PHOTOVOLTAIC SYSTEM 10.69 KW DC
XXXXXXXXXXXXXXX

PROJECT DATA

PROJECT ADDRESS:	XXXXX	
OWNER:	XXXXXXX	
CONTRACTOR:	XXXXXX	
DESIGNER:	XXXXXXXXXX	
SCOPE:	10.69 kW DC	7.44 kW AC
	ROOF MOUNT SOLAR SYSTEM WITH 31 MISSION SOLAR 345W SOLAR MODULES(MSE345SX5T) AND 31 ENPHASE IQ7-60-2-ACM-US MICROINVERTERS	
ELECTRICAL INFORMATION:	EXISTING	1ϕ, 3W, 120/240V
	MAIN SERVICE PANEL BUSBAR RATING	200A
	NEW MAIN SERVICE BREAKER RATING	NO MAIN
BUILDING INFORMATION:	ONE -TWO STORY HOUSE CONSTRUCTION TYPE: V-B OCCUPANCY: R ROOF: COMP. SHINGLE RAFTERS: 2"X6" @ 24" O.C.	
RACKING INFORMATION:	IRONRIDGE ROOF MOUNT	
APN:		
LOT AREA:		
LIVING AREA:		

CODE REFERENCES

THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC POWER SYSTEMS SHALL COMPLY WITH THE FOLLOWING CODES:
2018 INTERNATIONAL BUILDING CODE, IBC
2018 INTERNATIONAL EXISTING BUILDING CODE, IEBC
2018 INTERNATIONAL RESIDENTIAL CODE, IRC
2018 INTERNATIONAL FIRE CODE, IFC
2018 INTERNATIONAL MECHANICAL CODE, IMC
2018 INTERNATIONAL PLUMBING CODE, IPC
2018 INTERNATIONAL FUEL GAS CODE, IFGC
2018 INTERNATIONAL ENERGY CONSERVATION CODE, IECC
2017 (NEC) NATIONAL ELECTRIC CODE, NEC
2018 SAN ANTONIO PROPERTY MAINTENANCE CODE (BASED ON THE 2018 INTERNATIONAL PROPERTY MAINTENANCE CODE), IPC
ALL OTHER ORDINANCE ADOPTED BY THE LOCAL GOVERNING AGENCIES

GENERAL NOTES

1. ALL ELECTRICAL MATERIALS SHALL BE NEW AND LISTED BY RECOGNIZED ELECTRICAL TESTING LABORATORY CUSTOM MADE EQUIPMENT SHALL HAVE COMPLETE TEST DATA SUBMITTED BY THE MANUFACTURER ATTESTING TO ITS SAFETY
2. OUTDOOR EQUIPMENT SHALL BE AT LEAST NEMA 3R RATED
3. ALL METALLIC EQUIPMENT SHALL BE GROUNDED
4. ALL SPECIFIC WIRING IS BASED ON THE USE OF COPPER.
5.CONTRACTOR SHALL OBTAIN ELECTRICAL PERMITS PRIOR TO INSTALLATION AND SHALL COORDINATE ALL INSPECTIONS, TESTING COMMISSIONING AND ACCEPTANCE WITH THE CLIENT, UTILITY CO. AND CITY INSPECTORS AS NEEDED.
6.THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS OF SERVICE POINTS AND SERVICE SIZES WITH THE SERVING UTILITY COMPANY AND COMPLY WITH ALL UTILITY COMPANIES REQUIREMENTS. IF THE SOLAR BACK FED BREAKER IS OVER THE BUSS SIZE 20% LIMIT, CONTRACTOR SHALL INCLUDE THE COST TO REPLACE MAIN BREAKER OR ENLARGE MAIN CAPACITY.
7. DRAWINGS ARE DIAGRAMMATIC ONLY, ROUTING OF RACEWAYS SHALL BE OPTION OF THE CONTRACTOR UNLESS OTHERWISE NOTED AND SHALL BE COORDINATED WITH OTHER TRADES.
8. IF THE ROOF MATERIAL OR ROOF STRUCTURE NOT ADEQUATE FOR PV INSTALLATION, CALL ENGINEER PRIOR TO INSTALL. THE CONTRACTOR IS RESPONSIBLE TO VERIFY THAT THE ROOF IS CAPABLE OF WITHSTANDING THE EXTRA WEIGHT.
9. IF THE DISTANCES FOR CABLE RUNS ARE DIFFERENT THAN SHOWN, THE CONTRACTOR SHALL NOTIFY THE ELECTRICAL ENGINEER TO VALIDATE THE WIRE SIZE. FINAL DRAWINGS WILL BE RED-LINED AND UPDATED AS APPROPRIATE.
10. WHENEVER A DISCREPANCY IN QUALITY OF EQUIPMENT ARISES ON THE DRAWING OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIAL AND SERVICES REQUIRED BY THE STRICTEST CONDITIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS TO ENSURE COMPLETE COMPLIANCE AND LONGEVITY OF THE OPERABLE SYSTEM REQUIRED BY THE ARCHITECT/ENGINEERS.
11. ALL BROCHURES, OPERATION MANUALS, CATALOGS, SHOP DRAWINGS, ETC. SHALL BE HANDED OVER TO OWNER'S REPRESENTATIVE AT THE COMPLETION OF WORK

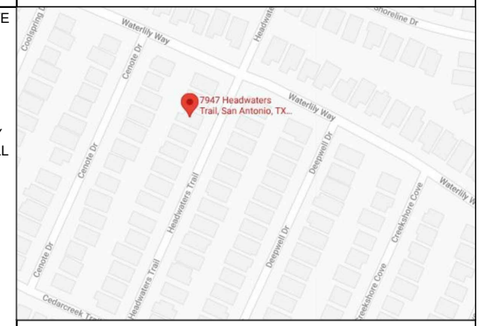
PHOTOVOLTAIC NOTES

1. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED AND IDENTIFIED UL 1703.
2. SOLAR SYSTEM SHALL NOT COVER ANY PLUMBING OR MECHANICAL VENTS
3. MODULES AND SUPPORT STRUCTURES SHALL BE GROUNDED.
4. SOLAR INVERTER MUST HAVE A MANUFACTURE INSTALLED DISCONNECTING MEANS THAT PREVENTS PARALLEL FEEDING UTILITY LINES DURING POWER OUTAGE.
5. REMOVAL OF AN INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PHOTOVOLTAIC SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTORS.
6. ALL PV MODULES AND ASSOCIATED EQUIPMENT AND WIRING SHALL BE PROTECTED FROM ANY PHYSICAL DAMAGE.
7. LIVE PARTS OF PV SOURCE CIRCUITS AND PV OUTPUT CIRCUITS OVER 150V TO GROUND SHALL NOT BE ACCESSIBLE TO OTHER THAN QUALIFIED PERSONS WHILE ENERGIZED.
8 .INVERTER IS EQUIPPED W/ INTEGRATED GFDI, THUS PROVIDING GROUND FAULT PROTECTION
9. ALL CONDUCTORS SHALL BE COPPER AND 90 DEG RATED
10. ALL ELECTRICAL EQUIPMENT SHALL BE LISTED BY A RECOGNIZED ELECTRICAL TESTING LABORATORY OR APPROVED BY THE DEPARTMENT.
11. CONDUITS SHOULD BE PAINTED TO MATCH EXISTING ROOF AND WALL COLORS
12.ALL WORK SHALL BE IN ACCORD WITH THE 2017 NEC WITH SPECIAL EMPHASIS ON ARTICLE 690
13. THE OUTPUT OF A UTILITY INTERACTIVE-INVERTER SHALL BE PERMITTED TO BE CONNECTED TO THE SUPPLY SIDE OF THE SERVICE DISCONNECTING MEANS AS PER 230.82(6)
14. A SINGLE CONDUCTOR SHALL BE PERMITTED TO BE USED TO PERFORM THE MULTIPLE FUNCTIONS OF DC GROUNDING, AC GROUNDING AND BONDING BETWEEN AC AND DC SYSTEMS SIZED AS PER SEC 250.122
15. EQUIPMENT GROUND CONDUCTOR REQUIRED IN RACEWAYS SIZED PER CEC 250-122.
16. PER ART 250.92. NON-CURRENT CARRYING METAL PARTS OF EQUIPMENT SHALL BE EFFECTIVELY BONDED TOGETHER. BOND BOTH ENDS OF RACEWAYS

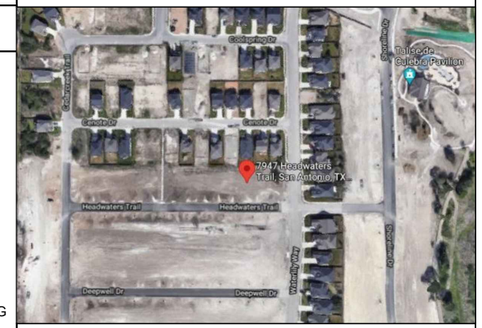
CITY REQUIRED NOTES

1.A SMOKE DETECTOR, APPROVED AND LISTED BY THE STATE FIRE MARSHAL, SHALL BE INSTALLED IN EACH DWELLING WHEN A PERMIT FOR ALTERATIONS, REPAIRS OR ADDITIONS EXCEEDS $1,000.00. A BATTERY POWERED SMOKE DETECTOR SATISFIES THE REQUIREMENTS FOR A SMOKE DETECTOR. (R314.6.2 CRC)
2.THE CONTRACTOR SHALL PROVIDE A WRITTEN LETTER TO THE BUILDING INSPECTOR STATING THAT ALL INACCESSIBLE STRUCTURAL CONNECTIONS HAVE BEEN INSTALLED IN CONFORMANCE WITH THE REQUIREMENTS OF THE APPROVED PLANS.
3.PROVIDE SMOKE ALARMS AT THE FOLLOWING LOCATIONS AND NOTE ON THE PLANS; (R314.3 CRC)
i. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF BEDROOMS.
ii. IN EACH ROOM USED FOR SLEEPING PURPOSES.
iii. IN EACH STORY, INCLUDING BASEMENTS. IN SPLIT LEVEL UNITS WITHOUT AN INTERVENING DOOR BETWEEN ADJACENT LEVELS, A SMOKE ALARM INSTALLED ON THE UPPER LEVEL SHALL SUFFICE PROVIDED THAT THE LOWER LEVEL IS LESS THAN ONE FULL STORY BELOW THE UPPER LEVEL.
iv. ALARMS SHALL BE INTERCONNECTED SUCH THAT THE ACTUATION OF ONE ALARM SHALL ACTIVATE ALL ALARMS.
v. ALARMS SHALL RECEIVE THEIR PRIMARY POWER FROM THE BUILDING WIRING WITH BATTERY BACKUP.
vi. APPROVED COMBINED SMOKE ALARMS AND CARBON DIOXIDE ALARMS SHALL BE ACCEPTABLE.
4.A CARBON MONOXIDE DETECTOR SHALL BE INSTALLED IN THE SPECIFIC EXISTING DWELLING UNIT THAT HAVE ATTACHED GARAGES OR FUEL-BURNING APPLIANCES FOR WHICH A PERMIT IS ISSUED FOR ALTERATIONS, REPAIRS OR ADDITIONS EXCEEDING $1,000.00. LISTED SINGLE- OR MULTI-STATION CARBON MONOXIDE ALARMS SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS AND ON EVERY LEVEL OF A DWELLING UNIT INCLUDING BASEMENTS. COMBINED SMOKE/CARBON MONOXIDE ALARMS MAY BE USED. THE ALARM SHALL RECEIVE ITS PRIMARY POWER FROM
THE BUILDING WIRING EXCEPT IT IS PERMITTED TO BE SOLELY BATTERY PERATED WHERE REPAIRS OR ALTERATIONS DO NOT RESULT IN THE REMOVAL OF WALL AND CEILING FINISHES OR THERE IS NO ACCESS BY MEANS OF AN ATTIC. SHOW ON THE PLANS.(R315 CRC)

VICINITY MAP



SATELLITE VIEW



SHEET INDEX

General Notes

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No.	Revision/Issue	Date

CONTRACTOR

Firm Name & Adress

Address:

X

Project Name & Adress

Date

Sheet 0

Scale AS INDICATED

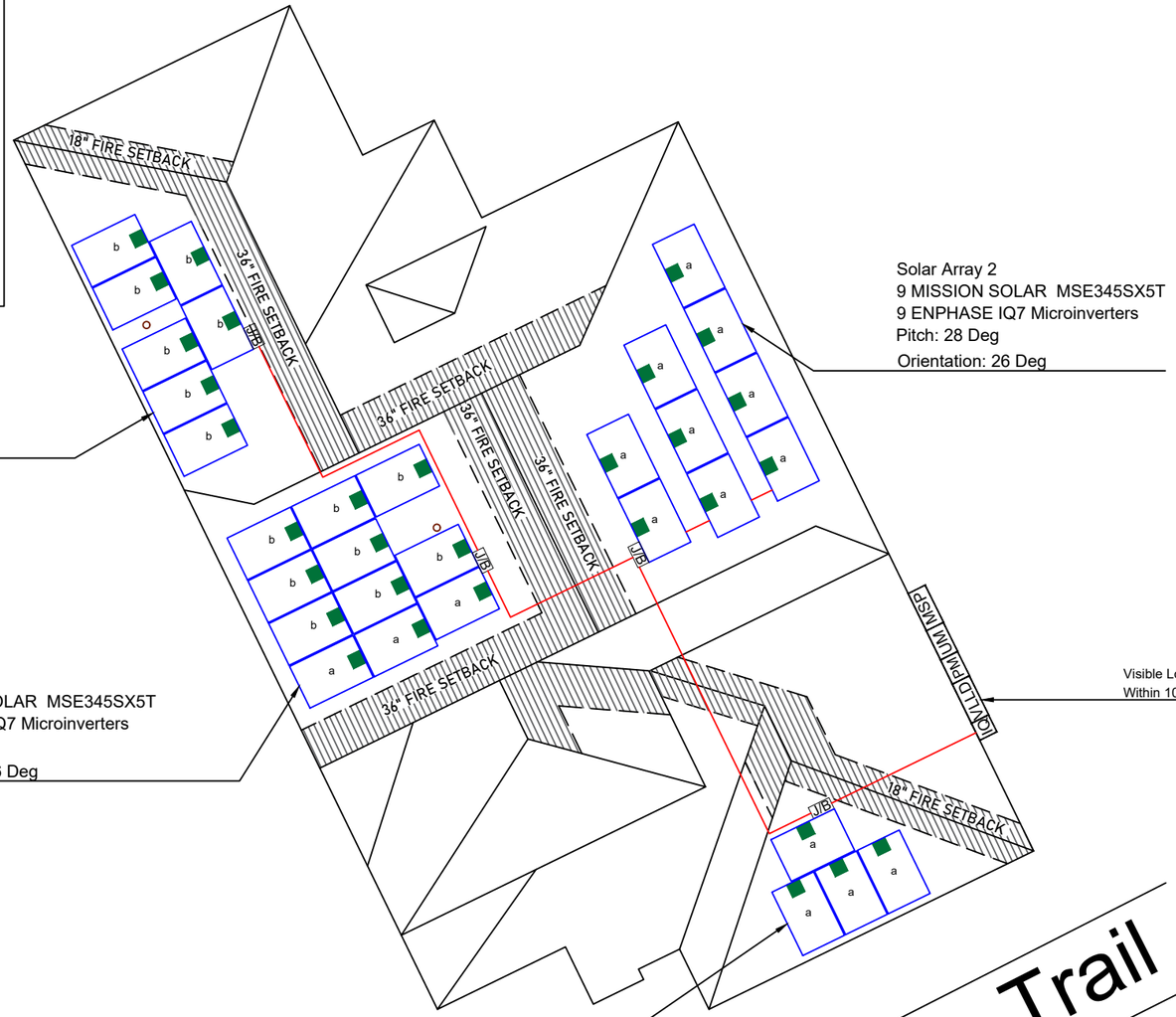
Project PV SYSTEM

PHOTOVOLTAIC ARRAY

(31) MISSION SOLAR 345W SOLAR MODULES (MSE345SX5T)
(31) ENPHASE ENERGY MICROINVERTERS (IQ7-60-2-ACM-US)

UNIT INDEX

MSP	(E) Main Service Panel
UM	(E) Utility Meter
IQ	(N) IQ Combiner Box
VLLD	(N) Visible Lockable, Labeled Disconnect within 10 feet of the Utility Meter
PM	Production Meter
J/B	(N) Junction Box
	Microinverter
	Solar Module
	PVC Type Conduit



Solar Array 4
7 MISSION SOLAR MSE345SX5T
7 ENPHASE IQ7 Microinverters
Pitch: 28 Deg
Orientation: 206 Deg

Solar Array 2
9 MISSION SOLAR MSE345SX5T
9 ENPHASE IQ7 Microinverters
Pitch: 28 Deg
Orientation: 26 Deg

Solar Array 3
11 MISSION SOLAR MSE345SX5T
11 ENPHASE IQ7 Microinverters
Pitch: 28 Deg
Orientation: 206 Deg

Visible Lockable Labeled Disconnect
Within 10 feet from the Utility Meter

Solar Array 1
4 MISSION SOLAR MSE345SX5T
4 ENPHASE IQ7 Microinverters
Pitch: 28 Deg
Orientation: 176 Deg

Headwaters Trail

N 0°
W 270° E 90°
S 180°

0 1 5 10 ft

General Notes

ROOF PLAN

No.	Revision/Issue	Date

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X

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Date

Scale AS INDICATED

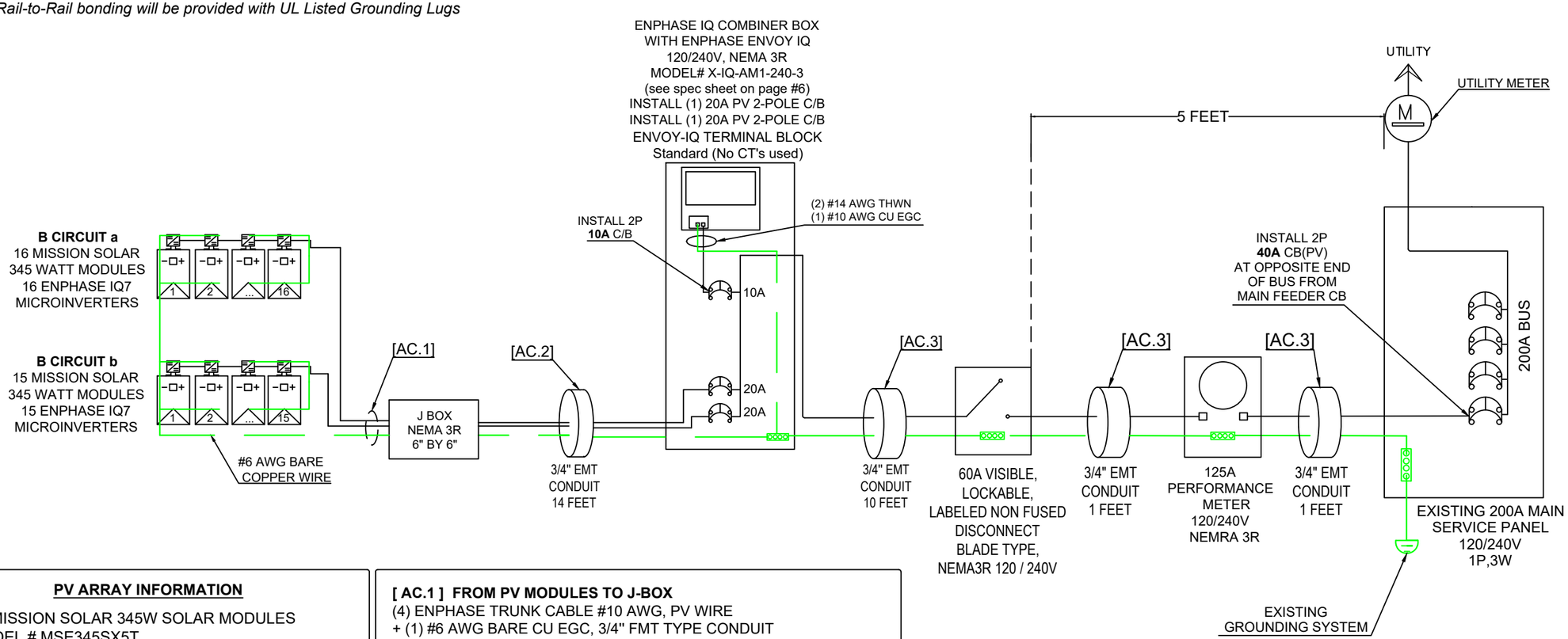
Project PV SYSTEM

Sheet 1

All the photovoltaic systems wires that on the roof and side of the building shall be protected against physical damage

Grounding Notes:

Ironridge Roof Mount has an integrated grounding system with UFO Clamps.
No additional ground lugs are needed for module-to-module and module-to-rail bonding.
Rail-to-Rail bonding will be provided with UL Listed Grounding Lugs



PV ARRAY INFORMATION

31 MISSION SOLAR 345W SOLAR MODULES
MODEL # MSE345SX5T
31 ENPHASE IQ7 MICROINVERTERS
MODEL # IQ7-60-2-ACM-US
NUMBER OF BRANCH CIRCUITS : 2
NUMBER OF MODULES IN BRANCH CIRCUITS a: 16
NUMBER OF MODULES IN BRANCH CIRCUITS b: 15
MAX WATTS STC: 16 * 345W = 5520W

PV MODULE RATINGS # STC

SHORT CIRCUIT CURRENT I-SC = 11.16A
MAXIMUM POWER CURRENT I-MP = 10.53A
OPEN CIRCUIT VOLTAGE V-OC = 41.2 V
MAXIMUM POWER VOLTAGE V-MP = 34.25 V

INVERTER RATING

PEAK PWR TRACKING VOLTAGE = 27 - 37 V
CEC EFFICIENCY = 97.0 %
ENCLOSURE : NEMA 6
MAXIMUM INPUT CURRENT = 15 A
MAXIMUM OUTPUT CURRENT = 1.00 A
MAXIMUM INPUT POWER = 235 - 350 W
MAXIMUM OUTPUT POWER = 240 W

[AC.1] FROM PV MODULES TO J-BOX
(4) ENPHASE TRUNK CABLE #10 AWG, PV WIRE
+ (1) #6 AWG BARE CU EGC, 3/4" FMT TYPE CONDUIT
BETWEEN ARRAYS

[AC.2] FROM J-BOX TO IQ COMBINER BOX
(4) #10 AWG THWN-2 + (1) #6 AWG CU EGC,
2-1/2" PVC TYPE CONDUIT
OF MICROINVERTERS IN BRANCH CIRCUITS a : 16
EACH INVERTER OUTPUT MAX CURRENT: 1.00 A
BRANCH CIRCUIT CURRENT:16 * 1.00 * 1.25 = 20.0A
BREAKER SIZE PER B. CRCT - **20A**
OF MICROINVERTERS IN BRANCH CIRCUITS b : 15
EACH INVERTER OUTPUT MAX CURRENT: 1.00 A
BRANCH CIRCUIT CURRENT: 15 * 1.00 * 1.25 = 18.75 A
BREAKER SIZE PER B. CRCT - **20A**

MAXIMUM CONTINUOUS CURRENT: 38.75A
RACEWAY HEIGHT FROM ROOF 1 $\frac{1}{2}$" (TEMP - 39 + 17 = 56C)
TEMP. DERATE FACTOR - 20.0A / 0.58 = 34.48 A
MORE THAN 3 CCC ADJST. FACTOR (4 WIRES) - 0.8
ADJUSTED CONDUCTOR AMPACITY - 34.48 A / 0.8 = 43.1 A
WIRE SIZE FROM NEC TABLE 310.15(b)16 - **#8 AWG**
AMBIENT TEM FACTOR 0.58 PER NEC 310.15(b)(2)(a)

[AC.3] FROM IQ COMBINER BOX TO MAIN SERVICE PANEL
(2) #8 AWG THWN-2 **+** (1) #6 AWG CU EGC,
2-1/2" PVC TYPE CONDUIT

BRANCH CIRCUITS: 2
TOTAL AMPS FROM 2 BRANCH CIRC : 31 * 1.00A = 31.00A
CONSIDER CONTINUOUS: 31.00 A * 1.25 = 38.75 A
TEMP. DERATE FACTOR - 38.75A / 0.91 = 42.58 A
WIRE SIZE FROM NEC TABLE 310.15(b)16 - **8 AWG**
AMBIENT TEM FACTOR 0.91 PER NEC 310.15(b)(2)(a)

OUTPUT CALCULATIONS

PV SYSTEM MAX DC OUTPUT:
31* 345W = 10,695W
PV SYSTEM MAX AC OUTPUT:
(31) MISSION SOLAR MSE345SX5T
(31) ENPHASE ENERGY IQ7-60-2-ACM-US
Pmax (PTC Rating) PER MODULE: 321.4W
321.4W * 31 = 9.96W
9.96 * 97.0% INVERTER = 9.66kW

MAIN PANEL RATING

SPLIT PHASE: 3W, 120/240V
BUSBAR RATING =200A
MAIN SERVICE BREAKER = NO MAIN

General Notes

SINGLE LINE DIAGRAM

No.	Revision/Issue	Date

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X

Project Name & Adress

Date

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Scale
AS INDICATED

Project
PV SYSTEM