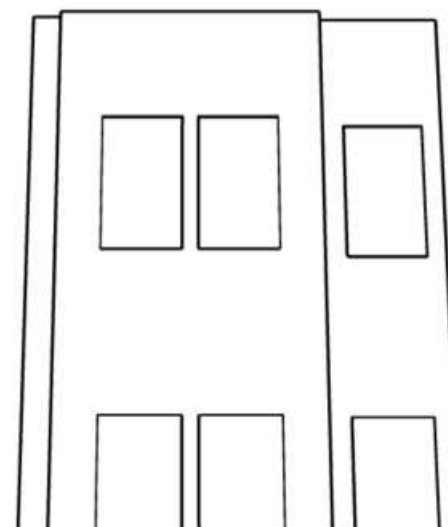
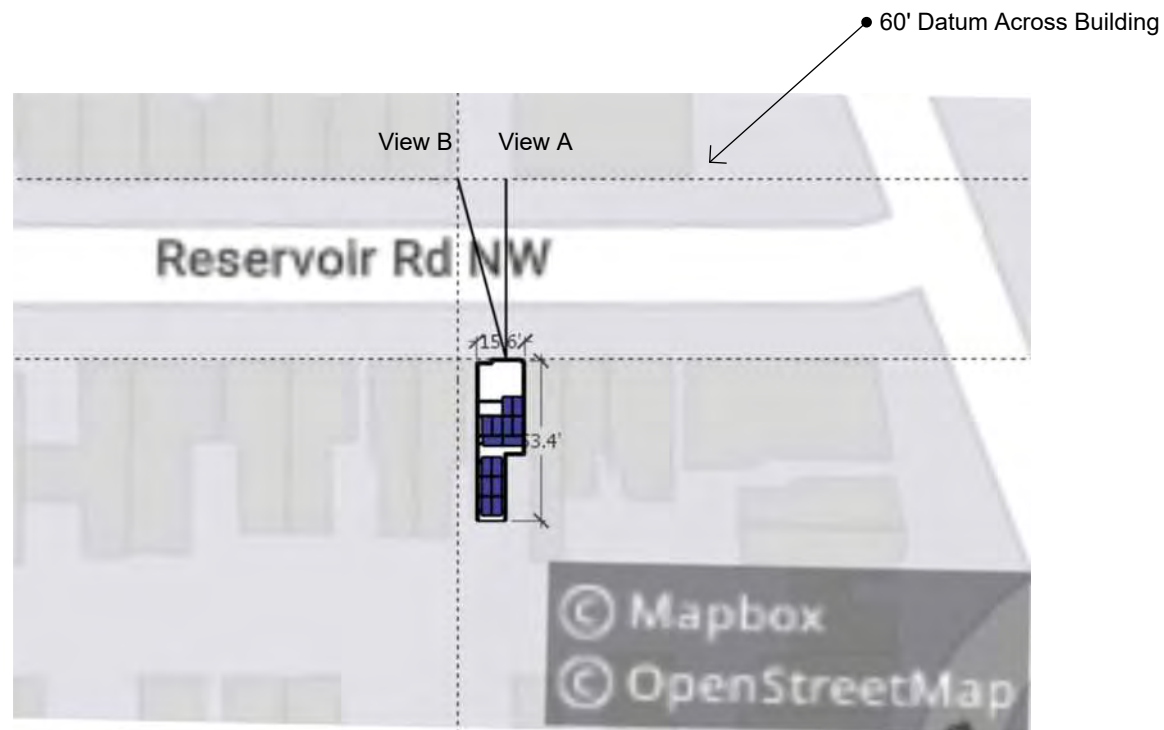


• TPO Roof Material

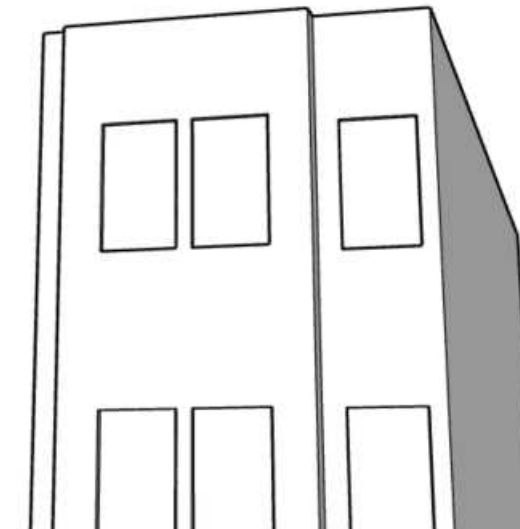


Front View of Building

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



View A



View B

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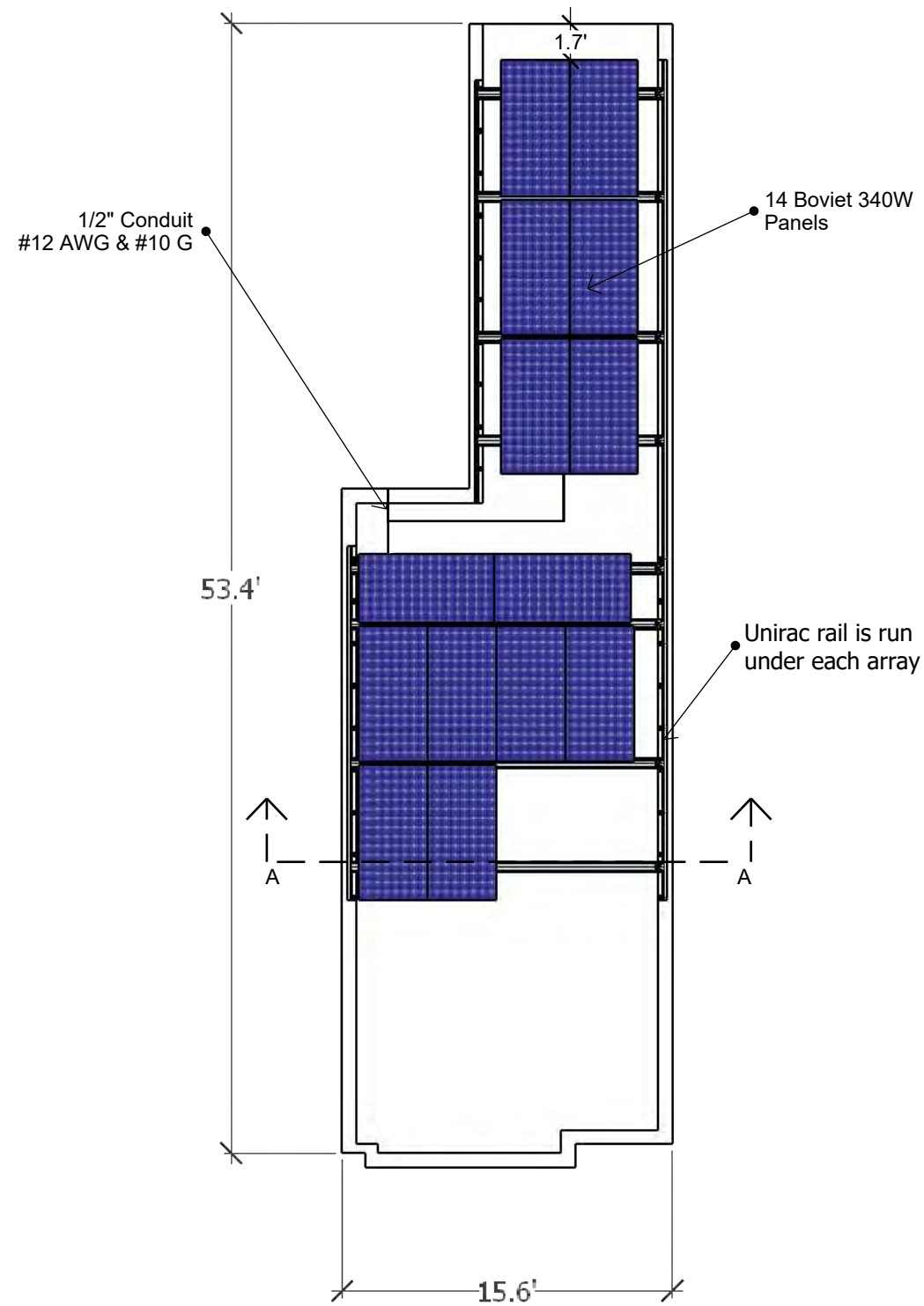
Line of Sight

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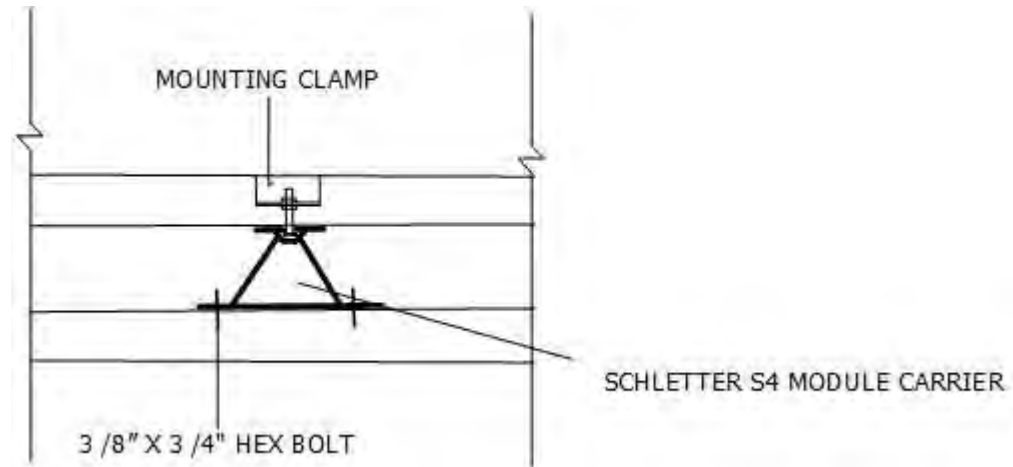
Revisions:

System Size:
4.76 kW

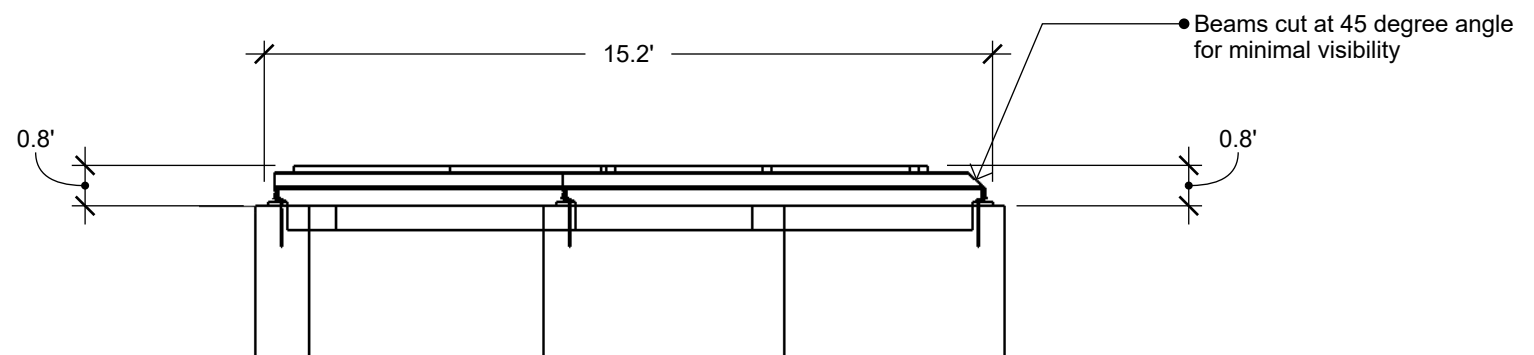




1 Roof Plan
 PV01 Scale: 1/8" : 1'



2 Mount Details
 PV01 Scale: 0" : 1'



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

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Mount Detail

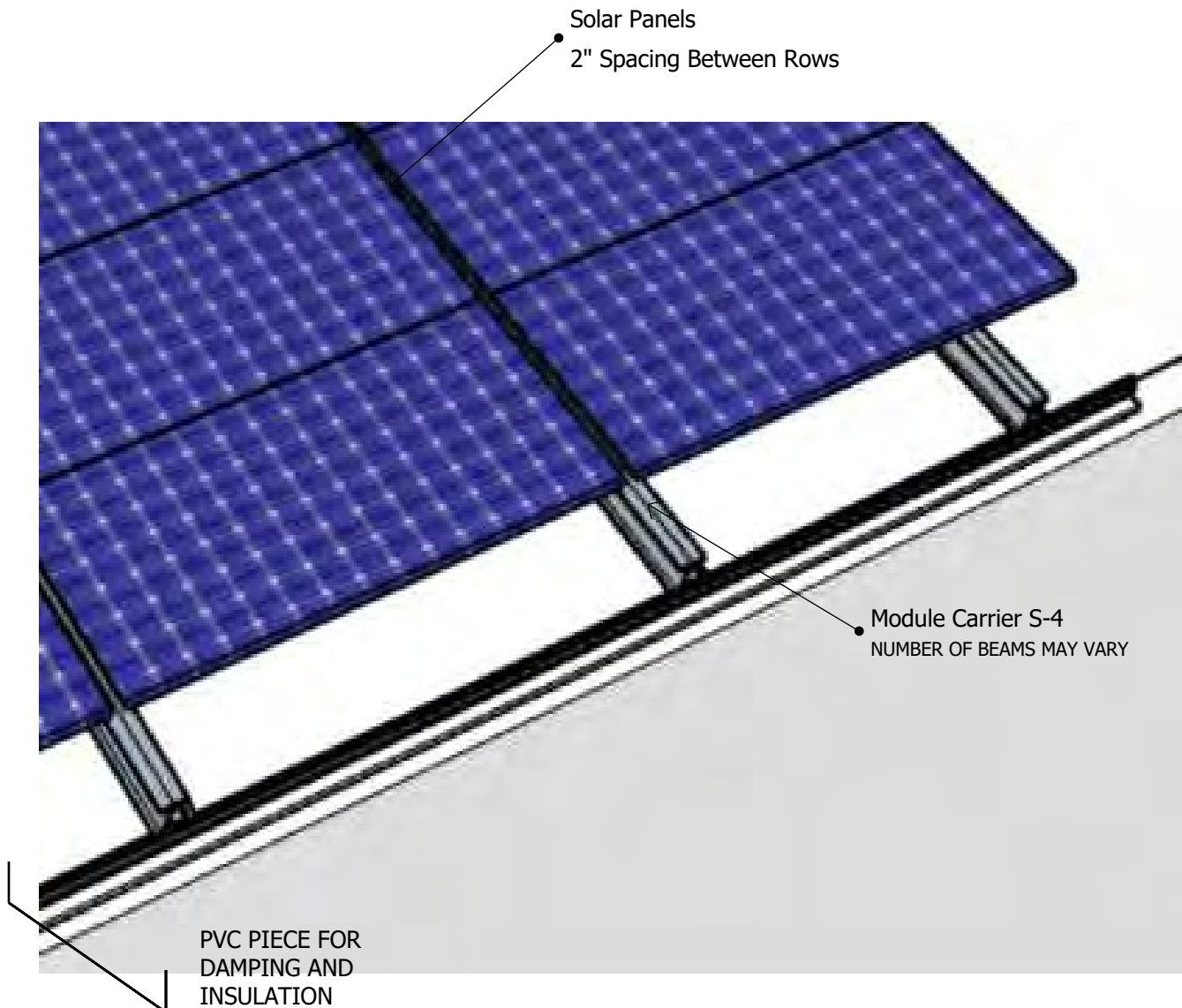
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Revisions:

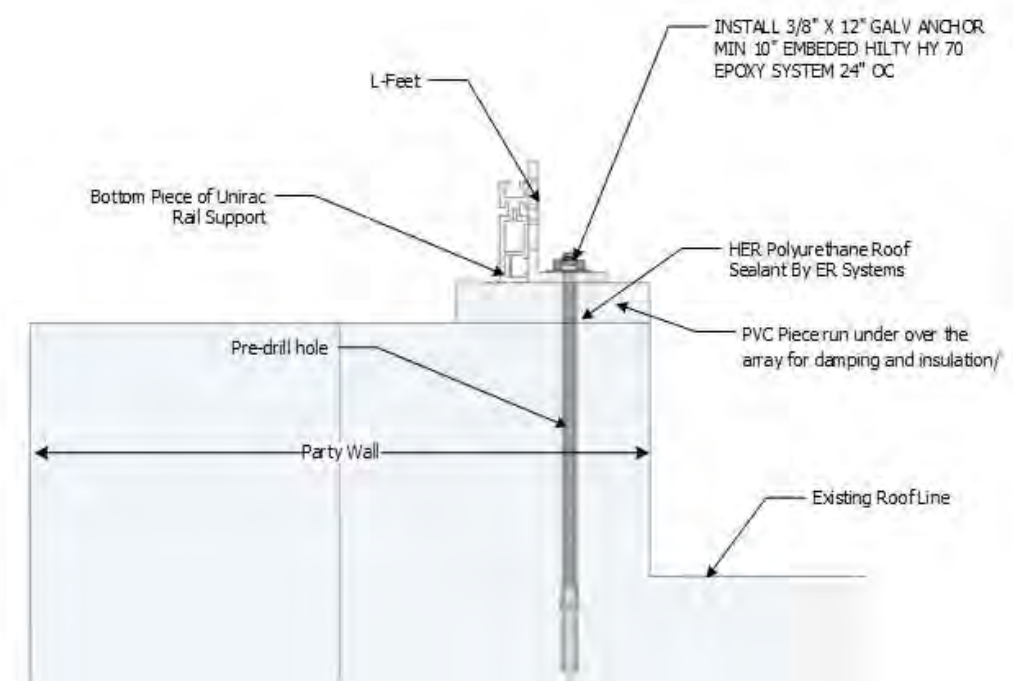
System Size:
 4.76 kW

pv

01



1 Mount Detail
PV02



2 Section Cut
PV02

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Mount Detail

Issue Date
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Revisions:

System Size:
4.76 kW

pv

02



Boviet 340 W

Boviet Solar USA high efficiency monocrystalline modules are perfect for space-limited applications in which the desired power output must be guaranteed in a limited space.

Electrical Data/STC

Nominal Power [Wp]: 340W
 Operational Voltage [Vmp]: 38.2V
 Operational Current [Imp]: 8.91A
 Open-Circuit Voltage [Voc]: 46.5V
 Short-Circuit Current [Isc]: 9.40A

Product Certificate

UL 1703, IEC 61215, IEC 61730, CEC listed, MCS and CE
 ISO 9001 for Quality Management Systems
 ISO 14001 for Environmental Management Systems

Component Materials

Cells per Module: 72
 Cell Type: Polycrystalline



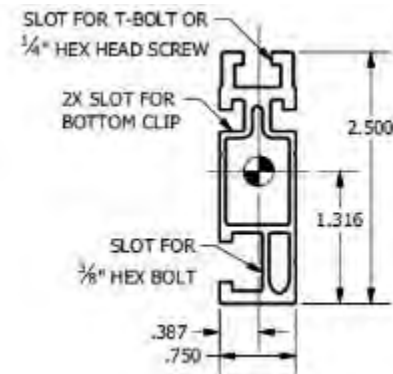
Enphase IQ 7+

Input Data (DC)

Recommended Input Power (STC): 235-440W
 Maximum Input DC Voltage: 60V
 Peak Power Tracking Voltage: 27V-45V
 Operating Range: 16-60V
 Min/Max Start Voltage: 22/60V
 Max DC Short Circuit Current: 15A

Output Data (AC)

Max Output Power: 290W
 Nominal Output Current: 1.21A
 Nominal Voltage Range: 211-264V
 Nominal Frequency/Range: 60Hz
 Extended Frequency/Range: 47-58Hz
 Power Factor: 1
 Maximum Units per Branch: 13



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 code compliance documentation.

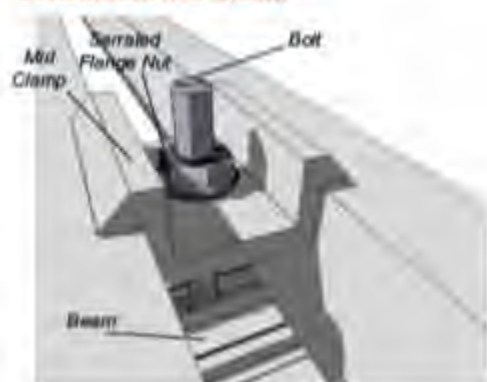


The S4 is manufactured from extruded aluminum to maximize spans while minimizing weight for improved handling. The S4 carrier has a side slot to enable the option of bottom mounting. Optimized features for large span length in Free Field systems.

Equivalent Properties: s-3.5

Area, Ax	=	2.374	in ²
Inertia, Ixx	=	9.837	in ⁴
Sx (Top)	=	4.004	in ³
Sx (Bot)	=	3.992	in ³
Plastic Zx	=	4.533	in ³
Plastic Zy	=	3.068	in ³
Torsional J	=	3.154	in ⁴

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 1/2"-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 1/2"-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

Issue Date
 09.23.2019

Revisions:

System Size:
 4.76 kW

pv

NOTE: The IQ 7 Micro, the IQ 7+ Micro, and the IQ 7X Micro have integrated ground and double insulation, so no GEC or EGC is required. 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

11 Boviet 340W Panels

#6 Bare Copper EGC

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

Junction Box

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

String 1

3 Boviet 340W Panels

#6 Bare Copper EGC

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

Junction Box

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

String 2

To/From Meter & Grid

Enphase IQ Combiner
30A
1PH
240VAC

Enphase Envoy Monitoring Unit

10A

20A

20A

30A

#10 AWG
insulated Ground
(Typical)

30A AC Disconnect housed
inside Combiner Box

Existing
150A
1PH
240VAC

Line Side

Existing
Ground

1/2" Conduit
(2) #10 AWG
Conductors & #10
insulated G

Load Side

CODE REFERENCE:

ART 690.8(B)(1)

1. CONDUCTION MUST HAVE 30 C AMPACITY > 125% OF CONTINUOUS CURRENT PER ART 215.2(A)(1)
2. CONDUCTOR MUST HAVE (AFTER CORRECTIONS FOR CONDITIONS OF USE) GREATER THAN OR EQUAL TO CONTINUOUS CURRENT PER TABLE 310.16
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: 14 X 340 W = 4.76 kW

PV SOURCE CIRCUIT

PV MODULE ISC = 9.40 A

OF MODULES IN PARALLEL PER CIRCUIT = 1

MAX ISC = 1 X 9.40 A X 1.25^2 = 14.69 A

SOURCE CIRCUIT WIRING

CONDUCTOR = COPPER #12 AWG THHN 90°C RATED

CORRECTION FACTORE FOR 60°C AMBIENT = 0.71

CORRECTED AMPACITY: 30 A X 0.71 X 0.8 = 17.0 A > 14.69 A

AC Current Calculations

Total Panels: 14 x 1.21A = 16.94A

String 1: 11 x 1.21A = 12.1A

String 2: 3 x 1.21A = 3.63A

Combiner Box Home Run Current: 14 x 1.21A = 16.94A

OCPD Sizing: 30A

80% of OCPD = 30A x .8 = 24A > 16.94A

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

Conductor for #10 AWG THHN 90 C Rated

Correction Factor for 45 C Ambient = 0.87

Corrected Ampacity: 40Ax0.87x0.8 = 27.84A > 16.94A



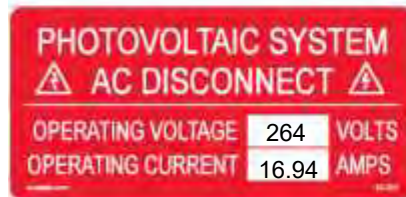
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Per code:
NEC 690.31.G.3



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



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



Location: (AC)(POI)
Per code:
NEC 690.14.C.2
NEC 690.54



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



Location: (POI)
Per code:
NEC 690.17.4



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



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



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