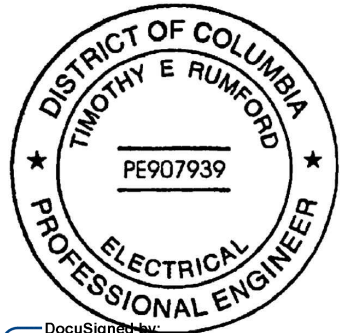


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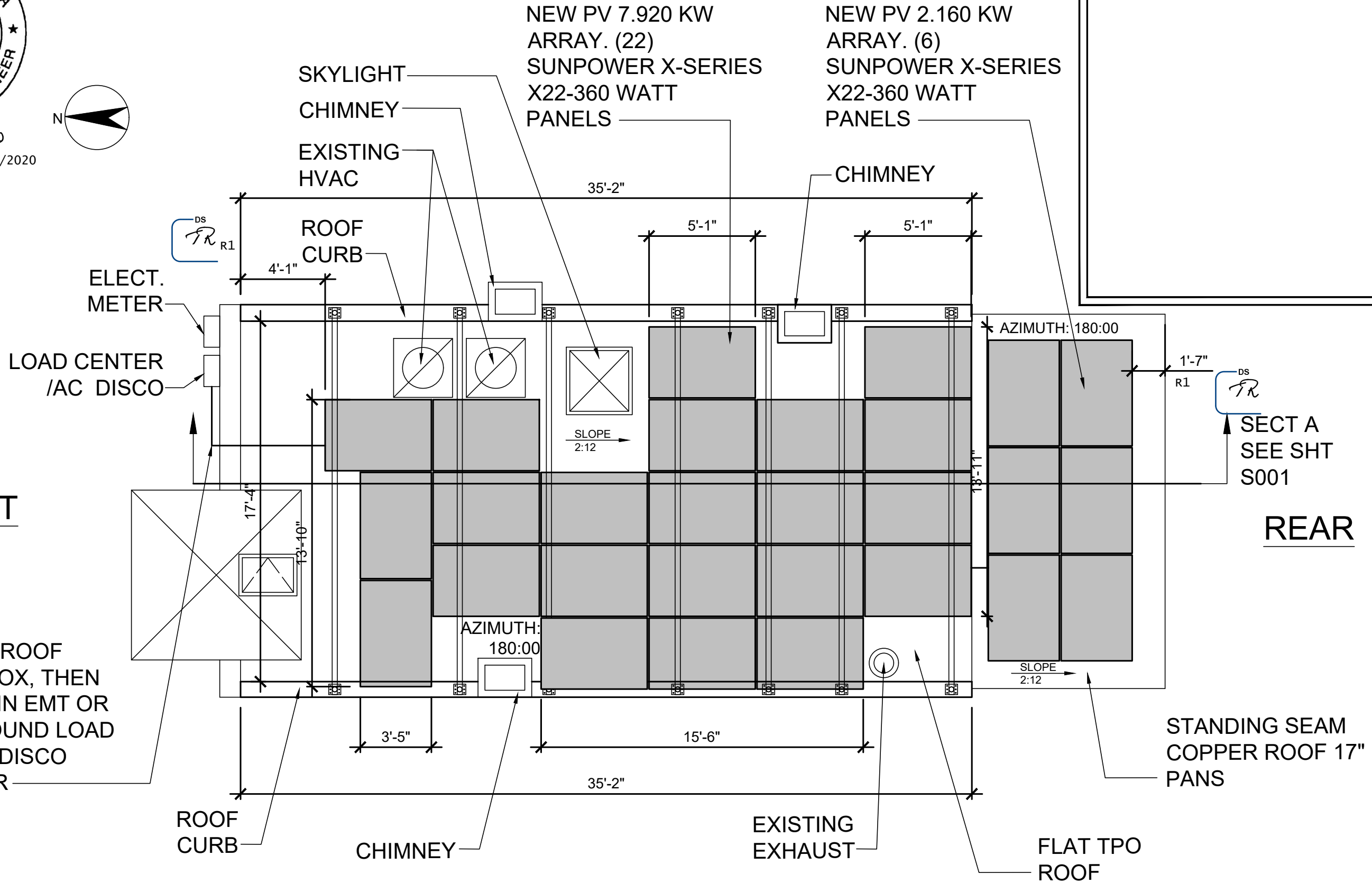
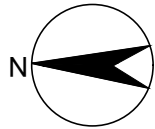
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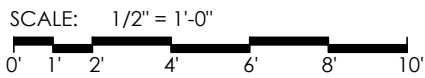
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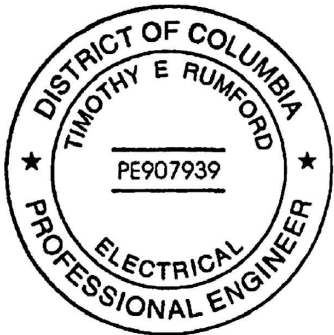
REAR

PV WIRE TO ROOF JUNCTION BOX, THEN FIELD WIRE IN EMT OR PVC TO GROUND LOAD CENTER/AC DISCO NEAR METER



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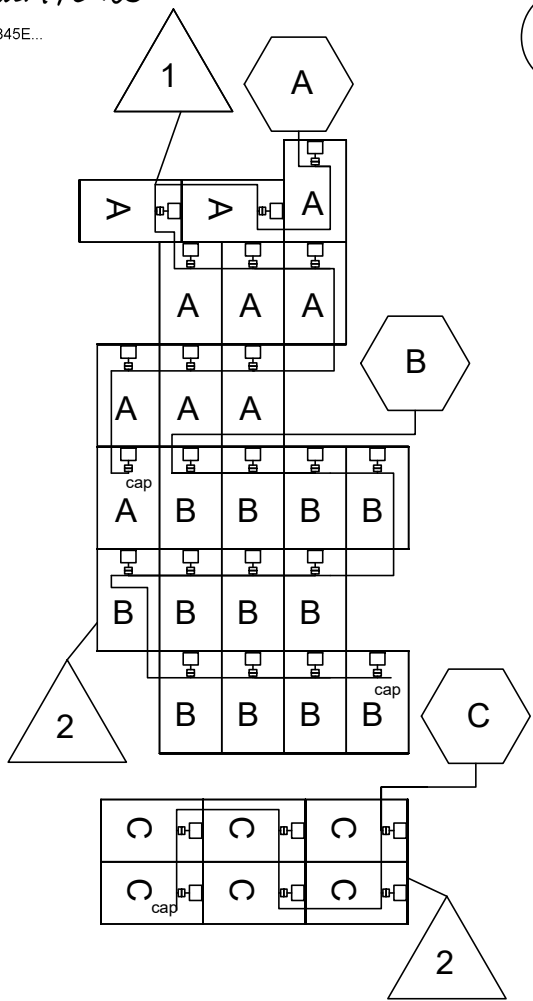
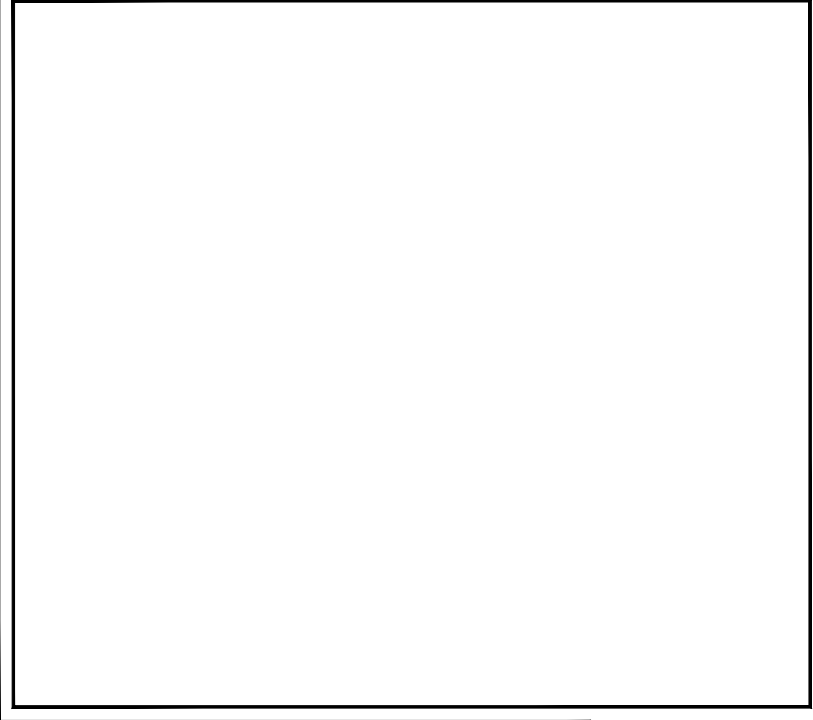
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DRAWING NUMBER	A001
SHEET	2 OF 11



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11/9/2019

EQUIPMENT SCHEDULE				
TAG	NAME	P/N	QTY	NOTES
1	SOLAR MODULES	SunPower X22 360-Watt AC Type-E panels	28	3 CIRCUIT
2	MicroInverters	SUNPOWER FACTORY ul	28	Mounted to modules at factory
3	JUNCTION BOX	Field determined	3	JUNCTION BOX, LOCATED BEHIND ARRAYOR IN ATTIC
4	LOAD CENTER	125-AMP 8-SPACE 16-CIRCUIT MAIN LUG LOAD CENTER. OR EQUIV	1	
5	AC Disco	AC FUSED DISCO, OUTDOOR RATING, WITH 50A Fuses	1	For Outside access. 240VAC, 60A.

WIRE SCHEDULE (EACH CIRCUIT)				
TAG	DESCRIPTION	GAUGE	QTY	CONDUIT, DISTANCE
1	SUNPOWER AC TRUNK Cable, 1-Ph (2-Wire) , CAP UNUSED CONNECTORS	#10 (REF)	AR	FACTORY CABLE, WITH INTEGRATED CONNECTORS. TIE TO MOUNTING RAILS. LENGTH OF ARRAY
2	CONTINUOUS EGC #10 COPPER RACKING SYSTEM TO EARTH GROUND	#10	1	ROUTED WITH PV WIRE, THEN IN CONDUIT AFTER JUNCTION BOX
3	AC POWER FROM ARRAY JB <sub>s</sub> TO AC LOAD CENTER THWN-2 (240 VAC) MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE)	#10 (L1, L2), #10 (EGC)	3	ROUTES to LOAD CENTER/ SWITCH NEAR METER ON HOUSE, IN EMT. APPROX. 100 FEET.
4	AC LOAD CENTER TO AC DISCO AT HOUSE THWN-2 (240 VAC) MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE)	#6 (L1, L2, N), #10 (EGC)	4	ROUTES TO MAIN BUILDING AC DISCO <10 FEET, EMT
5	AC DISCO TO LINE SIDE CONNECTION THWN-2 (240 VAC) MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE)	#6 (L1, L2, N), #6 (GEC)	4	ROUTES TO MAIN BUILDING AC DISCO <10 FEET, EMT



1+2 X28

10,080W

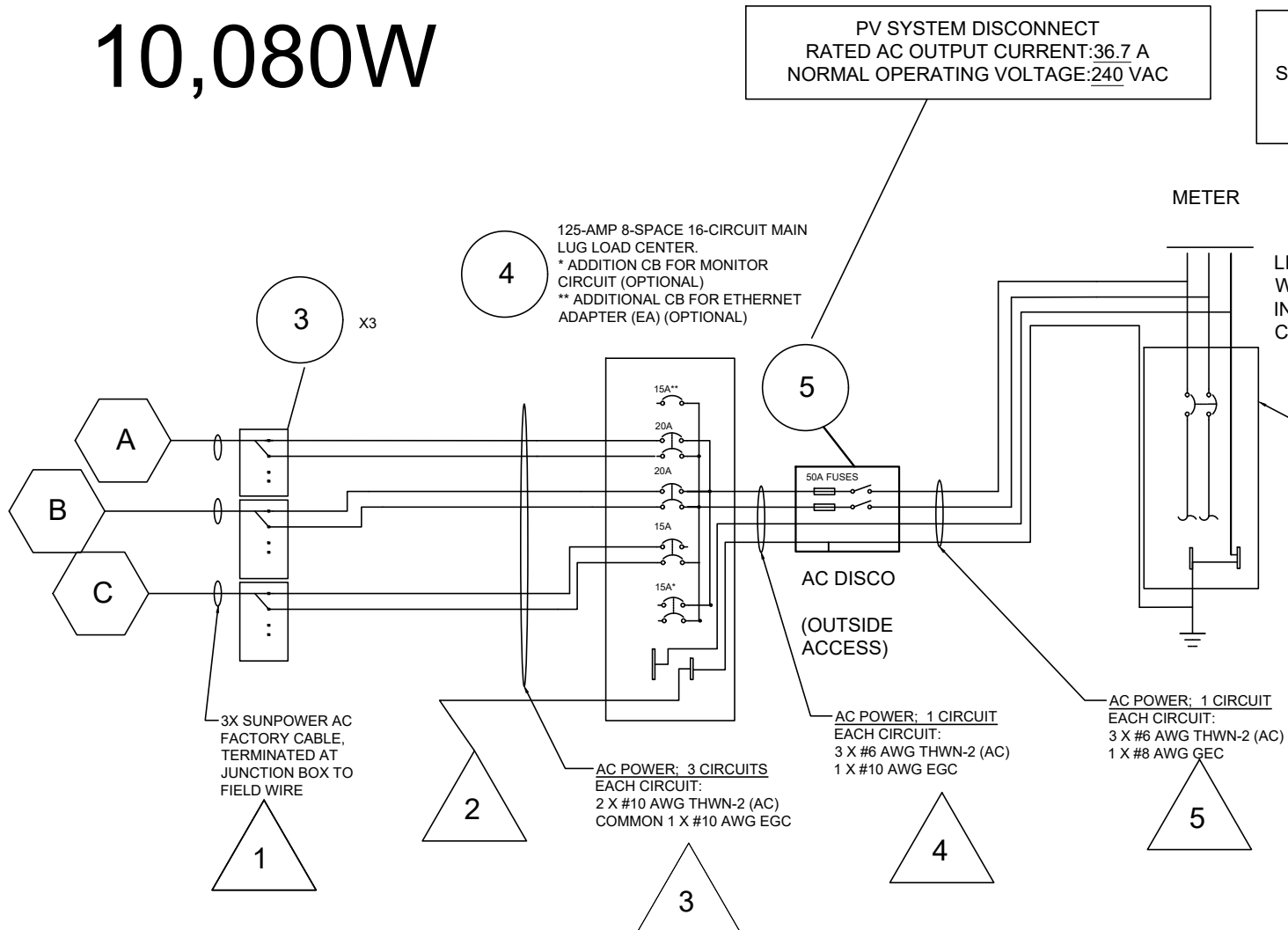


TABLE IAW WITH NEC 690.54:

TABLE IAW WITH NEC 690.54:

**WARNING**  
DUAL POWER SOURCES  
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM  
RATED AC OUTPUT CURRENT: 36.7 A  
NORMAL OPERATING VOLTAGE: 240 VAC

Common PV Signage/Marking: As per IFC 605.11.1, signs shall be reflective & weather resistant, with white letters at least 3/8" high on red background.

LINE SIDE CONNECTION  
WITH Kup-L-Tap IPC-4/0-6  
INSULATION PIERCING  
CONNECTORS

EXISTING 200A  
SERVICE PANEL  
(EXISTING)

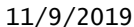
TABLE IAW WITH NEC 690.17:

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

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PROJECT FILE	20007-01
REVISION LEVEL	DATE
TBD	DATE
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SCALE	AS NOTED
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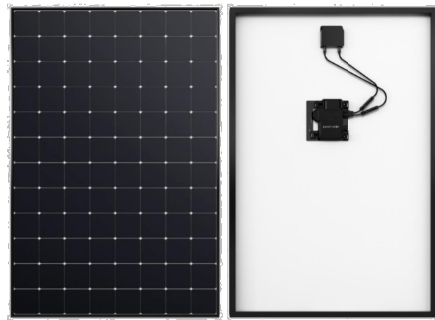


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SCALE	AS NOTED
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ELECTRICAL SCHEMATIC	
DRAWING NUMBER	
E002	
SHEET	8 OF 11





SUNPOWER®



### SunPower® X-Series: X22-370 | X22-360

## SunPower® Residential AC Module

Built specifically for use with the SunPower Equinox™ system, the only fully integrated solution designed, engineered, and warranted by one manufacturer.



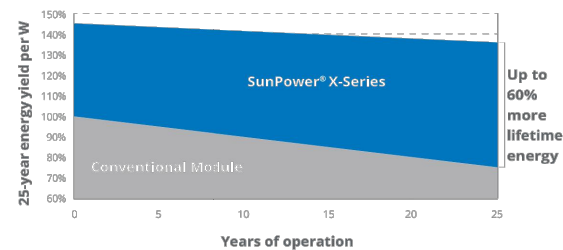
#### Maximum Power. Minimalist Design.

Industry-leading efficiency means more power and savings per available space. With fewer modules required and hidden microinverters, less is truly more.



#### Highest Lifetime Energy and Savings.

Designed to deliver 60% more energy over 25 years in real-world conditions like partial shade and high temperatures.<sup>1</sup>



#### Fundamentally Different. And Better.



##### The SunPower® Maxeon® Solar Cell

- Enables highest-efficiency modules available<sup>2</sup>
- Unmatched reliability<sup>3</sup>
- Patented solid metal foundation prevents breakage and corrosion



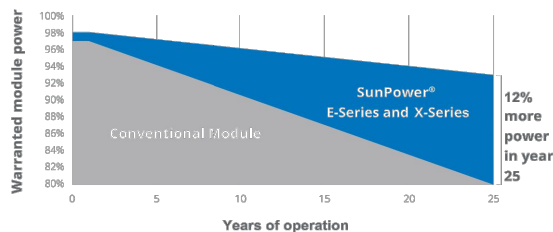
##### Factory-integrated Microinverter

- Simpler, faster installation
- Integrated wire management, rapid shutdown
- Engineered and calibrated by SunPower for SunPower modules



#### Best Reliability. Best Warranty.

With more than 25 million modules deployed around the world, SunPower technology is proven to last. That's why we stand behind our module and microinverter with the industry's best 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.



### X-Series: X22-370 | X22-360 SunPower® Residential AC Module

AC Electrical Data		
Inverter Model: Enphase IQ 7XS (IQ7XS-96-ACM-US)	@240 VAC	@208 VAC
Peak Output Power	320 VA	320 VA
Max. Continuous Output Power	315 VA	315 VA
Nom. (L–L) Voltage/Range² (V)	240 / 211–264	208 / 183–229
Max. Continuous Output Current (A)	1.31	1.51
Max. Units per 20 A (LL) Branch Circuit³	12 (single phase)	10 (two pole) wye
CEC Weighted Efficiency	97.5%	97.0%
Nom. Frequency	60 Hz	
Extended Frequency Range	47–68 Hz	
AC Short Circuit Fault Current Over 3 Cycles	5.8 A rms	
Overvoltage Class AC Port	III	
AC Port Backfeed Current	18 mA	
Power Factor Setting	1.0	
Power Factor (adjustable)	0.7 lead. / 0.7 lag.	
No active phase balancing for three-phase installations		

DC Power Data		
	SPR-X22-370-E-AC	SPR-X22-360-E-AC
Nominal Power <sup>4</sup> (P <sub>nom</sub> )	370 W	360 W
Power Tolerance	+5/-0%	+5/-0%
Module Efficiency <sup>5</sup>	22.7%	22.1%
Temp. Coef. (Power)	-0.29%/°C	-0.29%/°C
Shade Tolerance	• Three bypass diodes • Integrated module-level maximum power point tracking	

Tested Operating Conditions		
Operating Temp.	-40°F to +140°F (-40°C to +60°C)	
Max. Ambient Temp.	122°F (50°C)	
Max. Load	Wind: 62 psf, 3000 Pa, 305 kg/m² front & back Snow: 125 psf, 6000 Pa, 611 kg/m² front	
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)	

Mechanical Data		
Solar Cells	96 Monocrystalline Maxeon Gen III	
Front Glass	High-transmission tempered glass with anti-reflective coating	
Environmental Rating	Module: Outdoor rated Inverter: NEMA Type 6 Class II	
Frame	Class 1 black anodized (highest AAMA rating)	
Weight	42.9 lb (19.5 kg)	
Recommended Max. Module Spacing	1.3 in. (33 mm)	

1 SunPower 360 W compared to a conventional module on same-sized arrays (260 W, 16% efficient, approx. 1.6 m²), 4% more energy per watt (based on third-party module characterization and PVSim), 0.75%/yr slower degradation (Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013).

2 Based on search of datasheet values from websites of top 10 manufacturers per IHS, as of January 2017.

3 #1 ranking "Fraunhofer PV Durability Initiative for Solar Modules: Part 3," PVTech Power Magazine, 2015, Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013.

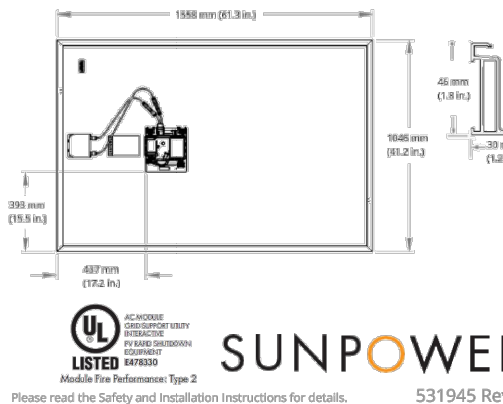
4 Factory set to 1547a-2014 default settings. CA Rule 21 default settings profile set during commissioning. See the Equinox Installation Guide #518101 for more information.

5 Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25°C). NREL calibration standard: SOMS current, LACCS FF and voltage. All DC voltage is fully contained within the module.

6 This product is UL Listed as PVSE and conforms with NEC 2014 and NEC 2017 690.12; and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors; when installed according to manufacturer's instructions.

See [www.sunpower.com/facts](http://www.sunpower.com/facts) for more reference information. For more details, see extended datasheet [www.sunpower.com/datasheets](http://www.sunpower.com/datasheets). Specifications included in this datasheet are subject to change without notice. ©2018 SunPower Corporation. All Rights Reserved. SUNPOWER, the SUNPOWER logo and MAXEON are registered trademarks of SunPower Corporation in the U.S. and other countries as well. 1-800-SUNPOWER.

Warranties, Certifications, and Compliance	
Warranties	• 25-year limited power warranty • 25-year limited product warranty
Certifications and Compliance	• UL 1703 • UL 1741 / IEEE-1547 • UL 1741 AC Module (Type 2 fire rated) • UL 62109-1 / IEC 62109-2 • FCC Part 15 Class B • ICES-0003 Class B • CAN/CSA-C22.2 NO. 107.1-01 • CA Rule 21 (UL 1741 SA) <sup>4</sup> (Includes Volt/Var and Reactive Power Priority) • UL Listed PV Rapid Shutdown Equipment <sup>6</sup>
Enables installation in accordance with:	
• NEC 690.6 (AC module) • NEC 690.12 Rapid Shutdown (inside and outside the array) • NEC 690.15 AC Connectors, 690.33(A)-(E)(1)	
When used with InvisiMount racking and InvisiMount accessories (UL 2703):	
• Module grounding and bonding through InvisiMount • Class A fire rated	
When used with AC module Q Cables and accessories (UL 6703 and UL 2238) <sup>6</sup> :	
• Rated for load break disconnect	
PID Test	Potential-induced degradation free



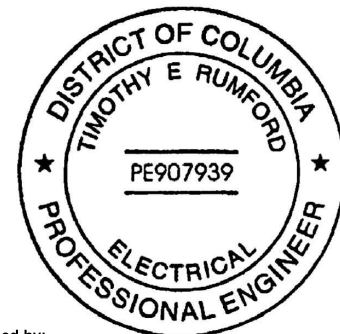
Datasheet

[sunpower.com](http://sunpower.com)

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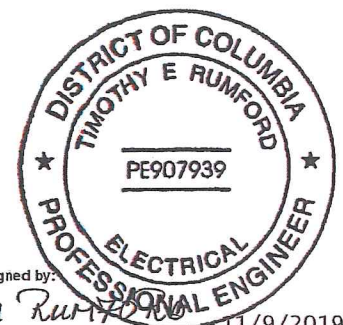
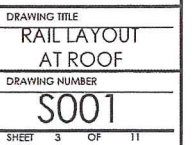
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Helios Solar Systems

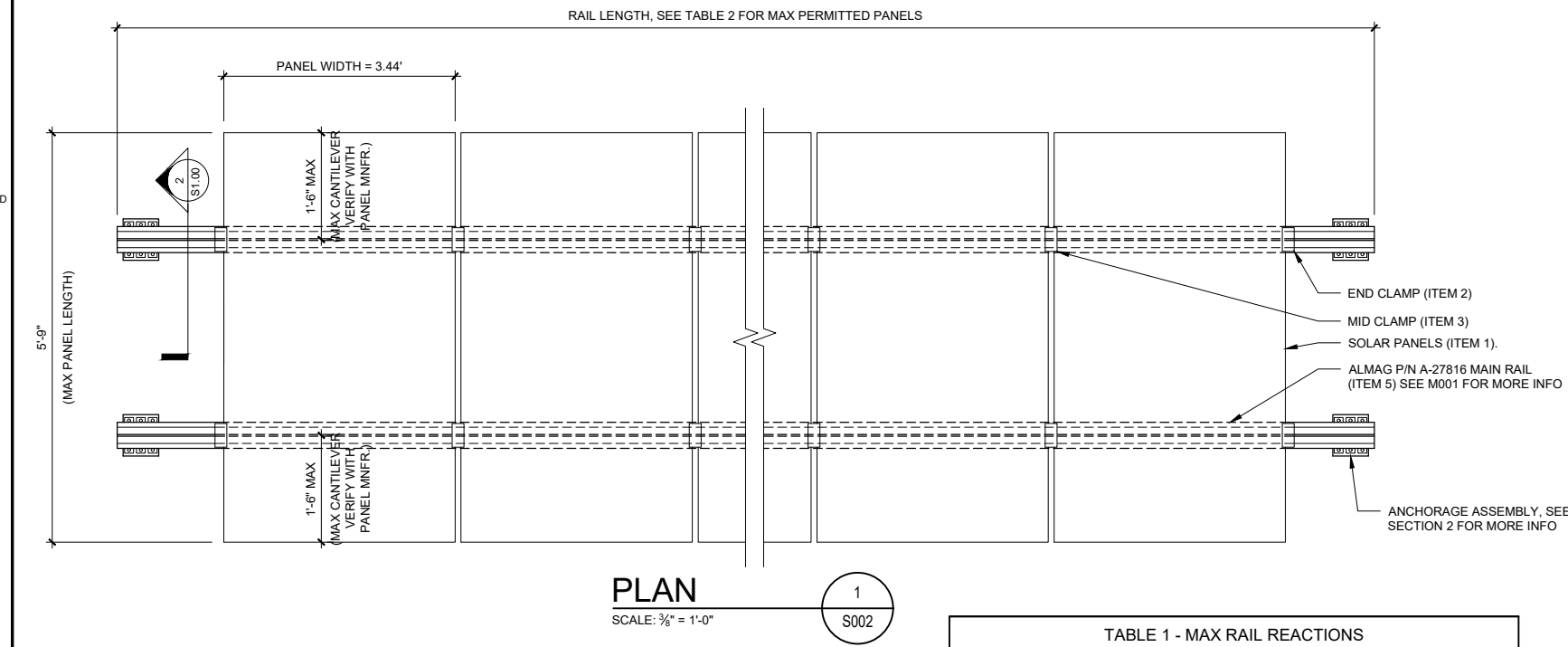
KEELER RESIDENCE  
PV SOLAR INSTALLATION  
3014 CAMBRIDGE PL. NW  
WASHINGTON, DC 20007

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11/9/2019  
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**DESIGN CRITERIA:**

2012 EDITION OF THE INTERNATIONAL BUILDING CODE, WITH DC AMENDMENTS

**LOADS:**

THE FOLLOWING DESIGN LOADS HAVE BEEN USED, AS SPECIFIED IN THE INTERNATIONAL BUILDING CODE, 2012 EDITION (IBC-2012), CHAPTER 16, SECTIONS 1603.1.1 THROUGH 1603.1.9 AND THE DISTRICT OF COLUMBIA MUNICIPAL REGULATIONS (DCMR12a) CONSTRUCTION CODES SUPPLEMENT OF 2013. MORE STRINGENT VALUES HAVE BEEN USED PER PROJECTS LOCAL JURISDICTION SPECIFIC REQUIREMENTS WHERE APPLICABLE.

**DEAD LOADS:**

RAIL SELF WEIGHT: 3.92 LBS/FOOT  
SOLAR PANEL MODULES: 2.87 PSF

**LIVE LOAD (SECTION 1607):**

CONCENTRATED LOAD ON PORTION OF RAIL NOT SUPPORTING A PANEL: 300 LBS (TABLE 1607.1)

**SNOW LOADS (SECTION 1608 AND 2013 DCMR SUPPLEMENT)**

GROUND SNOW LOAD:  $P_g = 25.0$  PSF (ASCE 7-10 FIG. 7-1)

EXPOSURE FACTOR:  $C_e = 1.0$  (ASCE 7-10, TABLE 7-2, FULLY EXPOSED ROOF)

IMPORTANCE FACTOR:  $I = 1.0$  (ASCE 7-10, TABLE 1.5-2)

THERMAL FACTOR:  $C_t = 1.2$  (ASCE7-10, TABLE 7-3)

REQUIRED FLAT ROOF SNOW LOAD:  $(.7) \times (1.0) \times (1) \times (1.2) \times (25 \text{ PSF}) = 21 \text{ PSF}$

DUE TO LACK OF WALLS AT EDGES OF PANELS, ASSUME NO DRIFTING ON PANELS

WIND LOAD (SECTION 1609, ASCE 7-10 CHAPTER 30.8):

ULTIMATE WIND SPEED  $V_{ult} = 115$  MPH (3-SECOND GUST, FIGURE 1609A OR 1609B)

RISK CATEGORY II (IBC TABLE 1604.5, ASCE 7-10, TABLE 1.5-1)

EXPOSURE B (SECTION 1609.4)

VELOCITY PRESSURE = 21 PSF (ASCE 7-10 30.3.2)

MAX ROOF SLOPE = 15°

NET PRESSURE COEFFICIENT  $C_n$  (ASCE 7-10 FIG 30.8-1)

FOR ENTIRE RAIL ATTACHMENT  $C_n = +/- 1.9$  (AREA > 4.0a<sup>2</sup>)

FOR SINGLE PANEL ATTACHMENT  $C_n = +/- 2.9$  (AREA < 4.0a<sup>2</sup>)

FINAL STRENGTH-LEVEL WIND PRESSURES (ASCE 7-10 30.8-1)

FOR ENTIRE RAIL LOADING: 39.9 PSF

FOR SINGLE PANEL LOADING: 60.9 PSF

**MEANS AND METHODS:**

THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED ALUMINUM RAIL STRUCTURE. THEY DO NOT INDICATE THE METHOD OR SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND PROVIDE ALL MEASURES NECESSARY TO PROTECT THE EXISTING STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR THE PROCEDURE OF CONSTRUCTION, NOR FOR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERE TO (NO SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS). THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL SCAFFOLDING, BRACING AND SHORING.

**STRUCTURAL ALUMINUM:**

DESIGN, DETAILING, AND FABRICATION OF ALUMINUM MEMBERS SHALL BE IN STRICT ACCORDANCE WITH THE LATEST EDITION OF "ALUMINUM DESIGN MANUAL" OF THE ALUMINUM ASSOCIATION. ALUMINUM MATERIALS SHALL BE ALUMINUM ALLOYS REGISTERED WITH THE ALUMINUM ASSOCIATION, AND APPLICABLE ASTM SPECIFICATIONS.

HOLLOW EXTRUSIONS SHALL BE 6005-T5

SOLIDS SHALL BE 6063-T6

**MISCELLANEOUS STEEL**

MISCELLANEOUS STRUCTURAL STEEL SHALL CONFORM TO THE LATEST EDITION OF THE AISC "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS".

PLATES SHALL BE ASTM A36 AND HOT-DIPPED GALVANIZED.

BOLTS AND WASHERS SHALL BE 304 STAINLESS STEEL CLASS 2 (A2-70)

AND NUTS SHALL BE 316

**POST-INSTALL EPOXY SYSTEM**

THE EPOXY SYSTEM FOR ATTACHING TO CONCRETE AND CMU PARAPET WALLS SHALL BE HT-HY 200 OR OTHER EPOXIES WITH THE SAME OR GREATER CAPACITY.

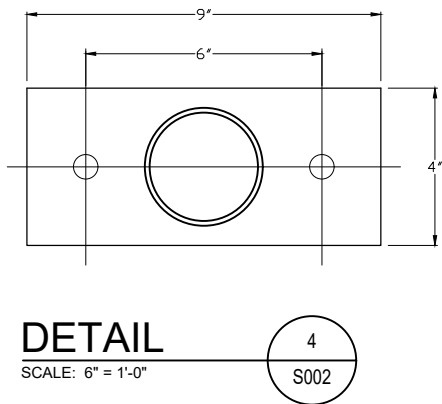
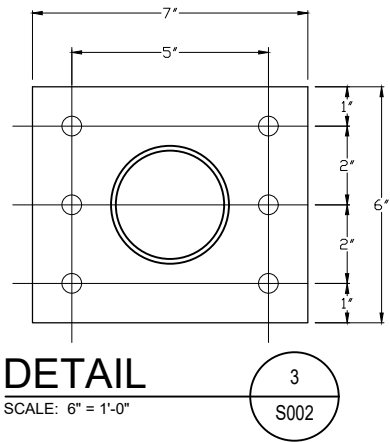
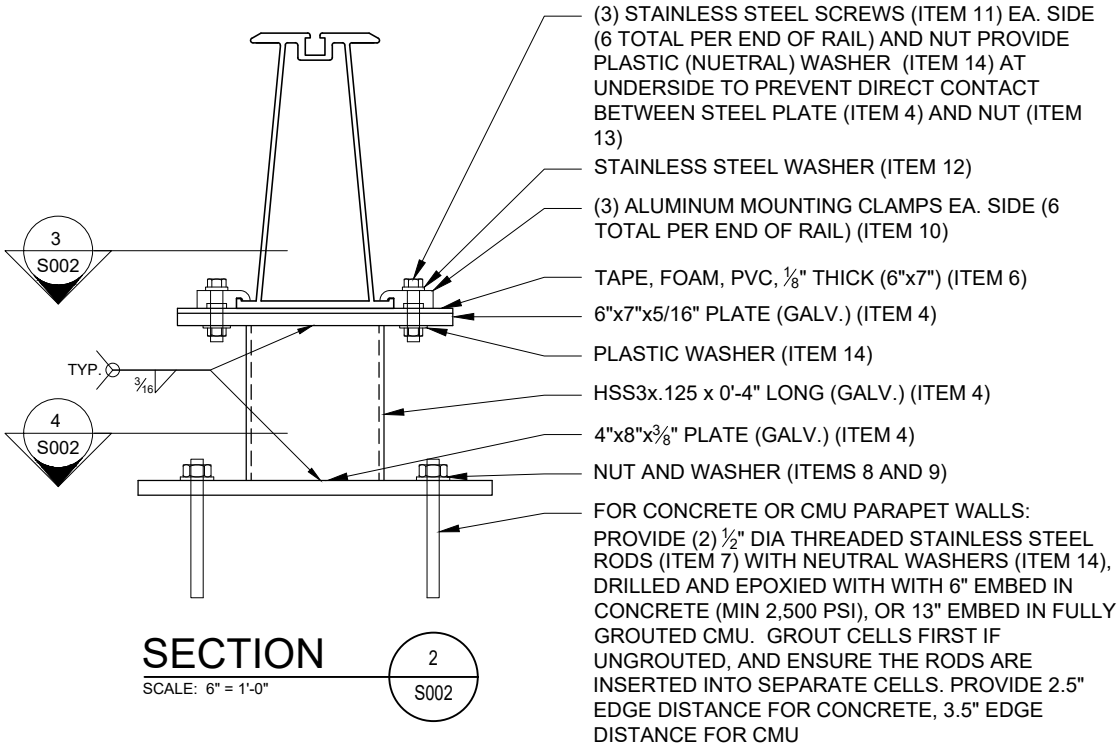
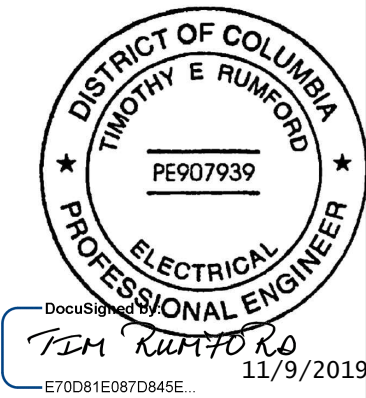
**BASE BUILDING DESIGN**

OWNER MUST VERIFY WITH PROFESSIONAL ENGINEER THAT ROOF STRUCTURE AND ITS COMPONENTS CAN SUPPORT AND TRANSFER POINT LOAD AT EACH CONNECTION LOCATION RESULTING FROM ADDITION OF SOLAR PANELS AND RACKING. SEE TABLE BELOW FOR REACTIONS AT END OF EACH RAIL. CONNECTION DESIGNS FOR CONCRETE AND CMU PARAPETS PROVIDED ON 2/S1.00. FOR OTHER MATERIALS, EOR TO DESIGN CUSTOM CONNECTION FROM PARAPET TO BASEPLATE.

TABLE 1 - MAX RAIL REACTIONS					
RAIL LENGTH (FT)	MAX UPLIFT		MAX COMPRESSION		PULL TEST FORCE PER ANCHOR (LBS)
	FACTORED (LBS)	SERVICE (LBS)	FACTORED (LBS)	SERVICE (LBS)	
≤26	1,480	880	3,380	2,200	660
≤24	1,360	810	3,110	2,030	610
≤22	1,240	730	2,840	1,850	540
≤20	1,120	660	2,570	1,670	500
≤18	1,000	600	2,300	1,500	450

TABLE 2 - RAIL CAPACITIES	
RAIL LENGTH (FT)	MAXIMUM # OF PANELS
25' - 27'	4
24' - 24.99'	5
21.5' - 23.99'	6
<21.5'	5

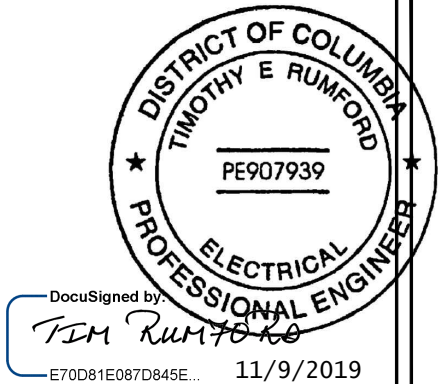
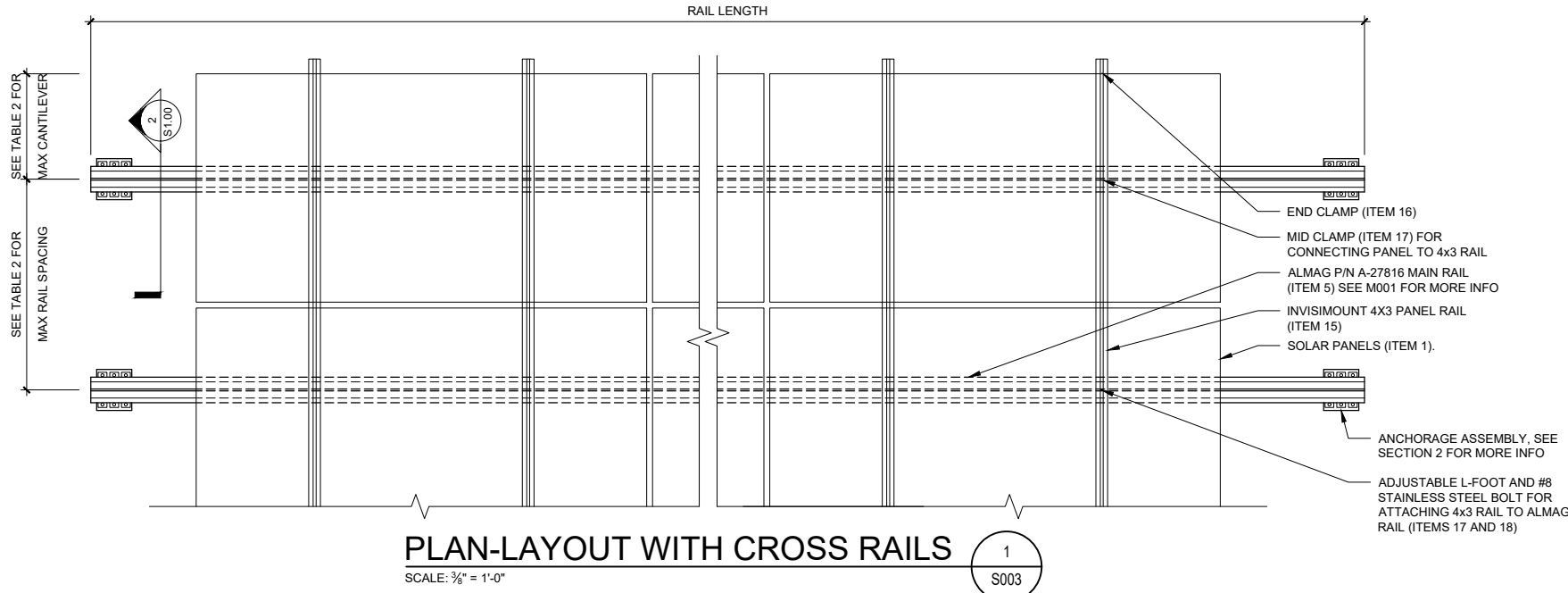
PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	VARIES	SOLAR PANEL MODULE
2	302025D	UNIRAC F-CLAMP FOR MODULES 45MM-47MM THICK.
3	302030D	UNIRAC MIDCLAMP PRO - DRK
4	EE0001-001	HOT-DIPPED GALVANIZED A36 STEEL STANDOFF ASSEMBLY (SEE 1/S1.00)
5	EE0002-001	ALMAG P/N A-27816 (SEE M001 FOR PROFILE)
6	973000-666	TAPE, FOAM, PVC, T=3/8" W=6", CUSTOM
7	TR12SS	1/2" ALL THREAD SS. SEE SECTION 2/S1.00 FOR LENGTH
8	12FWS	1/2" FLAT WASHER SS
9	12NS	1/2" NUTS STAINLESS STEEL
10	EE0003-001	MOUNTING CLAMP, LOCKING, 40 MM
11	943608-035	SCREW, HEX HEAD, M8x40 MM, DIN 933 304 SS
12	943921-010	WASHER, M10, DIN 125, 304 SS
13	943912-010	NUT, FLANGE, SERRATED, M10, DIN 6923 316 SS
14	EE0004-001	PLASTIC WASHER
15	522195	SUNPOWER INVISIMOUNT RAIL
16	519636	SUNPOWER INVISIMOUNT END CLAMP
17	506608	SUNPOWER INVISIMOUNT MID CLAMP



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PROJECT FILE	20007-01
REVISION LEVEL	DATE
TBD	07/17/19
DRAWN BY:	
GDC	
CHECKED BY:	
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SCALE	AS NOTED
DRAWING TITLE	PARAPET WALL MOUNT RACK- SINGLE ROW SUPPORT
DRAWING NUMBER	S002
SHEET	4 OF 11



**DESIGN CRITERIA:**  
2012 EDITION OF THE INTERNATIONAL BUILDING CODE, WITH DC AMENDMENTS

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SOLAR PANEL MODULES: 2.87 PSF

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EXPOSURE FACTOR:  $C_e = 1.0$  (ASCE 7-10, TABLE 7-2, FULLY EXPOSED ROOF)  
IMPORTANCE FACTOR:  $I = 1.0$  (ASCE 7-10, TABLE 1.5-2)  
THERMAL FACTOR:  $C_t = 1.2$  (ASCE 7-10, TABLE 7-3)  
REQUIRED FLAT ROOF SNOW LOAD:  $(7) \times (1.0) \times (1) \times (1.2) \times (25 \text{ PSF}) = 21 \text{ PSF}$   
DUE TO LACK OF WALLS AT EDGES OF PANELS, ASSUME NO DRIFTING ON PANELS

**WIND LOAD (SECTION 1609, ASCE 7-10 CHAPTER 30.8):**  
ULTIMATE WIND SPEED  $V_{ult} = 115$  MPH (3-SECOND GUST, FIGURE 1609A OR 1609B)  
RISK CATEGORY II (IBC TABLE 1604.5, ASCE 7-10, TABLE 1.5-1)  
EXPOSURE B (SECTION 1609.4)  
VELOCITY PRESSURE = 21 PSF (ASCE 7-10 30.3.2)  
MAX ROOF SLOPE = 15°  
NET PRESSURE COEFFICIENT  $C_n$  (ASCE 7-10 FIG 30.8-1)  
FOR ENTIRE RAIL ATTACHMENT  $C_n = +/- 1.9$  (AREA > 4.0 $\text{m}^2$ )  
FOR SINGLE PANEL ATTACHMENT  $C_n = +/- 2.9$  (AREA < 4.0 $\text{m}^2$ )  
FINAL STRENGTH-LEVEL WIND PRESSURES (ASCE 7-10 30.8-1)  
FOR ENTIRE RAIL LOADING: 39.9 PSF  
FOR SINGLE PANEL LOADING: 60.9 PSF

**MEANS AND METHODS:**  
THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED ALUMINUM RAIL STRUCTURE. THEY DO NOT INDICATE THE METHOD OR SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND PROVIDE ALL MEASURES NECESSARY TO PROTECT THE EXISTING STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR THE PROCEDURE OF CONSTRUCTION, NOR FOR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERE TO (NO SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS). THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL SCAFFOLDING, BRACING AND SHORING.

**STRUCTURAL ALUMINUM:**  
DESIGN, DETAILING, AND FABRICATION OF ALUMINUM MEMBERS SHALL BE IN STRICT ACCORDANCE WITH THE LATEST EDITION OF "ALUMINUM DESIGN MANUAL" OF THE ALUMINUM ASSOCIATION. ALUMINUM MATERIALS SHALL BE ALUMINUM ALLOYS REGISTERED WITH THE ALUMINUM ASSOCIATION, AND APPLICABLE ASTM SPECIFICATIONS.

HOLLOW EXTRUSIONS SHALL BE 6005-T5  
SOLIDS SHALL BE 6063-T6

**MISCELLANEOUS STEEL**  
MISCELLANEOUS STRUCTURAL STEEL SHALL CONFORM TO THE LATEST EDITION OF THE AISC "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS".

PLATES SHALL BE ASTM A36 AND HOT-DIPPED GALVANIZED.  
BOLTS AND WASHERS SHALL BE 304 STAINLESS STEEL CLASS 2 (A2-70)  
AND NUTS SHALL BE 316

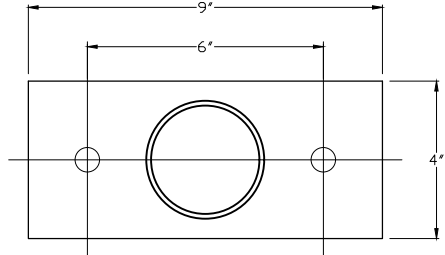
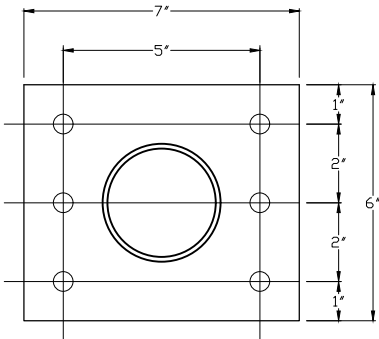
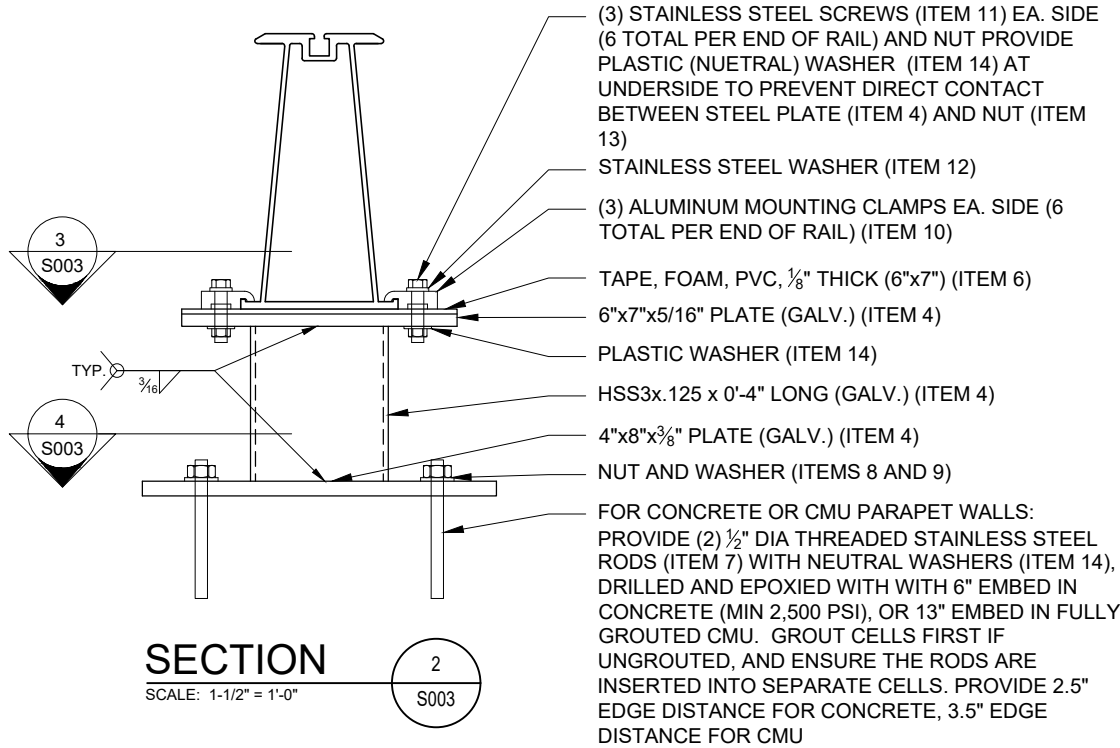
**POST-INSTALL EPOXY SYSTEM**  
THE EPOXY SYSTEM FOR ATTACHING TO CONCRETE AND CMU PARAPET WALLS SHALL BE HT-HY 200 OR OTHER EPOXIES WITH THE SAME OR GREATER CAPACITY.

**BASE BUILDING DESIGN**  
OWNER MUST VERIFY WITH PROFESSIONAL ENGINEER THAT ROOF STRUCTURE AND ITS COMPONENTS CAN SUPPORT AND TRANSFER POINT LOAD AT EACH CONNECTION LOCATION RESULTING FROM ADDITION OF SOLAR PANELS AND RACKING. SEE TABLE BELOW FOR REACTIONS AT END OF EACH RAIL. CONNECTION DESIGNS FOR CONCRETE AND CMU PARAPETS PROVIDED ON 2/S1.00. FOR OTHER MATERIALS, EOR TO DESIGN CUSTOM CONNECTION FROM PARAPET TO BASEPLATE.

TABLE 1 - MAX RAIL REACTIONS					
RAIL LENGTH (FT)	MAX UPLIFT		MAX COMPRESSION		PULL TEST FORCE PER ANCHOR (LBS)
	FACTORED (LBS)	SERVICE (LBS)	FACTORED (LBS)	SERVICE (LBS)	
≤26	1,480	880	3,380	2,200	660
≤24	1,360	810	3,110	2,030	610
≤22	1,240	730	2,840	1,850	540
≤20	1,120	660	2,570	1,670	500
≤18	1,000	600	2,300	1,500	450

TABLE 2 - RAIL CAPACITIES AND SPACING RESTRICTIONS		
RAIL LENGTH (FT)	MAXIMUM RAIL SPACING	MAXIMUM CANTILEVER OF SECONDARY RAIL
25' - 27'	36"	12"
24' - 24.99'	48"	15"
20.5' - 23.99'	60"	18"
<20.5'	72"	24"

PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	VARIABLES	SOLAR PANEL MODULE
2	302025D	UNIRAC F-CLAMP FOR MODULES 45MM-47MM THICK.
3	302030D	UNIRAC MIDCLAMP PRO - DRK
4	EE0001-001	HOT-DIPPED GALVANIZED A36 STEEL STANDOFF ASSMEBLY (SEE 1/S1.00)
5	EE0002-001	ALMAG P/N A-27816 (SEE M001 FOR PROFILE)
6	973000-666	TAPE, FOAM, PVC, T= $\frac{1}{8}"$ W=6", CUSTOM
7	TR12SS	$\frac{1}{2}"$ ALL THREAD SS. SEE SECTION 2/S1.00 FOR LENGTH
8	12FWS	$\frac{1}{2}"$ FLAT WASHER SS
9	12NS	$\frac{1}{2}"$ NUTS STAINLESS STEEL
10	EE0003-001	MOUNTING CLAMP, LOCKING, 40 MM
11	943608-035	SCREW, HEX HEAD, M8x40 MM, DIN 933 304 SS
12	943921-010	WASHER, M10, DIN 125, 304 SS
13	943912-010	NUT, FLANGE, SERRATED, M10, DIN 6923 316 SS
14	EE0004-001	PLASTIC WASHER
15	522195	SUNPOWER INVISIMOUNT RAIL
16	519636	SUNPOWER INVISIMOUNT END CLAMP
17	506608	SUNPOWER INVISIMOUNT MID CLAMP
17	KU14631	ECOFASTEN L-102-3, ANODIZED BLACK ALUMINUM ADJUSTABLE L-FOOT
18		#8 STAINLESS STEEL BOLT



**KEELER RESIDENCE**  
PV SOLAR INSTALLATION  
3014 CAMBRIDGE PL. NW  
WASHINGTON, DC 20007

PROJECT FILE	
20007-01	
REVISION LEVEL	DATE
TBD	07/17/19
DRAWN BY:	
GDC	
CHECKED BY:	
TR	
SCALE	AS NOTED
DRAWING TITLE	
PARAPET WALL MOUNT RACK- MULTIPLE ROW SUPPORT	
DRAWING NUMBER	
S003	
SHEET	5 OF 11



Project Name:	<b>Michael Keeler</b> <b>3014 Cambridge Pl NW, Washington, DC 20007</b>
Address:	
Description:	Near flat roof (approx 5 degrees), 28 SunPower X22 360-Watt AC Type-E panels. 22 Mounted with Almag parapet to parapet (see analysis on pages S002 and S003), 6 moudles mounted to a standing seam roof with S5! Clamps (this analysis)

Wind Speed (mph)	Snow load (psf)	Roof Height (ft)	Importance factor Cat	Wind Exposure	Roof Wind Zone
115	30	<30	II	B	1-3

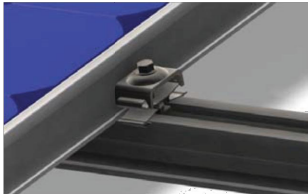
PROJECT FILE	
20007-01	
REVISION LEVEL	DATE
TBD	07/17/11
DRAWN BY:	
GDC	
CHECKED BY:	
TR	
SCALE	AS NOTED
DRAWING TITLE	
STRUCTURAL CALCULATIONS, DETAILS	
DRAWING NUMBER	
S003	
SHEET	6 OF 11



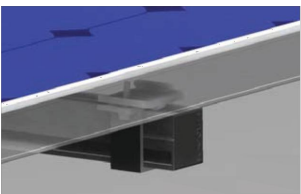
SunPower® InvisiMount™ | Residential Mounting System

InvisiMount Component Images

Module\* / Mid Clamp and Rail



Module\* / End Clamp and Rail



Mid Clamp



End Clamp



Rail & Rail Splice



Ground Lug Assembly



End Cap



InvisiMount Component Details		
Component	Material	Weight
Mid Clamp	Black oxide stainless steel AISI 304	63 g (2.2 oz)
End Clamp	Black anodized aluminum alloy 6063-T6	110 g (3.88 oz)
Rail	Black anodized aluminum alloy 6005-T6	830 g/m (9 oz/ft)
Rail Splice	Aluminum alloy 6005-T5	830 g/m (9 oz/ft)
Ground Lug Assembly	304 stainless (A2-70 bolt; tin-plated copper lug)	106.5 g/m (3.75 oz)
End Cap	Black acetal (POM) copolymer	10.4 g (0.37 oz)

Roof Attachment Hardware Supported by InvisiMount System Design Tool	
Application	<ul style="list-style-type: none"><li>• Composition Shingle Rafter Attachment</li><li>• Composition Shingle Roof Decking Attachment</li><li>• Curved and Flat Tile Roof Attachment</li><li>• Universal Interface for Other Roof Attachments</li></ul>

InvisiMount Operating Conditions	
Temperature	-40° C to 90° C (-40° F to 194° F)
Max. Load	2400 Pa uplift 5400 Pa downforce

InvisiMount Warranties And Certifications	
Warranties	25-year product warranty 5-year finish warranty
Certifications	UL 2703 Listed Class A fire rating when distance between roof surface and bottom of SunPower module frame is ≤ 3.5"

Roof Attachment Hardware Warranties	
Refer to roof attachment hardware manufacturer's documentation	

\*Module frame that is compatible with the InvisiMount system required for hardware interoperability.

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Document #509506 Rev B

SUNPOWER®

## Almag P/N A-27816 SPECIFICATION

CUSTOM RAIL DEVELOPED AS A MAIN SOLAR SUPPORT BEAM  
STO SPAN LARGE DISTANCES SUCH AS ACROSS PARAPET  
WALLS FOR RESIDENTIAL STRUCTURES AND FOR SPANNING  
ACROSS MAJOR BEAMS IN COMMERCIAL BUILDINGS

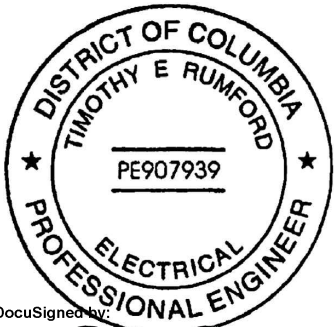
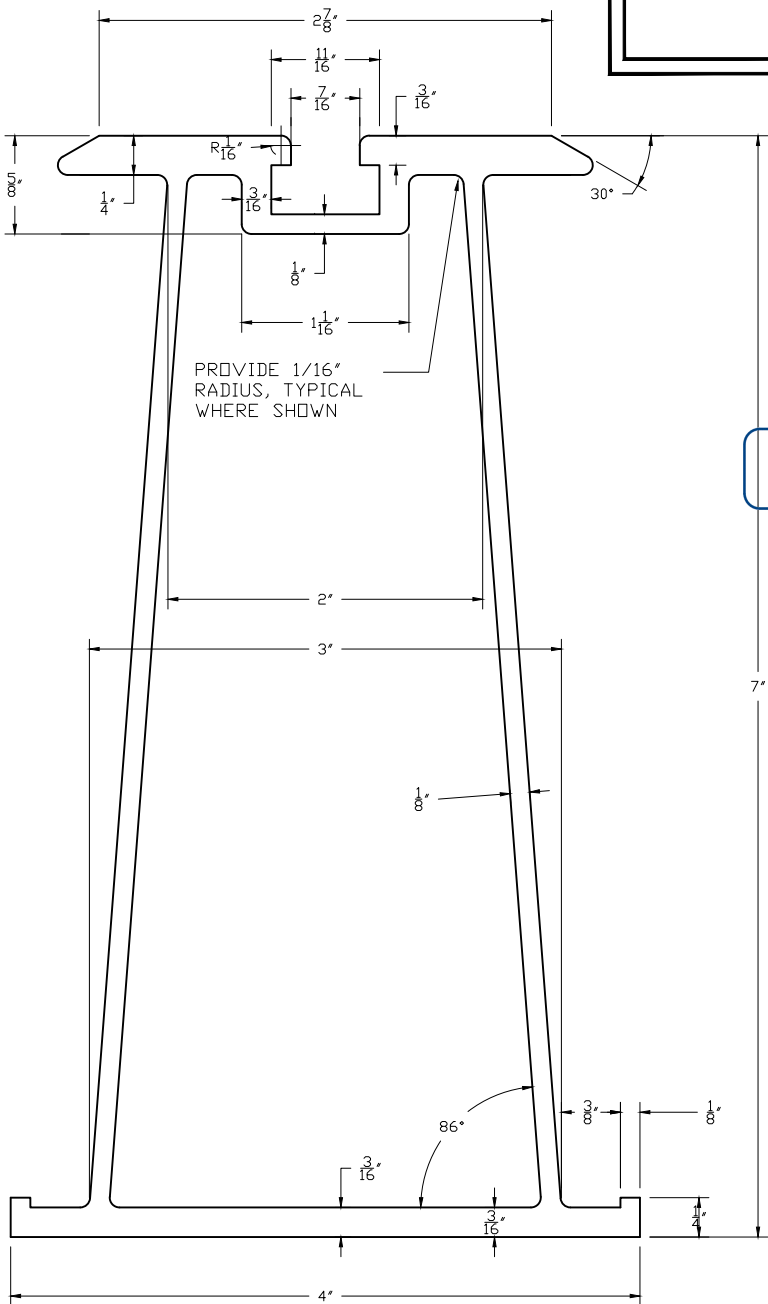
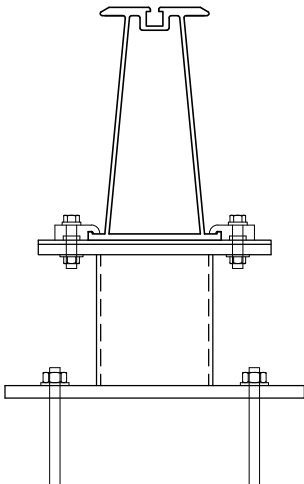
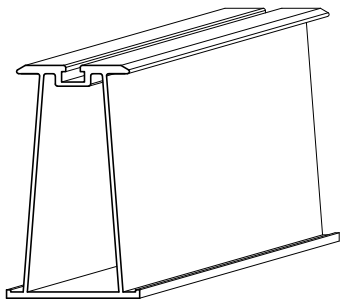
PHYSICAL CHARACTERISTICS:  
DIMENSIONS: 7" HIGH X 4" WIDE  
WEIGHT: 3.7 LBS/FT.

### STRUCTURAL CHARACTERISTICS:

$$\begin{aligned} S_{zz,comp.} &= 6.83 \text{ in}^3 \\ S_{zz,tens.} &= 7.22 \text{ in}^3 \\ I_{zz} &= 24.6 \text{ in}^4 \\ S_{yy} &= 2.08 \text{ in}^3 \\ I_{yy} &= 4.15 \text{ in}^4 \\ A &= 3.3 \text{ in}^2 \end{aligned}$$

MATERIAL:  
-EXTRUDED ALUMINUM, 6005-T5

SUPPORT SPAN CAPACITY:  
UP TO 26'-0", SEE TABLES



DocuSigned by:  
*TIM RUMFORD*  
11/9/2019  
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**Helios**  
SolarSystems

KEELER  
RESIDENCE  
PV SOLAR INSTALLATION  
3014 CAMBRIDGE PL. NW  
WASHINGTON, DC 20007

PROJECT FILE	20007-01
REVISION LEVEL	DATE
TBD	07/17/19
DRAWN BY:	GDC
CHECKED BY:	TR
SCALE	AS NOTED
DRAWING TITLE	HARDWARE MOUNTING DETAILS, SPEC
DRAWING NUMBER	M001
SHEET	90 OF 11



# S-5-PV Kit and EdgeGrab™

The S-5-PV Kit features a groundbreaking new stainless steel mounting disk with twelve nodes designed to ensure the module-to-module conductivity of anodized aluminum module frames. This means it automatically provides a ground path in the module frame. No lugs or wire required except to connect one string of modules to another and to ground the system. This connection detail represents installed electrical cost savings of \$6-\$12 per unit. In most cases, the savings in time and materials is sufficient to pay for the entire S-5-PV Kit and clamp setup.

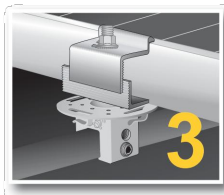
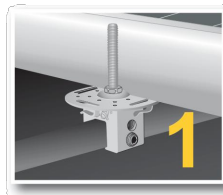


# S-5-PV Kit and EdgeGrab™

888-825-3432 | [www.S-5.com](http://www.S-5.com)



Listed to UL subject 2703.  
ETL Listed to UL 1703.\*



**S-5!® Warning! Please use this product responsibly!**

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Distributed by

**S-5-PV Kit**  
 L and ETL Listed)

Dimensions:

- 1.50" (38.00 mm)
- 0.87" (22.00 mm)
- 1.00" (25.00 mm)
- 0.71" (18.00 mm)
- 3.00" (76.00 mm)
- 2.67" (68.00 mm)
- 0.06" (1.50 mm)

Components:

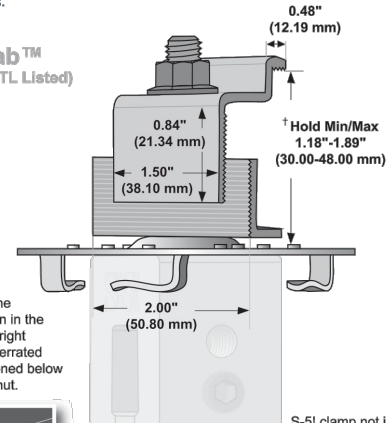
- Friction Reducing Coated Stainless Steel Universal PV Stud w/ M8 Integral Hex Nut
- Module Placement Bevel Guide
- Wire Zip Tie Slots
- Wire Management Hooks
- Mounting Disc

Base Note:  
 Dimensions of both the Universal PV Stud and Mounting Disk are

S-5! clamp not included.

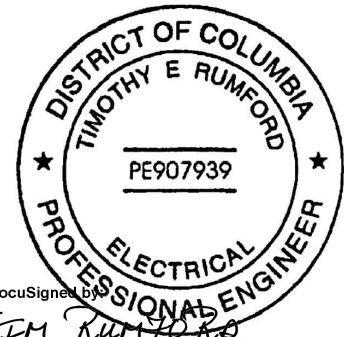
**Please Note:**  
Dimensions of both the  
Universal PV Stud and  
the Mounting Disk are  
identical between these  
two illustrations.

(Not UL or ETL Listed)



Please note: The assembly option in the diagram to the right illustrates the serrated L-flange positioned below the stud's hex nut.

*\* Patents pending. Certain components featured in illustration may not be UL listed.  
Due to the variety of attachment needs, S-5-PV Kits are sold separately from S-5! mini clamps. The S-5-PV Kit fits only S-5! mini clamps, NOT standard clamps.*



DocuSigned by

TIM KUMTORO

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11/9/2019

The logo for Helios Solar Systems features a stylized yellow sun icon with a spiral center, positioned above the word "Helios" in a large, bold, green sans-serif font. Below "Helios" is the word "SolarSystems" in a smaller, green sans-serif font, with "Solar" and "Systems" separated by a space.

KEELER  
RESIDENCE  
PV SOLAR INSTALLATION  
3014 CAMBRIDGE PL. NW  
WASHINGTON, DC 20007

PROJECT FILE

20007-01

REVISION LEVEL	DATE
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REV-1 DATE

DRAWN BY:

GDC

CHECKED BY:

TR

SCALE	AS NOTED
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DRAWING TITLE

## HARDWARE MOUNTING DETAILS, SPEC

DRAWING NUMBER

M002

SHEET 11 OF 11

Proposed Solar System, Home of Elizabeth & Michael Keeler

The house in the middle of the red circle, above, is the home of Michael & Elizabeth Keeler, 3014 Cambridge Pl. At left, with the red roof is 3016 Cambridge. At right is 3012 Cambridge.





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*Roof Pictures*



Keeler Home, 3014 Cambridge Place:  
View from front toward rear.



View from rear toward front.



View of 3016 Cambridge Pl. looking southwest.

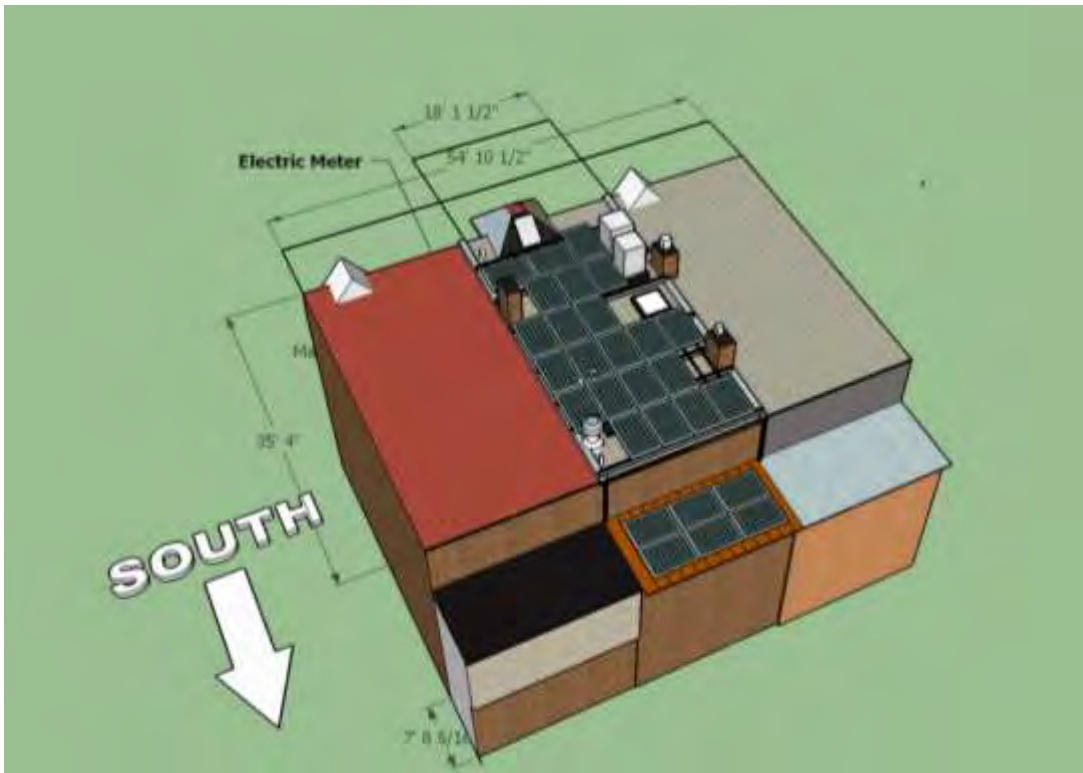


Another view toward 3016 taken  
from a few feet further to the front

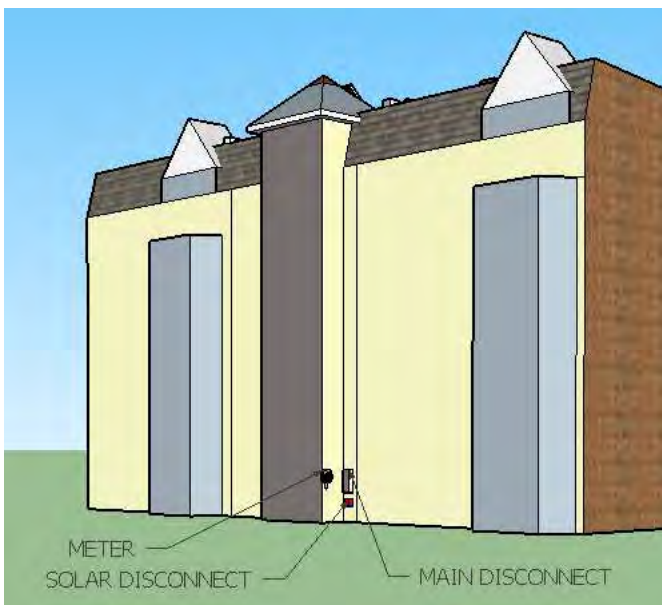


Two Views due east toward 3012 Cambridge Pl. Note condensing units in foreground are on roof of 3016. The metal finial atop the hipped slate roof is 3010 Cambridge.





Left to right, 3016, 3014 & 3012 Cambridge Pl. Image shows planned arrays on 3014. Measurements are for reference. Actuals are shown on construction drawings



Red Circle on drawing at right notes location of meter and disconnects behind steps to 3016 in photo





Current photo of the  
Keeler home street face  
showing planned location  
of solar system shutoff  
(in red)





Two views of last row  
of proposed array; at  
left, from above and,  
bottom, from below.



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*Before and after installation of the system*



At left, current view of Keeler home from alley. Above, rendering showing prospective rear edge of solar array on upper roof. Smaller, six panel array clamped to standing seam lower roof will not be visible from any angle in alley. (Note "false" downspout from upper gutter will hide conduit serving lower array)



## Photos of Street Face

Keeler home at center (home with red finial at top)















Photos from Alley







