

PROJECT DESCRIPTION

SYSTEM CAPACITY: 13.505 KW DC / 10.73 KW AC

PV PANELS: (37) DNA 120 MF26 365W BY APTOS

COMBINER: (1) IQ COMBINER BOX 3 BY ENPHASE

INVERTER: (37) IQ7+ MICROINVERTER BY ENPHASE

RACKING SYSTEM: ROCK-IT SYSTEM 3.0 BY ECOFASTEN

PROJECT INFORMATION

PROJECT LATITUDE	27.92484	MIN AMBIENT TEMP	-5 ° C
PROJECT LONGITUDE	-82.61121	MAX AMBIENT TEMP	35 ° C
AHJ	COLUMBIA COUNTY	WIND EXPOSURE	C
		DESIGN WIND SPEED	120 MPH

DRAWINGS INDEX

C-1	COVER SHEET
E-1	ONE LINE RISER DIAGRAM
E-2	SAFETY LABELS
S-1	STRUCTURAL PLAN
S-2	RACKING PLAN
S-3	RACKING PLAN
D-1	PV MODULES DATA SHEET
D-2	SMART MONITORING DATA SHEET
D-3	INVERTER DATA SHEET

GENERAL NOTES

PER FL. STATUTE 377.705 (REVISED 7/1/2017), I RAFAEL A. GONZALEZ SOTO, P.E. 83104 AN ENGINEER LICENSED PURSUANT TO CHAPTER 471, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS CONTAINED IN THE MOST RECENT VERSION OF THE FLORIDA BUILDING CODE.

APPLICABLE CODES: 2020 FLORIDA BUILDING CODE 7TH EDITION, ASCE 7-16 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES, FFPC 7TH EDITION, NFPA 2018, NFPA 70 AND NEC 2017.

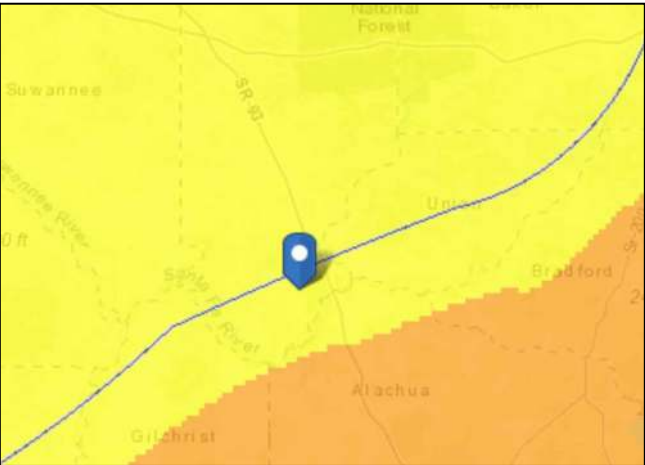
CONTRACTOR SHALL ENSURE ALL ROOF PENETRATIONS TO BE INSTALLED AND SEALED PER 2020 FLORIDA BUILDING CODE 7TH EDITION OR LOCAL GOVERNING CODE.

ALL WIRING METHODS AND INSTALLATION PRACTICES SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE (NEC) 2017, LOCAL STATE CODES, AND OTHER APPLICABLE LOCAL CODES. MEANS SHALL BE PROVIDED TO DISCONNECT ALL CURRENT CARRYING CONDUCTORS OF THE PHOTOVOLTAIC POWER SOURCE FROM ALL OTHER CONDUCTORS IN THE BUILDING. CONNECTORS TO BE TORQUED PER DEVICE LISTING, OR MANUFACTURERS RECOMMENDATIONS. NON-CURRENT CARRYING METAL PARTS SHALL BE CHECKED FOR PROPER GROUNDING.

REQUIRED SAFETY SIGNS AND LABELS SHALL BE PERMANENTLY ATTACHED BY ADHESIVE, OR OTHER MECHANICAL MEANS. LABELS SHALL COMPLY WITH ARTICLE 690 VI OF THE NEC 2017 OR OTHER APPLICABLE STATE AND LOCAL CODES. SEE LABELS AND MARKING PAGE FOR MORE INFORMATION.

RACKING ROOF MOUNT SYSTEM SHALL BE INSTALLED FOLLOWING MANUFACTURERS INSTRUCTION SPEC'S, INCLUDING ALL GROUNDING WEEB CLIPS, GROUND LUGS, AND RAIL SPLICE KITS FOR ELECTRICAL CONTINUITY.

MECAWIND TOOL IS BASED ON THE C&C WIND LOADS FOR ENCLOSED BUILDINGS. DESIGN WIND PRESSURES ARE CALCULATED USING ASCE 7-16 EQUATION 30.6-1. ALL NOTES IN FIGURES ASCE 7-16 30.4-1 AND 30.4-2(A,B AND /67C) HAVE BEEN INCORPORATED. MEAN ROOF HEIGHT MUST BE LESS THAN 60 FEET.



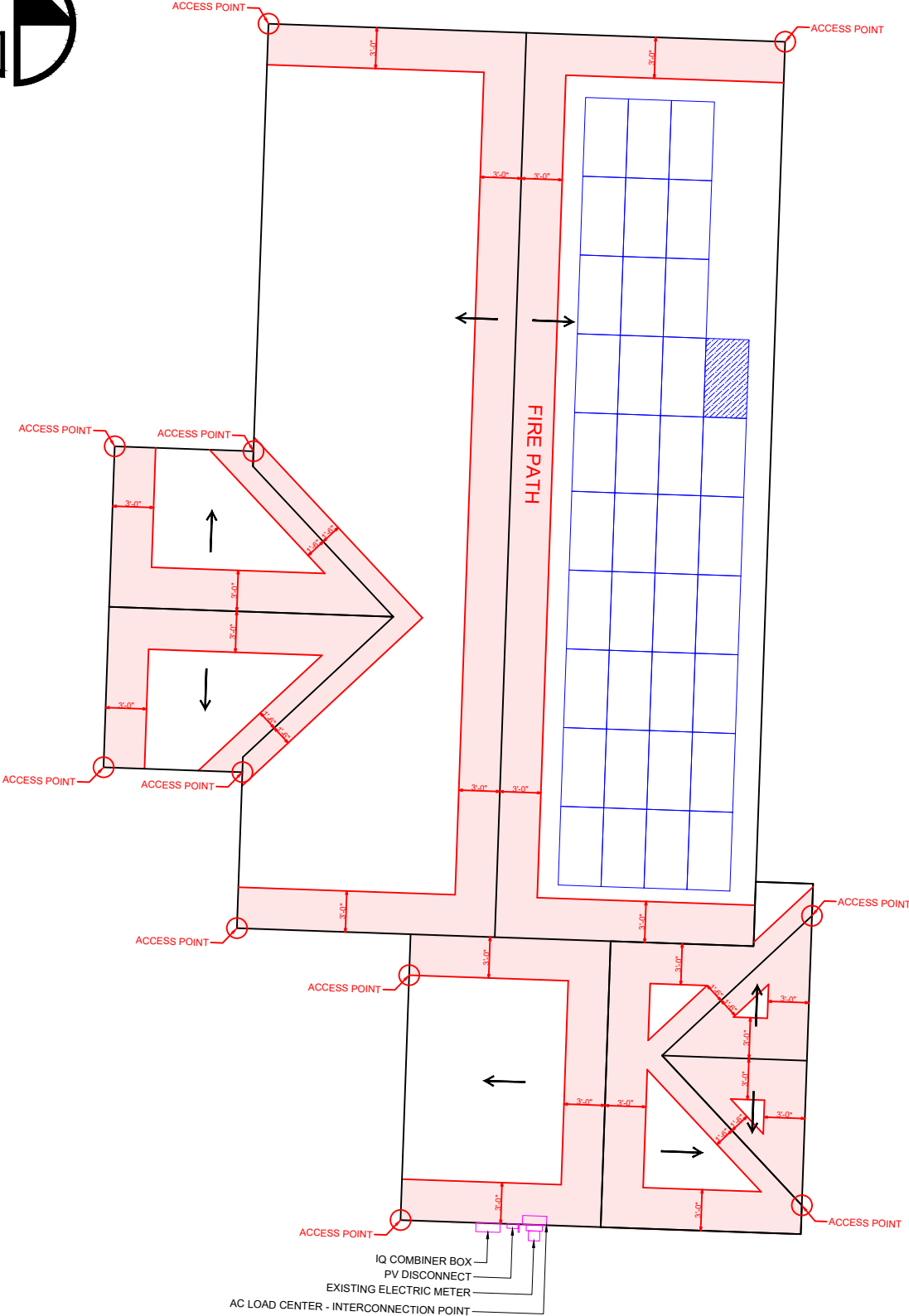
2 LOCATION MAP / WIND ZONES
N.T.S.



3 IRRADIANCE MAP
N.T.S.



4 3D RENDERING
N.T.S.



1 ROOF PLAN VIEW / BOS LOCATION
N.T.S.

"PROPERTY SIDE FACING STREET"

DOCUMENT CONTROL		DATE	CAD	QC
ISSUED FOR PERMIT		07-14-2022	JA	MM
REV	DESCRIPTION	DATE	CAD	QC

ENGINEER CONTACT INFORMATION		ENGINEERING STAMP
ENGIPARTNERS LLC		Rafael A Gonzalez
C.A. 32661		Soto
1825 PONCE DE LEON BLVD #114		2022.07.15
CORAL GABLES, FL 33134		08:51:34
DESIGN@ENGIPARTNERS.COM		-04'00'
833 - 888 - 3644		

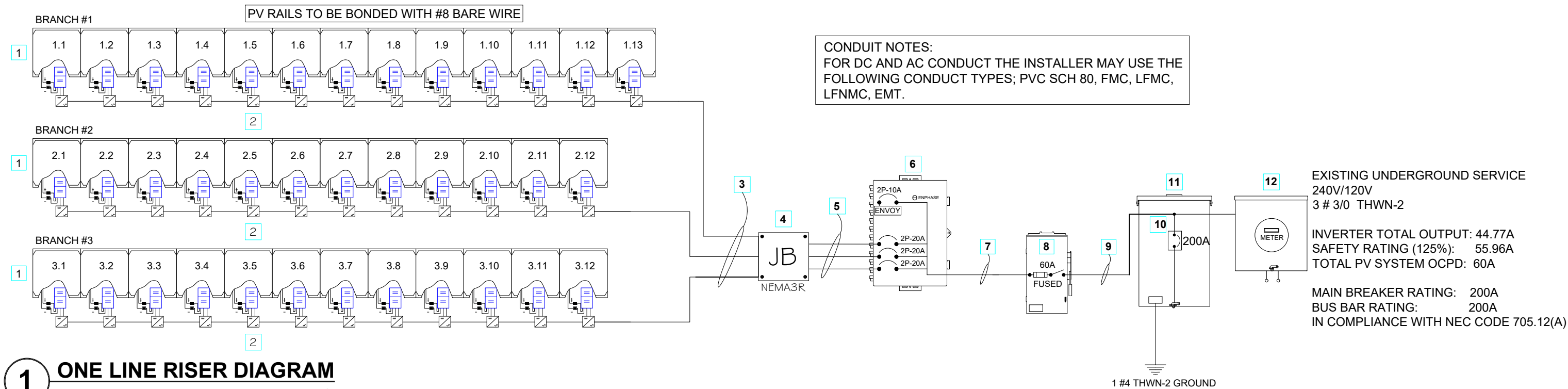
CONTRACTOR CONTACT INFORMATION	
ENERGY SOLUTIONS DIRECT	
6076 PARK BLVD N	
PINELLAS PARK, FL 33781	
(727) 744-0716 (800) 425-1175	
#EC13008844	



CUSTOMER:	BARBARA FEDOR
PROJECT ADDRESS:	19156 S US HIGHWAY 441 HIGH SPRINGS, FL 32643
PARCEL NUMBER:	33-6S-17-09834-202 (36340)

COVER SHEET		
PROJECT ID:	EP15179	SHEET TITLE:
ENGINEER OF RECORD:	ENG. RAFAEL A. GONZALEZ SOTO, PE	C-1
DATE:	07-13-2022	

WIRE SIZES, QUANTITY & TYPE				RACEWAY SIZE, TYPE & LOCATION			WIRE AMPACITY CALCULATIONS							ADDITIONAL INFORMATION			
WIRE TAG	CONDUCTOR QTY. SIZE & TYPE	NEUTRAL QTY. SIZE & TYPE	GROUND QTY. SIZE & TYPE	RACEWAY SIZE & TYPE	RACEWAY LOCATION	RACEWAY HEIGHT ABOVE ROOF	OUTPUT CURRENT (AMP)	125% OF OUTPUT CURRRENT (AMP)	MIN OCPD (AMP)	WIRE DE-RATED CALCULATION				DIST.	VOLTAGE	VOLTAGE DROP %	CONDUIT FILL %
										WIRE RATING	AMBIENT TEMPERATURE COEFFICIENT	# OF CONDUCTORS COEFFICIENT	DE-RATES AMPACITY				
AC.1 BRANCH 1 (BEFORE JB)	(1) IQ CABLE BY ENPHASE	N/A	(1) #8 AWG BARE COPPER	NOT APPLICABLE	UNDER ARRAY	1/2" TO 3-1/2"	15.73	19.66	20A	30A	0.76	1	22.8A	10 FT.	240V	0.11%	6.4%
AC.1 BRANCH 2 (BEFORE JB)	(1) IQ CABLE BY ENPHASE	N/A	(1) #8 AWG BARE COPPER	NOT APPLICABLE	UNDER ARRAY	1/2" TO 3-1/2"	14.52	18.15	20A	30A	0.76	1	22.8A	10 FT.	240V	0.11%	6.4%
AC.1 BRANCH 3 (BEFORE JB)	(1) IQ CABLE BY ENPHASE	N/A	(1) #8 AWG BARE COPPER	NOT APPLICABLE	UNDER ARRAY	1/2" TO 3-1/2"	14.52	18.15	20A	30A	0.76	1	22.8A	10 FT.	240V	0.11%	6.4%
AC.2 BRANCH 1 (FROM JB TO COMBINER BOX)	(2) #10 AWG THWN-2	N/A	(1) #8 AWG THWN-2	3/4" EMT CONDUIT	ABOVE ROOF	1/2" TO 3-1/2"	15.73	19.66	20A	40A	0.76	0.8	24.3A	20 FT.	240V	0.21%	8.1%
AC.2 BRANCH 2 (FROM JB TO COMBINER BOX)	(2) #10 AWG THWN-2	N/A	(1) #8 AWG THWN-2	3/4" EMT CONDUIT	ABOVE ROOF	1/2" TO 3-1/2"	14.52	18.15	20A	40A	0.76	0.8	24.3A	20 FT.	240V	0.21%	8.1%
AC.2 BRANCH 3 (FROM JB TO COMBINER BOX)	(2) #10 AWG THWN-2	N/A	(1) #8 AWG THWN-2	3/4" EMT CONDUIT	ABOVE ROOF	1/2" TO 3-1/2"	14.52	18.15	20A	40A	0.76	0.8	24.3A	20 FT.	240V	0.21%	8.1%
AC.3(FROM COMBINER BOX TO SERVICE)	(2) #6 AWG THWN-2	(1) #6 AWG THWN-2	(1) #8 AWG THWN-2	3/4" EMT CONDUIT	EXTERIOR WALL	"N/A"	44.77A	55.96A	60A	75A	1	1	75A	5 FT.	240V	0.1%	7.7%



1

ONE LINE RISER DIAGRAM

N.T.S.

LEGEND:

1	(37) DNA 120 MF26 365W BY APTOS REFER TO D-1 SHEET	2	IQ7+ MICROINVERTER BY ENPHASE REFER TO D-3 SHEET	3	3 IQ CABLE BY ENPHASE 1 #8 BARED WIRE GROUND
4	NEMA 3R JUNCTION BOX	5	6 #10 THWN-2 1 #8 THWN-2 GROUND 3/4" EMT CONDUIT	6	IQ COMBINER BOX BY ENPHASE - REFER TO D-2 SHEET WITH ENVOY BREAKER - OPTIONAL SIZE:10A, 15A OR 20 A
7	2 #6 L1,L2 THWN-2 1 #6 THWN-2 NEUTRAL	8	PV SYSTEM DISCONNECT - 60A RATED WITH 60A FUSES	9	2 #6 L1, L2 THWN-2 1 #6 THWN-2 NEUTRAL 3/4" EMT CONDUIT
10	PV INTERCONNECTION POINT-LINE SIDE	11	EXISTING INTERIOR PANEL RATED 200A	12	UTILITY ELECTRICAL SERVICE

DOCUMENT CONTROL				DATE	CAD	QC	ENGINEER CONTACT INFORMATION		ENGINEERING STAMP	CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO	CUSTOMER:		SHEET NAME:		
ISSUED FOR PERMIT				07-14-2022	JA	MM	ENGIPARTNERS LLC C.A. 32661 1825 PONCE DE LEON BLVD #114 CORAL GABLES, FL 33134 DESIGN@ENGIPARTNERS.COM 833 - 888 - 3644			Rafael A Gonzalez Soto 2022.07.15 08:52:00 -04'00'	ENERGY SOLUTIONS DIRECT 6076 PARK BLVD N PINELLAS PARK, FL 33781 (727) 744-0716 (800) 425-1175 #EC13008844		BARBARA FEDOR		ONE LINE RISER DIAGRAM		
REV				DESCRIPTION									PROJECT ADDRESS:				
													19156 S US HIGHWAY 441 HIGH SPRINGS, FL 32643				
													PARCEL NUMBER:				
													33-6S-17-09834-202 (36340)				
								PROJECT ID:		ENGINEER OF RECORD:		SHEET TITLE:					
								EP15179		ENG. RAFAEL A. GONZALEZ SOTO, PE							
										DATE:		E-1					
										07-13-2022							

**WARNING**

ELECTRICAL SHOCK HAZARD

TERMINALS ON BOTH LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

LABEL LOCATION:
AC DISCONNECT,
POINT OF INTERCONNECTION
PER CODE: NEC 690.13 (B)

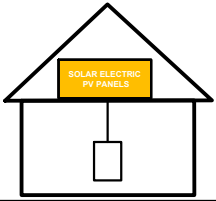
**WARNING**

TURN OFF PHOTOVOLTAIC
AC DISCONNECT PRIOR TO
WORKING INSIDE PANEL

LABEL LOCATION:
AC DISCONNECT, MAIN PANEL
PER CODE: NEC 110.27 (C)
OSHA 1910.145(f)(7)

**SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN**

TURN RAPID SHUTDOWN
SWITCH TO THE "OFF"
POSITION TO
SHUT DOWN PV SYSTEM
AND REDUCE SHOCK
HAZARD IN THE ARRAY.



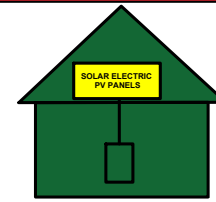
LABEL LOCATION:
AC DISCONNECT, MAIN PANEL
PER CODE: NEC 690.56(C)(1)(a)

**PHOTOVOLTAIC
SYSTEM EQUIPPED
WITH RAPID SYSTEM
SHUTDOWN**

LABEL LOCATION:
AC DISCONNECT
POINT OF INTERCONNECTION
PER CODE: NEC 690.56(C)

**EMERGENCY RESPONDER
THIS SOLAR PV SYSTEM IS
EQUIPPED WITH RAPID SHUTDOWN**

TURN RAPID SHUTDOWN
SWITCH TO THE "OFF"
POSITION TO SHUT DOWN
THE ENTIRE PV SYSTEM.



LABEL LOCATION:
AC DISCONNECT, MAIN PANEL
PER CODE: FFPC 7TH EDITION: 11.12.2.1.1.1.1

MICRO-INVERTER

NOMINAL OPERATING AC VOLTAGE

240 V

NOMINAL OPERATING AC FREQUENCY

60 HZ

MAXIMUM AC POWER

10.73 KW

MAXIMUM AC CURRENT

44.77A

MAX OVERCURRENT DEVICE RATING
FOR AC MODULE PROTECTION

20A

LABEL LOCATION:
INVERTER
PER CODE: NEC 690.52

MAXIMUM VOLTAGE

60 VDC

MAXIMUM CIRCUIT CURRENT

15.73 A

MAX RATED OUTPUT CURRENT OF
THE CHARGE CONTROLLER OR DC-TO-DC
CONVERTER
(IF INSTALLED)

N/A

LABEL LOCATION:
INVERTER
PER CODE: NEC 690.53

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT:

44.77 A

NOMINAL OPERATING AC VOLTAGE:

240V

LABEL LOCATION:
AC DISCONNECT
PER CODE: NEC 690.54

**MAIN PHOTOVOLTAIC
SYSTEM DISCONNECT**

LABEL LOCATION:
AC DISCONNECT
PER CODE: NEC 690.13 (B)

**WARNING: PHOTOVOLTAIC
POWER SOURCE**

LABEL LOCATION:
MAIN SERVICES
DISCONNECT, DC CONDUIT
PER CODE: NEC 690.31 (G) (3)

**WARNING**

**DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM**

LABEL LOCATION:
POINT OF
INTERCONNECTION
PER CODE: NEC 705.12 (B)(3)

**WARNING**

**POWER SOURCE OUTPUT CONNECTION. DO NOT
RELOCATE THIS OVERCURRENT DEVICE**

LABEL LOCATION:
POINT OF
INTERCONNECTION
PER CODE: NEC
705.12(B)(2)(3)(b)

**CAUTION**

PHOTOVOLTAIC SYSTEM CIRCUIT IS SUPPLY SIDE

LABEL LOCATION:
MAIN SERVICE PANEL
PER CODE: NEC 690.45(B)(5)

**DO NOT DISCONNECT
UNDER LOAD**

LABEL LOCATION:
POINT OF
INTERCONNECTION
PER CODE:
NEC 690.33(E)(2) & NEC
690.15 (C)

**CAUTION: SOLAR ELECTRIC
SYSTEM CONNECTED**

LABEL LOCATION: POINT OF INTERCONNECTION
PER CODE: NEC 690.15, NEC 690.13(B)

LABEL LOCATION: ADJACENT TO MAIN DISCONNECT

ENERGY SOLUTION DIRECT

PHONE NUMBER: (727) 744-0716
(800) 425-1175

ADDRESS: 6076 PARK BLVD N
PINELLAS PARK, FL 33781

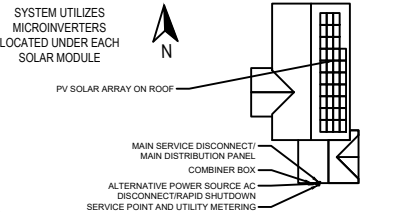
GENERAL NOTE:

ADHESIVE FASTENED SIGNS:

- THE LABEL SHALL BE VISIBLE, REFLECTIVE AND SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED [NFPA 1, 11.12.2.1]
- WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNINGS, AND MARKINGS SHOULD COMPLY WITH ANSI Z535.4 [NEC 110.21(B) FIELD MARKING].
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT [IFC 605.11.1.3]

**CAUTION**

POWER TO THIS BUILDING IS ALSO
SUPPLIED FROM THE FOLLOWING SOURCES
WITH DISCONNECTS LOCATED AS SHOWN:



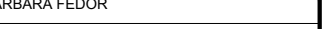
SYSTEM UTILIZES
MICROINVERTERS
LOCATED UNDER EACH
SOLAR MODULE

MAIN SERVICE DISCONNECT/
MAIN DISTRIBUTION PANEL
COMBINER BOX
ALTERNATIVE POWER SOURCE AC
DISCONNECT/RAPID SHUTDOWN
SERVICE POINT AND UTILITY METERING

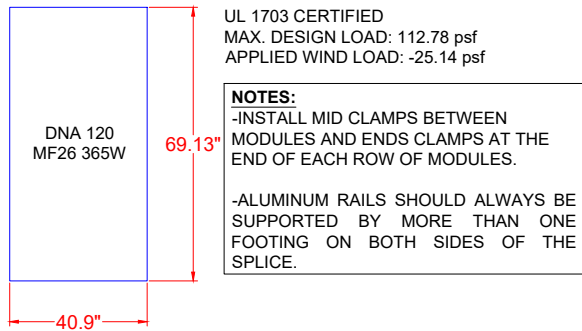
PER CODE: NEC 690.56 (B) , NEC705.10

1 PV SAFETY LABELS DATA

N.T.S.

DOCUMENT CONTROL				DATE	CAD	QC	ENGINEER CONTACT INFORMATION		ENGINEERING STAMP		CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO		CUSTOMER:		SHEET NAME:						
ISSUED FOR PERMIT				07-14-2022	JA	MM	ENGIPARTNERS LLC C.A. 32661 1825 PONCE DE LEON BLVD #114 CORAL GABLES, FL 33134 DESIGN@ENGIPARTNERS.COM 833 - 888 - 3644		 Rafael A Gonzalez Soto 2022.07.15 08:52:11 -04'00'		ENERGY SOLUTIONS DIRECT 6076 PARK BLVD N PINELLAS PARK, FL 33781 (727) 744-0716 (800) 425-1175 #EC13008844				CUSTOMER: BARBARA FEDOR		SAFETY LABELS						
REV				DESCRIPTION	DATE	CAD									QC	PROJECT ADDRESS:							
																	19156 S US HIGHWAY 441 HIGH SPRINGS, FL 32643		PROJECT ID:		ENGINEER OF RECORD:		SHEET TITLE:
																			EP15179		ENG. RAFAEL A. GONZALEZ SOTO, PE		
																					PARCEL NUMBER:		DATE:
													33-6S-17-09834-202 (36340)		07-13-2022		E-2						

LEGEND & SYMBOLS



WORST CASE MODULE:

ZONE 1: 39%

ZONE 2e: 61%

$$-25.14(0.39) + -25.14(0.61) = -25.14\text{psf}$$

ULTIMATE WIND SPEED	120	mph
DESIGN WIND SPEED	120	mph
RISK CATEGORY	II	
EXPOSURE CATEGORY	C	
ROOF SLOPE (°)	23	
ROOF TYPE	GABLED	
MATERIAL ROOF TYPE	ASPHALT SHINGLES	
PRESSURE ZONE:	1&2	
MEAN ROOF HEIGHT:	13.816'	
0.5 MEAN ROOF HEIGHT	6.908000	
2H ₂	10 "	
PERIMETER WIDTH:	3.78 '	
K _D	0.85	
K _{ZT}	1.0	
K _H	0.849	

VELOCITY PRESSURE (q) = 0.60*0.00256* K _H K _{ZT} K _D V ²	
VELOCITY PRESSURE (ASD)	15.96

NON EXPOSED EDGE FACTOR: $\gamma_E = 1.0$	EXPOSED EDGE FACTOR: $\gamma_E = 1.5$	ARRAY EQUALIZATION FACTOR: $\gamma_a = 0.7$
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EXTERNAL PRESSURE COEFFICIENT Z1	0.7	-1.5
EXTERNAL PRESSURE COEFFICIENT Z2e	0.7	-1.5
EXTERNAL PRESSURE COEFFICIENT Z2n	0.7	-2.5
EXTERNAL PRESSURE COEFFICIENT Z2r	0.7	-2.5
EXTERNAL PRESSURE COEFFICIENT Z3e	0.7	-2.5
EXTERNAL PRESSURE COEFFICIENT Z3r	0.7	-3.6

INTERNAL PRESSURE COEFFICIENT	0.18
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ZONES		PRESSURES (PSF)	NON EXPOSED PRESSURES (PSF)	EXPOSED PRESSURES (PSF)	MAX SPAN (FT)	MAX CANTI-LEVER (IN)
1		-26.81	-16.76	-25.14	6 '	24 "
2e		-26.81	-16.76	-25.14	6 '	24 "
2n		-42.77	-27.93	-41.90	4 '	16 "
2r		-42.77	-27.93	-41.90	4 '	16 "
3e		-42.77	-27.93	-41.90	4 '	16 "
3r		-60.33	-40.22	-60.33	4 '	16 "

TOTAL ROOF AREA	3669.97	sq.-ft
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TOTAL MODULES:	37
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TOTAL PHOTOVOLTAIC AREA:	726.63	sq.-ft
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TOTAL PERCENTAGE AREA OF PV SYSTEM:	19.80	%
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WIND LOAD (PSF):	-25.14
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TOTAL WIND LOAD (LBS):	-18,267.48
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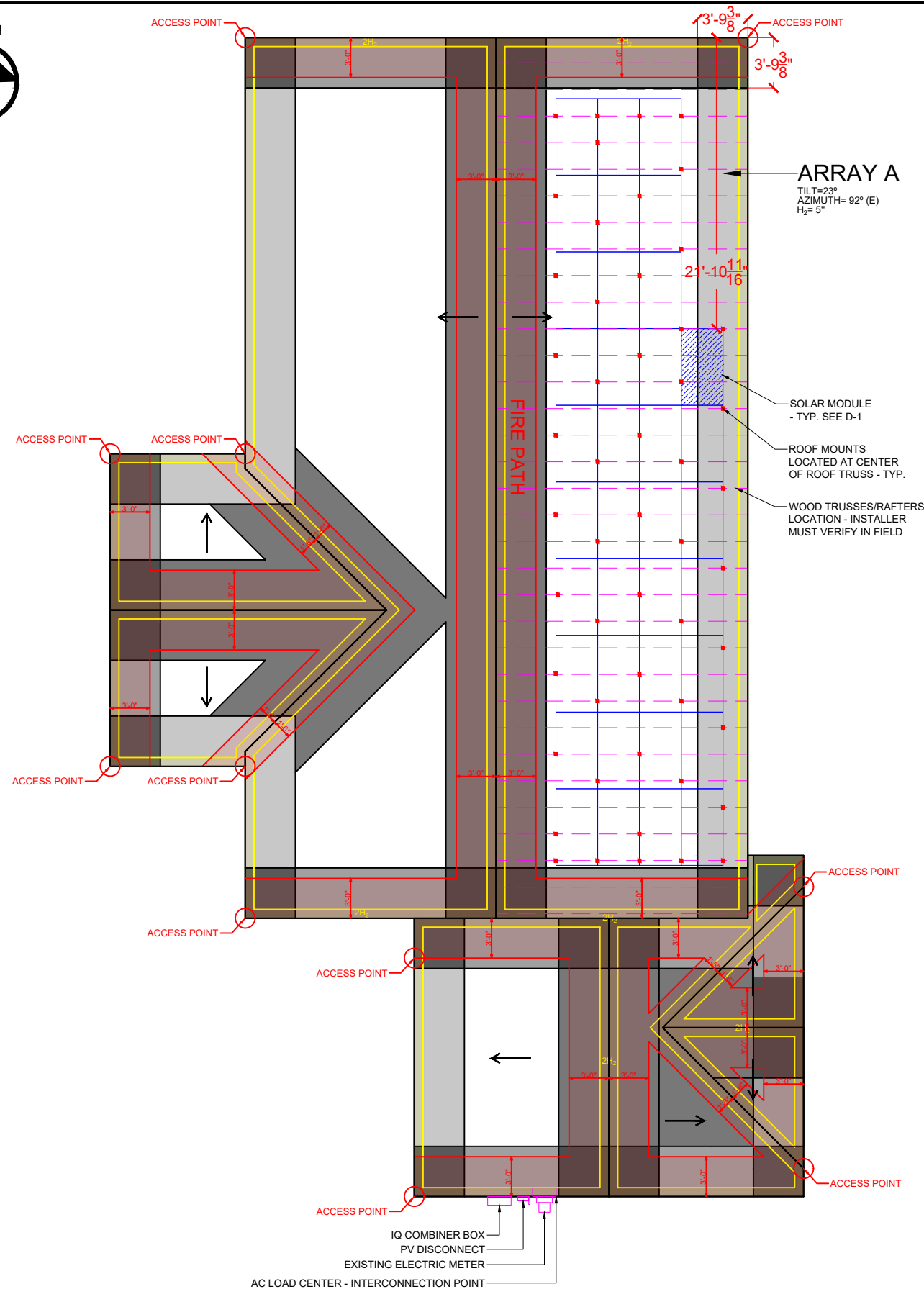
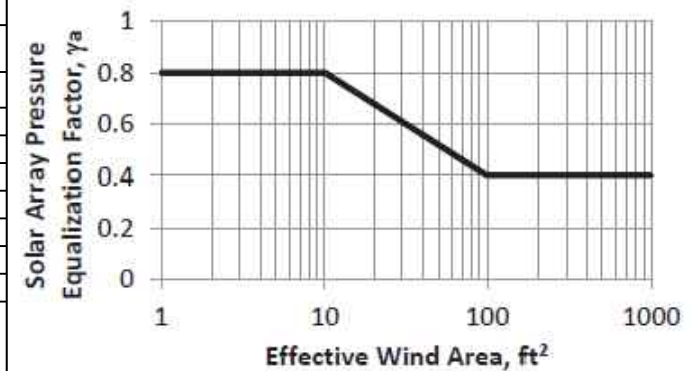
TOTAL ROOF MOUNTS:	52
TENSION FORCE PER MOUNT (LBS)	254.00

TENSION FORCE PER MOUNT (LBS):	-351.30
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ROOF'S GENERAL NOTES: 1- CONTRACTOR/INSTALLER TO VERIFY ROOF CONDITIONS FOR PROPER INSTALLATION OF THE PV SYSTEM. 2- CONTRACTOR/INSTALLER TO NOTIFY THE OWNER IMMEDIATELY OF ANY ROOF DEFICIENCIES AND/OR REPAIR REQUIRED TO INSTALL THE PV SYSTEM. 3- EOR DOES NOT ASSUME ANY RESPONSIBILITY FOR THE INSTALLATION OF ANY PV SYSTEM ON DEFICIENT ROOFS. 4-CONTRACTOR/INSTALLER ASSUMES ALL RESPONSIBILITY TO INSTALL AS PER MANUFACTURER STANDARDS.

ROOF INSPECTION NOTE:	
A PANEL IS DEFINED AS EXPOSED IF D1 TO THE ROOF EDGE >0.5H AND ONE OF THE FOLLOWING APPLIES:	
1.	D1 TO THE ADJACENT ARRAY > 4 FT (1.2 M) OR
2.	D2 TO THE NEXT ADJACENT PANEL> 4 FT. (1.2 M)

ASCE 7.16 - 29.4-7
DESIGNED WIND PRESSURES:
 $p = q_h (GC_p)(\gamma_E)(\gamma_a)$



1 STRUCTURAL ROOF PLAN & PV MODULES LAYOUT N.T.S.

DOCUMENT CONTROL		DATE	CAD	QC
ISSUED FOR PERMIT		07-14-2022	JA	MM
REV	DESCRIPTION	DATE	CAD	QC

ENGINEER CONTACT INFORMATION	
ENGINPARTNERS LLC C.A. 32661 1825 PONCE DE LEON BLVD #114 CORAL GABLES, FL 33134 DESIGN@ENGINPARTNERS.COM 833 - 888 - 3644	

CONTRACTOR CONTACT INFORMATION

ENERGY SOLUTIONS DIRECT
6076 PARK BLVD N
PINELLAS PARK, FL 33781
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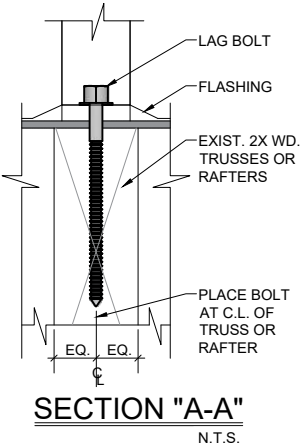
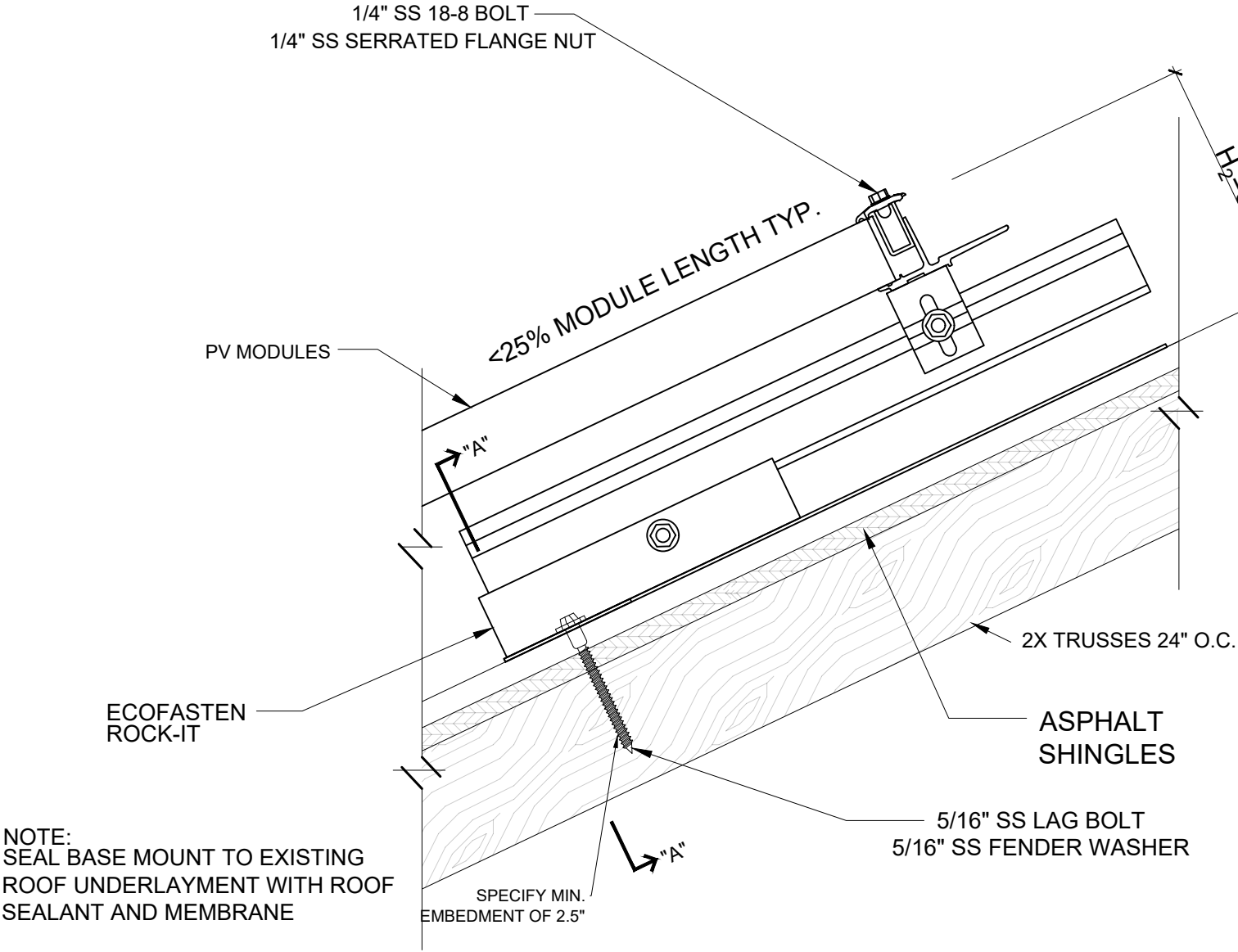
CUSTOMER:	BARBARA FEDOR
PROJECT ADDRESS:	19156 S US HIGHWAY 441 HIGH SPRINGS, FL 32643
PARCEL NUMBER:	33-6S-17-09834-202 (36340)

SHEET NAME:			STRUCTURAL PLAN		
PROJECT ID:		ENGINEER OF RECORD:		SHEET TITLE:	
EP15179		ENG. RAFAEL A. GONZALEZ SOTO, PE		S-1	
DATE:		07-13-2022			

MAXIMUM ATTACHMENT SPANS (INCHES)				ATTACHMENT SPAN FOR 72 CELL MODULE INSTALLED IN LANDSCAPE ORIENTATION						
GROUND SNOW LOAD	EXPOSURE CATERGORY	PANEL ANGLE	WIND SPEED	120 MPH						
			ROOF ZONE	1'	1	2e	2r	2n	3e	3r
0 PSF	C	20 TO 27	ARRAY INTERIOR	72	72	72	57	57	57	53
			ARRAY EDGE	64	64	64	38	38	38	35

LAG BOLT PULL OUT CALCULATIONS

Spruce, Pine,	Per inch Thread Depth	266lbs
SS Lag Bolt 5/16" x 4"	Min. Thread Depth	0'-3"
Wood Strength x Thread Depth = Pull Out Strength		
266 lbs. x 3 in = 798 lbs.		
Allowable Pull Out Strength per Lag Bolt		798 lbs.
Max. Pull Out Strength Required per Lag Bolt		351.30
Lag Bolt Pull Out Strength Safety Factor		2.27



DISTRIBUTED LOAD CALCULATIONS

PV MODULES & RACKING WEIGHT = (INDIVIDUAL MODULE WEIGHT + 3.5 LBS) * (MODULE QTY) = (48.69 LBS) * (37) = 1,801.53 LBS

PER SQUARE FEET (PSF) ARRAY LOAD = PV MODULES & RACKING WEIGHT / TOTAL ARRAY AREA = 1,801.53 LBS / 726.63 SQFT = 2.48 PSF

HENCE, ROOF WILL CARRY THE ADDITIONAL SOLAR SYSTEM LOAD

ASCE 7-16 Velocity Pressure
qz10 = 0.00256Kz Kzt Kd V2
Where:
qz10 = ASCE 7-16 velocity pressure evaluated at mean roof height (psf)
Kz = velocity pressure exposure coefficient
Kzt = topographic factor
Kd = wind directionality factor
V = basic wind speed (mph) from ASCE 7-16 maps referred to as ultimate wind speed maps in 2020 FBC.
As an example, for an array having an area of 158.04 sq.-ft., the total uplifting (resultant) force acting on the array would be -39.1 psf x 158.04 sq. ft. = -6,179.364 lb. Knowing this resultant force, the design engineer can now determine the number of attachment points and the size of the mounting hardware necessary to safely carry this load.
Live Loads:
Live loads associated with photovoltaic systems are usually assumed to be distributed uniformly and are small, on the order of 4 psf or less.

Uni-Rac Specs. Lag pull-out (withdrawal) capacities (lbs) in typical roof lumber (ASD)

STAINLESS STEEL Lag screw specifications		
	Specific gravity	5/16" shaft, * per inch thread depth
Douglas Fir, Larch	0.50	266
Douglas Fir, South	0.46	235
Engelman Spruce, Lodgepole Pine (MSR 1650 f & higher)	0.46	235
Hem, Fir, Redwood (close grain)	0.43	212
Hem, Fir (North)	0.46	235
Southern Pine	0.55	307
Spruce, Pine, Fir	0.42	205
Spruce, Pine, Fir (E of 2 million psi and higher grades of MSR and MEL)	0.50	266

Sources: American Wood Council, NDS 2005, Table 11.2A, 11.3A.

1 SHINGLE ROOF MOUNT DETAIL & DATA

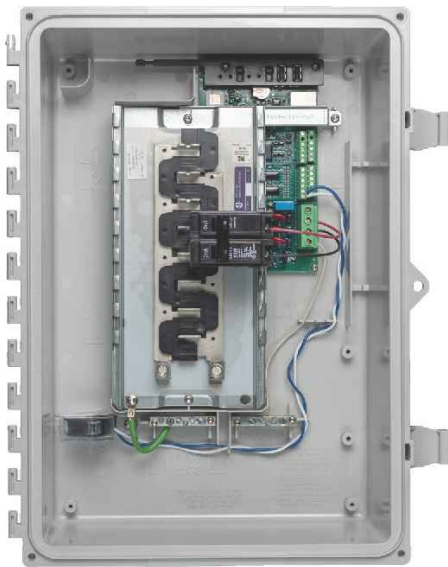
N.T.S.

DOCUMENT CONTROL				DATE	CAD	QC	ENGINEER CONTACT INFORMATION		ENGINEERING STAMP		CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO		CUSTOMER:		SHEET NAME:					
ISSUED FOR PERMIT				07-14-2022	JA	MM	ENIGPARTNERS LLC C.A. 32661 1825 PONCE DE LEON BLVD #114 CORAL GABLES, FL 33134 DESIGN@ENIGPARTNERS.COM 833 - 888 - 3644				Rafael A Gonzalez Soto 2022.07.15 08:52:32 -04'00'		ENERGY SOLUTIONS DIRECT 6076 PARK BLVD N PINELLAS PARK, FL 33781 (727) 744-0716 (800) 425-1175 #EC13008844				CUSTOMER: BARBARA FEDOR		RACKING PLAN			
PROJECT ADDRESS: 19156 S US HIGHWAY 441 HIGH SPRINGS, FL 32643																						
PARCEL NUMBER: 33-6S-17-09834-202 (36340)				PROJECT ID: EP15179		ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE											SHEET TITLE: S-2					
				DATE: 07-13-2022																		
REV	DESCRIPTION			DATE	CAD	QC																

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ISSUED FOR PERMIT				07-14-2022		JA	MM	ENGIPARTNERS LLC						ENERGY SOLUTIONS DIRECT						BARBARA FEDOR		PV MODULES DATA SHEET			
REV				DATE		CAD	QC	C.A. 32661						6076 PARK BLVD N						PROJECT ADDRESS:					
DESCRIPTION								1825 PONCE DE LEON BLVD #114						PINELLAS PARK, FL 33781						19156 S US HIGHWAY 441					
								CORAL GABLES, FL 33134						(727) 744-0716 (800) 425-1175						HIGH SPRINGS, FL 32643					
								DESIGN@ENGIPARTNERS.COM						#EC13008844				PARCEL NUMBER:		EP15179		ENGINEER OF RECORD:		SHEET TITLE:	
								833 - 888 - 3644										33-6S-17-09834-202 (36340)		ENG. RAFAEL A. GONZALEZ SOTO, PE		D-1			
																				DATE:					
																				07-13-2022					

Enphase IQ Combiner 3 (X-IQ-AM1-240-3)

The **Enphase IQ Combiner 3™** with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.



Smart

- Includes IQ Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring

Simple

- Reduced size from previous combiner
- Centered mounting brackets support single stud mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- UL listed



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 3

MODEL NUMBER	
IQ Combiner 3 X-IQ-AM1-240-3	IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).
ACCESSORIES and REPLACEMENT PARTS (not included, order separately)	
Enphase Mobile Connect™ CELLMODEM-03 (4G/12-year data plan) CELLMODEM-01 (3G/5-year data plan) CELLMODEM-M1 (4G based LTE-M/5-year data plan)	Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)
Consumption Monitoring* CT CT-200-SPLIT	Split core current transformers enable whole home consumption metering (+/- 2.5%).
* Consumption monitoring is required for Enphase Storage Systems	
Wireless USB adapter COMMS-KIT-01	Installed at the IQ Envoy. For communications with Enphase Encharge™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoy or Enphase IQ Combiner™ and allows redundant wireless communication with Encharge and Enpower.
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	65 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. continuous current rating (input from PV)	64 A
Max. total branch circuit breaker rating (input)	80A of distributed generation / 90A with IQ Envoy breaker included
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 37.5 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.06" (53.5 cm with mounting brackets).
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Cellular	Optional, CELLMODEM-01 (3G) or CELLMODEM-03 (4G) or CELLMODEM-M1 (4G based LTE-M) (not included)
COMPLIANCE	
Compliance, Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
Compliance, IQ Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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2019-11-04



DOCUMENT CONTROL				DATE	CAD	QC	ENGINEER CONTACT INFORMATION				ENGINEERING STAMP		CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO		CUSTOMER:		SHEET NAME:	
ISSUED FOR PERMIT				07-14-2022	JA	MM	ENGINEPARTNERS LLC				Rafael A Gonzalez		ENERGY SOLUTIONS DIRECT		ESD SOLAR		BARBARA FEDOR		SMART MONITORING DATA SHEET	
REV				DATE	CAD	QC	C.A. 32661 1825 PONCE DE LEON BLVD #114 CORAL GABLES, FL 33134				2022.07.15 08:53:04 -04'00'		6076 PARK BLVD N PINELLAS PARK, FL 33781 (727) 744-0716 (800) 425-1175 #EC13008844				PROJECT ADDRESS:			
							DESIGN@ENGINEPARTNERS.COM										19156 S US HIGHWAY 441 HIGH SPRINGS, FL 32643			
							833 - 888 - 3644										PARCEL NUMBER:		PROJECT ID:	
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																			ENGINEER OF RECORD:	
																			ENG. RAFAEL A. GONZALEZ SOTO, PE	
																			DATE:	
																			07-13-2022	
																			SHEET TITLE:	
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Enphase
IQ 7 and IQ 7+
Microinverters

The high-powered smart grid-ready **Enphase IQ 7 Micro™** and **Enphase IQ 7+ Micro™** dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.



To learn more about Enphase offerings, visit enphase.com

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell and 72-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.



Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)	IQ7-60-2-US / IQ7-60-B-US		IQ7PLUS-72-2-US / IQ7PLUS-72-B-US	
Commonly used module pairings ¹	235 W - 350 W +		235 W - 440 W +	
Module compatibility	60-cell PV modules only		60-cell and 72-cell PV modules	
Maximum input DC voltage	48 V		60 V	
Peak power tracking voltage	27 V - 37 V		27 V - 45 V	
Operating range	16 V - 48 V		16 V - 60 V	
Min/Max start voltage	22 V / 48 V		22 V / 60 V	
Max DC short circuit current (module Isc)	15 A		15 A	
Overvoltage class DC port	II		II	
DC port backfeed current	0 A		0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20 A per branch circuit			
OUTPUT DATA (AC)	IQ 7 Microinverter		IQ 7+ Microinverter	
Peak output power	250 VA		295 VA	
Maximum continuous output power	240 VA		290 VA	
Nominal (L-L) voltage/range ²	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz		60 Hz	
Extended frequency range	47 - 68 Hz		47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms	
Maximum units per 20 A (L-L) branch circuit ³	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III		III	
AC port backfeed current	0 A		0 A	
Power factor setting	1.0		1.0	
Power factor (adjustable)	0.7 leading ... 0.7 lagging		0.7 leading ... 0.7 lagging	
EFFICIENCY	@240 V		@240 V	@208 V
Peak CEC efficiency	97.6 %		97.5 %	97.3 %
CEC weighted efficiency	97.0 %		97.0 %	97.0 %

MECHANICAL DATA	
Ambient temperature range	-40°C to +65°C
Relative humidity range	4% to 100% (condensing)
Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US)	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)
Connector type (IQ7-60-B-US & IQ7PLUS-72-B-US)	Friends PV2 (MC4 intermateable). Adaptors for modules with MC4 or UTX connectors: - PV2 to MC4: order ECA-S20-S22 - PV2 to UTX: order ECA-S20-S25
Dimensions (WxHxD)	212 mm x 175 mm x 30.2 mm (without bracket)
Weight	1.08 kg (2.38 lbs)
Cooling	Natural convection - No fans
Approved for wet locations	Yes
Pollution degree	PD3
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure
Environmental category / UV exposure rating	NEMA Type 6 / outdoor

FEATURES	
Communication	Power Line Communication (PLC)
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.

1. No enforced DC/AC ratio. See the compatibility calculator at <https://enphase.com/en-us/support/module-compatibility>.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

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2018-05-24



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REV				DATE		CAD	QC	C.A. 32661				2022.07.15		6076 PARK BLVD N		19156 S US HIGHWAY 441		PROJECT ADDRESS:		PROJECT ID:		ENGINEER OF RECORD:	
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								CORAL GABLES, FL 33134				-04'00'		(727) 744-0716 (800) 425-1175		33-6S-17-09834-202 (36340)		PARCEL NUMBER:				DATE:	
								DESIGN@ENGINEPARTNERS.COM				#EC13008844										07-13-2022	
								833 - 888 - 3644														SHEET TITLE:	
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