

HISTORIC AND DESIGN REVIEW COMMISSION

December 02, 2015

Agenda Item No: 15

HDRC CASE NO: 2015-464
ADDRESS: 639 MISSION ST
LEGAL DESCRIPTION: NCB 2914 BLK 3 LOT 21 22, S 10 FT OF 20
ZONING: RM4 H HS
CITY COUNCIL DIST.: 1
DISTRICT: King William Historic District
LANDMARK: House
APPLICANT: Daniel Hudson/Texas Solar Systems
OWNER: Michael Villareal
TYPE OF WORK: Solar panel installation
REQUEST:

The applicant is requesting a Certificate of Appropriateness for approval to install a total of forty-five (45) black Axitec Solar Panels at 639 Mission. Within this request, the applicant is proposing to:

1. Install fifteen (15) solar panels on the rear (west facing) roof slope of the accessory structure located at the rear of the property behind the primary historic structure, noted as sub-array 3.
2. Install seventeen (17) solar panels on the rear (west facing) roof slope of the primary historic structure, noted as sub-array 2.
3. Install thirteen (13) solar panels on the southern roof slope, noted as sub-array 1.

APPLICABLE CITATIONS:

Historic Design Guidelines, Chapter 3, Guidelines for Additions

6. Designing for Energy Efficiency

C. SOLAR COLLECTORS

- i. Location*—Locate solar collectors on side or rear roof pitch of the primary historic structure to the maximum extent feasible to minimize visibility from the public right-of-way while maximizing solar access. Alternatively, locate solar collectors on a garage or outbuilding or consider a ground-mount system where solar access to the primary structure is limited.
- ii. Mounting (sloped roof surfaces)*—Mount solar collectors flush with the surface of a sloped roof. Select collectors that are similar in color to the roof surface to reduce visibility.
- iii. Mounting (flat roof surfaces)*—Mount solar collectors flush with the surface of a flat roof to the maximum extent feasible. Where solar access limitations preclude a flush mount, locate panels towards the rear of the roof where visibility from the public right-of-way will be minimized.

FINDINGS:

- a. The applicant has proposed to install a total of forty-five solar panels on the property at 639 Mission. Fifteen solar panels will be located on a rear accessory structure while a total of thirty solar panels will be located on the primary historic structure.
- b. According to the Guidelines for Additions 6.C.i., solar panels should be located on the side or rear roof pitch of the primary historic structure, or accessory structure to minimize visibility from the public right of way. Staff finds the applicant's proposal to install solar panels on the rear roof pitch of the accessory structure as well as the rear roof pitch of the primary historic structure appropriate and consistent with the Guidelines.
- c. The property at 639 Mission Street is unique in the fact that the property is a double lot at the corner of two streets where both the front and side façade are clearly visible from the public right of way. Per the Guidelines, solar panels should be installed in locations that have minimal visibility from the public right of way. Staff finds that the proposed side roof installations, noted as sub-array 1 is not consistent with the Guidelines.

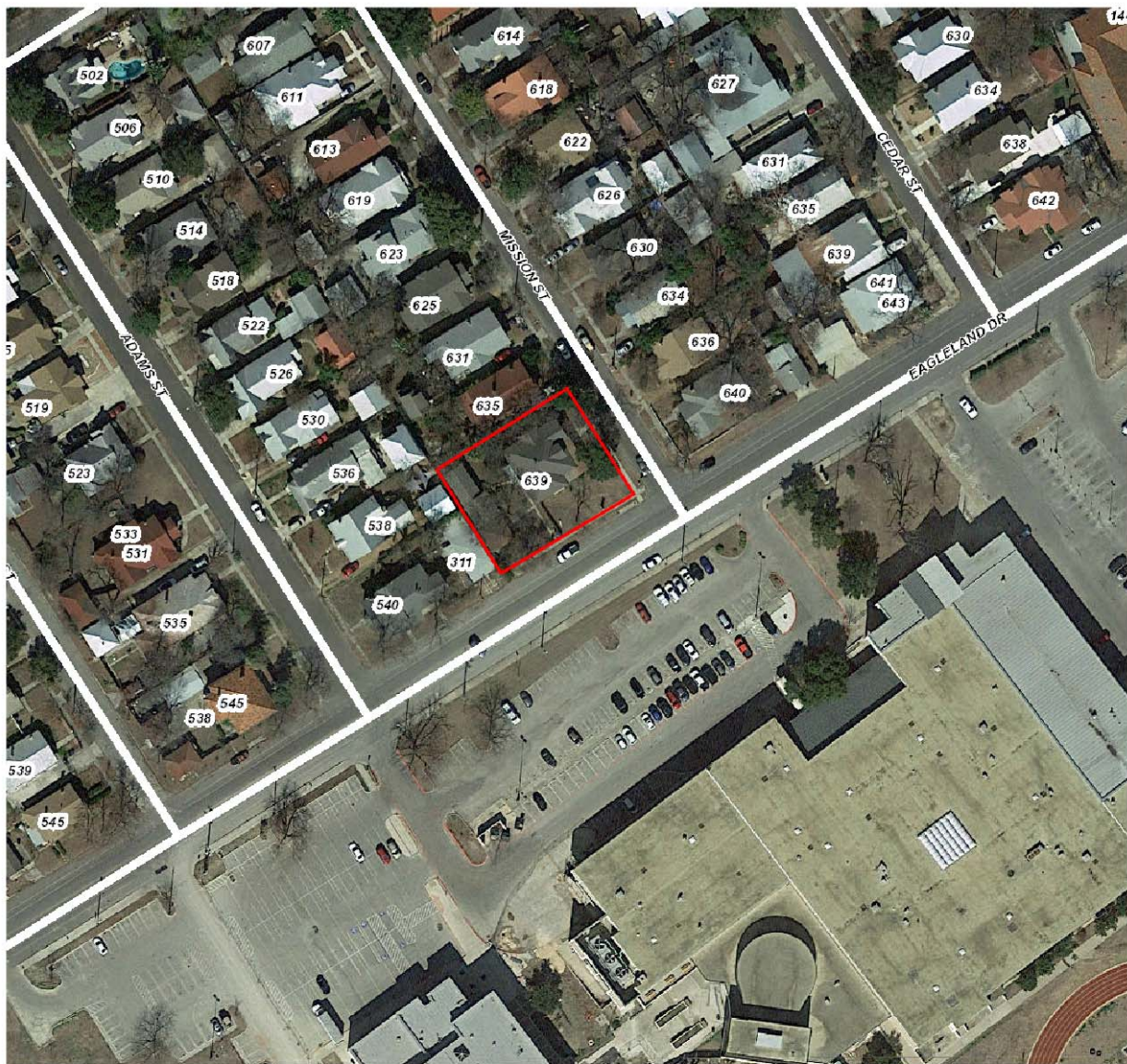
RECOMMENDATION:

Staff recommends approval of items #1 and #2 (sub-arrays 2 and 3) based on findings a and b.

Staff does not recommend approval of item #4 (sub-array 1) based on finding c.

CASE MANAGER:

Edward Hall

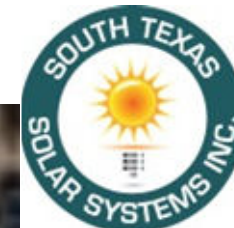


Flex Viewer

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Printed: Nov 23, 2015

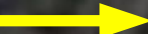
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10203 Kotzebue St
Suite 226
San Antonio, TX 78217



Approx location of
Service Entrance,
Inverters, AC
Combiner, Disconnect
and REC Meter



Sub-Array 2
Azimuth: 235°
Elevation: 30°

Sub-Array 1
Azimuth: 145°
Elevation: 30°

Sub-Array 3
Azimuth: 235°
Elevation: 23°

**Preliminary Array
Location & Layout**

ARRAY LAYOUT	
PROJECT REF:	Mike Villareal
SITE ADDRESS:	639 Mission St, San Antonio, TX 78210
SYSTEM SIZE:	16.425kW
1 String of 13, 1 String of 10 & 2 Strings of 11 Modules / Optimizers (LG Solar 365W / P400)	
Sheet 5 of 11	
Date: September 29, 2015	







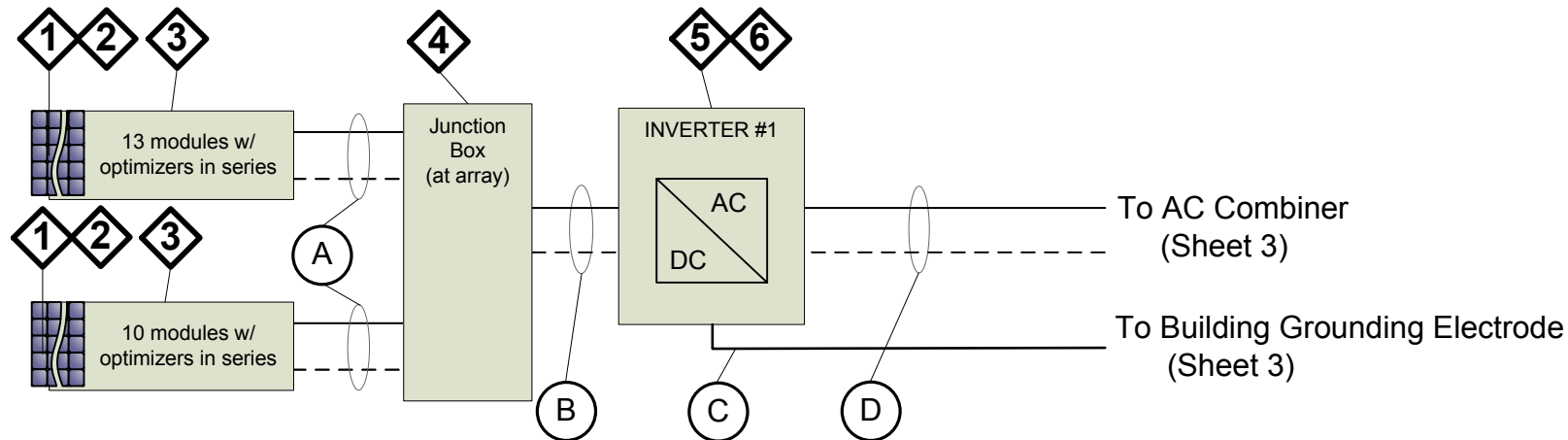
System Information			
PV Module Ratings		Inverter Ratings	
Module Make	LG Solar	Inverter Make	SolarEdge
Module Model	LG365N2W-B3	Inverter Model	SE7600A-US
Max Power	= 365 W	Max. Output Power	= 8350 W
Open Circuit Voltage	= 48.4 V	Max. DC Voltage	= 500 V
Max Power Point Voltage	= 38.6 V	Normal AC Voltage	= 240 V
Short Circuit Current	= 9.89 A	Max. AC Current	= 32 A
Max Power Point Current	= 9.46 A	CEC Inverter Efficiency	= 97.5%

Labels	
Photovoltaic DC Disconnect	
Rated MPP Current	= 23.0 A
Rated MPP Voltage	= 350.0 V
Max. System Voltage	= 500.0 V
Max. System Current	= 30.0 A
Photovoltaic AC Disconnect	
AC Output Current	= 32 A
Nominal AC Voltage	= 240 V

Label at Inverter #1



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Suite 226
San Antonio, TX 78217



PV System meets requirements for Rapid Shutdown as defined in 690.12.

EQUIPMENT SCHEDULE			
REF	DESCRIPTION	PN	NOTES
1	SOLAR PV MODULE	LG365N2W-B3	LG SOLAR 365W MONOCRYSTALLINE MODULE
2	PV MODULE OPTIMIZER	P400	SOLAREGE 400W PV MODULE OPTIMIZER
3	ARRAY MOUNTING HARDWARE	TBD	UNIRACE ROOF MOUNTING SYSTEM W/ TILE HOOKS
4	JUNCTION BOX	SDS-P-3-DC	SAFE-D PASS-THRU BOX, 3-STRINGS
5	AC/DC INVERTER	SE7600A-US	SOLAREGE 7.6KW INVERTER W/ AC/DC DISCONNECT
6	WIRELESS COMM	SE1000-ZBGW	SOLAREGE ZIGBEE WIRELESS COMMUNICATIONS

CONDUIT & CONDUCTOR SCHEDULE					
REF	DESCRIP. /CONDUCTOR TYPE	CONDUCTOR GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
A	PV-WIRE & BARE GROUND	#12 / #6	2 / 1	IN FREE AIR	
B	THWN-2	#10 / #6	4 / 1	EMT	1"
C	BARE GROUND	#6	1	IN FREE AIR	
D	THWN-2	#8 / #10	3 / 1	EMT	3/4"

Notes:

- Equipment, conductors & conduit as listed or equivalent.
- Expected nominal string voltage: 350Vdc.
- Expected nominal optimizer output voltage:
String of 10 – 35.0Vdc
String of 13 – 26.9Vdc

ONE-LINE STANDARD ELECTRICAL DIAGRAM
PROJECT REF: Mike Villareal
SITE ADDRESS: 639 Mission St, San Antonio, TX 78210
SUB-SYSTEM SIZE: 8.395kW
1 String of 13 & 1 String of 10 Modules / Optimizers (LG Solar 365W / P400)

Sheet 1 of 11
Date: September 29, 2015

NOT TO SCALE

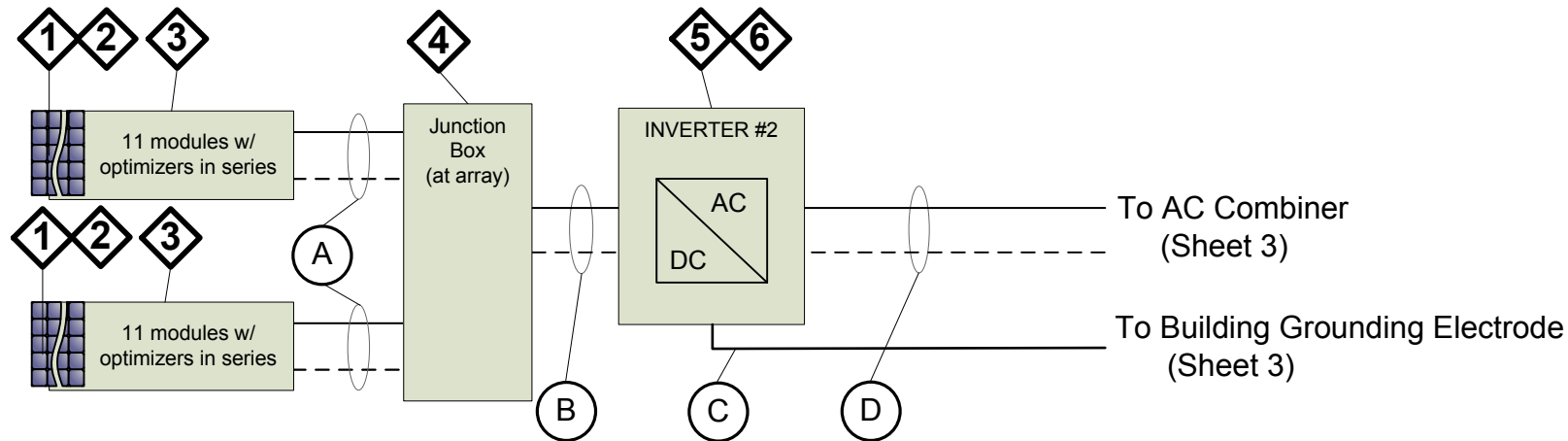
System Information			
PV Module Ratings		Inverter Ratings	
Module Make	LG Solar	Inverter Make	SolarEdge
Module Model	LG365N2W-B3	Inverter Model	SE7600A-US
Max Power	= 365 W	Max. Output Power	= 8350 W
Open Circuit Voltage	= 48.4 V	Max. DC Voltage	= 500 V
Max Power Point Voltage	= 38.6 V	Normal AC Voltage	= 240 V
Short Circuit Current	= 9.89 A	Max. AC Current	= 32 A
Max Power Point Current	= 9.46 A	CEC Inverter Efficiency	= 97.5%

Labels	
Photovoltaic DC Disconnect	
Rated MPP Current	= 22.9 A
Rated MPP Voltage	= 350.0 V
Max. System Voltage	= 500.0 V
Max. System Current	= 30.0 A
Photovoltaic AC Disconnect	
AC Output Current	= 32 A
Nominal AC Voltage	= 240 V

Label at Inverter #2



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Suite 226
San Antonio, TX 78217



PV System meets requirements for Rapid Shutdown as defined in 690.12.

EQUIPMENT SCHEDULE			
REF	DESCRIPTION	PN	NOTES
1	SOLAR PV MODULE	LG365N2W-B3	LG SOLAR 365W MONOCRYSTALLINE MODULE
2	PV MODULE OPTIMIZER	P400	SOLAREDGE 400W PV MODULE OPTIMIZER
3	ARRAY MOUNTING HARDWARE	TBD	UNIRACE ROOF MOUNTING SYSTEM W/ TILE HOOKS
4	JUNCTION BOX	SDS-P-3-DC	SAFE-D PASS-THRU BOX, 3-STRINGS
5	AC/DC INVERTER	SE7600A-US	SOLAREDGE 7.6KW INVERTER W/ AC/DC DISCONNECT
6	WIRELESS COMM	SE1000-ZBGW	SOLAREDGE ZIGBEE WIRELESS COMMUNICATIONS

CONDUIT & CONDUCTOR SCHEDULE					
REF	DESCRIP. /CONDUCTOR TYPE	CONDUCTOR GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
A	PV-WIRE & BARE GROUND	#12 / #6	2 / 1	IN FREE AIR	
B	THWN-2	#10 / #6	4 / 1	EMT	1"
C	BARE GROUND	#6	1	IN FREE AIR	
D	THWN-2	#8 / #10	3 / 1	EMT	3/4"

Notes:

- Equipment, conductors & conduit as listed or equivalent.
- Expected nominal string voltage: 350Vdc.
- Expected nominal optimizer output voltage: String of 11: 31.8Vdc

ONE-LINE STANDARD ELECTRICAL DIAGRAM
PROJECT REF: Mike Villareal
SITE ADDRESS: 639 Mission St, San Antonio, TX 78210
SUB-SYSTEM SIZE: 8.03kW
2 Strings of 11 Modules / Optimizers (LG Solar 365W / P400)
Sheet 2 of 11
Date: September 29, 2015

NOT TO SCALE

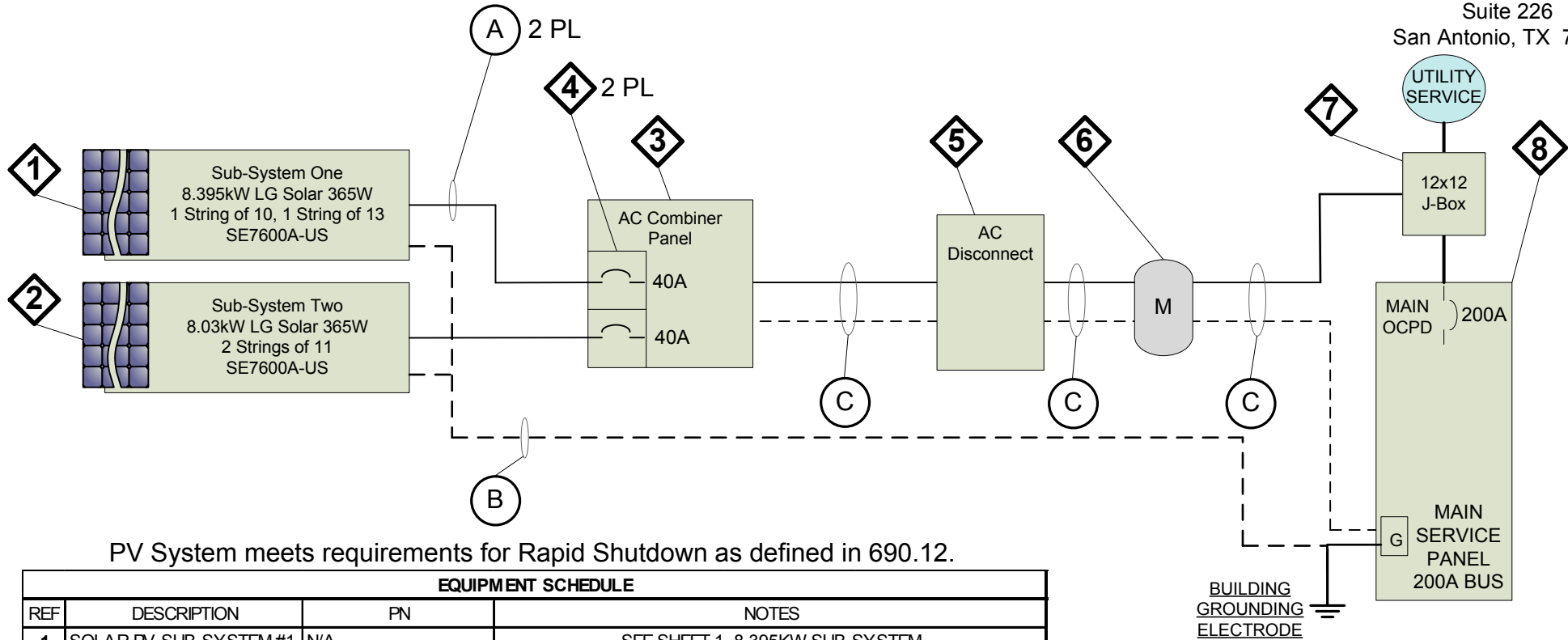
Notes:

- Equipment, conductors and conduit as listed or equivalent.
- AC Combiner panel should be labeled, "Solar Photovoltaic output circuits only. No load circuits permitted."

Label	
Photovoltaic AC Disconnect	
AC Output Current	= 64 A
Nominal AC Voltage	= 240V



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San Antonio, TX 78217



PV System meets requirements for Rapid Shutdown as defined in 690.12.

EQUIPMENT SCHEDULE			
REF	DESCRIPTION	PN	NOTES
1	SOLAR PV SUB-SYSTEM #1	N/A	SEE SHEET 1, 8.395KW SUB-SYSTEM
2	SOLAR PV SUB-SYSTEM #2	N/A	SEE SHEET 2, 8.03KW SUB-SYSTEM
3	AC COMBINER	TBD	240VAC, 100A, MAIN BUS ONLY
4	SOLAR OCPD	TBD	240VAC, 40A, 2-POLE CIRCUIT BREAKER (BACK-FED)
5	MAIN AC DISCONNECT	D223NRB	SQUARE D, SAFETY SWITCH, 240V, 100A, 2-POLE, 80A FUSING
6	GENERATION METER	TBD	
7	JUNCTION BOX	TBD	12x12 NEMA 3R FOR LINE-SIDE TAP
8	SERVICE PANEL	NA	240V, 200A BUS, 200A MAIN BREAKER (EXISTING)

CONDUIT & CONDUCTOR SCHEDULE					
REF	DESCRIP. / CONDUCTOR TYPE	CONDUCTOR GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
A	THWN-2	#8 / #10	3 / 1	EMT	3/4"
B	BARE GROUND	#6	1	IN FREE AIR	
C	THWN-2	#4 / #8	3 / 1	EMT	1-1/4"

ONE-LINE STANDARD ELECTRICAL DIAGRAM
PROJECT REF: Mike Villareal
SITE ADDRESS: 639 Mission St, San Antonio, TX 78210
SYSTEM SIZE: 16.425kW
1 String of 13, 1 String of 10 & 2 Strings of 11 Modules / Optimizers (LG Solar 365W / P400)
Sheet 3 of 11
Date: September 29, 2015

NOT TO SCALE

KELLY AFB



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Elev.	High Temp		Distance above roof			Extreme
	0.4%	2% Avg.	0.5"	3.5"	12"	Min
208 m	39 °C	37 °C	59 °C	54 °C	51 °C	-6 °C

Correction Temperatures

$$\Delta T_{\text{cold}} = -6^{\circ}\text{C} - 25^{\circ}\text{C} = -31^{\circ}\text{C} \quad \Delta T_{\text{hot}} = (37^{\circ}\text{C} + 35^{\circ}\text{C}) - 25^{\circ}\text{C} = 47^{\circ}\text{C}$$

Flush roof mount

Module Voltage Calculations

LG Neon 72 Cell 365W (LG365N2W-B3)

$$V_{oc} = 48.4\text{V} \quad V_{mp} = 38.6\text{V} \quad V_{oc} \text{ Temp Coefficient} = -0.28\%/^{\circ}\text{C}$$

$$I_{sc} = 9.89\text{A} \quad I_{mp} = 9.46\text{A} \quad P_{max} \text{ Temp Coefficient} = -0.39\%/^{\circ}\text{C}$$

$$\text{Cold } V_{oc} = 48.4\text{V} + (48.4\text{V} \times -0.28\%/^{\circ}\text{C} \times -31^{\circ}\text{C}) = 48.4\text{V} + 4.02\text{V} = \mathbf{52.6V}$$

$$\text{Hot } V_{mp} = 38.6\text{V} + (38.6\text{V} \times -0.39\%/^{\circ}\text{C} \times 47^{\circ}\text{C}) = 38.6\text{V} - 7.08\text{V} = \mathbf{31.5V}$$

SolarEdge P400 Optimizer

Maximum Power per String: 5250W

Max Input DC Power: 400W

Max Input DC Voltage: 80V

MPPT Operating Range: 8-80V

Max Input Isc Current: 10A

Maximum DC Output: 15A

Min/Max Input String Length: 8/25

String Sizing

$$10 \times 365\text{W} = 3650\text{W} \quad 11 \times 365\text{W} = 4015\text{W} \quad 13 \times 365\text{W} = 4745\text{W}$$

SolarEdge SE7600A-US Inverter

Max DC Input (V): 500V

Max DC Input (A): 23.0A

Nominal DC Input: 350V

Output voltage: 240Vac

Max Output current: 32.0A

Label Calculations

Sub-System 1 - MPPT DC Current:

$$365\text{W} \times 23 \div 350\text{V} = 24.0\text{A} \leftarrow \text{Limited to 23.0A by the inverter}$$

Sub-System 2 - MPPT DC Current:

$$365\text{W} \times 22 \div 350\text{V} = 22.9\text{A}$$

Conductor Ampacity

PV Source Circuit (Optimizer Output):

$$15\text{A} \times 125\% = 18.8\text{A} \text{ (continuous duty)}$$

$$18.8\text{A} \div 1.00 = 18.8 \text{ (PV Wire in free air)}$$

#12 AWG (rated for 25A into 75° terminals)

$$18.8\text{A} \div 0.71 \div 0.8 = 33.1\text{A} \text{ (conditions of use – temp and conduit fill)}$$

#10 AWG (rated for 35A into 75° terminals)

Inverter Output Circuit:

$$32.0\text{A} \times 125\% = 40.0\text{A}$$

#8 AWG (rated for 50A into 75° terminals and required OCPD)

AC Combiner Output Circuit:

$$32.0\text{A} \times 2 \times 125\% = 80.0\text{A}$$

#4 AWG (rated for 85A into 75° terminals and required OCPD)

OCPD & Disconnects

DC fusing not required. Only two strings per inverter, with each string landing on dedicated input terminals in the corresponding inverter.

DC/AC Disconnect functions integral to inverter.

Inverter OCPD:

$$32.0\text{A} \times 125\% = 40.0\text{A} \rightarrow 40\text{A}, 240\text{V}, 2\text{-Pole Back-Fed Circuit Breaker}$$

Main Solar OCPD & Disconnect:

$$32.0\text{A} \times 2 \times 125\% = 80.0\text{A} \rightarrow 80\text{A Fuses}$$

100A, 2-Pole, 240V Fused Disconnect

Voltage Drop calculations:

Worst case combination of distance and amperage:

PV Nominal String Voltage: 350Vdc

$$\text{PV MPPT String Current: } 365\text{W} \times 11 \div 350\text{V} = 11.5\text{A}$$

DC conductor run is 100 ft (estimated)

DC Voltage Drop

$$(2 \times 100\text{ft} \times 11.5\text{A} \times 1.24\Omega/\text{kft} \times 100) / (1000\text{ft}/\text{kft} \times 350\text{V}) = 0.81\%$$

Inverter Output is 240Vac, 32A

AC conductor run is 10 ft (estimated)

AC Voltage Drop

$$(2 \times 10\text{ft} \times 32.0\text{A} \times 0.778\Omega/\text{kft} \times 100) / (1000\text{ft}/\text{kft} \times 240\text{V}) = 0.21\%$$

AC Combiner Output is 240Vac, 64A

AC conductor run is 15 ft (estimated)

AC Voltage Drop

$$(2 \times 15\text{ft} \times 64.0\text{A} \times 0.308\Omega/\text{kft} \times 100) / (1000\text{ft}/\text{kft} \times 240\text{V}) = 0.25\%$$

ELECTRICAL CALCULATIONS

PROJECT REF: Mike Villareal

SITE ADDRESS: 639 Mission St, San Antonio, TX 78210

SYSTEM SIZE: 16.425kW

1 String of 13, 1 String of 10 & 2 Strings of 11
Modules / Optimizers (LG Solar 365W / P400)

Sheet 4 of 11

Date: September 29, 2015

Notes:

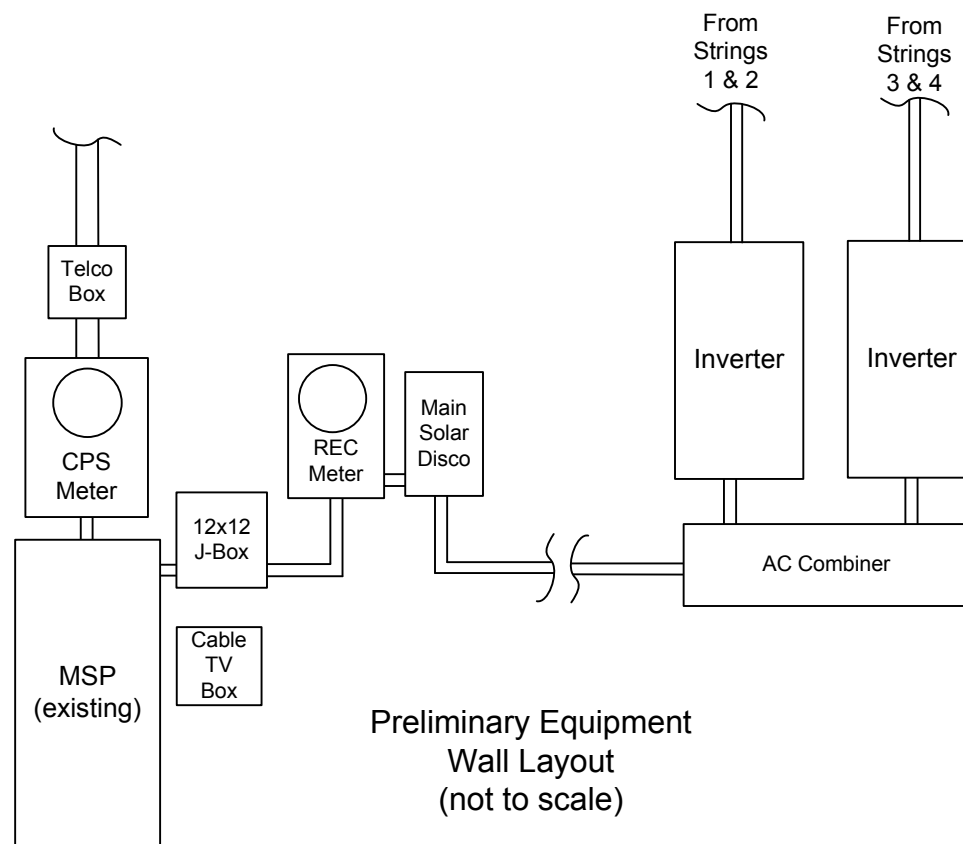
- PV System meets requirements for Rapid Shutdown as defined in 690.12.
- Each PV module is connected to a dedicated optimizer. The voltage generated by a string of modules/optimizers is controlled to 350Vdc at the inverter DC inputs.
- Calculations for the System Labeling based on SolarEdge Tech Note, *PV Power Source Labeling in a SolarEdge system*.
- Inverters, AC Combiner, AC Disconnect and REC Meter located near the service entrance near NE corner of residence. Location of equipment may be adjusted to maintain required clearance from existing gas meter. Some equipment may need to be placed on the opposite of the window near the service entrance.
- Ensure clearances around the inverters complies with Chapter 3 of the Solar Edge Installation Guide. The inverters should be installed to minimize exposure to sunlight, rainfall and direct water spray.
- Each module/optimizer string is run to a separate input on the corresponding inverter. Only two strings per conduit (one conduit per inverter).
- Interconnection to the main service via a line-side tap in a 12x12 Junction Box installed inline between the Utility Meter and the Main Service Panel. Complies with 705.12.
- Layout/location of array may be adjusted to avoid vent stacks, skylights and other roof protrusions. Adequate clearances should be maintained from roof eaves and ridge to allow for safe access.
- Conductor sizing listed is minimum required based on NEC ampacity calculations and a conduit fill of not more than 4 current carrying conductors. Minimum conductor size required for REC meter base typically #6 AWG.
- Conduit sizing is based upon NABCEP recommended maximum conduit fill of 25%. Conduit may be sized to comply with Annex C of NEC.
- Voltage drop calculations should be verified on-site based on actual wire run lengths. Recommended worst case system voltage drop – 2% total.
- All electrical work must be made in accordance with the local and applicable *National Electrical Code ANSI/NFPA 70*.
- PV System to be installed and labeled per National Electric Code 2014. Specifically:
 - 690.4(B)(1),(2) and (3)
 - 690.4(H)
 - 690.5
 - 690.17
 - 690.31
 - 690.35(C) and (F)
- Inverter listed to UL-1741 for grid-interactive use and GFDI protection.
- All equipment used UL listed.
- Equipment, conductors & conduit as listed or equivalent.

Module string assignments:

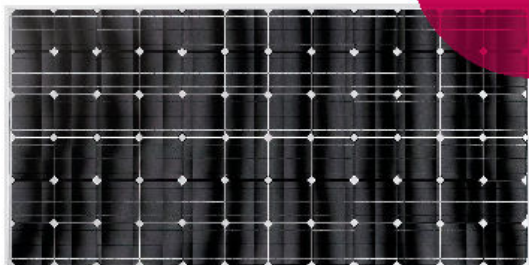
- String of 13 – all modules from sub-array 1
- String of 10 – 10 modules from sub-array 2
- String of 11 – 7 modules from sub-array 2 & 3 modules from sub-array 3
- String of 11 – 11 modules from sub-array 3



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SPECIAL NOTES
PROJECT REF: Mike Villareal
SITE ADDRESS: 639 Mission St, San Antonio, TX 78210
SYSTEM SIZE: 16.425kW
1 String of 13, 1 String of 10 & 2 Strings of 11 Modules / Optimizers (LG Solar 365W / P400)
Sheet 6 of 11 Date: September 29, 2015



LG NeON[™] 72cell LG365N2W-B3

Innovation for a Better Life

72 cell

Introducing LG NeON[™] 72 cell module series, which uses highly efficient n-type materials, an elaborate process control adopting a semiconductor processing solution and a double-sided structure. Our R&D concentrates on developing a product that is not only efficient, but strives to increase practical value for customers.



Enhanced Performance Warranty

LG NeON[™] 72 cell has an enhanced performance warranty. The annual degradation has fallen from -0.7%/yr to -0.6%/yr. Even after 25 years, the cell guarantees 2.4% more output than the previous LG NeON[™] modules.



N-Type Material

LG NeON[™] 72 cell uses n-type cells, boasting higher mobility of electric charge, resulting in higher generation efficiency.



Better Performance on a Sunny Day

LG NeON[™] 72 cell now performs better on a sunny day thanks to its improved temperature coefficient.



High Power Output

Compared with previous models, the LG NeON[™] 72 cell has been designed to significantly enhance its output efficiency making it efficient even in limited spaces.



Double-Sided Cell Structure

The rear of the cell used in LG NeON[™] 72 cell is designed to contribute to generation; the light beam reflected from the rear of the module is reabsorbed to generate a great amount of additional power.



Near Zero LID (Light Induced Degradation)

The n-type cells used in LG NeON[™] 72 cell have almost no boron, which may cause the initial efficiency to drop, leading to less LID.

LG NeON[™] 72cell LG365N2W-B3

Mechanical Properties

Cells	6 x 12
Cell Vendor	LG
Cell Type	Monocrystalline / N-type
Cell Dimensions	156.75 x 156.75 mm / 6 inches
# of Busbar	3
Dimensions (L x W x H)	1960 x 1000 x 46 mm 77.17 x 39.37 x 1.81 inch
Front Load	60 psf
Rear Load	60 psf
Weight	20.3 ± 0.5 kg / 44.75 ± 1.1 lbs
Connector Type	JM601, IP67
Junction Box	IP67 with 3 bypass diodes
Length of Cables	2 x 1200 mm / 2 x 47.24 inch
Glass	High Transmission Tempered Glass
Frame	Anodized Aluminum

Certifications and Warranty

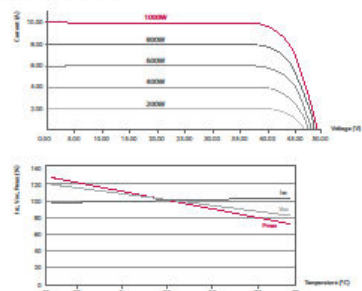
Certification	IEC 62716 (Ammonia Test) IEC 61701 (Salt Mist Corrosion Test) ISO 9001 UL 1703
Module Fire Performance (USA)	Type 2 (UL 1703)
Fire Rating (for CANADA)	Class C (ULC/ORD C1703)
Product Warranty	12 years
Output Warranty of Pmax	Linear warranty*

* (1) 1st year: 80%, (2) After 2nd year: 0.6% annual degradation, (3) 83.0% for 25 years

Temperature Characteristics

NOCT	45 ± 3 °C
Pmax	-0.39 %/°C
Voc	-0.28 %/°C
Isc	0.03 %/°C

Characteristic Curves



Electrical Properties (STC *)

Module Type	365 W
MPP Voltage (Vmp)	38.6
MPP Current (Imp)	9.46
Open Circuit Voltage (Voc)	49.4
Short Circuit Current (Isc)	9.89
Module Efficiency (%)	18.6
Operating Temperature (°C)	-40 ~ +90
Maximum System Voltage (V)	1000
Maximum Series Fuse Rating (A)	20
Power Tolerance (%)	0 ~ +3

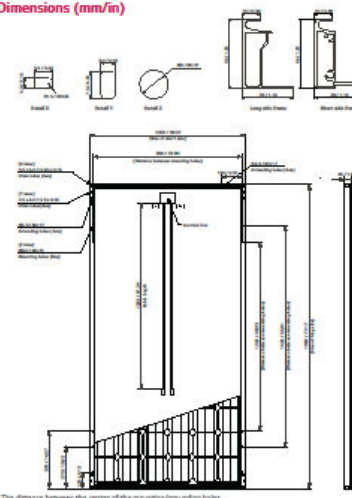
* STC (Standard Test Condition) Irradiance 1000 W/m², Module Temperature 25 °C, AM 1.5
* The respective power output is measured and determined by LG Electronics at its sole and absolute discretion.
* The typical temperature coefficient of Pmax is -0.39 %/°C in relation to 1000 W/m² at 25 °C.

Electrical Properties (NOCT*)

Module Type	365 W
Maximum Power (Pmax)	267
MPP Voltage (Vmp)	35.3
MPP Current (Imp)	7.55
Open Circuit Voltage (Voc)	44.9
Short Circuit Current (Isc)	7.98

* NOCT (Nominal Operating Cell Temperature) Irradiance 800 W/m², ambient temperature 20 °C, wind speed 1 m/s

Dimensions (mm/in)



* The distance between the center of the mounting/grounding holes.

About LG Electronics

LG Electronics is a global player who has been committed to expanding its operations with the solar market. The company has embarked on a solar energy research program in 1980, supported by its vast experience in the semi-conducting, LCD, electrolytic and various tech sectors. In 2010, LG Solar successfully released its first Mono Si⁺ series in the market, which is now available in J2 format. The LG NeON[™] (previous Mono Si⁺ NeON) and the LG NeON[™] won the "Inverter Award" in 2013 and 2015, which demonstrates LG Solar's lead, innovation and commitment to the industry.



North America Solar Business Team
LG Electronics U.S.A. Inc.
1000 Sylvan Ave, Englewood Cliffs, NJ 07632

Contact: lg.solar@lge.com
www.lgusolve.com

Product specifications are subject to change without notice.

DS-N1-72-C-G-P-EN-50724

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01/02/2015



SPECIFICATIONS

PROJECT REF:	Mike Villareal
SITE ADDRESS:	639 Mission St, San Antonio, TX 78210
SYSTEM SIZE:	16.425kW
1 String of 13, 1 String of 10 & 2 Strings of 11 Modules / Optimizers (LG Solar 365W / P400)	

Sheet 7 of 11
Date: September 29, 2015



10203 Kotzebue St
Suite 226
San Antonio, TX 78217



SolarEdge Single Phase Inverters For North America

SE3000A-US / SE3800A-US / SE5000A-US / SE6000A-US /
SE7600A-US / SE10000A-US / SE11400A-US



The best choice for SolarEdge enabled systems

- Integrated arc fault protection (Type 1) for NEC 2011 690.11 compliance
- Superior efficiency (98%)
- Small, lightweight and easy to install on provided bracket
- Built-in module-level monitoring
- Internet connection through Ethernet or Wireless
- Outdoor and indoor installation
- Fixed voltage inverter, DC/AC conversion only
- Pre-assembled Safety Switch for faster installation
- Optional – revenue grade data, ANSI C12.1

USA - GERMANY - ITALY - FRANCE - JAPAN - CHINA - AUSTRALIA - THE NETHERLANDS - ISRAEL

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INVERTERS



Single Phase Inverters for North America

SE3000A-US / SE3800A-US / SE5000A-US / SE6000A-US /
SE7600A-US / SE10000A-US / SE11400A-US

	SE3000A-US	SE3800A-US	SE5000A-US	SE6000A-US	SE7600A-US	SE10000A-US	SE11400A-US	
OUTPUT								
Nominal AC Power Output	3000	3800	5000	6000	7600	9980 @ 208V	11400	VA
Max. AC Power Output	3300	4150	5400 @ 208V	6000	8350	10000 @ 240V	12000	VA
AC Output Voltage Min-Nom-Max ⁽¹⁾	-	-	✓	-	-	✓	-	
AC Output Voltage Min-Nom-Max ⁽¹⁾	-	-	✓	-	-	✓	-	
AC Frequency Min-Nom-Max ⁽¹⁾	-	-	✓	-	-	✓	-	
Max. Continuous Output Current	12.5	16	21 @ 240V	25	32	42 @ 240V	47.5	A
GFDI Threshold	-	-	-	-	-	-	-	A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	-	-	-	-	-	-	-	Yes
INPUT								
Maximum DC Power (STC)	4000	5100	6750	8100	10250	13300	15350	W
Transformer-less, Ungrounded	-	-	-	-	-	-	-	Yes
Max. Input Voltage	-	-	-	-	-	-	-	Vdc
Nom. DC Input Voltage	-	-	-	-	-	-	-	Vdc
Max. Input Current ⁽¹⁾	9.5	13	16.5 @ 208V	18	23	33 @ 208V	34.5	Adc
Max. Input Short Circuit Current	-	-	-	-	-	-	-	Adc
Reverse-Polarity Protection	-	-	-	-	-	-	-	Yes
Ground-Fault Isolation Detection	-	-	-	-	-	-	-	Yes
Maximum Inverter Efficiency	97.7	98.2	98.3	98.3	98	98	98	%
CEC Weighted Efficiency	97.5	98	97.5 @ 208V	97.5	97.5	97 @ 208V	97.5	%
Nighttime Power Consumption	-	-	< 2.5	-	-	< 4	-	W
ADDITIONAL FEATURES								
Supported Communication Interfaces	-	-	-	-	-	-	-	RS485, RS232, Ethernet, ZigBee (optional)
Revenue Grade Data, ANSI C12.1	-	-	-	-	-	-	-	Optional ⁽²⁾
Rapid Shutdown – NEC 2014 690.12	-	-	-	-	-	-	-	Functionality enabled when SolarEdge rapid shutdown kit is installed ⁽³⁾
STANDARD COMPLIANCE								
Safety	-	-	-	-	-	-	-	UL1741, UL1699B, UL1998, CSA 22.2
Grid Connection Standards	-	-	-	-	-	-	-	IEEE1547
Emissions	-	-	-	-	-	-	-	FCC part15 class B
INSTALLATION SPECIFICATIONS								
AC output conduit size / AWG range	-	-	3/4" minimum / 16-6 AWG	-	-	3/4" minimum / 8-3 AWG	-	
DC input conduit size / # of strings / AWG range	-	-	3/4" minimum / 1-2 strings / 16-6 AWG	-	-	3/4" minimum / 1-2 strings / 14-6 AWG	-	
Dimensions with Safety Switch (HxWxD)	-	-	30.3 x 12.5 x 10.5 / 773 x 315 x 269	-	-	30.3 x 12.5 x 10.5 / 773 x 315 x 269	-	
Weight with Safety Switch	-	-	51.2 / 23.2	-	-	54.7 / 24.7	-	
Cooling	-	-	Natural Convection	-	-	Natural convection and internal fan (user replaceable)	-	
Noise	-	-	< 25	-	-	< 30	-	
Min-Max. Operating Temperature	-	-	-13 to +140 / -23 to +60 (-40 to +60 version available ⁽⁴⁾)	-	-	-	-	
Protection Rating	-	-	-	-	-	-	-	NEMA 3R

⁽¹⁾ For other regional settings please contact SolarEdge support.
⁽²⁾ A higher current source may be used; the inverter will limit its input current to the value stated.
⁽³⁾ Revenue grade inverter P/N: SE3000A-US000NR2 (for 3000W inverter) SE7600A-US000NR2 (for 7600W inverter) SE10000A-US000NR2 (for 10000W inverter) SE11400A-US000NR2 (for 11400W inverter)
⁽⁴⁾ -40 version P/N: SE3000A-US000NR2 (for 3000W inverter) SE7600A-US000NR2 (for 7600W inverter) SE10000A-US000NR2 (for 10000W inverter) SE11400A-US000NR2 (for 11400W inverter)



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SYSTEM SIZE: 16.425kW

1 String of 13, 1 String of 10 & 2 Strings of 11
Modules / Optimizers (LG Solar 365W / P400)

Sheet 8 of 11
Date: September 29, 2015



SolarEdge Power Optimizer

Module Add-On For North America

P300 / P400 / P405



POWER OPTIMIZER

PV power optimization at the module-level

- 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
- Module-level voltage shutdown for installer and firefighter safety

USA - GERMANY - ITALY - FRANCE - JAPAN - CHINA - ISRAEL - AUSTRALIA

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SolarEdge Power Optimizer

Module Add-On for North America

P300 / P400 / P405

	P300 (for 60-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)	
INPUT				
Rated Input DC Power ⁽¹⁾	300	400	405	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48	80	125	Vdc
MPPT Operating Range	8 - 48	8 - 80	12.5 - 105	Vdc
Maximum Short Circuit Current (Isc)	10	10	10	A _{dc}
Maximum DC Input Current	12.5	12.5	12.5	A _{dc}
Maximum Efficiency	99.5	99.5	99.5	%
Weighted Efficiency	99.8	99.8	99.8	%
Overvoltage Category	II			
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)				
Maximum Output Current		15		A _{dc}
Maximum Output Voltage		85		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)				
Safety Output Voltage per Power Optimizer		1		Vdc
STANDARD COMPLIANCE				
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3			
Safety	IEC62109-1 (class II safety), UL1741			
RoHS	Yes			
INSTALLATION SPECIFICATIONS				
Maximum Allowed System Voltage		1000		Vdc
Dimensions (W x L x H)	Pixo-2 series 128 x 152 x 27.5 / Pixo-5 series 5 x 5.97 x 1.08	141 x 212 x 40.5 / 5.55 x 8.34 x 1.59 128 x 152 x 35 / 5 x 5.97 x 1.37	128 x 152 x 48 / 5 x 5.97 x 1.89	mm / in mm / in
Weight (including cables)	Pixo-2 series 770 / 1.7	930 / 2.1 930 / 2.05	930 / 2.05	g / lb g / lb
Input Connector	MC4 Compatible			
Output Wire Type / Connector	Double Insulated; Amphenol			
Output Wire Length	0.95 / 3.0	1.2 / 3.9		m / ft m / ft
Operating Temperature Range	Pixo-2 series -40 ~ +85 / -40 ~ +185	IP65 / NEMA4		
Protection Rating	Pixo-5 series IP68 / NEMA6P			
Relative Humidity	Pixo-5 series 0 - 100			

⁽¹⁾ Rated STC power of the module. Module of up to 45% power tolerance allowed.

PV SYSTEM DESIGN USING A SOLAREDGE INVERTER ⁽¹⁾	SINGLE PHASE	THREE PHASE 208V	THREE PHASE 480V	
Minimum String Length (Power Optimizers)	8	10	18	
Maximum String Length (Power Optimizers)	25	25	50	
Maximum Power per String	5250	6000	12750	W
Parallel Strings of Different Lengths or Orientations	Yes			

⁽¹⁾ It is not allowed to mix P405 with P300/P400/P300/P700 in one string.



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78210

SYSTEM SIZE: 16.425kW

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Sheet 9 of 11
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10203 Kotzebue St
Suite 226
San Antonio, TX 78217

Project:

Mike Villareal
Tuesday, September 29, 2015 1:09 PM
639 Mission St
San Antonio, TX 78210

Location:

San Antonio, Texas, United States

System data:

Installed power: 16.43 kWp
Max achieved DC power: 16.48 kW
Inverter active power: 15.20 kW
Maximum apparent power: 15.20 kVA

PV Array # 1: PV Array # 1

Tilt	Azimuth	Mounting
30°	145°	Co-planar with roof
LG Solar, LG NEON 72Cell 365W, 365.00 W		

PV Array # 2: PV Array # 2

Tilt	Azimuth	Mounting
30°	235°	Co-planar with roof
LG Solar, LG NEON 72Cell 365W, 365.00 W		

PV Array # 3: PV Array # 3

Tilt	Azimuth	Mounting
23°	235°	Co-planar with roof
LG Solar, LG NEON 72Cell 365W, 365.00 W		

Inverter design

Inverter 1: SE7600A-US

String 1: PV Array # 1: 13 x P400
String 2: PV Array # 2: 10 x P400

Inverter 2: SE7600A-US

String 1: PV Array # 3: 11 x P400
String 2: PV Array # 2: 7 x P400
PV Array # 3: 4 x P400

STRING SIZING TOOL REPORT

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Power optimizer extreme operating conditions

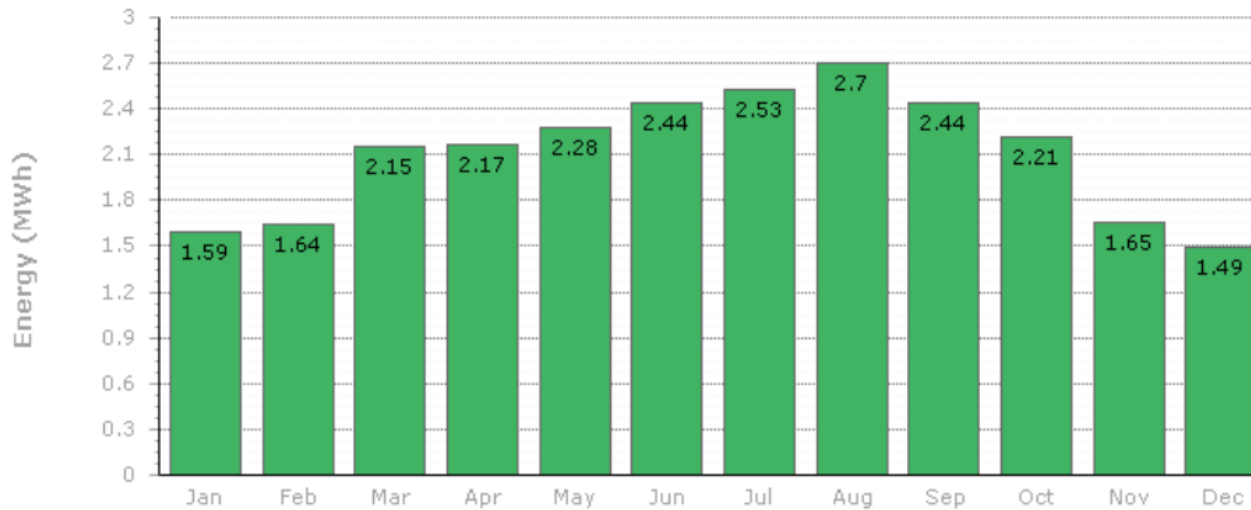
P400

	Calculated	Limit	
Max input power	365 W	400 W	✓
Min input voltage	42 V	8 V	✓
Max input voltage	53 V	80 V	✓
Max input current	10 A	10 A	✓
Max output current	14 A	15 A	✓

* Calculated values are the absolute min/max of all arrays using this power optimizer configuration.

Energy estimation

Estimated monthly energy



Estimated yearly energy: 25.285 MWh

Energy yields are an approximation; they are not guaranteed by SolarEdge.

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