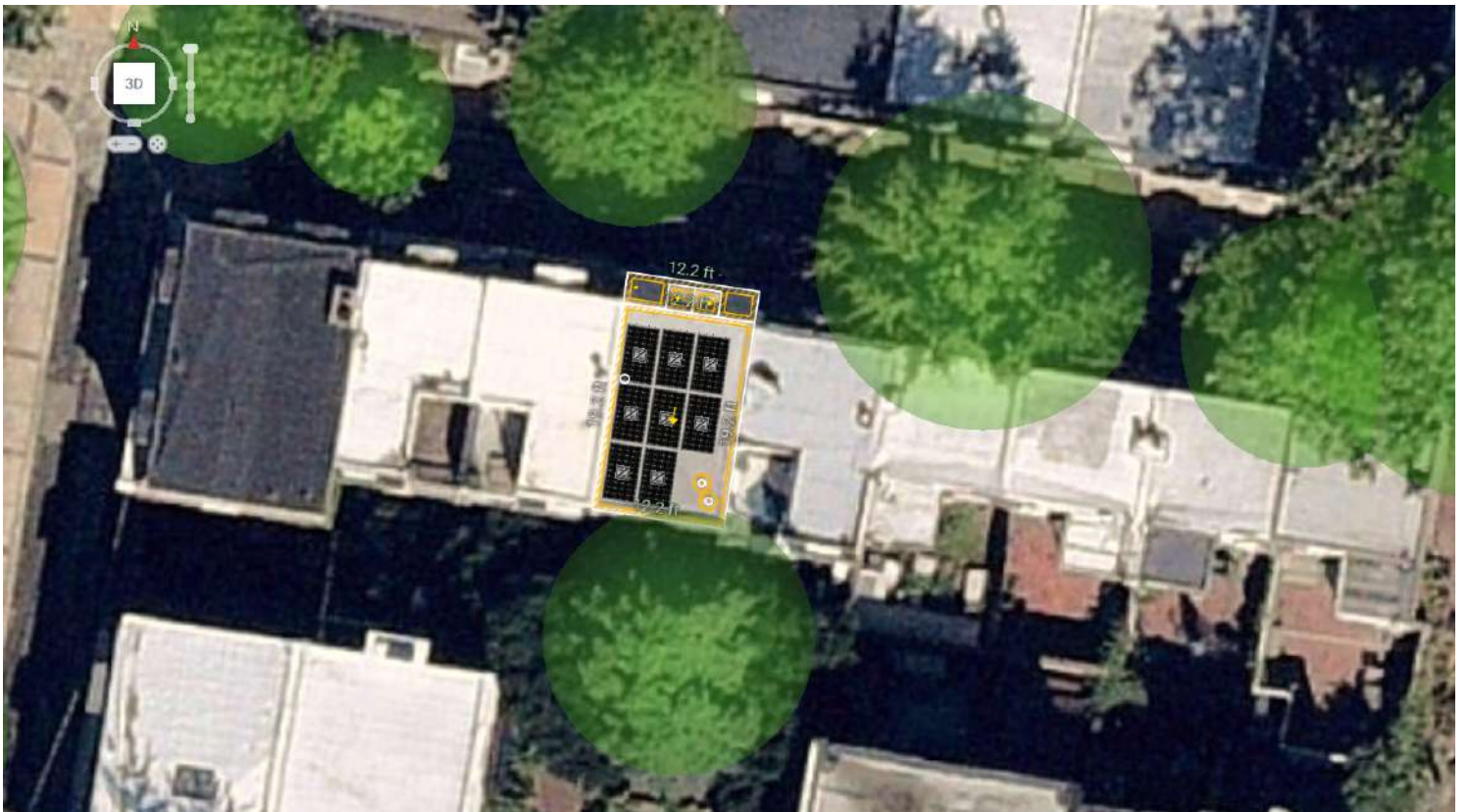


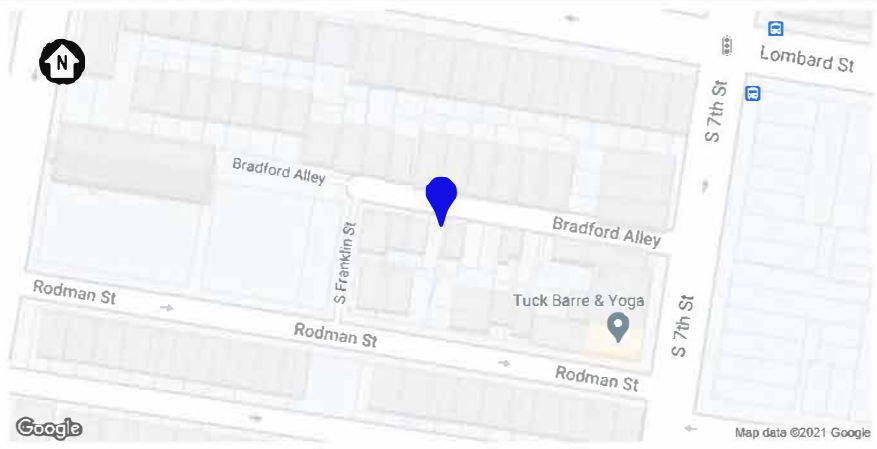
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DIRECTORY OF PAGES	
PV-1	PROJECT SUMMARY
PV-2	SITE PLAN
PV-3	SINGLE-LINE DIAGRAM
PV-4	SAFETY LABELS
PV-7	FIRE SAFETY PLAN
APPENDIX	ELECTRICAL CALCULATIONS
	MODULE DATASHEET
	ARRAY WIRING BOX DATASHEET
	INVERTER DATASHEET

PROJECT DETAILS	
PROPERTY ADDRESS	718 BRADFORD ALLEY, PHILADELPHIA, PA 19147 US
ZONING	RESIDENTIAL
USE AND OCCUPANCY CLASSIFICATION	ONE- OR TWO-FAMILY DWELLING GROUP (GROUP R3)
UTILITY COMPANY	PECO ENERGY CO
ELECTRICAL CODE	2014 NEC (NFPA 70)
FIRE CODE	2015 IFC
OTHER BUILDING CODES	IBC 2015 IRC 2015 IMC 2015

CONTRACTOR INFORMATION	
CONTRACTOR SIGNATURE	



**1** PLOT  
PV-1 SCALE: NTS



**2** LOCALE  
PV-1 SCALE: NTS

**SCOPE OF WORK**

THIS PROJECT INVOLVES THE INSTALLATION OF A GRID-INTERACTIVE PV SYSTEM. PV MODULES WILL BE MOUNTED USING A PREENGINEERED MOUNTING SYSTEM. THE MODULES WILL BE ELECTRICALLY CONNECTED WITH DC TO AC POWER INVERTERS AND INTERCONNECTED TO THE LOCAL UTILITY USING MEANS AND METHODS CONSISTENT WITH THE RULES ENFORCED BY THE LOCAL UTILITY AND PERMITTING JURISDICTION.

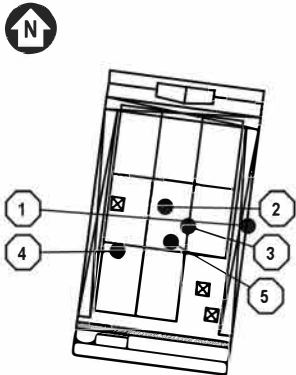
THIS DOCUMENT HAS BEEN PREPARED FOR THE PURPOSE OF DESCRIBING THE DESIGN OF A PROPOSED PV SYSTEM WITH ENOUGH DETAIL TO DEMONSTRATE COMPLIANCE WITH APPLICABLE CODES AND REGULATIONS. THE DOCUMENT SHALL NOT BE RELIED UPON AS A SUBSTITUTE FOR FOLLOWING MANUFACTURER INSTALLATION INSTRUCTIONS. THE SYSTEM SHALL COMPLY WITH ALL MANUFACTURERS LISTING AND INSTALLATION INSTRUCTIONS, AS WELL AS ALL APPLICABLE CODES. NOTHING IN THIS DOCUMENT SHALL BE INTERPRETED IN A WAY THAT OVERRIDES THEM. CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF ALL CONDITIONS, DIMENSIONS, AND DETAILS IN THIS DOCUMENT.

SYSTEM DETAILS	
DESCRIPTION	NEW GRID-INTERACTIVE PV SYSTEM WITH NO ENERGY STORAGE
DC RATING OF SYSTEM	2.56KW
AC RATING OF SYSTEM	1.92KW
AC OUTPUT CURRENT	8.0A
INVERTER(S)	8 X ENPHASE IQ7-60-2-US
MODULE	Q-CELLS Q.PEAK DUO BLK-G5 320
ARRAY WIRING	(1) BRANCH OF 8 IQ7-60-2-US MICROINVERTERS

INTERCONNECTION DETAILS	
POINT OF CONNECTION	NEW SUPPLY SIDE AC CONNECTION PER NEC 705.12(A)
UTILITY SERVICE	120/240V 1Φ
LOCATION	INSIDE PANELBOARD, PROTECTED BY FUSED SQUARE D D222NRB, 2-POLE, 60A, 240VAC

SITE DETAILS	
ASHRAE EXTREME LOW	-14°C (7°F)
ASHRAE 2% HIGH	34°C (93°F)
CLIMATE DATA SOURCE	PHILADELPHIA INTERNATIONAL AIRPORT (KPHL)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	C

<b>P-153972</b>	
<b>GRID-TIED SOLAR POWER SYSTEM</b>	718 BRADFORD ALLEY PHILADELPHIA, PA 19147
<b>PROJECT SUMMARY</b>	
DOC ID: 153972-189748-1	
DATE: 5/6/21	
CREATOR: M.C.	
REVIEWER:	
<b>REVISIONS</b>	
<b>PV-1</b>	



1 SITE PLAN  
PV-2 SCALE: 1" = 10'

GENERAL NOTES	
1	EQUIPMENT LIKELY TO BE WORKED UPON WHILE ENERGIZED SHALL BE INSTALLED IN LOCATIONS THAT SATISFY MINIMUM WORKING CLEARANCES PER NEC 110.26.
2	CONTRACTOR SHALL USE ONLY COMPONENTS LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY FOR THE INTENDED USE.
3	CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL EQUIPMENT, CABLES, ADDITIONAL CONDUITS, RACEWAYS, AND OTHER ACCESSORIES NECESSARY FOR A COMPLETE AND OPERATIONAL PV SYSTEM.

- 1 (E) Utility Meter indoor, located in basement
- 2 (N) PROPOSED ROOF-MOUNTED PHOTOVOLTAIC ARRAY, FLAT ROOF, 8 PV MODULES (BLACK FRAME, BLACK BACKSHEET), 0° TILT, 187° AZIMUTH
- 3 (E) MAIN SERVICE PANEL (MSP), INDOOR
- 4 (N) TRANSITION BOX, OUTDOOR, OUTPUT CIRCUIT CONDUCTORS SHALL BE RUN IN PVC-40 CONDUIT OVER ROOF NO CLOSER THAN 0.0" ABOVE ROOF SURFACE
- 5 (N) VISIBLE, LOCKABLE, READILY-ACCESSIBLE AC DISCONNECT LOCATED WITHIN 10 FT OF UTILITY METER, LOCATED IN BASEMENT

P-153972

GRID-TIED SOLAR POWER SYSTEM

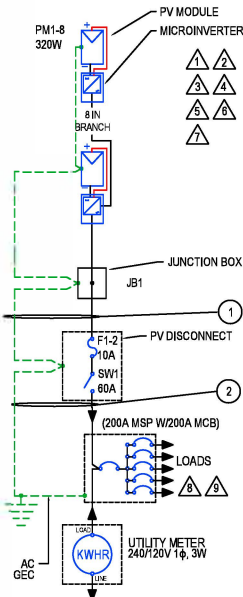
718 BRADFORD ALLEY  
PHILADELPHIA, PA 19147

SITE PLAN

DOC ID: 153972-189748-1  
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PV-2



MODULES										
REF.	QTY.	MAKE AND MODEL	P <sub>MAX</sub>	PTC	ISC	IMP	VOC	VMP	TEMP. COEFF. OF VOC	FUSE RATING
PM1-8	8	Q-CELLS Q-PEAK DUO BLK-GS 320	320W	297 W	9.94A	9.47 A	40.6V	33.8V	-0.114 V/C (-0.28%/°C)	20A

INVERTERS									
REF.	QTY.	MAKE AND MODEL	AC VOLTAGE	GROUND	RATED POWER	MAX OUTPUT CURRENT	MAX INPUT CURRENT	MAX INPUT VOLTAGE	GEC WEIGHTED EFFICIENCY
I1-8	8	ENPHASE IQ7-60-2-US	240V	UNGROUNDING	240W	1.0A	15.0A	48V	97.0%

DISCONNECTS				OCPDS				
REF.	QTY.	MAKE AND MODEL	RATED CURRENT	MAX RATED VOLTAGE	REF.	QTY.	RATED CURRENT	MAX VOLTAGE
SW1	1	SQUARE D DZZZ1F8 OR EQUIV.	60A	240VAC	F1-2	2	10A	DNAC

SYSTEM SUMMARY	
INVERTERS PER BRANCH	8
MAX AC CURRENT	8A
MAX AC OUTPUT	1,920W
ARRAY STC POWER	2,560W
ARRAY PTC POWER	2,376 W
MAX AC CURRENT	8A
MAX AC POWER OUTPUT	1,920W
DERATED AC POWER OUTPUT	1,920W

- NOTES**
- △ THE DC AND AC CONNECTORS OF THE ENPHASE IQ7-60-2-US AND ARE LISTED TO MEET REQUIREMENTS AS A DISCONNECT MEANS AS ALLOWED BY NEC 690.15(A). MATING CONNECTORS SHALL COMPLY WITH NEC 690.17(E).
  - △ THE ENPHASE IQ7-60-2-US HAS A CLASS II DOUBLE-INSULATED RATING AND DOES NOT REQUIRE GROUNDING ELECTRODE CONDUCTORS (GEC) OR EQUIPMENT GROUNDING CONDUCTORS (EGC). THE RATING INCLUDES GROUND FAULT PROTECTION (GFP). TO SUPPORT GFP, USE ONLY PV MODULES EQUIPPED WITH DC CABLES LABELED PV WIRE OR PV CABLE.
  - △ ENPHASE SYSTEM MEETS REQUIREMENTS FOR PHOTOVOLTAIC RAPID SHUTDOWN SYSTEM (PVRS), AS PER NEC 690.12.
  - △ MICROINVERTER BRANCH CIRCUIT CONDUCTORS ARE MANUFACTURED ENPHASE Q CABLES LISTED FOR USE IN 20A OR LESS CIRCUITS OF ENPHASE IQ MICROINVERTERS. THEY ARE ROHS, OIL RESISTANT, AND UV RESISTANT. THEY CONTAIN TWO 12 AWG CONDUCTORS OF TYPE THHN/THWN-2 DRY/WET AND CERTIFIED TO UL3003 AND UL 9703.
  - △ UNGROUNDING SYSTEM DC CONDUCTORS SHALL BE COLOR-CODED AS FOLLOWS. DC POSITIVE SHALL BE RED (OR MARKED RED) AND DC NEGATIVE SHALL BE BLACK (OR MARKED BLACK)
  - △ ALL METAL ENCLOSURES, RACEWAYS, CABLES AND EXPOSED NONCURRENT-CARRYING METAL PARTS OF EQUIPMENT SHALL BE GROUNDED TO EARTH AS REQUIRED BY NEC 250.4(B) AND PART III OF ARTICLE 250 AND EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45(A). THE GROUNDING ELECTRODE SYSTEM SHALL ADHERE TO NEC 690.47 AND NEC 250.169. THE DC GROUNDING ELECTRODE SHALL BE SIZED ACCORDING TO NEC 250.166 AND INSTALLED IN COMPLIANCE WITH NEC 250.64.
  - △ MAX DC VOLTAGE OF PV MODULE IS 45.0V AT -14°C (-14°C - 25°C) X -0.114 V/C + 40.56V = 45.0V.
  - △ POINT-OF-CONNECTION IS ON THE SUPPLY SIDE OF SERVICE DISCONNECT, INSIDE PANELBOARD ENCLOSURE USING UNUSED TERMINALS, TERMINALS THAT ARE SUITABLE FOR DOUBLE LUGGING, OR USING OTHER LOCALLY-APPROVED METHODS AND HARDWARE, IN COMPLIANCE WITH NEC 705.12(A). THE PANELBOARD SHALL HAVE SUFFICIENT SPACE TO ALLOW FOR ANY TAP HARDWARE AS REQUIRED BY NEC 110.3 AND NEC 312.8
  - △ PV SYSTEM DISCONNECT SHALL BE A VISIBLE KNIFE-BLADE TYPE DISCONNECT THAT IS ACCESSIBLE AND LOCKABLE BY THE UTILITY. THE DISCONNECT SHALL BE LOCATED WITHIN 10 FT OF UTILITY METER. DISCONNECT SHALL BE GROUNDED IN ACCORDANCE WITH NEC 230.72.

CONDUCTOR AND CONDUIT SCHEDULE W/ELECTRICAL CALCULATIONS														
ID	TYPICAL	CONDUCTOR	CONDUIT / CABLE	CURRENT-CARRYING CONDUCTORS IN CONDUIT / CABLE	OCPD	EGC	TEMP. CORR. FACTOR	FILL FACTOR	CONT. CURRENT	MAX CURRENT (125%)	BASE AMP.	DERATED AMP.	TERM. TEMP. RATING	AMP. @ TERM. TEMP. RATING
1	1	10 AWG THWN-2, COPPER	0.5" DIA. PVC-40	2	10A	10 AWG THWN-2, COPPER	0.58 (67°C)	1.0	8A	10A	40A	23.2A	75°C	35A
2	1	6 AWG THWN-2, COPPER	0.75" DIA. PVC-40	2	10A	14 AWG THWN-2, COPPER	0.56 (34°C)	1.0	8A	10A	75A	72A	75°C	65A

- GENERAL ELECTRICAL NOTES**
- UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
  - CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.10 (D).
  - CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).

- GROUNDING NOTES**
- ALL EQUIPMENT SHALL BE PROPERLY GROUNDED PER THE REQUIREMENTS OF NEC ARTICLES 250 & 690
  - PV MODULES SHALL BE GROUNDED TO MOUNTING RAILS USING MODULE LUGS OR RACKING INTEGRATED GROUNDING CLAMPS AS ALLOWED BY LOCAL JURISDICTION. ALL OTHER EXPOSED METAL PARTS SHALL BE GROUNDED USING UL-LISTED LAY-IN LUGS.
  - INSTALLER SHALL CONFIRM THAT MOUNTING SYSTEM HAS BEEN EVALUATED FOR COMPLIANCE WITH UL 2703 "GROUNDING AND BONDING" WHEN USED WITH PROPOSED PV MODULE.

- IF THE EXISTING MAIN SERVICE PANEL DOES NOT HAVE A VERIFIABLE GROUNDING ELECTRODE, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE.
- AC SYSTEM GROUNDING ELECTRODE CONDUCTOR (GEC) SHALL BE A MINIMUM SIZE #8AWG WHEN INSULATED, #6AWG IF BARE WIRE.
- EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC ARTICLE 690.45, AND BE A MINIMUM OF #10AWG WHEN NOT EXPOSED TO DAMAGE, AND #6AWG SHALL BE USED WHEN EXPOSED TO DAMAGE
- GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLOR CODED GREEN, OR MARKED GREEN IF #4AWG OR LARGER

**GRID TIED SOLAR POWER SYSTEM**  
 718 BRADFORD ALLEY  
 PHILADELPHIA, PA 19147

**SINGLE-LINE DIAGRAM**

PROJECT ID: 153972  
 DATE: 05/06/21  
 CREATED BY: M.C.  
 CHECKED BY:

REVISIONS

1 SINGLE-LINE DIAGRAM  
 PV-3 SCALE: NTS

SW1 - DISCONNECT  
(SQUARE DD222NRB)

1 2 3

1 EACH DISCONNECTING MEANS FOR PHOTOVOLTAIC EQUIPMENT (SW1)

2 AC SOLAR DISCONNECT (SW1)

3 AC DISCONNECT (SW1)

MSP - MAIN SERVICE PANEL

4

**I WARNING I**  
ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

NEC690.17(E)

PHOTOVOLTAIC AC DISCONNECT

NEC690.13(B)

MAXIMUM AC OPERATING CURRENT: 8.0A  
MAXIMUM AC OPERATING VOLTAGE: 240V

NEC690.54

4 ANY AC ELECTRICAL PANEL THAT IS FED BY BOTH THE UTILITY AND THE PHOTOVOLTAIC SYSTEM (MSP)

**I WARNING I**  
DUAL POWER SOURCE. SECOND SOURCE IS PHOTOVOLTAIC SYSTEM.

NEC705.12(D)(3)

LABELING NOTES	
1	ALL PLAQUES AND SIGNAGE REQUIRED BY 2014 NEC AND 2015 IFC WILL BE INSTALLED AS REQUIRED.
2	LABELS, WARNING(S) AND MARKING SHALL COMPLY WITH ANSI Z535.4, WHICH REQUIRES THAT DANGER, WARNING, AND CAUTION SIGNS USED THE STANDARD HEADER COLORS, HEADER TEXT, AND SAFETY ALERT SYMBOL ON EACH LABEL. THE ANSI STANDARD REQUIRES A HEADING THAT IS AT LEAST 50% TALLER THAN THE BODY TEXT, IN ACCORDANCE WITH NEC 110.21(B).
3	A PERMANENT PLAQUE OR DIRECTORY SHALL BE INSTALLED PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS IF NOT IN THE SAME LOCATION IN ACCORDANCE WITH NEC 690.56(B).

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GRID-TIED SOLAR POWER SYSTEM

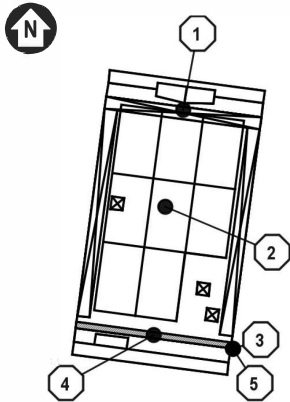
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SAFETY LABELS

DOC ID: 153972-189748-1  
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CREATOR: M.C.  
REVIEWER:

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PV-4



1 FIRE SAFETY PLAN  
PV-7 SCALE: 1" = 10'

GENERAL NOTES	
1	ROOF ACCESS POINTS SHALL BE LOCATED IN AREAS THAT DO NOT REQUIRE THE PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS WINDOWS OR DOORS, AND LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES OR SIGNS. (IFC 605.11.1.1)
2	PANELS AND MODULES INSTALLED ON GROUP R-3 BUILDINGS SHALL BE LOCATED NOT LESS THAN 3 FEET (914 MM) FROM THE RIDGE IN ORDER TO ALLOW FOR FIRE DEPARTMENT SMOKE VENTILATION OPERATIONS, EXCEPT IN SUCH CASES WHERE AN ALTERNATIVE VENTILATION METHOD APPROVED BY THE FIRE CHIEF HAS BEEN PROVIDED OR WHERE THE FIRE CHIEF HAS DETERMINED VERTICAL VENTILATION TECHNIQUES WILL NOT BE EMPLOYED. (IFC 605.11.1.2.5)

- 1 0.5 FT. WIDE FIRE ACCESS PATHWAY
- 2 PV MODULES INSTALLED ON ROOF WITH IRONRIDGE ROOF MOUNTING SYSTEM. THE MOUNTING SYSTEM IS UL 1703 CLASS A FIRE RATED ON A FLAT SLOPED ROOF WHEN INSTALLED WITH TYPE 1 MODULES. THE Q-CELLS Q,PEAK DUO BLK-G5 320 IS TYPE 1.
- 3 ROOF ACCESS POINT
- 4 0.5 FT. WIDE FIRE ACCESS PATHWAY
- 5 ROOF ACCESS POINT
- 6 TOTAL PLAN VIEW ARRAY AREA IS 145.9 SQ.FT, WHICH REPRESENTS 50.9% OF TOTAL PLAN VIEW ROOF AREA (286.8 SQ.FT)
- 7 THIS SYSTEM UTILIZES MICROINVERTERS. THERE ARE NO DC CIRCUITS OUTSIDE OF THE ARRAY PERIMETER OR INSIDE THE BUILDING.
- 8 CABLES, WHEN RUN BETWEEN ARRAYS, SHALL BE ENCLOSED IN CONDUIT.

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GRID-TIED SOLAR POWER SYSTEM

718 BRADFORD ALLEY  
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FIRE SAFETY PLAN

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PV-7