

Applicant/Contractor: Rooftop Power, LLC, 275 W Natick Rd, Ste 800, Warwick, RI 02886

Owner: Tamera Bedford, 24 Barnes Street, Providence, RI 02906

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

- the installation of 27 solar panels, 12 to the east and 15 to the west of the gable end roof.

Issues: The following issues are relevant to this application:

- Some of the modifications as proposed will be (minimally) visible from the public rights-of-way;
- The modifications as proposed meets Minor Alterations: Solar Energy Systems Guidelines, Section 2, in the following manner: Panel layout shall be sympathetic or appropriate to design and scale of building. Rectangular configurations are preferred, with ample setback from edge of roof, dormers, chimneys, etc. (2.A); Panels shall be installed parallel to the existing roof slope and matched as closely as possible to the roof plane (2.B); Panels shall be installed without destroying or replacing original or historic materials or significantly compromising or altering the building's structural integrity (2.C); Panels shall be compatible in color to existing roofing insofar as possible (2.D); Installation of panels shall be as inconspicuous as possible when viewed from public right-of-way (2.E); Installation shall be reversible. Panels shall be removed when no longer viable or functioning and roofing restored to pre-existing conditions (2.F); and,
- Plans, specifications and pictures have been submitted.

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

- a) 12 Gibbon Court is a structure of historical and architectural significance that contributes to the significance of the Armory local historic district having been recognized as a contributing structure to the Broadway/Armory National Register Historic District;
- b) The modifications as proposed meets Minor Alterations: Solar Energy Systems Guidelines, Section 2, and the application is considered complete; and,
- c) The work as proposed is in accord with PHDC Standards 8 & 9 as follows: 8) the work will be done so that it does not destroy the historic character of the property or the district as they are not on the primary elevation and will be minimally-to-not visible from the public rights-of-way; and, 9) Whenever possible... alterations to structures shall be done in such a manner that if removed in the future, the essential form and integrity of the structure and the site will be unimpaired.

Staff recommends a motion be made stating that: The application is considered complete. 12 Gibbon Court is a structure of historical and architectural significance that contributes to the significance of the Armory local historic district having been recognized as a contributing structure to the Broadway/Armory National Register Historic District. The Commission grants Final Approval of the proposal as submitted as the proposed alteration is appropriate having determined that the proposed alteration does not destroy the historic character of the property or the district and are historically and architecturally compatible with the property and district as the proposed alteration meets Minor Alterations: Solar Energy Systems Guidelines, Section 2, is reversible and will not have an adverse effect on the property or district as they are not on the primary elevation and will be minimally visible from the public rights-of-way (Standards 8 & 9), and the recommendations in the staff report, with staff to review any additional required details.

Aurora Shade Report

Customer
Benjamin Tyler

Designer
Dana Goodman

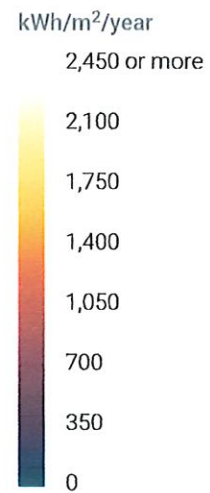
Organization
NEC Solar

Address
12 Gibbon Court
Providence, RI

Coordinates
(41.813785, -71.435433)

Date
27 September 2022

Annual irradiance



Summary

Array	Panel Count	Azimuth (deg.)	Pitch (deg.)	Annual TOF (%)	Annual Solar Access (%)	Annual TSRF (%)
1	10	80	34	76	86	65
2	20	260	34	83	83	69
Weighted average by panel count	-	-	-	-	83.8	67.5

Monthly solar access (%) across arrays

Array	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	70	73	82	91	92	93	93	92	86	74	73	71
2	65	71	79	89	90	91	90	89	84	72	66	57

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NEC Solar

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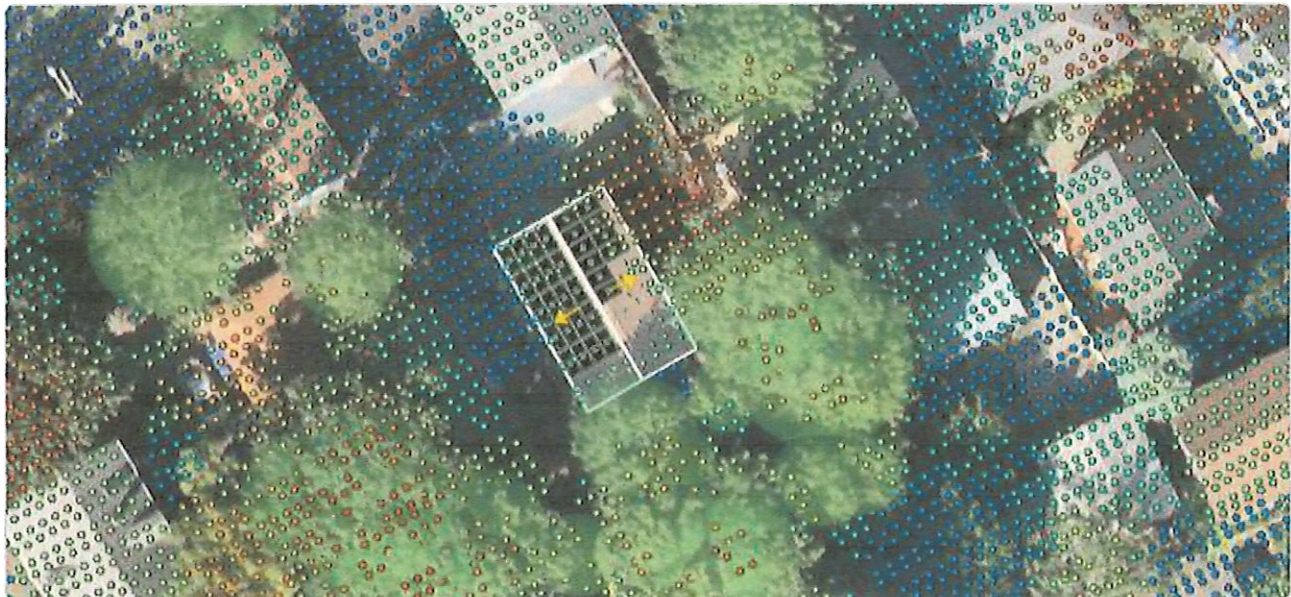
Zoomed out satellite view



3D model



3D model with LIDAR overlay  41 ft



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Benjamin Tyler

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Dana Goodman

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12 Gibbon Court
Providence, RI

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(41.813785, -71.435433)

Date
27 September 2022

Street view and corresponding 3D model



I, **Dana Goodman**, certify that I have generated this shading report to the best of my abilities, and I believe its contents to be accurate.

PHOTOVOLTAIC ROOF MOUNT SYSTEM

27 MODULES-ROOF MOUNTED - 10.94 KW DC, 7.83 KW AC, 12 GIBBON CT, PROVIDENCE, RI 02909

PHOTOVOLTAIC SYSTEM SPECIFICATIONS:

SYSTEM SIZE: 10.94 KW DC
7.83 KW AC
MODULE TYPE & AMOUNT: (27) REC405AA PURE BLACK
MODULE DIMENSIONS: (LxWxH) 71.77x40.11x2
INVERTERS: (27) ENPHASE IQ8P LUS-72-24US (240V)
INTERCONNECTION METHOD: LINE SIDE TAP

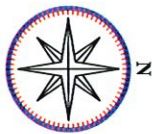
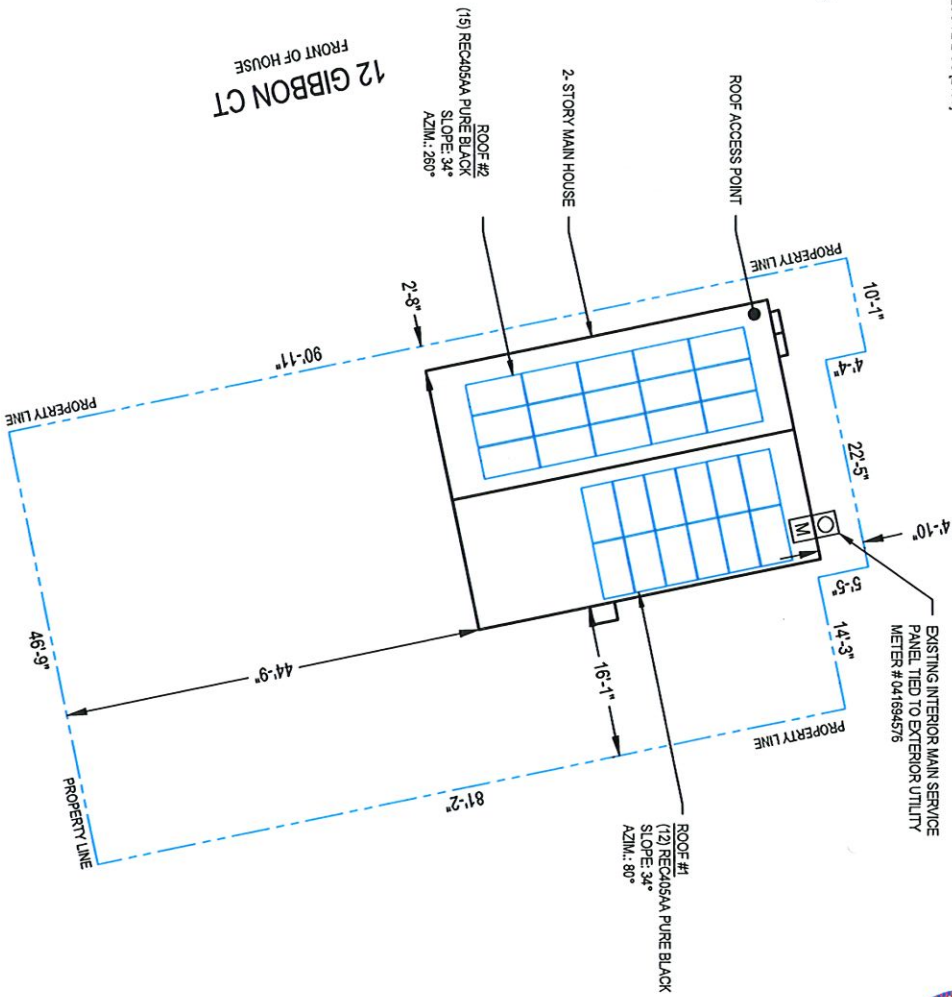
GOVERNING CODES

- ADOPTED CONSTRUCTION CODES
- 2018 INTERNATIONAL BUILDING CODE, IBC
 - 2018 INTERNATIONAL RESIDENTIAL CODE, IRC
 - 2020 NATIONAL ELECTRIC CODE

GENERAL NOTES:

- INSTALLATION OF SOLAR PHOTOVOLTAIC SYSTEM SHALL BE IN ACCORDANCE WITH NEC ARTICLE 690, AND ALL OTHER APPLICABLE NEC CODES WHERE NOTED OR EXISTING.
- PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL COMPLY WITH NEC ARTICLE 110.
- ALL CONDUCTORS, INCLUDING THE GROUNDING ELECTRODE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE IN ACCORDANCE WITH NEC ARTICLE 250.
- THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE. THIS SYSTEM IS UTILITY INTERACTIVE PER UL 1741 AND DOES NOT INCLUDE STORAGE BATTERIES OR OTHER ALTERNATIVE STORAGE SOURCES. ALL DC WIRES SHALL BE SIZED ACCORDING TO INEC 890.81
- DC CONDUCTORS SHALL BE WITHIN PROTECTED RACEWAYS IN ACCORDANCE WITH INEC 890.31
- ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL JURISDICTIONAL BUILDING CODE.
- PV MODULES TO BE RATED UL 1703 CLASS C FIRE RATING OR BETTER.
- ALL EQUIPMENT TO BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY.

1 PLOT PLAN
SCALE: 5/8" = 1'-0"



SHEET INDEX:

PV 00	COVER SHEET
PV 10	SITE PLAN
E 1.1	JOINT DETAILS & ROOF SECTION
E 1.2	3-LINE DIAGRAM
E 1.3	NOTES
DS*	WARNING LABELS
DS*	EQUIPMENT SPEC SHEET

ROOF ACCESS POINT

ROOF ACCESS POINT SHALL NOT BE LOCATED IN AREAS THAT REQUIRE THE PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS WINDOWS OR DOORS, AND LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES OR SIGNS.



2 SATELLITE VIEW

SCALE: NTS



3 VICINITY MAP

SCALE: NTS

		127 BRONCKHORN RD. BRISTOL, RI 02809 PH: 401-846-6592 #813-AC656 #844-420803							
Project Name & Address BENJAMIN TYLER RESIDENCE 12 GIBBON CT, PROVIDENCE, RI 02909 APN NO.: PROV36L295		REVISIONS <table border="1"> <tr> <th>Description</th> <th>Date</th> <th>Rev</th> </tr> <tr> <td>Revision</td> <td>2/26/2023</td> <td>01</td> </tr> </table>		Description	Date	Rev	Revision	2/26/2023	01
Description	Date	Rev							
Revision	2/26/2023	01							
Sheet Name COVER SHEET		Signature with Seal							
Sheet Size ANSI B 11" X 17"		Drawn By PremiumCAD							
Sheet Number PV 0.0									

PHOTOVOLTAIC SYSTEM SPECIFICATIONS:

SYSTEM SIZE: 10.94 kWDC
 7.83 kW AC
 MODULE TYPE & AMOUNT: (27) REC405AA PURE BLACK
 MODULE DIMENSIONS: (LxW) 71.7"X47.12"
 INVERTER: (27) ENPHASE IQBPPLUS-72-2US (240V)

VISIBLE, LOCKABLE, LABELED DISCONNECT WITHIN 10' OF UTILITY METER

BILL OF MATERIALS

NUMBER OF MODULES	27	REC405AA PURE BLACK
NUMBER OF MICROINVERTER	27	ENPHASE IQBPPLUS-72-2US (240V)
COMBINER PANEL	1	1234 ENPHASE IQ COMBINER & X1C1AM1-240-4, 240V
AC DISCONNECT	1	80A FUSIBLE AC DISCONNECT, 50A FUSES, 240V
NUMBER OF ATTACHMENTS	104	SNAPRACK COMPOSITION L-FOOT KIT
RAILS	20	SNAPRACK ULTRA RAIL 40 RACKING-188" SECTION
RAIL SPLICE	16	SPLICE KIT
MID CLAMPS	44	MID CLAMPS /JIFO
END CLAMPS	20	END CLAMPS / STOPPER SLEEVE
GROUNDING LUG	5	GROUNDING LUG

1 SITE PLAN
 SCALE: 3/16" = 1'-0"



EXISTING INTERIOR MAIN SERVICE PANEL & POINT OF INTERCONNECTION, TIED TO EXTERIOR UTILITY METER #041894576
 NEW PV AC DISCONNECT GROUPED WITH SERVICE EQUIPMENT (VISIBLE, LOCKABLE, LABELED)
 NEW AC COMBINER PANEL



SYSTEM LEGEND

- M** EXISTING INTERIOR MAIN SERVICE PANEL & POINT OF INTERCONNECTION, TIED TO EXTERIOR UTILITY METER #041894576
- AC** NEW VISIBLE, LOCKABLE LABELED DISCONNECTS LOCATED WITHIN 10' FROM THE UTILITY METER
- C** NEW DEDICATED PV SYSTEM COMBINER PANEL
- FIRE PATHWAY
- ATTACHMENT POINTS
- RAFTER
- PACKING SYSTEM
- CONDUIT RUN
- +** JUNCTION BOX

ROOF SECTIONS

- ROOF #01** MODULE - 12
 SLOPE - 34°
 AZMUTH - 86°
 MATERIAL - COMP. SHINGLE
 RAFTER SIZE & SPACING - 2"x6" @ 32" O.C.
- ROOF #02** MODULE - 15
 SLOPE - 34°
 AZMUTH - 286°
 MATERIAL - COMP. SHINGLE
 RAFTER SIZE & SPACING - 2"x6" @ 32" O.C.

CIRCUIT(S)

- CIRCUIT #1 - 09 MODULES**
- CIRCUIT #2 - 09 MODULES**
- CIRCUIT #3 - 09 MODULES**

MODULE ARRAY WEIGHT (LOAD CALC'S)

Number of Modules	27
Module Weight	45 LBS
Total Module (Array) Weight	1215.00 LBS
Number of Attachment point	104
Mounting System Weight	1.5 LBS
Total System Weight	156.00 LBS
Weight at Each Attachment Point	11.68 LBS
Module Area (71.7x47)	19.92 Sqft
Total Array Area	537.75 Sqft
Distributed Load	2.33 Per Sqft
Total Roof Area	1040 Sqft
Total Percentage of Roof Covered	51.71%



NEC SOLAR
 121 BROADCOMMON RD,
 BRISTOL, RI 02809,
 PH# (401) 644-5592
 # RI AC2555
 # MA AC2003

REVISIONS

Revision	Date	Rev
202003	01	

Signature with Seal

Project Name & Address

BENJAMIN TYLER RESIDENCE
 12 GIBBON CT,
 PROVIDENCE, RI 02909
 APN NO.: PROV361295

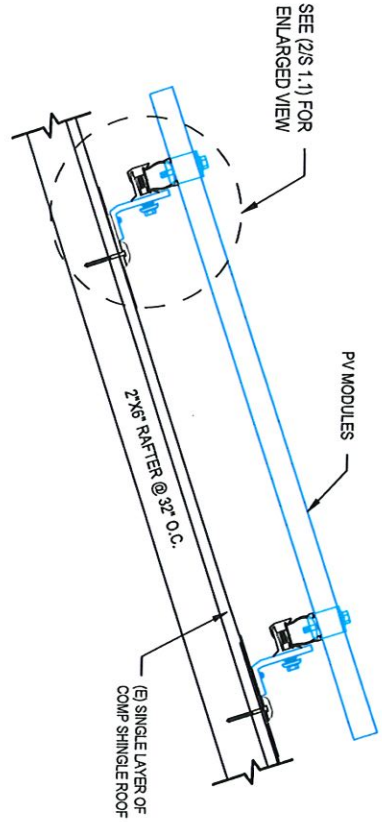
Sheet Name
SITE PLAN
 Sheet Size
ANSI B 11" X 17"
 Sheet Number
PV 1.0
 Drawn By
PremiumCAD

GENERAL STRUCTURAL NOTES:

1. THE SOLAR PANELS ARE TO BE MOUNTED TO THE ROOF FRAMING USING THE SNAPRACK RACKING SYSTEM WITH SNAPRACK ULTRA-ROOT ASSEMBLY. THE MOUNTING FEET ARE TO BE SPACED AS SHOWN IN THE DETAILS, AND MUST BE STAGGERED TO ADJACENT FRAMING MEMBERS TO SPREAD OUT THE ADDITIONAL LOAD.
2. UNLESS NOTED OTHERWISE, MOUNTING ANCHORS SHALL BE 5/16" LAG SCREWS WITH A MINIMUM OF 2-1/2" PENETRATION INTO ROOF-FRAMING.
3. THE PROPOSED PV SYSTEM ADDS 2.6 PSF TO THE ROOF-FRAMING SYSTEM.
4. ROOF LIVE LOAD = 20 PSF TYPICAL, 0 PSF UNDER NEW PV SYSTEM.
5. GROUND SNOW LOAD = 35 PSF
6. WIND SPEED = 133 MPH
7. EXPOSURE CATEGORY = B
8. RISK CATEGORY = II

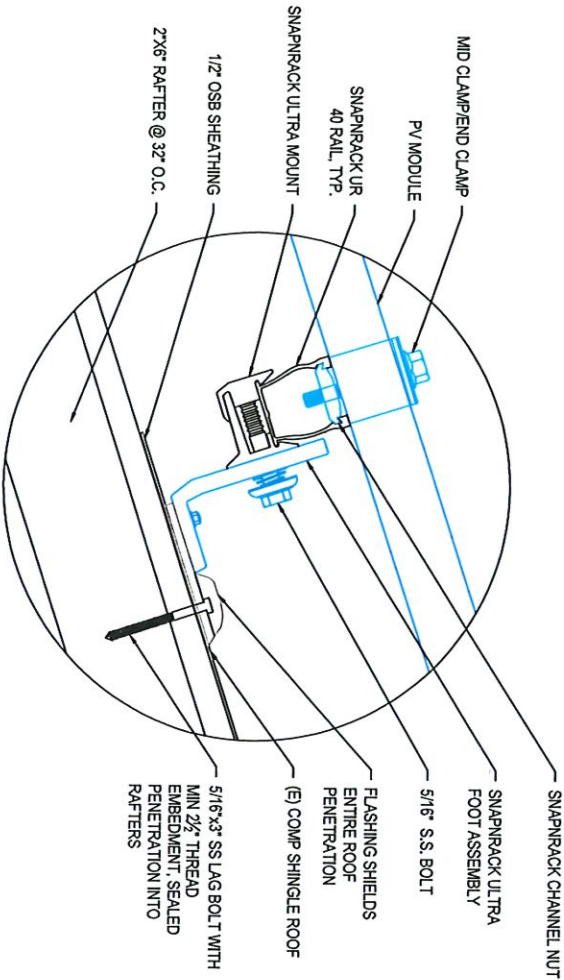
1 ATTACHMENT DETAIL (SIDE VIEW)

SCALE: NTS



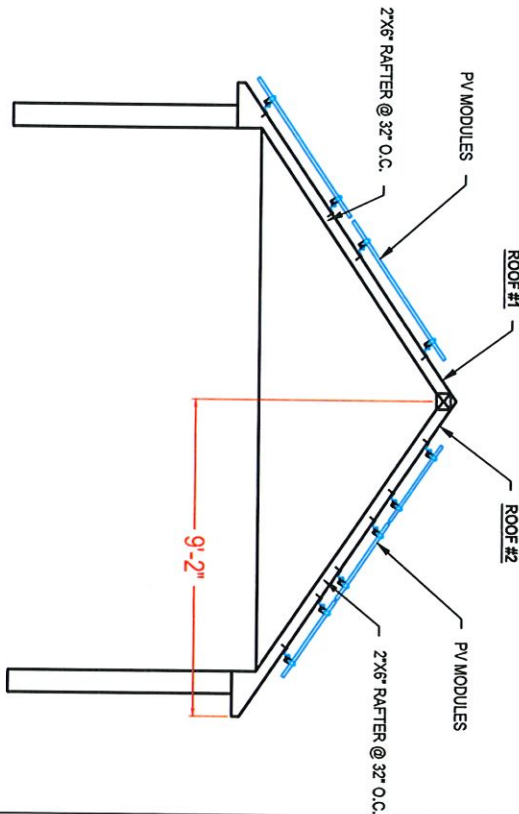
2 ATTACHMENT DETAIL (ENLARGED VIEW)

SCALE: NTS



3 ROOF SECTION #1 & 2

SCALE: NTS



NEC SOLAR
121 BROADCOMMON RD.
BRISTOL, RI 02809
PH: (401) 644-5932
RI AC655
MA A20803

REVISIONS	
Description	Date
Revision	202003 01

Signature with Seal

Project Name & Address

BENJAMIN TYLER RESIDENCE
12 GIBBON CT,
PROVIDENCE, RI 02909
APN NO.: PROV36L295

Sheet Name
**MOUNT DETAILS
& ROOF SECTION**

Sheet Size
**ANSI B
11" X 17"**

Sheet Number
S 1.1

Drawn By
PremiumCAD



SOLAR'S MOST TRUSTED



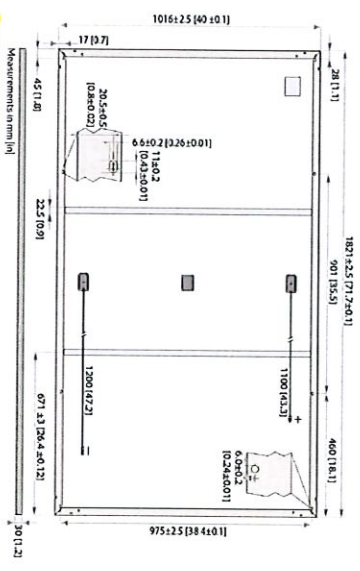
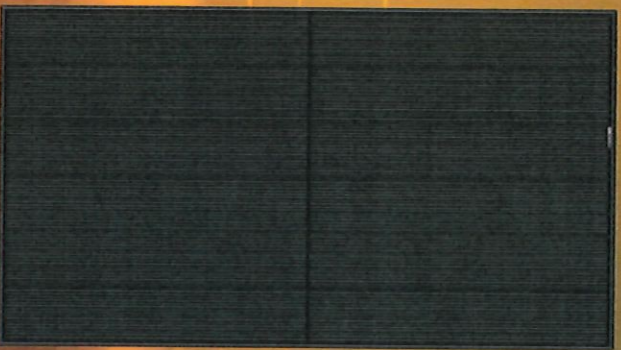
SOLAR'S MOST TRUSTED

PRODUCT SPECIFICATIONS



REC ALPHA[®] PURE
BLACK SERIES
PRODUCT SPECIFICATIONS

400 WP
20.3 W/FT²



GENERAL DATA

Cell type	120 half-cut REC heterojunction cells with lead-free, glassless technology	Connectors	Shabbli MC4P+MC4F (K5T4 12AWG (4mm) in accordance with IEC 62852 IP68) only when connected
Glass	0.13 in (3.2 mm) solar glass with anti-reflection surface treatment	Cable	12AWG (4mm) PV wire, 43-47 in (1.1-1.2m) eco-conductance (EcoCon)
Backsheet	Highly resistant polymer (black)	Dimensions	717 x 40 x 1.2 in (B21 x 1016 x 30 mm)
Frame	Anodized aluminum (black)	Weight	45 lbs (20.5 kg)
Junction box	3-part, bypass diode, IP67 rated in accordance with IEC 62790	Origin	Made in Singapore

ELECTRICAL DATA

	Product Code: RECxxxxAA Pure Black					
Power Output - P _{max} (Wp)	385	390	395	400	405	405
Watt Class Sorting - (W)	0/-5	0/-5	0/-5	0/-5	0/-5	0/-5
Nominal Power Voltage - V _{oc} (V)	41.2	41.5	41.8	42.1	42.4	42.4
Nominal Power Current - I _{sc} (A)	9.35	9.40	9.45	9.51	9.56	9.56
Open Circuit Voltage - V _{oc} (V)	48.5	48.6	48.7	48.8	48.9	48.9
Short Circuit Current - I _{sc} (A)	9.99	10.03	10.07	10.10	10.14	10.14
Power Density (W/ft ²)	19.3	19.6	19.8	20.1	20.3	20.3
Panel Efficiency (%)	20.8	21.1	21.3	21.6	21.9	21.9
Power Output - P _{max} (Wp)	293	297	301	305	309	309
Nominal Power Voltage - V _{oc} (V)	38.8	39.1	39.4	39.7	40.0	40.0
Nominal Power Current - I _{sc} (A)	7.55	7.59	7.63	7.68	7.72	7.72
Open Circuit Voltage - V _{oc} (V)	45.7	45.8	45.9	46.0	46.1	46.1
Short Circuit Current - I _{sc} (A)	8.07	8.10	8.13	8.16	8.19	8.19

Values at standard test conditions (STC: Irradiance 1000 W/m², Temperature 25°C, Air Mass 1.5). In accordance with IEC 61215. Maximum power point voltage (V_{mp}), Maximum power point current (I_{mp}), Maximum power point efficiency (η_{mp}), and Maximum power point power (P_{mp}) are also available upon request. All values are based on production samples. Values are rounded to the nearest integer. Values in bold indicate the nominal power class (P_{max}) at STC. Values in italics indicate the nominal power class (P_{max}) at STC. Values in red indicate the nominal power class (P_{max}) at STC.



Typical low irradiance performance of module at STC.

LOW LIGHT BEHAVIOUR

TEMPERATURE RATINGS

Nominal Module Operating Temperature	44°C (122°F)
Temperature coefficient of P _{max}	-0.26 %/°C
Temperature coefficient of V _{oc}	-0.24 %/°C
Temperature coefficient of I _{sc}	0.04 %/°C

The temperature coefficients stated are linear values.

MAXIMUM RATINGS

Operational temperature	-40 ... +135°F (-40 ... +55°C)
Maximum system voltage	1000V
Maximum system current	+7000A (146 lbs/ft ²)
Maximum test load (front)	-4000 Pa (83.5 lbs/ft ²)
Max series fuse rating	25 A
Max reverse current	25 A

*See installation manual for mounting instructions. Design load - 1st load / 1.5 (safety factor)

WARRANTY

Installed by	Standard	REC Product
Professional	All	Yes
System Size	<25 kW	25-500 kW
Product Warranty (yr)	20	25
Power Warranty (yr)	25	25
Labour Warranty (yr)	0	25
Power in Year ¹	96%	96%
Annual Degradation	0.25%	0.25%
Power in Year ²⁵	92%	92%

¹See warranty documents for details. Conditions apply.

CERTIFICATIONS

IEC 61215:2016, IEC 61730:2016, UL 61730 (Pending), ISO 14001:2015, ISO 9001:2015, OHSAS 18001:2007, IEC 62941



Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation and a low carbon footprint in the solar materials and solar manufacturing sectors. REC is headquartered in Singapore, with regional offices in Europe, and Asia-Pacific.

