

Structural Capacity, PC

STRUCTURAL CONSULTING GROUP

North Carolina Firm License Number – C3406

November 14, 2019

Ms. Heather Ueltschi
LuminaSun Smart Home, LLC
344 Rolling Hill Road
Mooresville, NC 28117

Re: Underhill, George (SCPC Project No. – 2019.08.2630)
295 Anderson Creek School Road
Bunnlevel, NC 28323

Dear Ms. Ueltschi:

At the request of LuminaSun Smart Home, LLC, Structural Capacity, PC (SCPC) made a site visit to evaluate the solar panel installation on November 06, 2019 at the above noted site. SCPC provided a structural letter, dated October 28, 2019, "SCPC Letter" detailing installation requirements to meet loading requirements in accordance to the 2018 North Carolina Residential Code.

Based on our observations, the installation meets the structural intent of the SCPC Letter. The roof structure at the above noted site is adequate to support the solar panels in accordance with 2018 North Carolina Residential Code.

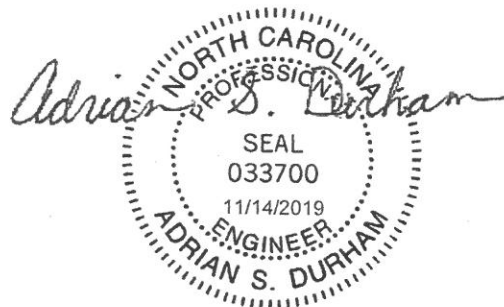
If there are any questions, feel free to contact me directly.

Sincerely,

Structural Capacity, PC



Adrian S. Durham, PE, SE, LEED AP



Structural Capacity, PC

STRUCTURAL CONSULTING GROUP

North Carolina Firm License Number – C3406

October 28, 2019

Ms. Melissa Darge
LuminaSun Smart Home, LLC
344 Rolling Hill Road
 Mooresville, NC 28117

Re: Underhill, George (SCPC Project No. – 2019.08.2340)
295 Anderson Creek School Road
Bunnlevel, NC 28323

Dear Ms. Darge:

At the request LuminaSun Smart Home, LLC Structural Capacity, PC (SCPC) has evaluated the roof structure at the above noted site to determine its adequacy to support the attachment of roof mounted solar arrays (3.5psf max). The residence is a pre-engineered manufactured home that has been designed for minimum Zone 1 wind loads and 20psf roof loads per HUD.

Each panel will be supported by (2) mounting rails, (1) at each end. The mounting legs of the solar panel railing will be attached directly to the trusses with a 5/16 inch (min) diameter lag screw. The installer shall use best practice construction methods to locate the lag screw in the center of each truss. All wood members supporting PV modules should consist of sound lumber without significant signs of deterioration.

The mounting legs of the solar panel racking system shall be located at 4'-0" o.c. maximum. The mounting legs should be staggered at the primary framing member spacing at adjacent solar panel rails. The maximum rail cantilever span should be limited to 1'-0".

The existing roof structure at the above referenced site is adequate to support the solar panel loadings, as noted above, per the 2018 North Carolina Residential Code, if installed in accordance with the above stated conditions. The adequacy of the solar racking system and attachments to the roof structure are outside the scope of this letter and to be provided by solar panel and racking manufacturer, if required.

The roof conditions stated above should be field verified, by the installer, prior to construction. If any conditions are found in conflict with those stated above, SCPC should

be made aware immediately for re-evaluation and report amendment, as applicable, before proceeding with solar panel installation.

Sincerely,

Structural Capacity, PC

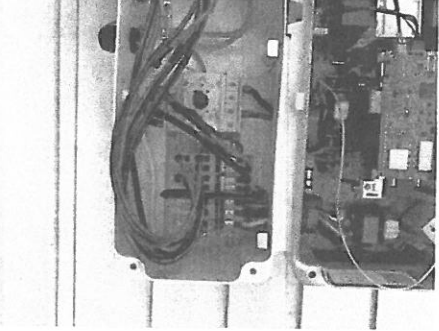
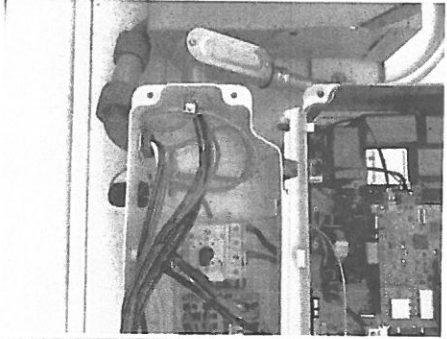
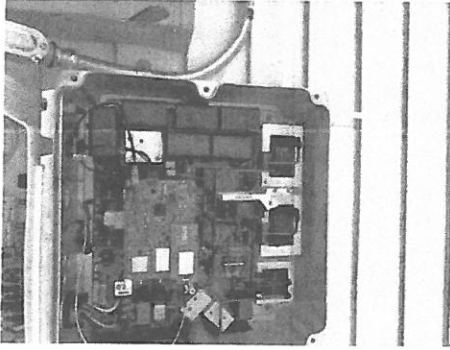
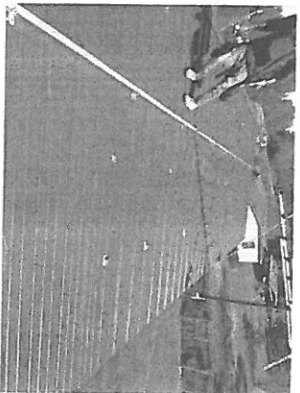
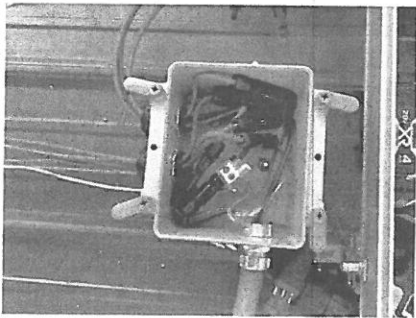
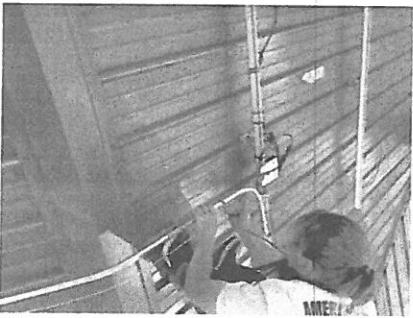
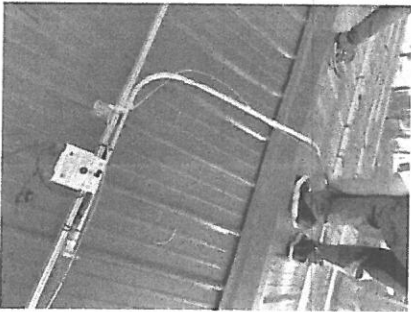
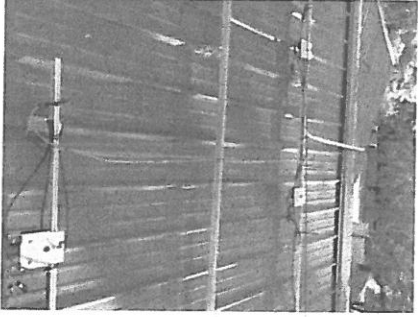
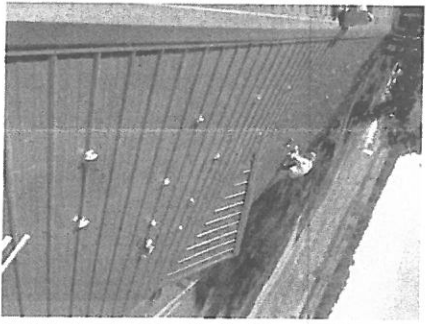
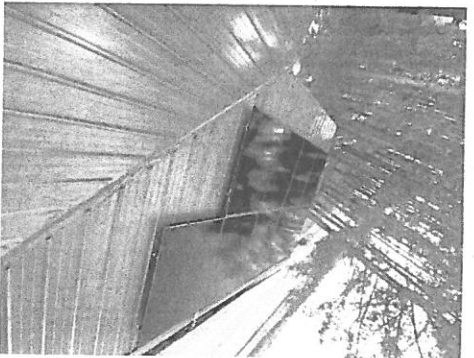
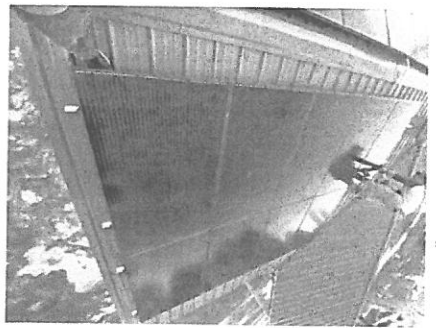
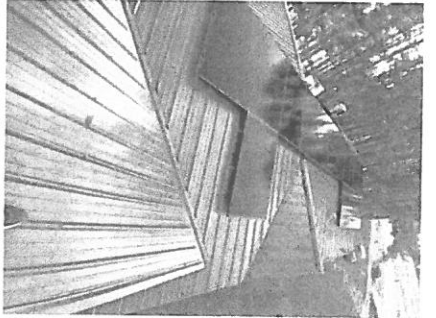
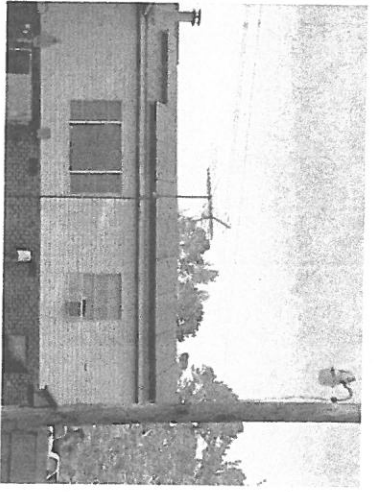
Adrian S. Durham

Adrian S. Durham, PE, SE, LEED AP

Adrian S. Durham

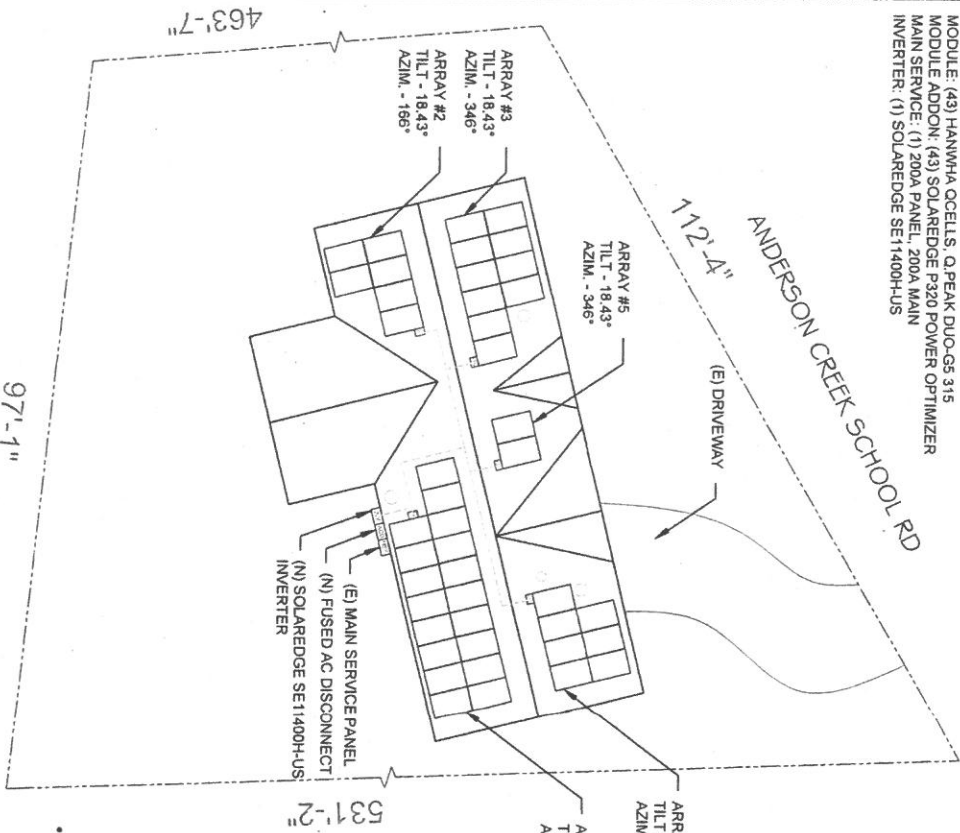


George Underhill
295 Anderson Creek School
Rd
Bunnlevel, NC 28323
(910) 514-2052



PROJECT DESCRIPTION:

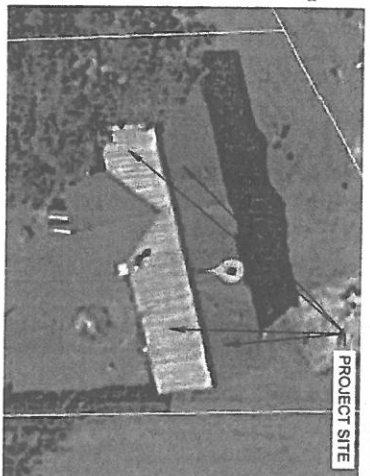
ONE STORY
 2 X 4 TRUSS @ 24" OC ONE LAYER METAL
 MODULE: (43) HANWHA OCELLS, Q-PEAK DUO-GS 315
 MODULE ADDON: (43) SOLAREEDGE P320 POWER OPTIMIZER
 MAIN SERVICE: (1) 200A PANEL, 200A MAIN
 INVERTER: (1) SOLAREEDGE SE11400H-US



1 PLOT PLAN WITH ROOF PLAN

SCALE: 1/16" = 1'-0"

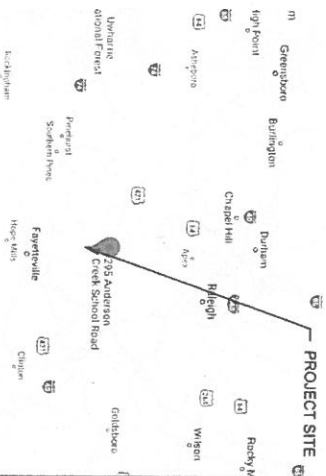
- SOLAR ELECTRIC SYSTEM NOTES:**
- ALL MATERIALS, EQUIPMENT INSTALLATION AND WORK SHALL COMPLY WITH THE FOLLOWING APPLICABLE CODES:
 - 2018 NORTH CAROLINA BUILDING CODE (2018 NCBC)
 - 2018 NORTH CAROLINA RESIDENTIAL CODE (2018 NCRC)
 - 2018 NORTH CAROLINA ELECTRICAL CODE (2018 NCEC)
 - 2018 NORTH CAROLINA FIRE CODE (2018 NCFC)
 - AND AHJ AMENDMENTS
 - EXISTING PLUMBING VENTS, SKYLIGHTS, EXHAUST OUTLETS, VENTILATION'S INTAKE AIR OPENINGS SHALL NOT BE COVERED BY THE SOLAR PHOTOVOLTAIC SYSTEM.
 - ALL EQUIPMENT SHALL BE LISTED AND LABELED BY A RECOGNIZED ELECTRICAL TESTING LABORATORY AND INSTALLED PER THE LISTING REQUIREMENTS AND THE MANUFACTURER'S INSTRUCTIONS. [NEC 890.4(D)]
 - ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED, INCLUDING ALL ROOF MOUNTED TRANSITION BOXES AND SWITCHES.
 - PAINT PV CONDUIT TO MATCH THE DWELLING EXTERIOR.
 - CONTACT THE SERVING UTILITY BEFORE POWERING ON THE PHOTOVOLTAIC SYSTEM



2 HOUSE PHOTO

PV-1

SCALE: NTS



3 VICINITY MAP

PV-1

SCALE: NTS

- SHEET INDEX**
- PV-1 PLOT PLAN & VICINITY MAP
 - PV-2 ROOF PLAN & MODULES
 - PV-3 ATTACHMENT DETAIL
 - PV-4 ELECTRICAL LINE DIAGRAM
 - PV-5 SIGNAGE
 - PV-6 to 11 EQUIPMENT SPECIFICATIONS



REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

DATE: 10/23/2019
 PROJECT NAME & ADDRESS

GEORGE T UNDERHILL II RESIDENCE
 295 ANDERSON CREEK SCHOOL RD
 BUNNLEVEL, NC 28323

DC SIZE: 13,545KW
 AC SIZE: 11,40KW

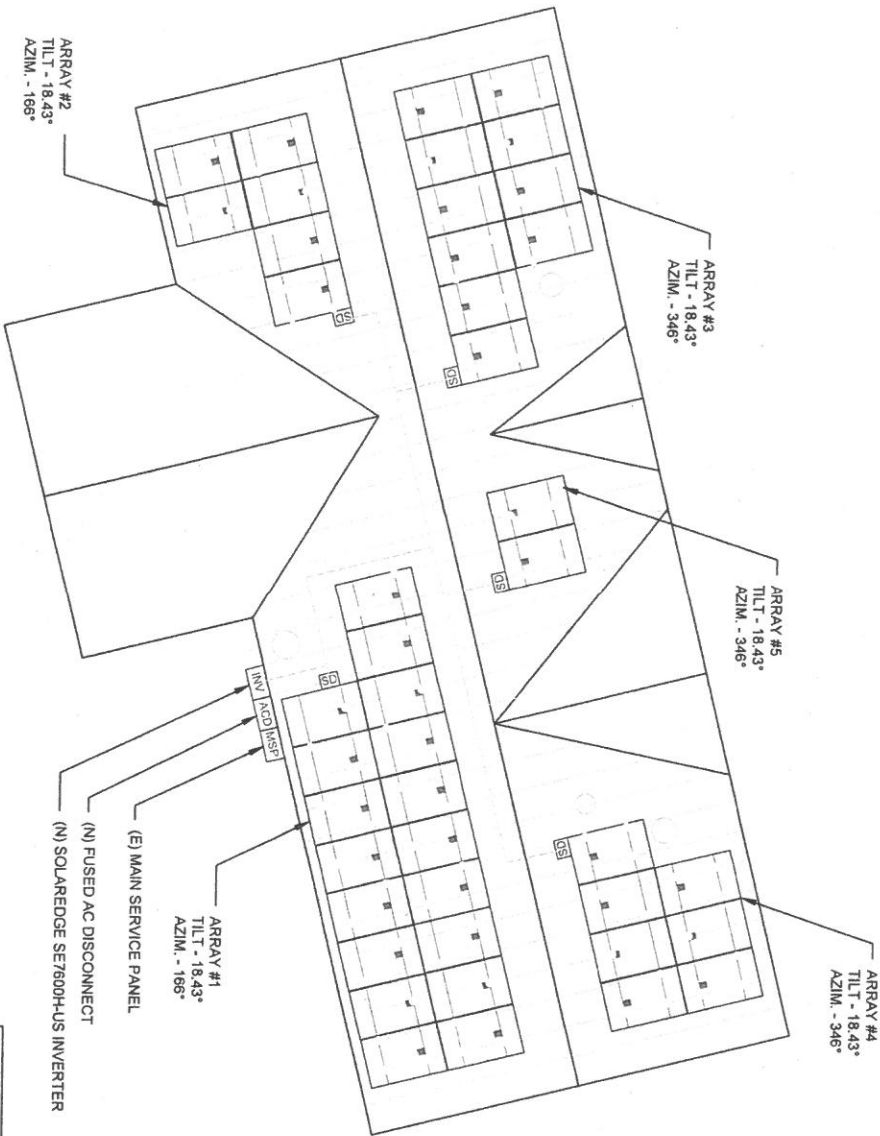
SHEET NAME
PLOT PLAN & VICINITY MAP

SHEET SIZE
**ANSI B
 11" X 17"**

SHEET NUMBER
PV-1

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 43 MODULES
 MODULE TYPE = HANWHA OCELLS, Q, PEAK DUO-GS 315
 MODULE WEIGHT = 41.23 LBS / 18.7 KG.
 MODULE DIMENSIONS = 66.34" X 39.37" = 18.14 SF
 UNIT WEIGHT OF ARRAY = 2.27 PSF

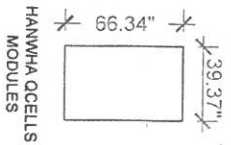


1 ROOF PLAN & MODULES

PV-2 SCALE: 1/8"=1'-0"

ROOF DESCRIPTION			
ROOF TYPE	CORRUGATED METAL	TRUSS SIZE	TRUSS SPACING
#1, 2	18.43°	166°	2X4
#3, 4	18.43°	346°	2X4
#5	18.43°	346°	2X4

ARRAY AREA & ROOF AREA CALC'S			
ROOF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)	ROOF AREA (Sq. Ft.)
#1	18	326.58	856.50
#2	6	108.84	856.50
#3	10	181.40	523.79
#4	7	126.98	308.96
#5	2	36.28	523.79



- LEGEND**
- SD - SOLA DECK
 - INV - INVERTER
 - ACD - AC DISCONNECT
 - MSP - MAIN SERVICE PANEL
 - V - VENT, ATTIC FAN (ROOF OBSTRUCTION)
 - R - ROOF ATTACHMENT
 - RA - RAFTERS
 - C - CONDUIT

LuminaSun

REVISIONS	DESCRIPTION	DATE	REV

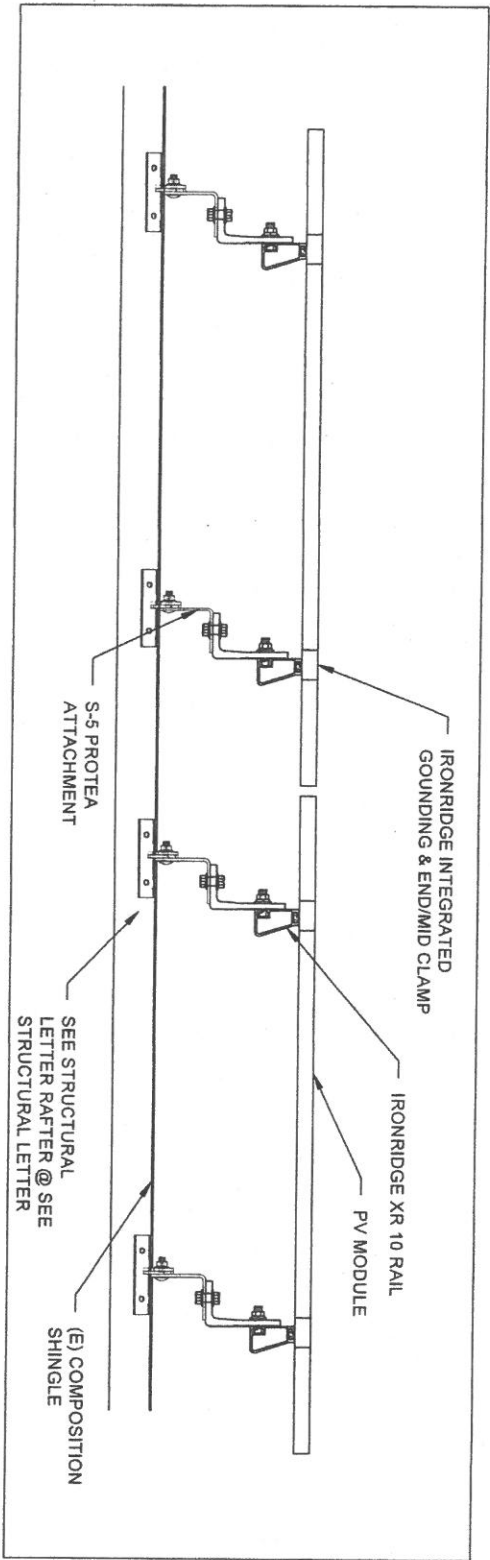
Signature with Seal

GEORGE T UNDERHILL II RESIDENCE
 295 ANDERSON CREEK SCHOOL RD BUNNLEVEL, NC 28323

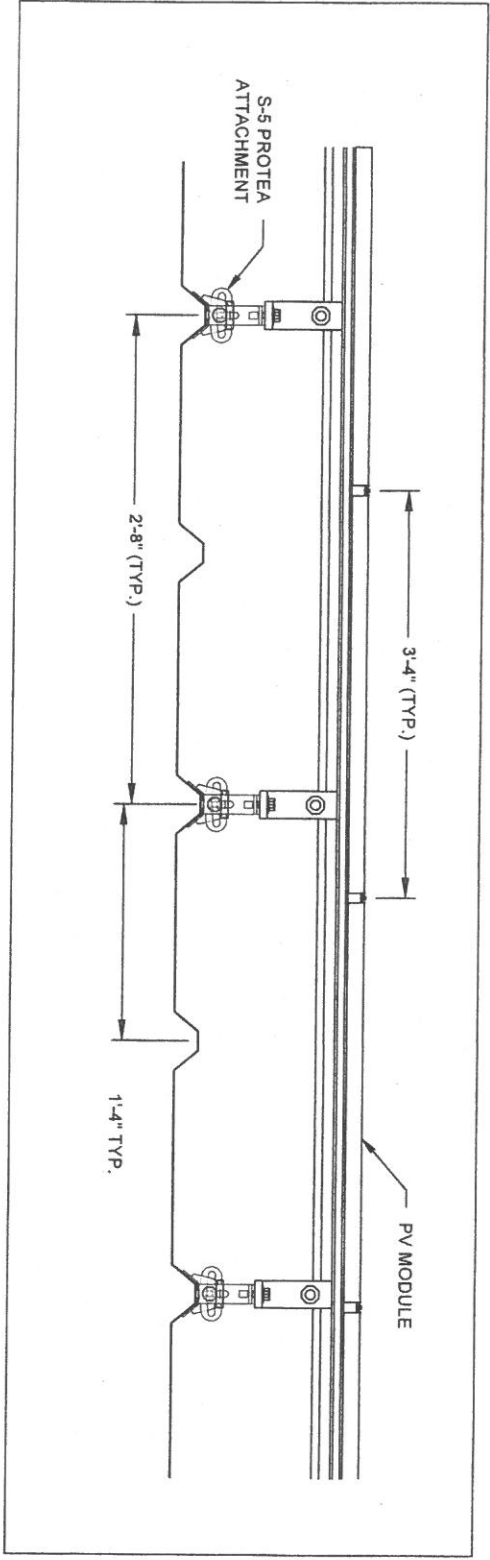
DATE: 10/23/2019
 PROJECT NAME & ADDRESS: GEORGE T UNDERHILL II RESIDENCE

DC SIZE: 13,545KW
 AC SIZE: 11,400W

SHEET NAME: ROOF PLAN & MODULES
 SHEET SIZE: ANSI B 11" X 17"
 SHEET NUMBER: PV-2



1 STRUCTURAL ATTACHMENT (SIDE VIEW)
 PV-3 SCALE: 1" = 1'-0"



2 ATTACHMENT DETAIL (enlarged view)
 PV-3 SCALE: 1" = 1'-0"



REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

DATE: 10/23/2019
 PROJECT NAME & ADDRESS

GEORGE T UNDERHILL II
 RESIDENCE
 295 ANDERSON CREEK SCHOOL
 RD BUNNLEVEL, NC 28323

DC SIZE: 13.545KW
 AC SIZE: 11.40KW

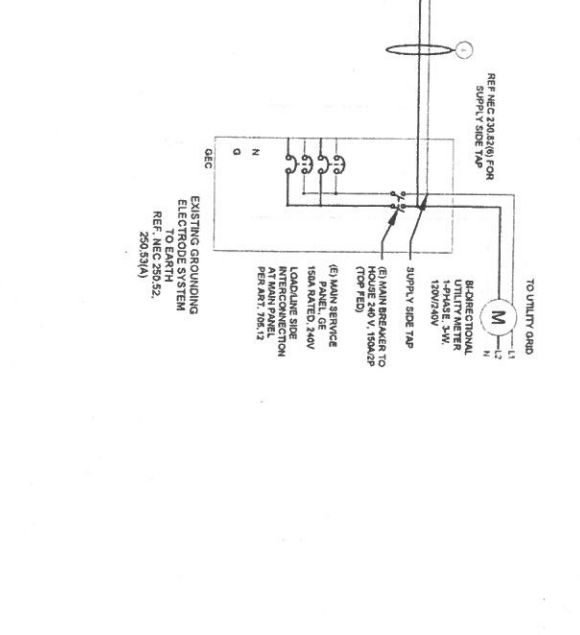
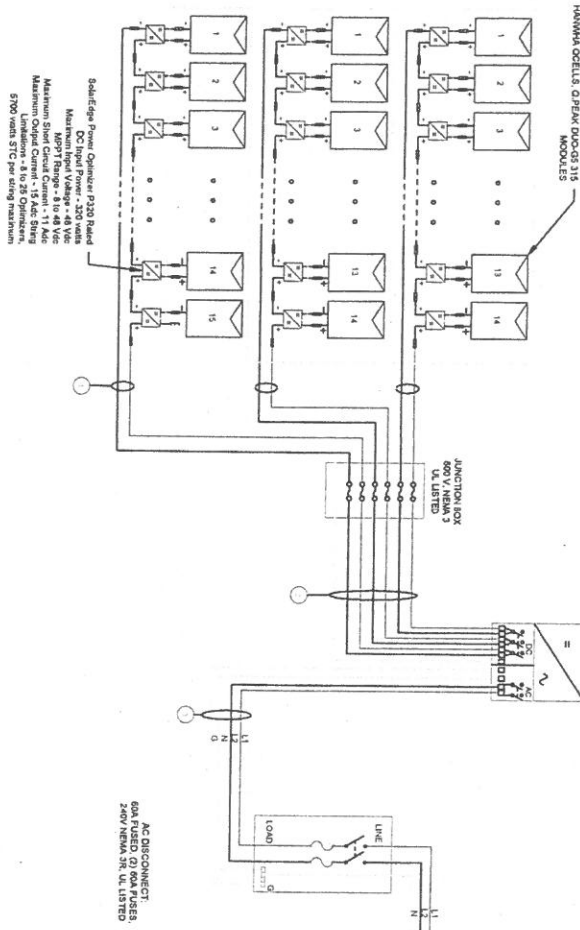
SHEET NAME
 ATTACHMENT
 DETAIL

SHEET SIZE
 ANSI B
 11" X 17"

SHEET NUMBER
 PV-3

WIRE CHART							
#	MAX AMPS NEC MULT = DESIGN AMPS	BREAKER SIZE (A)	WIRE TYPE	EGC	WIRE RATING X TEMP DERATE X CONDUCTOR DEBATE = DERATED WIRE	TERMINATION AMPS @ 60°C	CONDUIT SIZE
1	12 x 1.25 = 15	15	(6) #10 PV WIRE	(1) #10 BARE SOLID COPPER EGC	40 X 0.65 X 0.8 = 20.8 >= 15	30 >= 15	FREE AIR
2	12 x 1.25 = 15	15	(4) #10 THWN-2	(1) #10 THWN-2 EGC	40 X 0.65 X 0.8 = 20.8 >= 15	30 >= 15	0.75" EMT FILL: 0.1477, 28%
3	29.2 x 1.25 = 36.5	40	(3) #8 THWN-2	(1) #10 THWN-2 EGC	55 X 0.87 X 1 = 47.85 >= 36.5	40 >= 36.5	0.75" EMT FILL: 0.1309, 25%
4	29.2 x 1.25 = 36.5	40	(3) #6 THWN-2	(1) #10 THWN-2 EGC	75 X 0.87 X 1 = 65.25 >= 36.5	55 >= 36.5	0.75" EMT FILL: 0.1732, 32%

ELECTRICAL EQUIPMENT LIST			
#	ITEM	DESCRIPTION	QTY
1	PV MODULE	Hanwha Q.PEAK Duo G5-315 (315W) Voc = 46.9V, Vmp = 37.8V Isc = 9.14A, Imp = 8.74A	43
2	INVERTER	SOLAREEDGE SE11400H-US 99% CEC EFFICIENCY NOMINAL OUTPUT VOLTAGE 240vac MAX OUTPUT CURRENT 48.5Aac MAX INPUT CURRENT 30.5Aac	1
3	JUNCTION BOX	6" x 6" x 4" UL LISTED, STEEL WATER TIGHT NEMA TYPE 3	5
4	AC DISCONNECT	EATON 60A, 2P BLADE TYPE 240V WITH 40A FUSE	1
5	MAIN SERVICE PANEL	(E) MAIN SERVICE PANEL & METER: 200A MAIN BUSBAR W/(E) 200A MAIN BREAKER	1
6	PV METER	PV UTILITY METER KWH METER FORM 25 100A/240V MILBANK CAT#U5929-XL OR EQUIV	1
7	POWER OPTIMIZER	SolarEdge P320 POWER OPTIMIZER INPUT POWER: 320WATTS MAX INPUT VOLTAGE: 48Vdc MPP RANGE: 8 TO 48Vdc MAX INPUT CURRENT: 13.75adc MAX OUTPUT CURRENT: 13.75adc STRING	43



1
ELECTRICAL LINE DIAGRAM
SCALE: NTS
PV-4



REVISIONS	
DESCRIPTION	DATE

Signature with Seal

DATE: 10/23/2019
PROJECT NAME & ADDRESS
GEORGE T UNDERHILL II RESIDENCE
295 ANDERSON CREEK SCHOOL RD BUNNLEVEL, NC 28323

DC SIZE: 13,545KW
AC SIZE: 11,40KW
SHEET NAME
ELECTRICAL LINE DIAGRAM
SHEET SIZE
ANSI B
11" X 17"
SHEET NUMBER
PV-4

Powered by
QUANTUM DUO

Q.PEAK DUO-G5 315-B

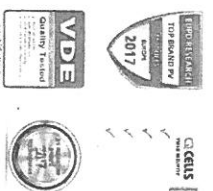
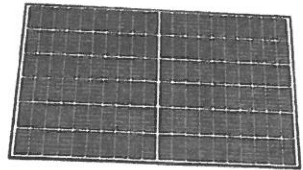
Q.ANTUM SOLAR MODULE

The new Q.PEAK DUO-G5 solar module from Q CELLS impresses thanks to innovative Q.ANTUM DUO Technology, which enables particularly high performance on a small surface. Q.ANTUM's world-record-holding cell concept has now been combined with state-of-the-art circuitry half cells and a six-busbar design, thus achieving outstanding performance under real conditions – both with low-intensity solar radiation as well as on hot, clear summer days.

- Q.ANTUM TECHNOLOGY:** LOW LEVELLED COST OF ELECTRICITY
Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 19.9%.
- INNOVATIVE ALL-WEATHER TECHNOLOGY**
Optimal yields, whatever the weather with excellent low-light and temperature behaviour.
- ENDURING HIGH PERFORMANCE**
Long-term yield security with Anti LID Technology, Anti PID Technology*, Hot-Spot Protect and Traceable Quality Tra.Q™.
- EXTREME WEATHER RATING**
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).
- A RELIABLE INVESTMENT**
Inclusive 12-year product warranty and 25-year linear performance warranty*.
- STATE OF THE ART MODULE TECHNOLOGY**
Q.ANTUM DUO combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology.

THE IDEAL SOLUTION FOR:
 Residential buildings
 Commercial / Industrial buildings

Engineered in Germany

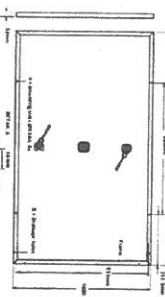


*AFT test conditions according to IEC TS 62804-1:2015, method B (-1500 V, 168 h) (see data sheet on rear for further information).

Q CELLS

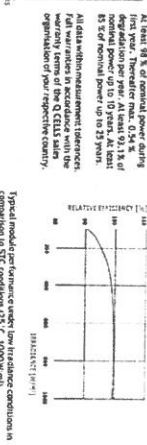
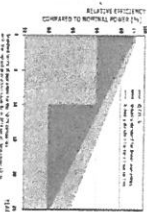
MECHANICAL SPECIFICATION

Frontal	1435 mm ± 100 mm ± 23 mm (including frame)
Weight	14.2 kg
Front Cover	3.2 mm thermally prestressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 20 monocrystalline Q.ANTUM solar half cells
Junction box	7 × 42 mm ± 50°/0° mm ± 13°/1° mm Protection class: IP67
Cable	4 mm² solar cable (+) 1000 mm, (-) 1000 mm
Connector	Multi-Contact, MC4, 1055 and 1058



ELECTRICAL CHARACTERISTICS

POWER CLASS	315	320	325	330
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC (POWER TOLERANCE: ±5 W / -0 W)				
Power at MPPT*	P _{MP} [W]	315	320	325
Short Circuit Current*	I _{sc} [A]	10.04	10.09	10.14
Open Circuit Voltage*	V _{oc} [V]	39.87	40.13	40.40
Current at MPPT*	I _{MP} [A]	9.35	9.60	9.71
Voltage at MPPT*	V _{MP} [V]	32.98	33.32	33.65
Efficiency*	η [%]	18.2	19.3	19.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NOC†				
Power at MPPT	P _{MP} [W]	233.4	237.2	240.9
Short Circuit Current*	I _{sc} [A]	8.09	8.14	8.22
Open Circuit Voltage*	V _{oc} [V]	37.10	37.54	37.79
Current at MPPT*	I _{MP} [A]	7.51	7.56	7.60
Voltage at MPPT*	V _{MP} [V]	31.07	31.39	31.70
†NOC: 1000 W/m², 25 °C spectrum AM 1.5G, Measurement tolerance STC, NOC: 0.5% (900 W/m²), NOCT: 45 °C, spectrum AM 1.5G				
Q CELLS PERFORMANCE WARRANTY				
At least 98 % of nominal power during first year. Thereafter max. 0.54 % of nominal power per year. At least 91 % of nominal power after 25 years. At least 85 % of nominal power up to 25 years.				
All data within measurement tolerance. Full warranty in accordance with the operating terms of the Q CELLS solar modules. Please refer to the operating terms for specific conditions.				



TEMPERATURE COEFFICIENTS

Temperature Coefficient of I _{sc}	α [%/K]	-0.04	Temperature Coefficient of V _{oc}	β [%/K]	-0.28
Temperature Coefficient of P _{max}	γ [%/K]	-0.37	Normal Operating Cell Temperature	NOCT [°C]	45

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage	V _{max} [V]	1000	Safety Class	II
Maximum System Current	I _{max} [A]	20	Fire Rating	C
Pub. / Pull Load (Test) load in accordance with IEC 61215	F _{pub} / F _{pull} [N]	5400 / 4000	Permitted Middle Temperature	-40 °C up to +85 °C
			En. certificate valid	



NOTE: Installation instructions must be followed. See the installation and operating manual or contact your technical service department for further information on approved installation and use of this product.

Human Q CELLS GmbH
 Sonnenallee 17-21, 40784 Bielefeld-Wedden, Germany | TEL: +49 (0)5204 64 3144 | FAX: +49 (0)5204 64 993300 | E-MAIL: sales@q-cells.com | WWW: www.q-cells.com

Engineered in Germany

Q CELLS



REVISIONS

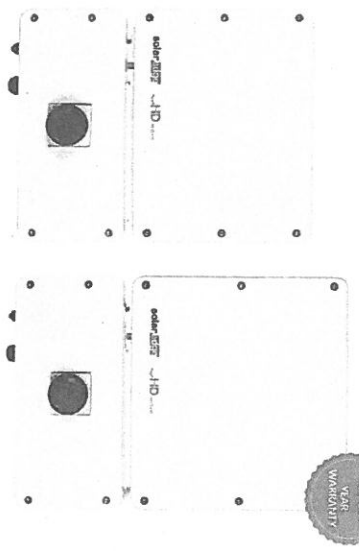
DESCRIPTION	DATE	REV

Signature with Seal
 DATE: 10/23/2019
 PROJECT NAME & ADDRESS
 GEORGE T UNDERHILL II RESIDENCE
 295 ANDERSON CREEK SCHOOL RD BUNNLEVEL, NC 28323

SHEET NAME
 EQUIPMENT SPECIFICATION
 SHEET SIZE
 ANSIB
 11" X 17"
 SHEET NUMBER
 PV-6
 DC SIZE: 13,545KW
 AC SIZE: 11,40KW

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US



INVERTERS

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

OUTPUT	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US
Rated AC Power Output	3000	3800	5000	6000	7600	10000	11400
Max AC Power Output	3600	4500	5900	7000	9000	11600	13200
AC Output Voltage	120V @ 240V	120V @ 240V	120V @ 240V	120V @ 240V	120V @ 240V	120V @ 240V	120V @ 240V
AC Output Frequency	60Hz	60Hz	60Hz	60Hz	60Hz	60Hz	60Hz
AC Output Phase	1-Phase	1-Phase	1-Phase	1-Phase	1-Phase	1-Phase	1-Phase
AC Output Protection	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Efficiency	97.5%	97.5%	97.5%	97.5%	97.5%	97.5%	97.5%
AC Output THD	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%
AC Output Surge Capacity	1000VA	1000VA	1000VA	1000VA	1000VA	1000VA	1000VA
AC Output Grounding	Grounded	Grounded	Grounded	Grounded	Grounded	Grounded	Grounded
AC Output Grounding Type	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Location	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Method	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Material	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Color	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Dimensions	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Weight	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Temperature	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Humidity	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Altitude	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Seismicity	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Wind Speed	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Snow Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Ice Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Rain Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Hail Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Debris Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Fire Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Flood Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Earthquake Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Tornado Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Hurricane Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741
AC Output Grounding Other Load	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741	UL1741

Optimized Installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Quick and easy inverter commissioning directly from a smartphone using the SolarEdge SetApp
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

solaredge.com



INPUT	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US
Max DC Power Input	4850	5800	7750	9350	11800	15500	17800
Max DC Voltage	1500V	1500V	1500V	1500V	1500V	1500V	1500V
Max DC Current	3.23A	3.87A	5.17A	6.23A	7.87A	10.33A	11.87A
Max DC Voltage Surge	1500V	1500V	1500V	1500V	1500V	1500V	1500V
Max DC Current Surge	3.23A	3.87A	5.17A	6.23A	7.87A	10.33A	11.87A
Max DC Voltage Surge Duration	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Duration	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Frequency	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Frequency	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Temperature	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Temperature	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Humidity	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Humidity	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Altitude	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Altitude	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Seismicity	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Seismicity	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Wind Speed	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Wind Speed	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Snow Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Snow Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Ice Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Ice Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Rain Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Rain Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Hail Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Hail Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Debris Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Debris Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Fire Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Fire Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Flood Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Flood Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Earthquake Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Earthquake Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Tornado Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Tornado Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Hurricane Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Hurricane Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Voltage Surge Other Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms
Max DC Current Surge Other Load	100ms	100ms	100ms	100ms	100ms	100ms	100ms

DATE: 10/23/2019
PROJECT NAME & ADDRESS
GEORGE T UNDERHILL II RESIDENCE
295 ANDERSON CREEK SCHOOL RD BUNNLEVEL, NC 28323

REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

DC SIZE: 13.54KW
AC SIZE: 11.40KW

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-7

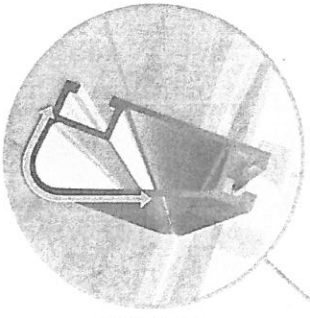
IRONRIDGE

XR Rail Family

Solar is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

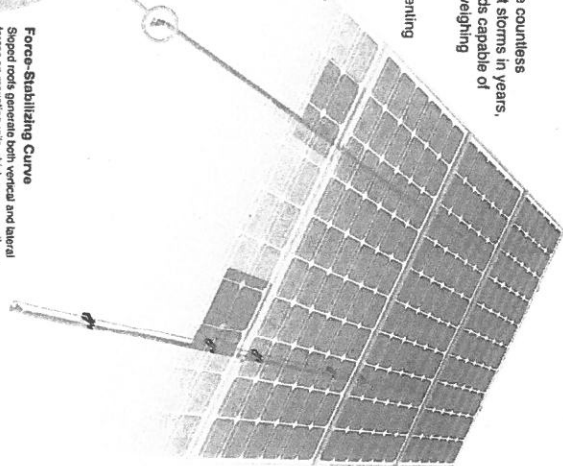
XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability reduces the number of roof penetrations and the amount of installation time.



Force Stabilizing Curve
Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specifically designed to increase strength in both directions. The curved shape also provides a feature that ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs
XR Rails are compatible with FlatRoof and other pitched roof attachments.
Ironridge offers a range of fit leg options for flat roof mounting applications.

Corrosion-Resistant Materials
All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.



XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.



XR10
XR10 is a sleek, low-profile mounting rail designed for regions with light or no snow. It achieves 8 foot spans, while remaining light and economical.

- 6' spanning capability
- Moderate load capacity
- Clear anodized finish
- Internal splices available



XR100
XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capacity
- Clear & black anodized finish
- Internal splices available



XR1000
XR1000 is a heavyweight, strong solar mounting rail. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capacity
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit ironridge.com for detailed span tables and certifications.

Snow (PSF)	Wind (mph)	Rail Spans			
		4 ft	6 ft	8 ft	10 ft
None	100				
	120				
	140				
10-20	160				
	100				
	120				
30	140				
	160				
	100				
40	180				
	100				
	180				
50-70	160				
	100				
	180				
80-90	160				
	100				
	180				



REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

DATE: 10/23/2019

PROJECT NAME & ADDRESS

GEORGE T UNDERHILL II RESIDENCE
295 ANDERSON CREEK SCHOOL RD BUNNLEVEL, NC 28323

DC SIZE: 13,545KW
AC SIZE: 11,40KW

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9

Simplified Grounding for Every Application

The UFO family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge XR Rails. All system types that feature the UFO family—Flush Mount, Tilt Mount and Ground Mount—are fully listed to the UL 2703 standard.

UFO hardware forms secure electrical bonds with both the module and the rail, resulting in many parallel grounding paths throughout the system. This leads to safer and more reliable installations.

Stopper Sleeve
The Stopper Sleeve snaps onto the UFO, converting it into a bonded end clamp.

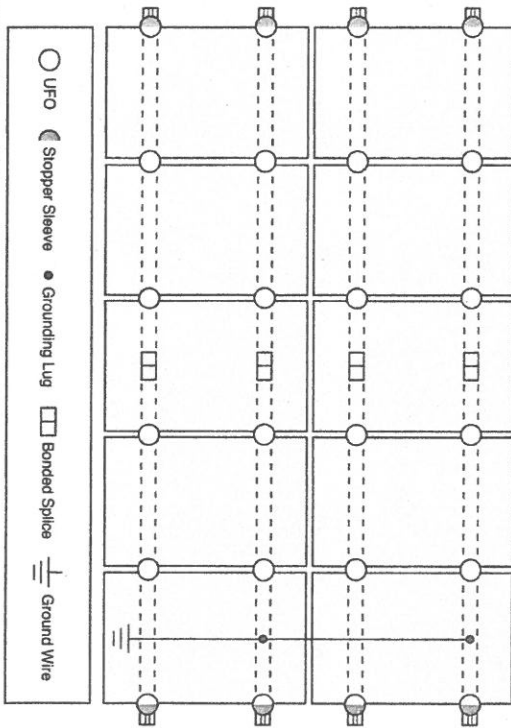
Universal Fastening Object (UFO)
The UFO securely bonds solar modules to XR Rails. It comes assembled and lubricated, and can fit a wide range of module heights.

Bonded Splice
Each Bonded Splice uses self-drilling screws to form a secure connection. No bonding strap needed.

Grounding Lug
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.

Bonded Attachments
The bonding bolt attaches and bonds the L-rod to the rail. It is installed with the same socket as the rest of the system.

System Diagram



Approved Engphase microinverters can provide equipment grounding of IronRidge systems, eliminating the need for grounding lugs and field installed equipment ground conductors (EGC). A minimum of two microinverters mounted to the same rail and connected to the same Engphase cable is required. Refer to installation manual for additional details.

UL Certification

The IronRidge Flush Mount, Tilt Mount, and Ground Mount Systems have been listed to UL 2703 by Intertek Group Inc.

UL 2703 is the standard for evaluating solar mounting systems. It ensures these devices will maintain strong electrical and mechanical connections over an extended period of time in extreme outdoor environments.

Go to IronRidge.com/UFO

Cross-System Compatibility			
Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✓	✓	XR1000 Only
UFO/Stopper	✓	✓	✓
Bonded Splice	✓	✓	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
	Emphase - M250-72, M250-90, M215-60, C250-72 Darton - MG240, MG300, G320, G340 & Power Optimizers	SolarEdge - P300, P400, P405, P500, P700, P730	Class A
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manual for a detailed list.		



REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

DATE: 10/23/2019

PROJECT NAME & ADDRESS

GEORGE T UNDERHILL II
RESIDENCE
295 ANDERSON CREEK SCHOOL
RD BUNNLEVEL, NC 28323

DC SIZE: 13,545KW
AC SIZE: 11,40KW

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

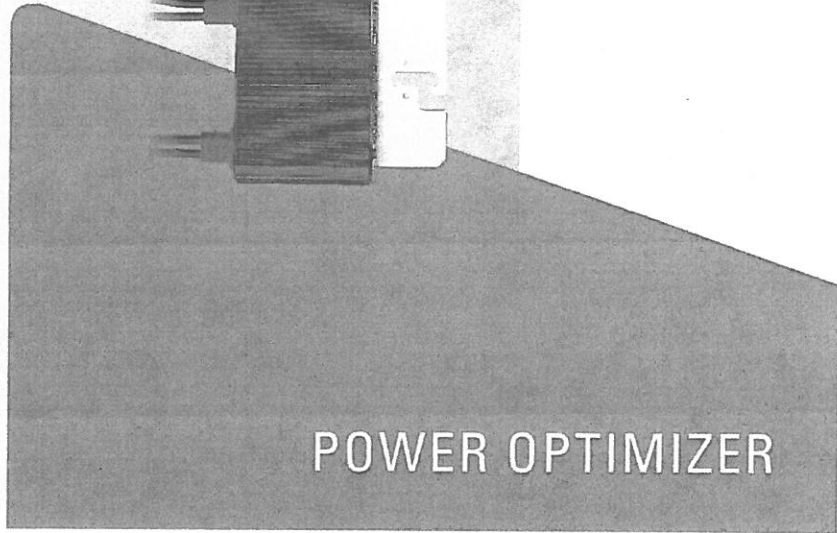
SHEET NUMBER
PV-10

solar edge

Power Optimizer

P320 / P370 / P400 / P405 / P505

POWER OPTIMIZER



- PV power optimization at the module-level**
- Specifically designed to work with SolarEdge inverters
 - Up to 25% more energy
 - Superior efficiency (99.5%)
 - Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
 - Flexible system design for maximum space utilization
 - Fast installation with a single bolt
 - Next generation maintenance with module-level monitoring
 - Compliant with arc fault protection and rapid shutdown (NEC requirements (when installed as part of the SolarEdge system))
 - Module-level voltage shutdown for installer and firefighter safety

www.solaredge.us

solar edge

Power Optimizer

P320 / P370 / P400 / P405 / P505

INPUT	P320 (per high power 60-watt modules)	P370 (per high power 60 and 72-watt modules)	P400 (per 72.5 Watt modules)	P405 (per 72.5 Watt modules)	P505 (per 100 Watt modules)
Rated Input DC Power ¹	320	370	400	405	505
Rated Maximum Input Voltage (Voc at lowest temperature)	48	60	60	125	83
Rated Operating Range (Maximum Input Current (Isc))	8.48	6.60	6.60	11.75	11.75
Maximum Input Current (Isc)	11	11	11	11	11
Maximum DC Input Current	11.75	11.75	11.75	11.75	11.75
Maximum Efficiency	99.5	99.5	99.5	99.5	99.5
Weighted Efficiency	98.8	98.8	98.8	98.8	98.8
Overcurrent Category	II	II	II	II	II
OUTPUT DURING OPERATION POWER OPTIMIZER CONNECTED TO OPERATING SOLAREGE INVERTER					
Maximum Output Current	15	15	15	15	15
Maximum Output Voltage	60	60	60	85	85
OUTPUT DURING STANDBY POWER OPTIMIZER DISCONNECTED FROM SOLAREGE INVERTER OR SOLAREGE INVERTER IS OFF					
Safety Output Voltage per Power Optimizer	1 ± 0.1	1 ± 0.1	1 ± 0.1	1 ± 0.1	1 ± 0.1
STANDARD COMPLIANCE					
EMC	IEC Part 5, Class B, RE 60905-6.2, RE 60905-6.3				
Safety	IEC 62310-1, IEC 62310-2, IEC 62310-3, IEC 62310-4, IEC 62310-5, IEC 62310-6, IEC 62310-7, IEC 62310-8, IEC 62310-9, IEC 62310-10, IEC 62310-11, IEC 62310-12, IEC 62310-13, IEC 62310-14, IEC 62310-15, IEC 62310-16, IEC 62310-17, IEC 62310-18, IEC 62310-19, IEC 62310-20, IEC 62310-21, IEC 62310-22, IEC 62310-23, IEC 62310-24, IEC 62310-25, IEC 62310-26, IEC 62310-27, IEC 62310-28, IEC 62310-29, IEC 62310-30, IEC 62310-31, IEC 62310-32, IEC 62310-33, IEC 62310-34, IEC 62310-35, IEC 62310-36, IEC 62310-37, IEC 62310-38, IEC 62310-39, IEC 62310-40, IEC 62310-41, IEC 62310-42, IEC 62310-43, IEC 62310-44, IEC 62310-45, IEC 62310-46, IEC 62310-47, IEC 62310-48, IEC 62310-49, IEC 62310-50, IEC 62310-51, IEC 62310-52, IEC 62310-53, IEC 62310-54, IEC 62310-55, IEC 62310-56, IEC 62310-57, IEC 62310-58, IEC 62310-59, IEC 62310-60, IEC 62310-61, IEC 62310-62, IEC 62310-63, IEC 62310-64, IEC 62310-65, IEC 62310-66, IEC 62310-67, IEC 62310-68, IEC 62310-69, IEC 62310-70, IEC 62310-71, IEC 62310-72, IEC 62310-73, IEC 62310-74, IEC 62310-75, IEC 62310-76, IEC 62310-77, IEC 62310-78, IEC 62310-79, IEC 62310-80, IEC 62310-81, IEC 62310-82, IEC 62310-83, IEC 62310-84, IEC 62310-85, IEC 62310-86, IEC 62310-87, IEC 62310-88, IEC 62310-89, IEC 62310-90, IEC 62310-91, IEC 62310-92, IEC 62310-93, IEC 62310-94, IEC 62310-95, IEC 62310-96, IEC 62310-97, IEC 62310-98, IEC 62310-99, IEC 62310-100				
INSTALLATION SPECIFICATIONS					
Maximum Allowable Output Voltage	1000				
Compatible Inverters	All SolarEdge Single Phase and Three Phase Inverters				
Dimensions (W x H x D)	128 x 152 x 28 / 5,151 x 6.11	128 x 152 x 36 / 5,151 x 7.14	128 x 152 x 36 / 5,151 x 7.14	128 x 152 x 59 / 5,151 x 1.36	128 x 152 x 59 / 5,151 x 1.36
Weight (kg/lb)	0.90 / 1.98	0.90 / 1.98	0.90 / 1.98	0.90 / 1.98	0.90 / 1.98
Operating Temperature Range	-40 °C to +85 °C / -40 °F to +185 °F				
Storage Temperature Range	-40 °C to +85 °C / -40 °F to +185 °F				
Relative Humidity	0% to 100%				
Shock Resistance	0.35g, 10ms				
Vibration Resistance	0.35g, 10ms				
IP Rating	IP67				
Material	Aluminum				
Color	Black				
Finish	Anodized				
Lead Time	1-2 weeks				
Warranty	25 Year				

PV SYSTEM DESIGN USING A SOLAREGE INVERTER

Parameter	SINGLE PHASE HD-WAVE		SINGLE PHASE		THREE PHASE 200V		THREE PHASE 480V	
	A	B	A	B	A	B	A	B
Minimum String Length	520	570	25	25	25	25	11	11
Maximum String Length	750	750	25	25	25	25	11	11
Maximum Power per String	5700 (600-watt)	5700 (600-watt)	520	520	600	600	1250	1250
Parallel Strings of Different Lengths	Yes							



LuminaSun

REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

DATE: 10/23/2019
PROJECT NAME & ADDRESS

**GEORGE T UNDERHILL II
RESIDENCE**
295 ANDERSON CREEK SCHOOL
RD BUNNLEVEL, NC 28323

DC SIZE: 13.645KW
AC SIZE: 11.40KW

SHEET NAME
**EQUIPMENT
SPECIFICATION**

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-11