

STAFF REPORT: 2/17/2021 MEETING

PREPARED BY: D. RIEDEN

APPLICATION NUMBER: #21-7089

ADDRESS: 15519 Piedmont

HISTORIC DISTRICT: ROSEDALE PARK

APPLICANT: PETER DENICOLA

PROPERTY OWNER: MASAKO GREEN

DATE OF PROVISIONALLY COMPLETE APPLICATION: 01/07/2021

DATE OF STAFF SITE VISIT: 2/7/2021

SCOPE: SOLAR PANELS ON ROOF

EXISTING CONDITIONS

This 2-story single-family English Tudor Revival style stands on the corner lot of Piedmont and Midland streets, facing east. The side-gabled brown brick dwelling features masonry details over windows and sills with a massive chimney. A patina awning over the front door rests under a window planter box of this front-gabled entrance. The rear elevation, also publicly viewed from Midland Street, features a shed dormer roof and attached sunroom shed, all enclosed with matching casements. A wood-paneled privacy fence connects the house to the detached two-car, side-gabled garage with a concrete driveway that opens onto Midland Street.



Site Photo 1, by Staff February 7, 2021: (East) front side



Site Photo 2 by Staff February 7, 2021: (North/West) side/rear.

The owner purchased the property in November 2011. As staff currently does not have access to some of the previous paper applications and approval letters, the Detroit Property Index is the only available information on the property. No previous HDC approved work nor any violations have been listed on this property.



Sanborn Map, Vol. 25, P2502



Aerial of Parcel 22087535. 15519 Piedmont

PROPOSAL

The current owner is working through a contractor, and has provided an application, engineering analysis, 3D modeling and site photos for the following proposed work: Install roof-mounted, 3.84 kW grid-tied, solar modules (12) and battery (1) on front and rear roof elevations. See attached detailed documents provided by the applicant.

STAFF OBSERVATIONS AND RESEARCH

- Upon receipt of the application, Staff requested the following details regarding the applicant's proposed scope of work. To date of this report, staff has not received a response:
 - Show details on the equipment/hardware to illustrate how lines run from the solar panels into the side of the house.
 - Has the team considered other lower roof locations in the backside of the house or garage roof?
- Staff received a copy of the engineering analysis by PennFusion that shows locations of proposed solar panels meets structural requirements of 2015 Michigan Residential Code and ASCE7-10. See attached.
- Staff visited the site on February 7, 2021. Staff photographed the property from the public right-of-way and observed that both the front (east), side (north) and rear (west) sides of the house and front of the two-car garage have high public visibility from the adjacent streets and sidewalks. (See staff photos enclosed)
- The proposed location of the solar panels on the front elevation roof, with its steep pitch, would be highly visible to the public.
- The proposed location of the solar panels on the shed dormer roof on the rear elevation of the house has a much flatter pitch and therefore much less visible to the public.
- The proposed equipment location to the on the south (side) elevation of the house may be an appropriate location, but staff requested further information on location and equipment details, which has not yet been received.
- The roof with its steep gabled inclines is a character-defining feature identified in the Elements of Design for Rosedale Historic District:
 - *“English Revival-influenced dwellings include arched windows and door openings, steeply-pitched gables, towers, clustered chimneys, and sometimes half-timbering. Classically-derived styles display modest detail and architectural elements, mostly in wood in the form of columned porches, shutters, cornices, and keystones. A great variety of dormer types (shed, gabled, hipped, round-arched, and wall dormers), complimentary to the style of pre-circa 1935 buildings, are very common throughout the district.”* (Section 21-2-199-d (10))
 - *“Relationship of roof shapes. A variety of roof shapes exists, relating to the style of the dwellings. Common on English Revival buildings are steeply sloped pitched or hipped roofs with complex arrangements of secondary roof shapes, including steeply sloped gables, clipped gables, and shed roofs. These roofs are commonly interrupted by gabled, shed, and multi-sided dormers, and substantial chimneys which are sometimes clustered”* (Section 21-2-199-d (11))
- The front elevation and roof is a more important and distinctive character-defining feature. The rear shed roof is less important.

ISSUES

- All solar panels and mounting hardware are of appropriate color, size and scale.
- However, because the front elevation roof is a distinctive character-defining feature, Staff recommends that the front elevation location is not appropriate and must be preserved under Secretary of the Interior's Standards for Rehabilitation, specifically Standards:

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

- The proposed rear location of the solar panels, particularly on the flatter, shed dormer, is considered appropriate because this elevation is a less important character-defining feature, and the installation proposed is minimally visible for minimal impact.

RECOMMENDATION

Staff finds that the placement of the solar panels on the front elevation of the house destroys the historic character of this property and removes distinctive features. The proposed solar panels at front elevation location of the roof alters distinctive character-defining features of the property, and introduces a material and design that does not retain the historic character of the property. Staff therefore recommends that the Commission issue a Denial for the proposed location of the front elevation use for solar panels, as it does not conform to the Elements of Design for the Rosedale Historic District nor does it meet the Secretary of the Interior's Standards for Rehabilitation, specifically Standards:

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

HDC staff recommends the Commission issue an approval for the below work items because they meet the Secretary of the Interior's Standards for Rehabilitation and conform to the Elements of Design for the Rosedale Historic District:

- Solar panels at the proposed rear elevation location on the roof shed dormer.



15519



15519





15519
PLATE BY THEWAY

15519



HISTORIC DISTRICT COMMISSION PROJECT REVIEW REQUEST

CITY OF DETROIT
PLANNING & DEVELOPMENT DEPARTMENT
2 WOODWARD AVENUE, ROOM 808, DETROIT, MI 48226

DATE: _____

PROPERTY INFORMATION

ADDRESS: _____ AKA: _____

HISTORIC DISTRICT: _____

SCOPE OF WORK: Windows/Doors Roof/Gutters/Chimney Porch/Deck Landscape/Fence/Tree/Park General Rehab
(Check ALL that apply) New Construction Demolition Addition Other: _____

APPLICANT IDENTIFICATION

Property Owner/Homeowner Contractor Tenant or Business Occupant Architect/Engineer/Consultant

NAME: _____ COMPANY NAME: _____

ADDRESS: _____ CITY: _____ STATE: _____ ZIP: _____

PHONE: _____ MOBILE: _____ EMAIL: _____

PROJECT REVIEW REQUEST CHECKLIST

Please attach the following documentation to your request:

PLEASE KEEP FILE SIZE OF ENTIRE SUBMISSION UNDER 30MB

- Completed Building Permit Application** (highlighted portions only)
- ePLANS Permit Number** (only applicable if you've already applied for permits through ePLANS)
- Photographs** of ALL sides of existing building or site
- Detailed photographs** of location of proposed work (photographs to show existing condition(s), design, color, & material)
- Description of existing conditions** (including materials and design)
- Description of project** (if replacing any existing material(s), include an explanation as to why replacement--rather than repair--of existing and/or construction of new is required)
- Detailed scope of work** (formatted as bulleted list)
- Brochure/cut sheets** for proposed replacement material(s) and/or product(s), as applicable

NOTE:

Based on the scope of work, additional documentation may be required.

See www.detroitmi.gov/hdc for scope-specific requirements.

Upon receipt of this documentation, staff will review and inform you of the next steps toward obtaining your building permit from the Buildings, Safety Engineering and Environmental Department (BSEED) to perform the work.

SUBMIT COMPLETED REQUESTS TO HDC@DETROITMI.GOV

P2 - BUILDING PERMIT APPLICATION

Date: _____

PROPERTY INFORMATION

Address: _____ Floor: _____ Suite#: _____ Stories: _____
 AKA: _____ Lot(s): _____ Subdivision: _____
 Parcel ID#(s): _____ Total Acres: _____ Lot Width: _____ Lot Depth: _____
 Current Legal Use of Property: _____ Proposed Use: _____
 Are there any existing buildings or structures on this parcel? Yes No

PROJECT INFORMATION

Permit Type: New Alteration Addition Demolition Correct Violations
 Foundation Only Change of Use Temporary Use Other: _____
 Revision to Original Permit #: _____ (Original permit has been issued and is active)

Description of Work (Describe in detail proposed work and use of property, attach work list)

MBC use change No MBC use change

Included Improvements (Check all applicable; these trade areas require separate permit applications)

HVAC/Mechanical Electrical Plumbing Fire Sprinkler System Fire Alarm

Structure Type

New Building Existing Structure Tenant Space Garage/Accessory Building
 Other: _____ Size of Structure to be Demolished (LxWxH) _____ cubic ft.

Construction involves changes to the floor plan? Yes No

(e.g. interior demolition or construction to new walls)

Use Group: _____ Type of Construction (per current MI Bldg Code Table 601) _____

Estimated Cost of Construction \$ _____ By Contractor \$ _____ By Department

Structure Use

Residential-Number of Units: _____ Office-Gross Floor Area _____ Industrial-Gross Floor Area _____
 Commercial-Gross Floor Area: _____ Institutional-Gross Floor Area _____ Other-Gross Floor Area _____

Proposed No. of Employees: _____ List materials to be stored in the building: _____

PLOT PLAN SHALL BE submitted on separate sheets and shall show all easements and measurements (must be correct and in detail). SHOW ALL streets abutting lot, indicate front of lot, show all buildings, existing and proposed distances to lot lines. (Building Permit Application Continues on Next Page)

For Building Department Use Only

Intake By: _____ Date: _____ Fees Due: _____ DngBld? No

Permit Description:

Permit #:

Current Legal Land Use: _____ Proposed Use: _____

Permit#: _____ Date Permit Issued: _____ Permit Cost: \$ _____

Zoning District: _____ Zoning Grant(s): _____

Lots Combined? Yes No (attach zoning clearance)

Revised Cost (revised permit applications only) Old \$ _____ New \$ _____

Structural: _____ Date: _____ Notes: _____

Zoning: _____ Date: _____ Notes: _____

Other: _____ Date: _____ Notes: _____



IDENTIFICATION (All Fields Required)

Property Owner/Homeowner

Property Owner/Homeowner is Permit Applicant

Name: _____ Company Name: _____

Address: _____ City: _____ State: _____ Zip: _____

Phone: _____ Mobile: _____

Driver's License #: _____ Email: _____

Contractor

Contractor is Permit Applicant

Representative Name: _____ Company Name: _____

Address: _____ City: _____ State: _____ Zip: _____

Phone: _____ Mobile: _____ Email: _____

City of Detroit License #: _____

TENANT OR BUSINESS OCCUPANT

Tenant is Permit Applicant

Name: _____ Phone: _____ Email: _____

ARCHITECT/ENGINEER/CONSULTANT

Architect/Engineer/Consultant is Permit Applicant

Name: _____ State Registration#: _____ Expiration Date: _____

Address: _____ City: _____ State: _____ Zip: _____

Phone: _____ Mobile: _____ Email: _____

HOMEOWNER AFFIDAVIT (Only required for residential permits obtained by homeowner.)

I hereby certify that I am the legal owner and occupant of the subject property and the work described on this permit application shall be completed by me. I am familiar with the applicable codes and requirements of the City of Detroit and take full responsibility for all code compliance, fees and inspections related to the installation/work herein described. I shall neither hire nor sub-contract to any other person, firm or corporation any portion of the work covered by this building permit.

Print Name: _____ Signature: _____ Date: _____
(Homeowner)

Subscribed and sworn to before me this _____ day of _____ 20 _____ A.D. _____ County, Michigan

Signature: _____ My Commission Expires: _____
(Notary Public)

PERMIT APPLICANT SIGNATURE

I hereby certify that the information on this application is true and correct. I have reviewed all deed restrictions that may apply to this construction and am aware of my responsibility thereunder. I certify that the proposed work is authorized by the owner of the record and I have been authorized to make this application as the property owner(s) authorized agent. Further I agree to conform to all applicable laws and ordinances of jurisdiction. **I am aware that a permit will expire when no inspections are requested and conducted within 180 days of the date of issuance or the date of the previous inspection and that expired permits cannot be**

Print Name: _____ Signature: POW Date: _____
(Permit Applicant)

Driver's License #: _____ Expiration: _____

Subscribed and sworn to before me this _____ day of _____ 20 _____ A.D. _____ County, Michigan

Signature: _____ My Commission Expires: _____
(Notary Public)

Section 23a of the state construction code act of 1972, 1972PA230, MCL 125.1523A, prohibits a person from conspiring to circumvent the licensing requirements of this state relating to persons who are to perform work on a residential building or a residential structure. Visitors of Section 23a are subject to civil fines.

This application can also be completed online. Visit detroitmi.gov/bseed/elaps for more information.



Job at 15519 Piedmont Street – Masako Green:

Description of existing conditions: Installation on asphalt shingles, flat ceiling profile. Roof design analyzed to show:

- Ground snow (Pg): 20psf
- Wind Speed (V): 115 mph

Roof has been determined to handle the load of roof-mounted solar modules.

Description of project: Roof-mounted solar installation

Detailed scope of proposed work for approval:

- Installing 12 roof-mounted solar modules.
- Modules are 3.84 kW and grid tied.
- Modules are to be installed on an existing residence.
- Battery installation is also to be performed.



Green, Masako – 3D Rendering of panels











15519

WELCOME BY
XFINITY
Home







PROJECT DESCRIPTION:

12 X 320 SILFAB SOLAR SIL-320 BL MODULES
 ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES

SYSTEM SIZE: 3.84 kW DC STC
 ARRAY AREA: ROOF#1 - 128.10 SQ FT
 ARRAY AREA: ROOF#2 - 91.50 SQ FT

EQUIPMENT SUMMARY

- 12 SILFAB SOLAR SIL-320 BL MODULES
- 02 GENERAC PV LINK S2502 POWER OPTIMIZERS
- 01 GENERAC PWRCELL X7602 INVERTER

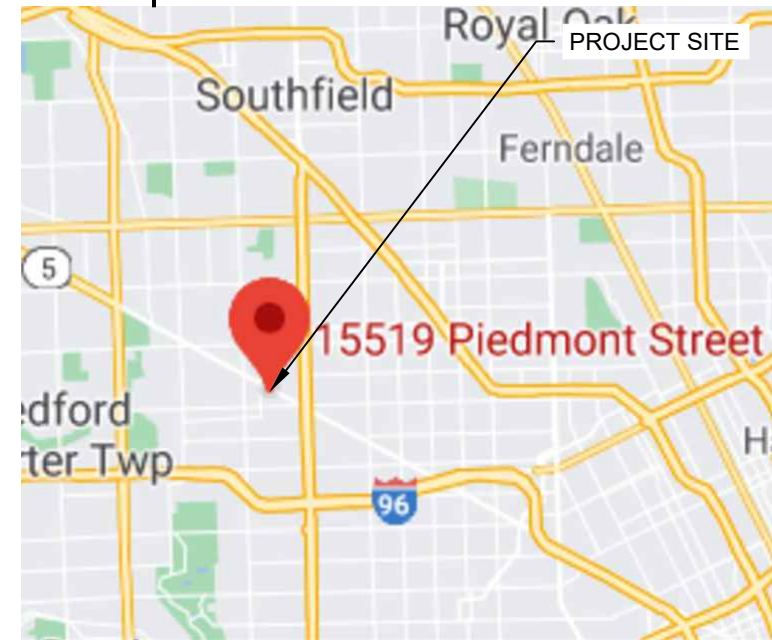
APPLICABLE CODES & STANDARDS
 MICHIGAN RESIDENTIAL CODE 2015
 NEC 2017

AUTHORITIES HAVING JURISDICTION
 BUILDING : WAYNE COUNTY
 ZONING : WAYNE COUNTY
 UTILITY : DTE ENERGY

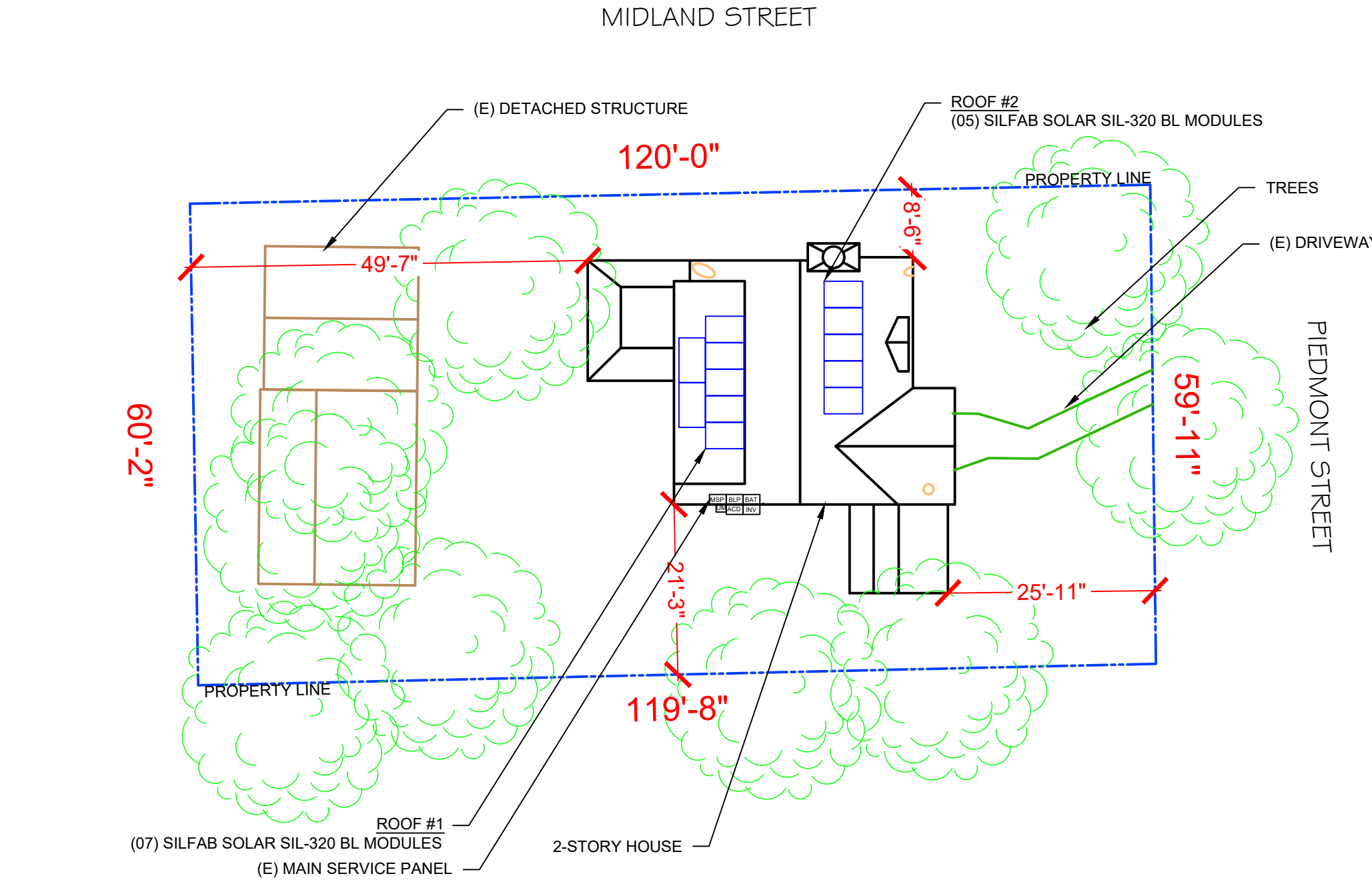
DESIGN SPECIFICATIONS
 OCCUPANCY : II
 CONSTRUCTION : SINGLE-FAMILY
 ZONING : RESIDENTIAL
 GROUND SNOW LOAD : SEE STRUCTURAL LETTER
 WIND EXPOSURE : SEE STRUCTURAL LETTER
 WIND SPEED : SEE STRUCTURAL LETTER



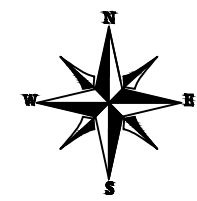
2 HOUSE PHOTO
 PV-1 | SCALE: NTS



3 VICINITY MAP
 PV-1 | SCALE: NTS



1 PLOT PLAN & VICINITY MAP
 PV-1 | SCALE: 1/16" = 1'-0"



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 Web: www.powerhome.com

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal
 DATE: 9/9/2020

PROJECT NAME & ADDRESS
 MASAKO S GREEN
 RESIDENCE
 15519 PIEDMONT STREET,
 DETROIT, MI 48223

SHEET NAME
PLOT PLAN & VICINITY MAP

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

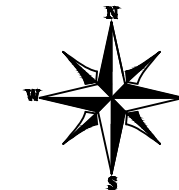
SHEET NUMBER
PV-1

SHEET INDEX

PV-1	PLOT PLAN & VICINITY MAP
PV-2	ROOF PLAN & MODULES
PV-2A	STRING LAYOUT
PV-3	ATTACHMENT DETAIL
PV-4	ELECTRICAL LINE DIAGRAM
PV-5	WIRING CALCULATIONS
PV-6 to 12	EQUIPMENT SPECIFICATIONS

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 12 MODULES
 MODULE TYPE = SILFAB SOLAR SIL-320 BL MODULES
 MODULE WEIGHT = 43.00 LBS / 19.5 KG.
 MODULE DIMENSIONS = 66.93"x 39.37" = 18.30 SF
 UNIT WEIGHT OF ARRAY = 2.35 PSF



ROOF DESCRIPTION				
ROOF TYPE			COMPOSITION SHINGLE	
ROOF	ROOF TILT	AZIMUTH	FRAMING SIZE	FRAMING SPACING
#1	30.26°	270°	SEE STRUCTURAL LETTER	
#2	30.26°	90°		

ARRAY AREA & ROOF AREA CALC'S				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1	07	128.10	247.00	52
#2	05	91.50	355.63	26

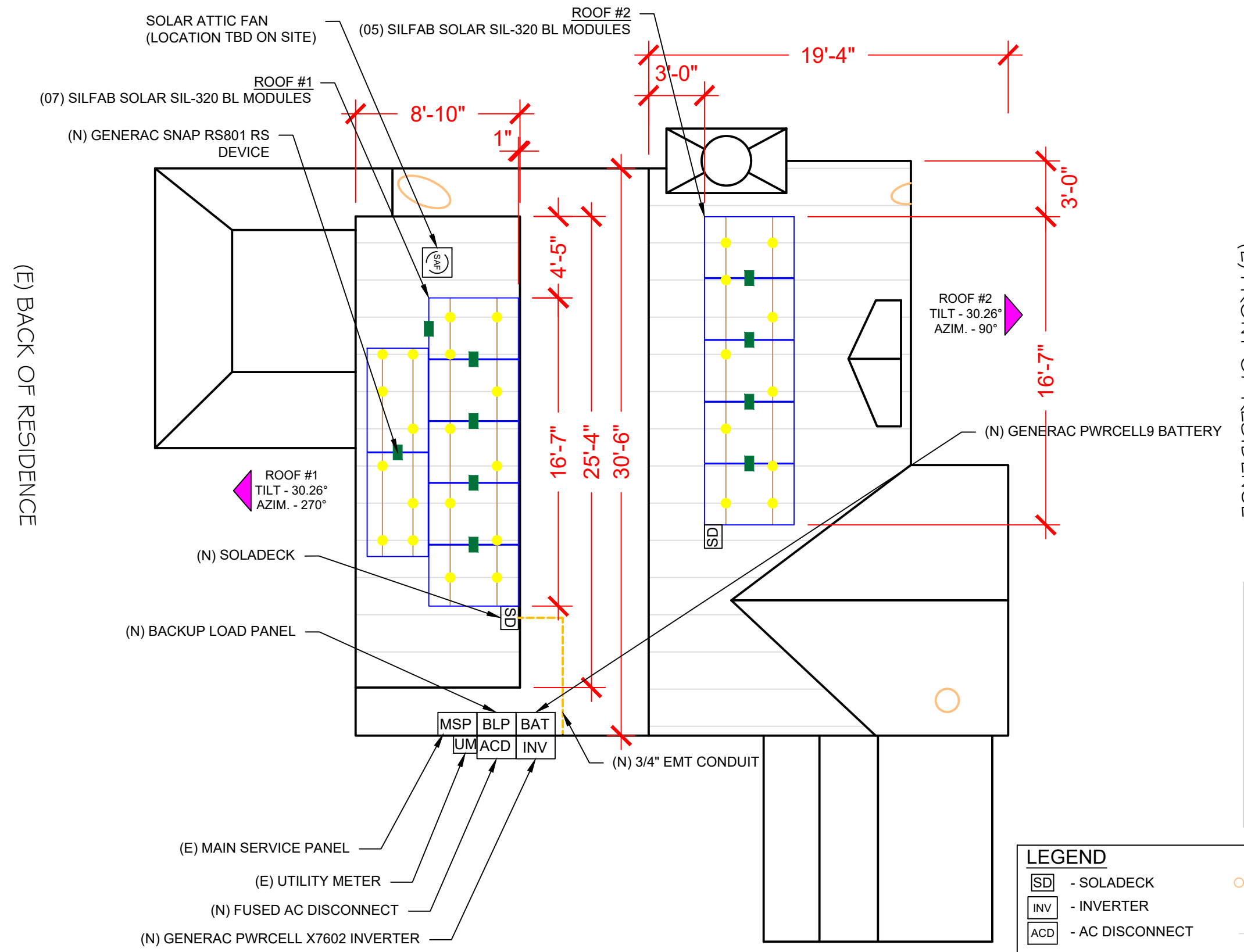
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REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal
 DATE: 9/9/2020

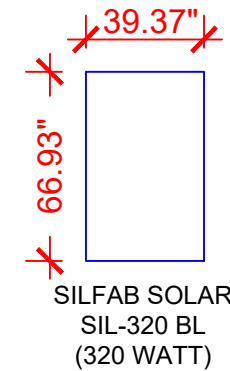
PROJECT NAME & ADDRESS
MASAKO S GREEN RESIDENCE
 15519 PIEDMONT STREET,
 DETROIT, MI 48223

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



(E) FRONT OF RESIDENCE

PIEDMONT STREET



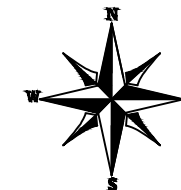
(SAF) SOLAR ATTIC FAN

NOTES:

- THE LOCATION OF THE SAF SHOULD BE DETERMINED ON SITE.
- THE SAF SHOULD BE LOCATED 30"-36" FROM THE PEAK OF THE ROOF OR ABOUT 5 ROWS DOWN FROM THE RIDGE.
- THE SAF SHOULD NOT BE MOUNTED ON ANY STRUCTURAL MEMBER LIKE TRUSS/RAFTER.
- "CAN VENTS" CAN BE REPLACED BY SAF.
- SAF CANNOT BE MOUNTED ON A METAL ROOF. PLEASE CARRY GABLE VENT FANS FOR METAL ROOF INSTALLATION (IF APPLICABLE).

LEGEND

- (SD)** - SOLADECK
- (INV)** - INVERTER
- (ACD)** - AC DISCONNECT
- (MSP)** - MAIN SERVICE PANEL
- (BLP)** - BACKUP LOAD PANEL
- (OP)** - PV LINK OPTIMIZER
- (SAF)** - SOLAR ATTIC FAN (ROOF OBSTRUCTION)
- (●)** - ROOF ATTACHMENT
- (---)** - RAFTERS
- (---** - CONDUIT
- (BAT)** - BATTERY
- (■)** - RAPID SHUTDOWN



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REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

 DATE: 9/9/2020

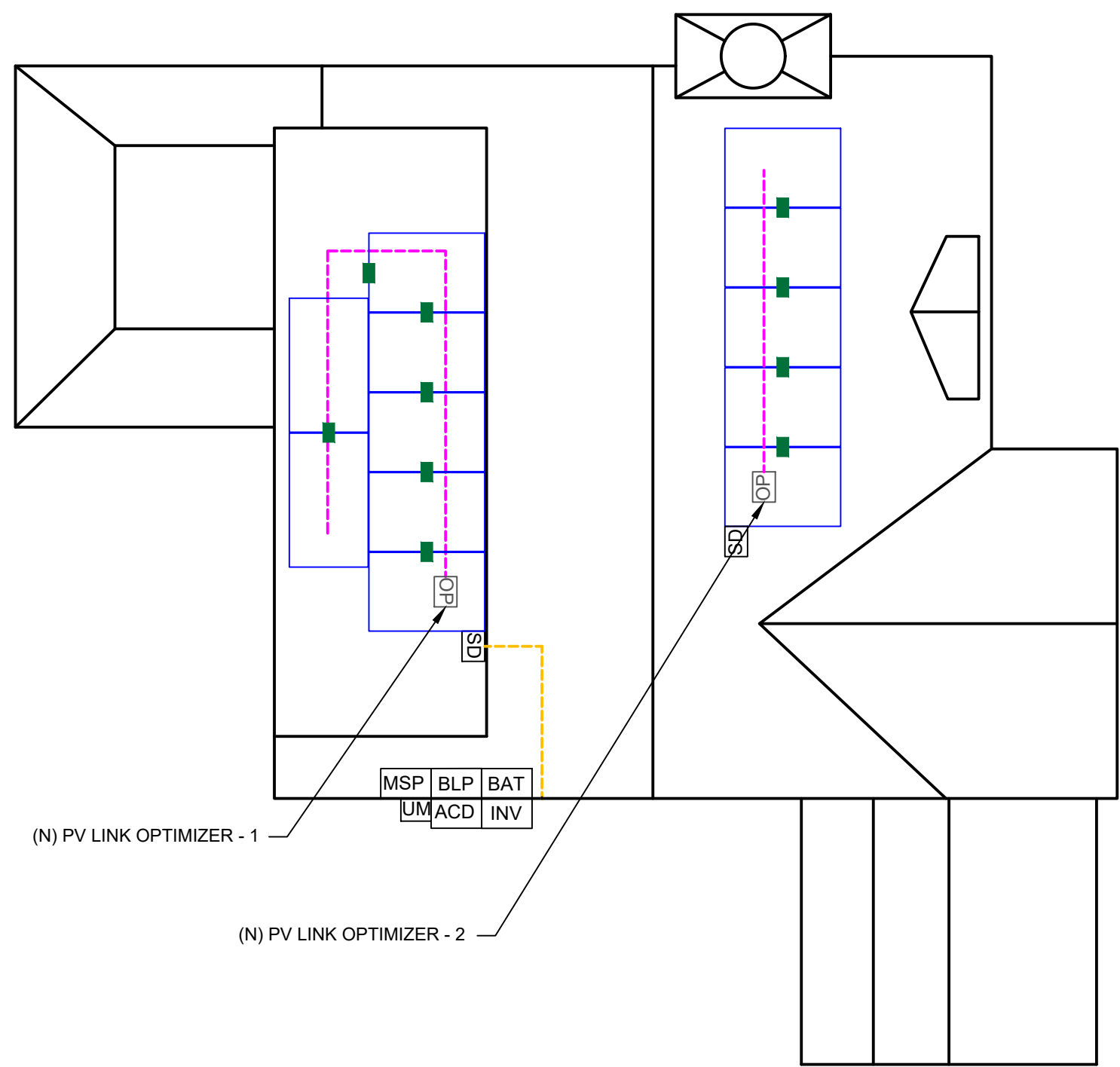
PROJECT NAME & ADDRESS

MASAKO S GREEN
 RESIDENCE
 15519 PIEDMONT STREET,
 DETROIT , MI 48223

SHEET NAME
STRING LAYOUT

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

SHEET NUMBER
PV-2A

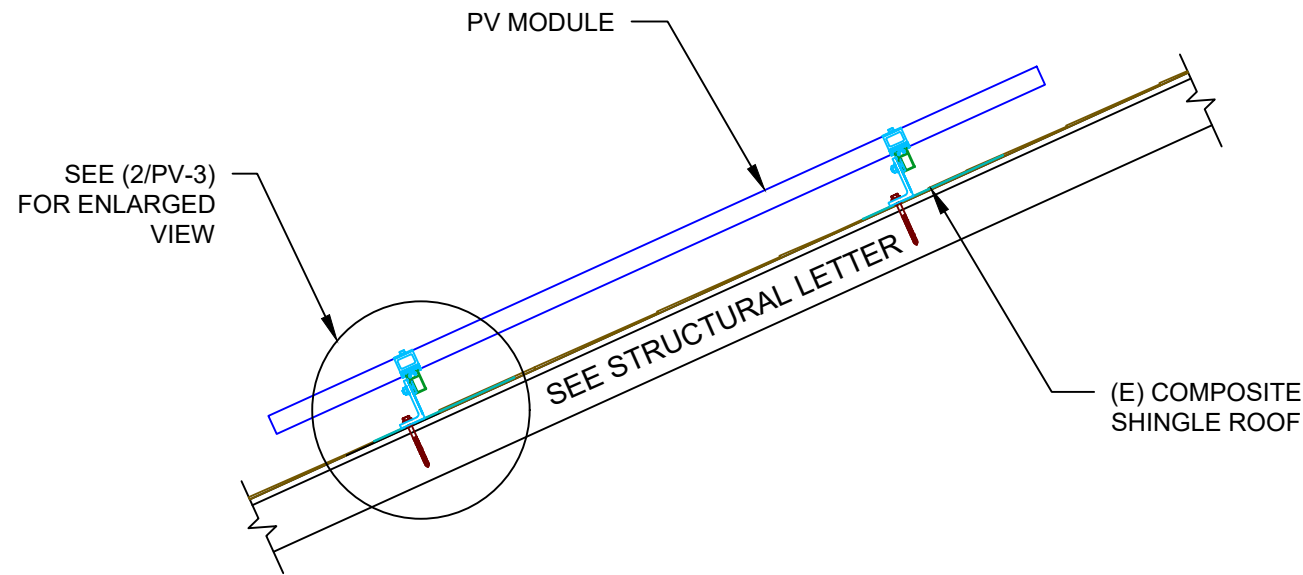


(N) PV LINK OPTIMIZER - 1

(N) PV LINK OPTIMIZER - 2

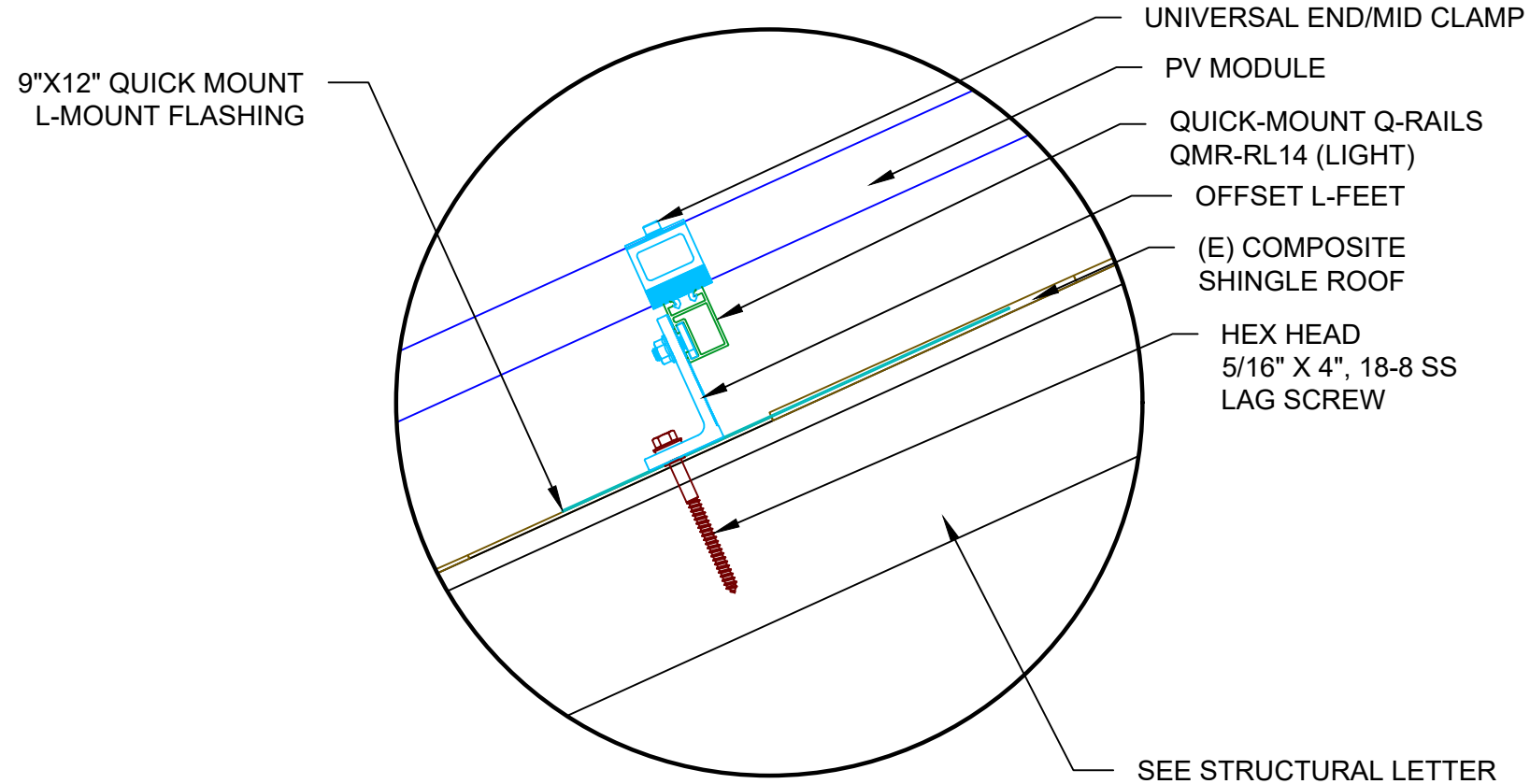
MSP BLP BAT
 UM ACD INV

BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	12	SILFAB SOLAR SIL-320 BL MODULES
OPTIMIZER	02	GENERAC PV LINK S2502 POWER OPTIMIZERS
GENERAC SNAP RS	12	GENERAC SNAPRS MODEL RS801
INVERTER	01	GENERAC PWRCELL X7602 INVERTER
AC DISCONNECT	1	60A FUSED, (2) 40A FUSES, 240V, NEMA 3R, UL LISTED
SOLADECK	2	SOLADECKS 600 V, NEMA 3R, UL LISTED
BATTERY	1	GENERAC PWRCELL9 BATTERY
BACKUP PANEL	1	125A, BACKUP PANEL, 240V
RAILS	7	QRAIL LIGHT 14 FT. BLACK
SPLICE KIT	5	QSPLICE INTERNAL LIGHT
WEEB BMC	0	WEEB BMC MILL
MODULE CLAMPS	18	UNIVERSAL MID CLAMP
GROUNDING LUG	3	WEEB LUG W/ T-BOLT
END CLAMPS	12	UNIVERSAL END CLAMPS
ATTACHMENT	33	L-MOUNT ATTACHMENT (QUICKMOUNT)
T-BOLT	35	T-BOLT W/ NUT M8 X 20MM



1 ATTACHMENT DETAIL

PV-3 SCALE: 1" = 1'-0"



2 ATTACHMENT DETAIL (enlarged view)

PV-3 SCALE: NTS

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Signature with Seal

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PROJECT NAME & ADDRESS

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 RESIDENCE**
 15519 PIEDMONT STREET,
 DETROIT , MI 48223

SHEET NAME
**ATTACHMENT
 DETAIL**

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

SHEET NUMBER
PV-3

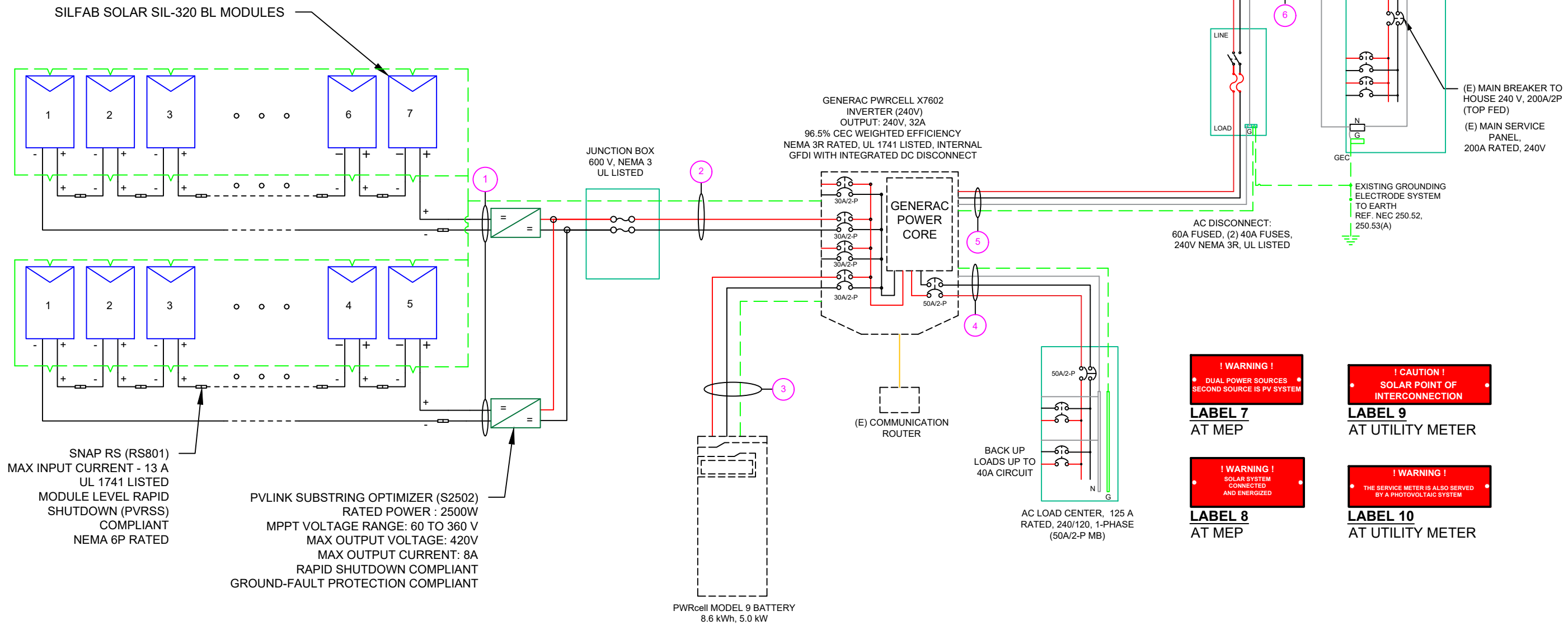
(12) SILFAB SOLAR SIL-320 BL MODULES
 (1) PV LINK OF 7 MODULES &
 (1) PV LINK OF 5 MODULES CONNECTED IN SERIES

WIRE LEGEND

	PV ARRAY +VE CONDUCTOR AND L1
	PV ARRAY -VE CONDUCTOR AND L2
	NEUTRAL CONDUCTOR
	EGC AND GEC
	SINGLE TWISTED PAIR, CAT 5 WIRE

SERVICE INFO

UTILITY PROVIDER:	DTE ENERGY
MAIN SERVICE VOLTAGE:	240V
MAIN PANEL BRAND:	NA
MAIN SERVICE PANEL:	200A
MAIN CIRCUIT BREAKER RATING:	200A
MAIN SERVICE LOCATION:	SOUTH
SERVICE FEED SOURCE:	OVERHEAD



SNAP RS (RS801)
 MAX INPUT CURRENT - 13 A
 UL 1741 LISTED
 MODULE LEVEL RAPID
 SHUTDOWN (PVRSS)
 COMPLIANT
 NEMA 6P RATED

PVLINK SUBSTRING OPTIMIZER (S2502)
 RATED POWER : 2500W
 MPPT VOLTAGE RANGE: 60 TO 360 V
 MAX OUTPUT VOLTAGE: 420V
 MAX OUTPUT CURRENT: 8A
 RAPID SHUTDOWN COMPLIANT
 GROUND-FAULT PROTECTION COMPLIANT

PWRcell MODEL 9 BATTERY
 8.6 kWh, 5.0 kW

! WARNING !
 • DUAL POWER SOURCES •
 • SECOND SOURCE IS PV SYSTEM •

LABEL 7
 AT MEP

! CAUTION !
 • SOLAR POINT OF
 INTERCONNECTION •

LABEL 9
 AT UTILITY METER

! WARNING !
 • SOLAR SYSTEM
 CONNECTED
 AND ENERGIZED •

LABEL 8
 AT MEP

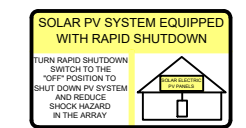
! WARNING !
 • THE SERVICE METER IS ALSO SERVED
 BY A PHOTOVOLTAIC SYSTEM •

LABEL 10
 AT UTILITY METER

AC DISCONNECT TO
 BE PLACED WITHIN 5
 FEET OF THE METER
 AS PER DTE ENERGY

! WARNING !
 • PHOTOVOLTAIC
 POWER SOURCE •

LABEL 1
 ON ALL CONDUITS
 SPACED AT MAX 10FT



LABEL 2
 AT INVERTER

! CAUTION !
 • SOLAR ELECTRIC
 SYSTEM CONNECTED
 AND ENERGIZED •

LABEL 3
 AT INVERTER

**PHOTOVOLTAIC
 DC DISCONNECT**

LABEL 4
 AT EACH DC
 DISCONNECT

! WARNING !
 • ELECTRIC SHOCK HAZARD
 TERMINALS ON BOTH LINE AND LOAD SIDES
 MAY BE ENERGIZED IN THE OPEN POSITION •

LABEL 5
 AT EACH AC
 DISCONNECT

**PHOTOVOLTAIC
 AC DISCONNECT**

LABEL 6
 AT EACH AC
 DISCONNECT

QTY	CONDUCTOR INFORMATION	CONDUIT TYPE	CONDUIT SIZE
(4)	#10AWG - PV WIRE/USE-2	N/A	N/A
(1)	#6AWG - BARE COPPER IN FREE AIR		
(2)	#10AWG - THWN-2	EMT OR FLEX IN ATTIC	3/4"
(1)	#6AWG - THWN-2 GND		
(2)	#10AWG - THWN-2	EMT OR FLEX	3/4"
(1)	#10AWG - THWN-2 GND		
(3)	#6AWG - THWN-2	EMT OR FLEX	3/4"
(1)	#6AWG - THWN-2 GND		
(3)	#6AWG - THWN-2	EMT OR FLEX	3/4"
(1)	#6AWG - THWN-2 GND		
(3)	#6AWG - THWN-2	EMT OR FLEX	3/4"

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 Web: www.powerhome.com

REVISIONS

DESCRIPTION	DATE	REV
(E) MAIN BREAKER TO HOUSE 240 V, 200A/2P (TOP FED)		
(E) MAIN SERVICE PANEL, 200A RATED, 240V		

Signature with Seal
 DATE: 9/9/2020

PROJECT NAME & ADDRESS
**MASAKO S GREEN
 RESIDENCE**
 15519 PIEDMONT STREET,
 DETROIT , MI 48223

SHEET NAME
**ELECTRICAL LINE
 DIAGRAM**

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

SHEET NUMBER
PV-4

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	SILFAB SOLAR SIL-320 BL
VMP	33.85V
IMP	9.46A
VOC	41.9V
ISC	9.92A
TEMP. COEFF. VOC	-0.301%/°C
PTC RATING	286.4W
MODULE DIMENSION	66.93"L x 39.37"W x 1.50"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	GENERAC PWRCELL X7602
AC POWER OUTPUT (LOADS/GRID)	7600VA
AC POWER OUTPUT (BACKUP)	8000VA
NOMINAL OUTPUT VOLTAGE	240 VAC
MAX OUTPUT CURRENT @240V (LOADS/GRID)	32A
MAX OUTPUT CURRENT @240V (BACKUP)	50A
NOMINAL DC INPUT VOLTAGE	380Vdc
MAX DC INPUT VOLTAGE	420Vdc
CEC WEIGHTED EFFICIENCY	96.5%
MAX DC POWER (PV)	10000W
MAX INPUT CURRENT (PV)	20Adc
CONT. PEAK POWER (BATTERY)	8000W

SERIES SUB STRING OPTIMIZER SPECIFICATIONS	
MANUFACTURER / MODEL #	PV LINK S2502
RATED POWER	2500W
MPPT VOLTAGE RANGE	60-360 Vmp
MAXIMUM INPUT VOLTAGE	420Voc
MAXIMUM OUTPUT	420 Adc
NOMINAL OUTPUT	380 Vdc
MAXIMUM OUTPUT CURRENT	8 A
MAXIMUM SHORT CIRCUIT CURRENT	18 A

BATTERY SPECIFICATIONS	
MANUFACTURER / MODEL #	GENERAC PWRCELL9 BATTERY
USABLE ENERGY	8.6kW
RATED CONTINUOUS POWER	3.4Kw
POWER: 60 MINUTES	4.2kW
POWER: 2 MINUTES	5.0kW
REBUS VOLTAGE: INPUT/ OUTPUT	360-420Vdc
MODULE VOLTAGE	46.8Vdc
ROUND-TRIP EFFICIENCY	96.5%

ELECTRICAL NOTES

- 1.) ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- 2.) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- 3.) WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- 4.) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- 5.) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- 6.) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- 7.) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- 8.) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- 9.) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEBB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- 10.) THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-20°
AMBIENT TEMP (HIGH TEMP 2%)	32°
CONDUIT HEIGHT	0.5"
ROOF TOP TEMP	54°

DC CONDUCTOR AMPACITY CALCULATIONS: ARRAY TO SOLADECK:

EXPECTED WIRE TEMP (In Celsius)	54°
TEMP. CORRECTION PER NEC TABLE 310.15 (B)(2)(a)	0.76
NO. OF CURRENT CARRYING CONDUCTORS	4
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	0.8
CIRCUIT CONDUCTOR SIZE	10 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	40A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	10A
1.25 X I _{max}	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	24.32A
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	
Result should be greater than (10A) otherwise less the entry for circuit conductor size and ampacity	

FROM SOLADECK TO INVERTER:

EXPECTED WIRE TEMP (In Celsius)	54°
TEMP. CORRECTION PER NEC TABLE 310.15 (B)(2)(a)	0.76
NO. OF CURRENT CARRYING CONDUCTORS	2
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	1
CIRCUIT CONDUCTOR SIZE	10 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	40A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	20A
1.25 X I _{max} X # of PV LINKS PER INPUT	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	30.4A
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	
Result should be greater than (20A) otherwise less the entry for circuit conductor size and ampacity	

FROM BATTERY TO INVERTER:

EXPECTED WIRE TEMP (In Celsius)	32°
TEMP. CORRECTION PER NEC TABLE 310.15 (B)(2)(a)	0.96
NO. OF CURRENT CARRYING CONDUCTORS	2
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	1
CIRCUIT CONDUCTOR SIZE	10 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	40A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	26.25A
1.25 X I _{max}	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	38.40A
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	
Result should be greater than (26.25A) otherwise less the entry for circuit conductor size and ampacity	

AC CONDUCTOR AMPACITY CALCULATIONS: FROM INVERTER TO BACK-UP PANEL:

No. OF INVERTER	1
EXPECTED WIRE TEMP (In Celsius)	32°
TEMP. CORRECTION PER NEC TABLE 310.15(B)(2)(a)	0.96
NO. OF CURRENT CARRYING CONDUCTORS	3
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	1
CIRCUIT CONDUCTOR SIZE	6 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	75A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	42.5A
1.25 X INVERTER OUTPUT CURRENT (BACKUP POWER)	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	72A
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	
Result should be greater than (42.5A) otherwise less the entry for circuit conductor size and ampacity	

AC CONDUCTOR AMPACITY CALCULATIONS: FROM INVERTER TO MEP:

No. OF INVERTER	1
EXPECTED WIRE TEMP (In Celsius)	32°
TEMP. CORRECTION PER NEC TABLE 310.15(B)(2)(a)	0.96
NO. OF CURRENT CARRYING CONDUCTORS	3
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	1
CIRCUIT CONDUCTOR SIZE	6 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	75A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	40A
1.25 X MAX INVERTER OUTPUT CURRENT (LOADS/GRID)	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	72A
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	
Result should be greater than (40A) otherwise less the entry for circuit conductor size and ampacity	



REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

DATE: 9/9/2020

PROJECT NAME & ADDRESS

**MASAKO S GREEN
RESIDENCE**
15519 PIEDMONT STREET,
DETROIT, MI 48223

SHEET NAME

**WIRING
CALCULATIONS**

SHEET SIZE

**ANSI B
11" X 17"**

SHEET NUMBER

PV-5



BC Series SIL-320 BL

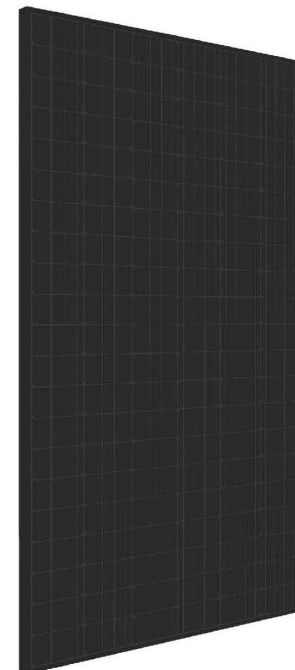


126 Cell Monocrystalline PV Module

INDUSTRY LEADING WARRANTY
All our products include an industry leading 25-year product workmanship and 30-year performance warranty.

MAXIMUM ENERGY OUTPUT
Silfab BC Series utilizes next generation Back Contact technology to reduce production/manufacturing steps and improve quality while maximizing power. Ideal for residential and commercial projects where maximum power density is preferred.

NORTH AMERICAN QUALITY
Silfab is the largest and most automated solar manufacturer in North America. Utilizing premium quality materials and strict quality control management to deliver the highest efficiency, premium quality PV modules 100% made in North America.



CHUBB
* Chubb provides error and omission insurance to Silfab Solar Inc.

PROVIDES MAXIMUM EFFICIENCY

126 high-efficiency half-cut cells combined with a black conductive back-sheet resulting in a maximum power.

35+ YEARS OF SOLAR INNOVATION

Leveraging over 35+ years of worldwide experience in the solar industry, Silfab is dedicated to superior manufacturing processes and innovations such as Bifacial and Back Contact technologies to ensure our partners have the latest in solar innovation.

BAA / ARRA COMPLIANT

Silfab panels are designed and manufactured to meet Buy American Act Compliance. The US State Department, US Military and FAA have all utilized Silfab panels in their solar installations.

LIGHT AND DURABLE

Engineered to accommodate low load bearing structures up to 5400Pa. The light-weight frame is exclusively designed for wide-ranging racking compatibility and durability.

LOWEST DEFECT RATE

Total automation ensures strict quality controls during the entire manufacturing process at our ISO certified facilities. 48.18 ppm as per December 2018.

DOMESTIC PRODUCTION

Silfab Solar manufactures our PV modules in two automated locations within North America. Our 300+ North American team is ready to help our partners win the hearts and minds of customers, providing customer service and product delivery that is direct, efficient and local.

SUPERIOR POWER

Super power achieved through relocation of tabbing ribbon to reduce shading on module front service and circuit resistance.

AESTHETICALLY PLEASING

Sleek aesthetics from black cells to black back-sheet without tabbing or bus-bar ribbons, ideal for residential applications.

STABLE PERFORMANCE

Enhanced life-time performance through reduced thermal stresses and increased current flow paths.

PID RESISTANT

PID Resistant due to advanced cell technology and material selection. In accordance to IEC 62804-1

Printed on recycled paper.

Electrical Specifications		SIL-320 BL mono PERC MWT Technology	
Test Conditions		STC	NOCT
Module Power (Pmax)	Wp	320	242.1
Maximum power voltage (Vpmax)	V	33.85	30.42
Maximum power current (Ipmax)	A	9.46	7.95
Open circuit voltage (Voc)	V	41.9	38.7
Short circuit current (Isc)	A	9.92	8.13
Module efficiency	%	18.8	17.8
Maximum system voltage (VDC)	V		1000
Series fuse rating	A		20
Power Tolerance	Wp		0/+10

Measurement conditions: STC 1000 W/m² • AM 1.5 • Temperature 25 °C • NOCT 800 W/m² • AM 1.5 • Measurement uncertainty ≤ 3%
* Sun simulator calibration reference modules from Fraunhofer Institute. Electrical characteristics may vary by ±5% and power by 0/+10W.

Temperature Ratings		SIL-320 BL mono PERC MWT Technology	
Temperature Coefficient Isc	%/°C		-0.031
Temperature Coefficient Voc	%/°C		-0.301
Temperature Coefficient Pmax	%/°C		-0.419
NOCT (± 2°C)	°C		40.6
Operating temperature	°C		-40/+85

Mechanical Properties and Components		SIL-320 BL mono PERC MWT Technology	
Module weight (± 1 kg)	kg		19.5
Dimensions (H x L x D; ± 1 mm)	mm		1700 x 1000 x 38
Maximum surface load (wind/snow)*	Pa		4000 Pa rear load / 5400 Pa front load
Hail impact resistance			Ø 25 mm at 83 km/h

Cells	126 high-efficiency half-cut mono-PERC MWT C-si cells		
Glass	3.2 mm high transmittance, tempered, DSM antireflective coating		
Backsheet	Multilayer, integrated insulation film and electrically conductive backsheet		
Frame	Anodized Al (Black)		
Bypass diodes	3 diodes-20SQ040 (45V, 20A)		
Cables and connectors	1000 mm Ø 5.7 mm (4 mm ²), Multicontact MC4 connectors (refer to installation manual)		
Junction Box	UL 3730 Certified, IP67 rated		

Warranties		SIL-320 BL mono PERC MWT Technology	
Module product workmanship warranty		25 years**	
		30 years	
		≥ 97% end of 1 st year	
		≥ 90% end of 12 th year	
		≥ 82% end of 25 th year	
		≥ 80% end of 30 th year	

Linear power performance guarantee

Certifications		SIL-320 BL mono PERC MWT Technology	
Product		ULC ORD C1703, UL 1703, FSEC and CEC listed. Product durability proven up to 3 x IEC, climate chamber tests up to DH3000-TC600-HF30	
Factory		UL Fire Rating: Type 1 ISO9001:2015	

*Please refer to the Safety and Installation Manual for mounting specifications.
**12 year extendable to 25 years subject to registration and conditions outlined under "Warranty" at www.silfabsolar.com.

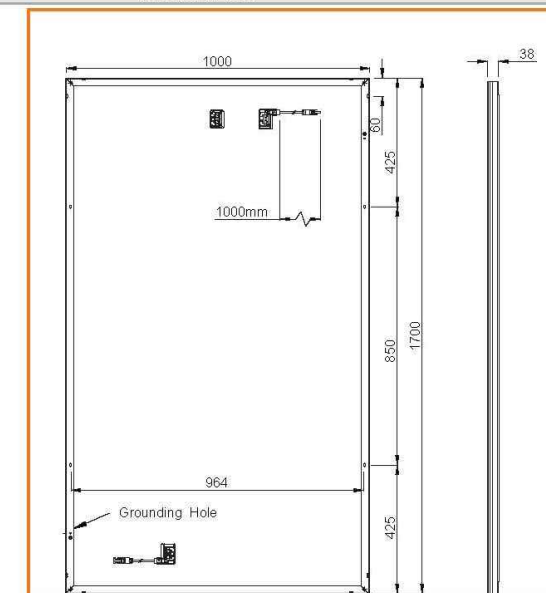
Warning: Read the installation and User Manual before handling, installing and operating modules.

- Modules Per Pallet: 26
- Pallets Per Truck: 36
- Modules Per Truck: 936



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240 Courtneypark Drive East
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Email: info@powerhome.com
Web: www.powerhome.com

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

DATE: 9/9/2020

PROJECT NAME & ADDRESS

MASAKO S GREEN
RESIDENCE
15519 PIEDMONT STREET,
DETROIT, MI 48223

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

GENERAC[®] PWRCELL

7.6kW 1Ø, 11.4kW 3Ø PWRcell Inverter with CTs
Model: APKE00014, APKE00013
Certification Model Reference: X7602, X11402



Solar + storage is simple with the Generac PWRcell™ Inverter. This bi-directional, REbus™-powered inverter offers a simple, efficient design for integrating smart batteries with solar. Ideal for self-supply, backup power, zero-export and energy cost management, the PWRcell Inverter is the industry's most feature-rich line of inverters, available in single-phase and three-phase models.

FEATURES & BENEFITS

- Single inverter for grid-tied solar with smart battery integration
- Simplified system design: No autotransformer or battery inverter needed
- User-selectable modes for backup power, self-supply, time-of-use and zero-export
- Free system monitoring included via PWRview™ Web Portal and Mobile App

AC OUTPUT/GRID-TIE	MODEL APKE00014	MODEL APKE00013
RATED AC POWER OUTPUT:	7600W	11400W
AC OUTPUT VOLTAGE:	120/240, 1Ø VAC	120/208, 3Ø VAC
AC FREQUENCY:	60 Hz	60 Hz
MAXIMUM CONTINUOUS OUTPUT CURRENT:	32 A, RMS	32 A, RMS
GROUND-FAULT ISOLATION DETECTION:	Included	Included
CHARGE BATTERY FROM AC:	Yes	Yes
THD (CURRENT):	< 2%	< 2%
TYPICAL NIGHTTIME POWER CONSUMPTION:	< 7W	< 7W

AC OUTPUT/BACKUP	MODEL APKE00014	MODEL APKE00013
RATED AC BACKUP POWER OUTPUT (ISLANDED):	8000W	8000W
MAXIMUM AC BACKUP POWER OUTPUT:	10000W	10000W
AC BACKUP OUTPUT VOLTAGE:	120/240, 1Ø VAC	120/240, 1Ø VAC
AC FREQUENCY:	60 Hz	60 Hz
AC CIRCUIT BREAKER:	50 A	50 A
THD (VOLTAGE):	< 2%	< 2%
AUTOMATIC SWITCHOVER TIME:	< 1 Seconds	< 1 Seconds
TYPICAL NIGHTTIME POWER CONSUMPTION:	30W	30W

DC INPUT	MODEL APKE00014	MODEL APKE00013
DC INPUT VOLTAGE RANGE:	360-420 VDC	360-420 VDC
NOMINAL DC BUS VOLTAGE:	380 VDC	380 VDC
MAX IMPORT CURRENT:	20 A	30 A
MAX INPUT CURRENT:	30 A	30 A
REVERSE-POLARITY PROTECTION:	Yes	Yes
GROUND-FAULT ISOLATION DETECTION:	Yes	Yes
TRANSFORMERLESS, UNGROUNDED:	Yes	Yes
TYPICAL NIGHTTIME POWER CONSUMPTION:	< 7W	< 7W

DC INPUT/ BATTERY	MODEL APKE00014	MODEL APKE00013
MAXIMUM CONTINUOUS POWER:	8000W	8000W
INTERNAL DC DISTRIBUTION BREAKERS:	4x 2p30A	4x 2p30A
DC FUSES ON PLUS AND MINUS:	40 A	40 A
2-POLE DISCONNECTION:	Yes	Yes

EFFICIENCY	MODEL APKE00014	MODEL APKE00013
PEAK EFFICIENCY:	97%	98%
CEC WEIGHTED EFFICIENCY:	96.50%	97.50%

¹Inverter limits DC current import to AC power rating. Total DC current from multiple DC inputs may safely exceed this value up to Max. Input Current. The inverter safely limits the amount utilized
²Per input, four DC inputs total

Specifications

FEATURES AND MODES

ISLANDING ³ :	Yes
GRID SELL:	Yes
SELF CONSUMPTION:	Yes
PRIORITIZED CHARGING FROM RENEWABLES:	Yes
GRID SUPPORT - ZERO EXPORT:	Yes

ADDITIONAL FEATURES

SUPPORTED COMMUNICATION INTERFACES:	REbus™, CANbus, RS485 ⁴ , Ethernet
SYSTEM MONITORING:	PWRview™ Web Portal and Mobile App
BACKUP LOADS DISCONNECT ³ :	Yes
MANUAL INVERTER BYPASS SWITCH:	Automatic
WARRANTY:	10 Years

STANDARDS COMPLIANCE

SAFETY:	UL1741 SA, CSA 22.2
GRID CONNECTION STANDARDS:	IEEE1547, Rule 21, Rule 14H, CSIP
EMISSIONS:	FCC Part 15 Class B

DIMENSIONS AND INSTALLATION SPECIFICATIONS

ENCLOSURE KNOCKOUTS - QTY, SIZE - IN (MM):	6 x Combo 3/4" x 1" (19 x 25.4) 7 x Combo 1/2" x 3/4" (12.7 x 19)
DIMENSIONS L x W x H - IN (MM):	24.5" x 19.25" x 8" (622.3 x 488.9 x 203.2)
WEIGHT - LB (KG):	62.7 (28.4)
COOLING:	Forced convection
NOISE:	< 40 dBA
OPERATING TEMPERATURE - FAHRENHEIT (CELSIUS):	-4 to 122 °F (-20 to 50 °C) ⁵
PROTECTION RATING:	NEMA 3R

INSTALLATION GUIDELINES

BATTERY TYPES SUPPORTED:	PWRcell™ Battery
MODULE STRING SIZE PER PV LINK OPTIMIZER:	Varies, refer to PV Link Installation Manual
MAXIMUM RECOMMENDED DC POWER FROM PV:	15kW

³3Ø inverters offer islanding for 1Ø loads

⁴Modbus

⁵Reduced power at extreme temperatures

Generac Power Systems, Inc.
S45 W29290 Hwy. 59, Waukesha, WI 53189

www.Generac.com | 888-GENERAC (436-3722)

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GENERAC[®]



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REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

DATE: 9/9/2020

PROJECT NAME & ADDRESS

MASAKO S GREEN
RESIDENCE
15519 PIEDMONT STREET,
DETROIT, MI 48223

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-7

GENERAC

SnapRS™

Inline Disconnect Switch
Model: APKE00011
Certification Model Reference: RS801



Generac SnapRS are a simple way to satisfy rapid shutdown compliance for solar + storage systems. Generac SnapRS are 2017/2020 NEC 690.12 compliant, don't require any extra hardware to mount, and need no pairing or fussy digital communications.

FEATURES & BENEFITS

- Fast, easy, and simple to install
- One SnapRS device per PV module
- Achieves PVRSS Compliance
- Low cost, high efficiency solution

SYSTEM DESIGN

Snap a Generac SnapRS disconnect device (RS) to the negative lead (-) of each module in the solar array for simple module-level rapid shutdown compliance. SnapRS devices isolate array voltage when a rapid shutdown is initiated at a PWRcell™ Inverter. When rapid shutdown is initiated, SnapRS units isolate each PV module in the array, reducing array voltage to <80V in seconds.

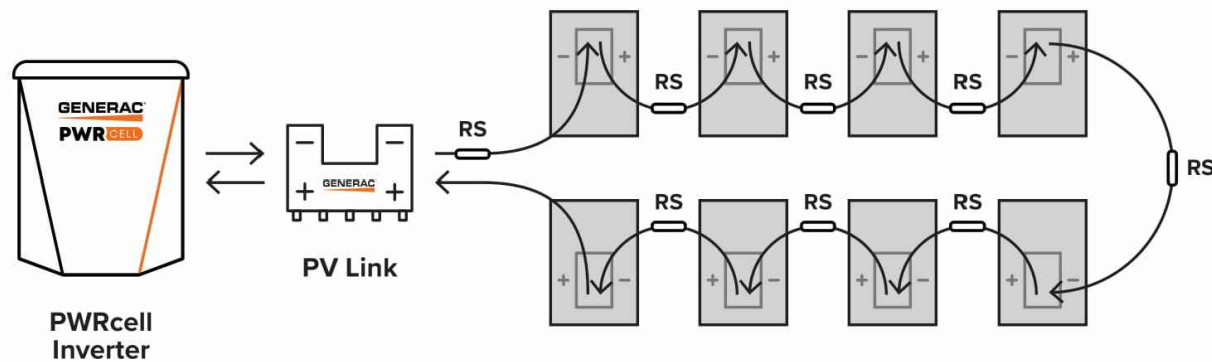


Diagram is applicable for most 60 cell PV modules. Modules with higher cell count may require a different arrangement. Contact Generac for more details.

Specifications

SnapRS™ (APKE00011)	
PV MODULE MAX VOC:	75 V
EFFICIENCY:	99.8%*
MAX INPUT CURRENT:	13 A
SHUTDOWN TIME:	< 10 Seconds
ENCLOSURE RATING:	NEMA 6P
OPERATING TEMPERATURE - FAHRENHEIT (CELSIUS):	-40 to 158 °F (-40 to 70 °C)
CERTIFICATIONS:	UL1741
PROTECTIONS:	PVRSE
WEIGHT - LB (KG):	0.17 (0.08)
DIMENSIONS, L x W x H - IN (MM):	7" x 1" x 1" (177.8 x 25.4 x 25.4)
WARRANTY:	25 Years

*When used with a 50V panel

Connect one SnapRS device to the negative lead of each PV module in the PV Link controlled array for complete PV Rapid shutdown performance



Generac Power Systems, Inc.
S45 W29290 Hwy. 59, Waukesha, WI 53189
www.Generac.com | 888-GENERAC (436-3722)
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GENERAC



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REVISIONS

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Signature with Seal

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SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-8

GENERAC PWRCELL

Model APKE00007, PWRcell Battery Cabinet
 Model A0000391219, 2.85kWh PWRcell Battery Module
 Certification Model Reference: BJ-DCB05ZKAX
 Model APKE00008, PWRcell Spacer Kit
 Model APKE00009, PWRcell Upgrade Kit
 Certification Model Reference for Battery Configurations:
 PWRcell 9, PWRcell 12, PWRcell 15, PWRcell 17

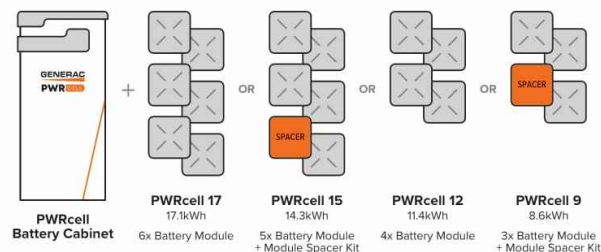
The PWRcell™ Battery Cabinet is a modular smart battery platform that allows for a range of configurations to suit any need, small or large. No other smart battery offers the power and flexibility of PWRcell. Whether for backup power or smart energy management, PWRcell has power and capacity options for every need, without sacrificing flexibility or function.



PWRcell BATTERY CABINET DESIGN

The PWRcell Battery Cabinet allows system owners the flexibility to scale from the economical 8.6kWh PWRcell 9 to the massive 17.1kWh PWRcell 17 by installing additional battery modules to the PWRcell Battery Cabinet. When needs change, an existing PWRcell Battery Cabinet can be upgraded with additional modules. Use the graphic below and the chart on the back of this sheet to understand what components you need for your chosen PWRcell configuration.

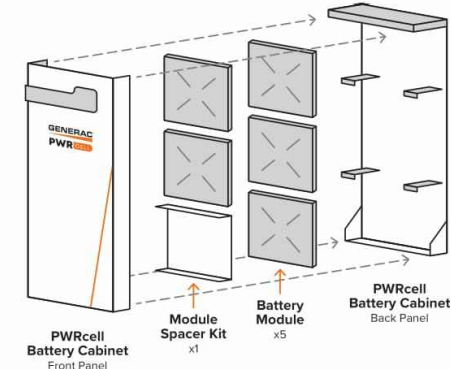
BATTERY CONFIGURATION GUIDE



FEATURES & BENEFITS

- Connect 2 PWRcell Battery Cabinets to a single PWRcell Inverter for 34.2kWh of storage
- Best-in-class battery backup power
- Plug-and-play with PWRcell Inverter and PV Link™
- Time-of-use (TOU) and zero-export ready
- Residential and commercial application ready

BATTERY CABINET ASSEMBLY



Specifications

PWRcell™ BATTERY CONFIGURATIONS	9	12	15	17
BATTERY MODULES:	3	4	5	6
USABLE ENERGY:	8.6kWh	11.4kWh	14.3kWh	17.1kWh
POWER - RATED CONTINUOUS:	3.4kW	4.5kW	5.6kW	6.7kW
POWER - 60 MINUTES:	4.2kW	5.6kW	7.0kW	8.4kW
POWER - 2 MINUTES:	5.0kW	6.7kW	8.4kW	10.0kW
REbus™ VOLTAGE - INPUT/OUTPUT:	360-420 VDC			
MODULE VOLTAGE:	46.8 VDC			
ROUND-TRIP EFFICIENCY:	96.50%			
OPERATING TEMPERATURE - FAHRENHEIT (CELSIUS):	41 to 113 °F (5 to 45 °C)			
RECOMMENDED AMBIENT TEMPERATURE - FAHRENHEIT (CELSIUS):	55 to 86 °F (13 to 30 °C)			
MAXIMUM INSTALLATION ALTITUDE - FT (M):	9834 (3000)			
DIMENSIONS, L x W x H - IN (MM):	22" x 10" x 68" (559 x 254 x 1727)			
WEIGHT, ENCLOSURE - LB (KG):	115 (52)			
WEIGHT, INSTALLED - LB (KG):	280 (127)	335 (152)	390 (178)	445 (202)
WARRANTY - LI-ION MODULES:	10 Years, (7.56MWh)			
WARRANTY - ELECTRONICS AND ENCLOSURE:	10 Years			
COMMUNICATION PROTOCOL:	REbus™ DC Nanogrid™			
COMPLIANCE:	UL 9540, UL 1973, UL 1642, CSA 22.2			

UPGRADING PWRcell

Inside of the PWRcell Battery Cabinet, battery modules are stacked two deep on three levels, allowing for up to six modules to be connected in series. You can upgrade an existing PWRcell Battery Cabinet by adding Battery Modules and a Module Spacer (APKE00008) if required. PWRcell 9 and PWRcell 15 require a module spacer.

Generac offers a convenient PWRcell Battery Upgrade Kit (APKE00009) to help replace lost or misplaced hardware. A PWRcell Battery Upgrade Kit may be purchased from your Generac distributor.

Refer to the table to the right for material requirements related to upgrading the PWRcell Battery Cabinet.

UPGRADE MATERIAL REQUIREMENTS

STARTING CONFIGURATION	ENDING CONFIGURATION		
	PWRcell 17	PWRcell 15	PWRcell 12
PWRcell 9	+ 3 x PWRCell Mod + 2 x APKE00009*	+ 2 x PWRCell Mod + 1 x APKE00009*	+ 1 x PWRCell Mod + 1 x APKE00009*
PWRcell 12	+ 2 x PWRCell Mod + 1 x APKE00009*	+ 1 x PWRCell Mod + 1 x APKE00008	
PWRcell 15	+ 1 x PWRCell Mod + 1 x APKE00009*		

*APKE00009 (Upgrade kit) only required if original hardware is unavailable

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 Specifications are subject to change without notice.



REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

DATE: 9/9/2020

PROJECT NAME & ADDRESS

MASAKO S GREEN
 RESIDENCE
 15519 PIEDMONT STREET,
 DETROIT, MI 48223

SHEET NAME
EQUIPMENT SPECIFICATION

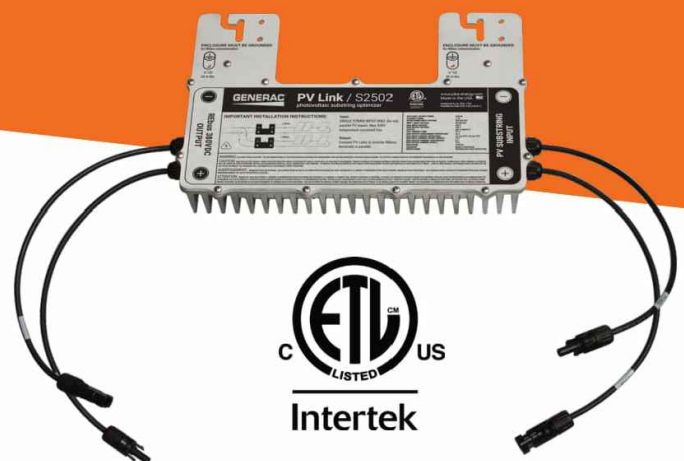
SHEET SIZE
**ANSI B
 11" X 17"**

SHEET NUMBER
PV-9

GENERAC

PV Link™

2500W MPPT Substring Optimizer
 Model: APKE00010
 Certification Model Reference: S2502



PV Link is the simple solar optimizer for quick installation and long-lasting performance. Connect PV modules to each PV Link to overcome shading and challenging roof lines.

FEATURES & BENEFITS

- Fast, simple installation
- Lower failure risk than module-level optimizers
- 2017/2020 NEC rapid shutdown compliant with SnapRS™
- Quick connections with MC4 connectors
- Exports up to 2500W
- Compatible with PWRcell™ Inverters
- Cost-effective solution for high-performance PV
- Ground-fault protection

SINGLE-STRING PV ARRAY WITH SnapRS DEVICES

Where PV module-level rapid shutdown is required (NEC 690.12), a SnapRS device (RS) is installed to negative (-) lead of each PV module.

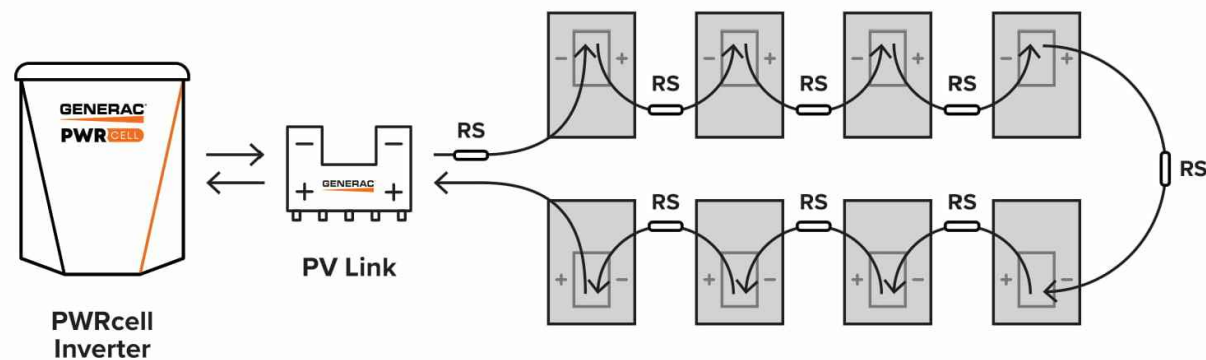


Diagram is applicable for most 60 cell PV modules. Modules with higher cell count may require a different arrangement. Contact Generac for more details.

Specifications

PV Link™ (APKE00010)	
RATED POWER*:	2500W
PEAK EFFICIENCY:	99%
MPPT VOLTAGE RANGE:	60-360 VMP
MAX INPUT VOLTAGE:	420 VOC; max when cold
MAX OUTPUT:	420 VOC
NOMINAL OUTPUT (REbus™):	380 VDC
MAX OUTPUT CURRENT (CONTINUOUS):	8 A
MAX OUTPUT CURRENT (FAULT):	10 A
MAX INPUT CURRENT (CONTINUOUS):	13 A @ 50°C, 10 A @ 70°C
MAX INPUT SHORT CIRCUIT CURRENT (ISC):	18 A
STANDBY POWER:	< 1 W
PROTECTIONS:	Ground-fault, Arc-fault (Arc-fault Type 1 AFCI, Integrated), PVRSE
MAX OPERATING TEMP: FAHRENHEIT (CELSIUS)	158 °F (70 °C)
SYSTEM MONITORING:	PWRview™ Web Portal and Mobile App
ENCLOSURE:	Type 3R
WEIGHT - LB (KG):	7.3 lb (3.3 kg)
DIMENSIONS, L x W x H - IN (MM):	15.4" x 2" x 9.6" (391.2 x 50.8 x 243.8)
COMPLIANCE:	UL 1741, CSA 22.2
WARRANTY:	25 Years

*PV Link can tolerate higher than rated power at its input if Max Input Voltage and Short Circuit Current specifications are not exceeded



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REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

DATE: 9/9/2020

PROJECT NAME & ADDRESS

MASAKO S GREEN
 RESIDENCE
 15519 PIEDMONT STREET,
 DETROIT, MI 48223

SHEET NAME
 EQUIPMENT
 SPECIFICATION

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-10



QRail™ — Fully Integrated Mounting and Racking System

The QRail Series is a strong and versatile solar array mounting system that provides unrivaled benefits to solar designers and installers. Combined with Quick Mount PV's industry-leading waterproof mounts, QRail offers a complete racking solution for mounting solar modules on any roof.



Easily design array configurations with the QDesign software application. Generate complete engineering reports and calculate a precise bill of materials for all the mounting, racking and accessories needed for a complete solar array.

Comprehensive, One-Source Solution

QRail, together with Quick Mount PV's waterproof mounting products, provides the benefit of a single-sourced, seamlessly integrated rooftop installation that works with all roof types — composition/asphalt shingles, flat or curved tile, metal shingle, shake, slate and low slope roofs. The QRail system also works with any roof attachment system for maximum flexibility.

Superior Strength and Versatility

QRail is engineered for optimal structural performance. The system is certified to UL 2703, fully code compliant and backed by a 25-year warranty. QRail is available in Light, Standard and Heavy versions to match all geographic locations. QRail is compatible with virtually all modules and works on a wide range of pitched roof surfaces. Modules can be mounted in portrait or landscape orientation in standard or shared-rail configurations.

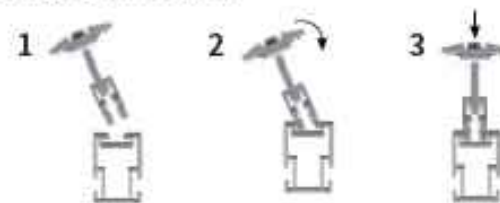


QRails come in two lengths —
168 inches (14 ft) and 208 inches (17.3 ft)
Mill and Black Finish

Fast, Simple Installation: It Just Clicks

QClick Technology™

The universal mid and end clamps use QClick technology to simply "click" into the rail channel and remain upright, ready to accept the module. The pre-assembled clamps fit virtually all module frames and require no extra hardware, eliminating pre-loading and reducing installation time.



Installing is as easy as 1-2-3



UNIVERSAL END CLAMP
2 clamps for modules from
30-45mm or 38-50mm thick



UNIVERSAL BONDED MID CLAMP
2 clamps for modules from
30-45mm or 38-50mm thick

QSplice™ Technology

QRail's innovative internal QSplice installs in seconds, requiring no tools or screws. Simply insert QSplice into the rail and slide the other rail on to create a fully structural, bonded splice. An external splice is also available.



Installs in seconds — no tools or hardware required

Fully Integrated Electrical Bonding

The QRail system provides an integrated electrical bonding path, ensuring that all exposed metal parts and the solar module frames are electrically connected. All electrical bonds are created when the components are installed and tightened down.



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REVISIONS

DESCRIPTION	DATE	REV

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DATE: 9/9/2020

PROJECT NAME & ADDRESS

MASAKO S GREEN
RESIDENCE
15519 PIEDMONT STREET,
DETROIT, MI 48223

SHEET NAME

EQUIPMENT
SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

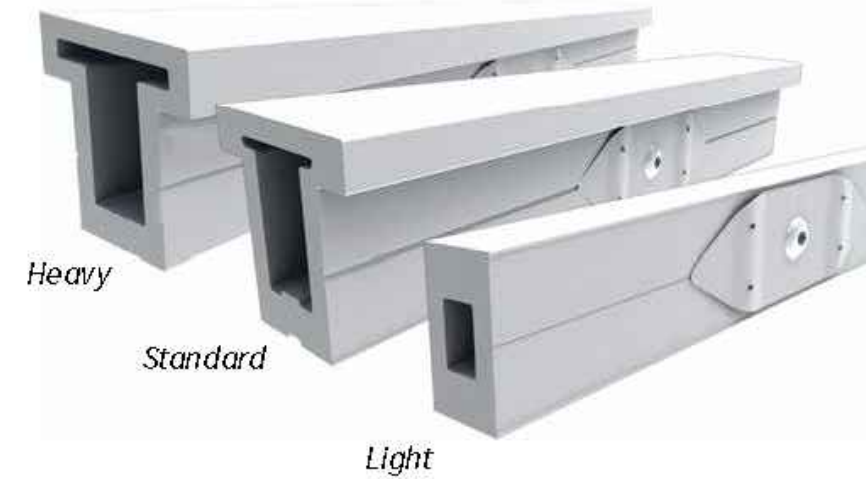
PV-10A

QRail™ Configurations



Item Code	Part Number	Description	Finish
QMR-RL14 A 60	800	QRail Light, 14 ft., 60 Pack	Mill
QMR-RL17.3 A 60	801	QRail Light, 17.3 ft., 60 Pack	Mill
QMR-RL14 B 60	805	QRail Light, 14 ft., 60 Pack	Black
QMR-RL17.3 B 60	806	QRail Light, 17.3 ft., 60 Pack	Black
QMR-RS14 A 60	810	QRail Standard, 14 ft., 60 Pack	Mill
QMR-RS17.3 A 60	811	QRail Standard, 17.3 ft., 60 Pack	Mill
QMR-RS14 B 60	815	QRail Standard, 14 ft., 60 Pack	Black
QMR-RS17.3 B 60	816	QRail Standard, 17.3 ft., 60 Pack	Black
QMR-RH14 A 60	820	QRail Heavy, 14 ft., 60 Pack	Mill
QMR-RH17.3 A 60	821	QRail Heavy, 17.3 ft., 60 Pack	Mill
QMR-RH14 B 60	825	QRail Heavy, 14 ft., 60 Pack	Black
QMR-RH17.3 B 60	826	QRail Heavy, 17.3 ft., 60 Pack	Black

QSplice™ Internal Structural Splice



Item Code	Part Number	Description	Finish
QMR-ISL A 15	830	QSplice Internal, Light, 15 Pack	Mill
QMR-ISS A 15	831	QSplice Internal, Standard, 15 Pack	Mill
QMR-ISH A 15	832	QSplice Internal, Heavy, 15 Pack	Mill

QSplice™ External Structural Splice



Item Code	Part Number	Description	Finish
QMR-ESS A 15	834	QSplice External, Standard, 15 Pack	Mill
QMR-ESH A 15	835	QSplice External, Heavy, 15 Pack	Mill



REVISIONS		
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 DETROIT , MI 48223

SHEET NAME
**EQUIPMENT
 SPECIFICATION**

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

SHEET NUMBER
PV-11

Universal End Clamp with QClick™ Technology



Black

Mill

Item Code	Part Number	Description	Finish
QMR-UEC3045 A 20	860	Universal End Clamp, 30-45mm, 20 Pack	Mill
QMR-UEC3850 A 20	861	Universal End Clamp, 38-50mm, 20 Pack	Mill
QMR-UEC3045 B 20	865	Universal End Clamp, 30-45mm, 20 Pack	Black
QMR-UEC3850 B 20	866	Universal End Clamp, 38-50mm, 20 Pack	Black
QMR-UEC3045BP A 20	862	Universal End Clamp, 30-45mm, w/ Bonding, 20 Pack	Mill
QMR-UEC3850BP A 20	863	Universal End Clamp, 38-50mm, w/ Bonding, 20 Pack	Mill
QMR-UEC3045BP B 20	867	Universal End Clamp, 30-45mm, w/ Bonding, 20 Pack	Black
QMR-UEC3850BP B 20	868	Universal End Clamp, 38-50mm, w/ Bonding, 20 Pack	Black

Mid Clamp with QClick™ Technology



Black

Mill

Item Code	Part Number	Description	Finish
QMR-UMC3045BP 1.2 A 20	872	Universal Mid Clamp, 30-45mm, w/ Bonding, 20 Pack	Mill
QMR-UMC3850BP 1.2 A 20	873	Universal Mid Clamp, 38-50mm, w/ Bonding, 20 Pack	Mill
QMR-UMC3045BP 1.2 B 20	877	Universal Mid Clamp, 30-45mm, w/ Bonding, 20 Pack	Black
QMR-UMC3850BP 1.2 B 20	878	Universal Mid Clamp, 38-50mm, w/ Bonding, 20 Pack	Black

Single-Slot L-Foot



Item Code	Part Number	Description	Finish
QMC-LF A 12	692	Single-slot L-foot, 12 Pack	Mill
QMC-LF B 12	693	Single-slot L-foot, 12 Pack	Black

End Caps



Heavy

Standard

Light

Item Code	Part Number	Description	Finish
QMR-CPL B 50	885	End Cap Light, 50 Pack	Black
QMR-CPS B 50	886	End Cap Standard, 50 Pack	Black
QMR-CPH B 50	887	End Cap Heavy, 50 Pack	Black



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EQUIPMENT
 SPECIFICATION

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-11A

T-Bolt



Item Code	Part Number	Description	Finish
QMR-TB A 300	880	T-Bolt w/ Nut, 300 Pack	stainless steel

Grounding Lug



Item Code	Part Number	Description	Finish
QMR-GL A 50	890	WEEB Lug w/ T-Bolt, 50 Pack	n/a

Wire Clip



Works with both PV and Trunk Cabling

Item Code	Part Number	Description	Finish
QMR-WCA 300	892	Trunk/PV Cable, 300 Pack	stainless steel

WEEB BMC



Item Code	Part Number	Description	Finish
QMR-ECWA 50	891	WEEB BMC, 50 Pack	stainless steel



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 SPECIFICATION

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-11B

L-Mount | QMLM / QMLM-ST

Elevated Water Seal Technology®

ITEM NO.	DESCRIPTION	QTY.
1	FLASHING, ROUNDED CORNERS, 9" X 12" X .040", .438" HOLE, 5052, MILL	1
2	L-FOOT, 2" X 3.30" FOR .438" O.D. FASTENER, 2-1/16" SLOT, 6061-T6/6005A-T6T, MILL	1
3	WASHER, SEALING, 5/16" ID X 3/4" OD, EPDM BONDED SS	1
4	LAG SCREW, HEX HEAD, 5/16" X 4", 18-8 SS	1
*5	STRUCTURAL SCREW, QMPV, T-30 HEX WASHER HEAD, 5/16" X 4-1/2", 18-8SS	1

THIS EDGE TOWARDS ROOF RIDGE

12.00

9.00

4.50

3.00 (4.20)

2.00

1.00

Ø .408

2.09

3.30

.040

(2.50)

(3.54)

QMLM

QMLM-ST

2.75

4.04

4

3

2

1

*5

STRUCTURAL SCREW AVAILABLE ON QMLM-ST VERSIONS ONLY

AVAILABLE IN MILL AND BLACK FINISHES

Quick Mount PV®

TITLE: QMLM & QMLM-ST: L-MOUNT, 2-1/16" SLOT

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: FRACTIONAL ± 1/8" TWO PLACE DECIMAL ± .015 THREE PLACE DECIMAL ± .004

SIZE: A

DRAWN BY: AAP

DATE: 4/4/2019

REV: 11

SCALE: 1:1

WEIGHT: 0.7565

SHEET 1 OF 1

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DO NOT SCALE DRAWING

L-Mount Installation Instructions

Installation Tools Required: tape measure, roofing bar, chalk line, stud finder, caulking gun, sealant compatible with roofing materials, drill with 7/32" or 1/8" bit, drill or impact gun with 1/2" socket.

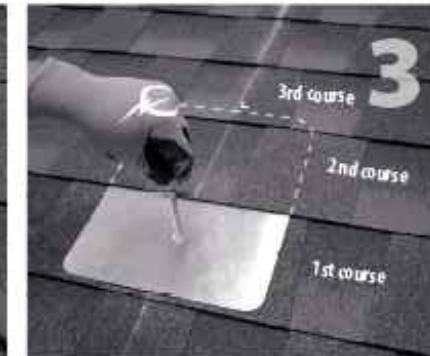
WARNING: Quick Mount PV products are NOT designed for and should NOT be used to anchor fall protection equipment.



1 Locate, choose, and mark centers of rafters to be mounted. Select the courses of shingles where mounts will be placed.



2 Carefully lift composition roof shingle with roofing bar, just above placement of mount. Remove nails as required and backfill holes with approved sealant. See "Proper Flashing Placement" on next page.



3 Insert flashing between 1st and 2nd course. Slide up so top edge of flashing is at least 3/4" higher than the butt-edge of the 3rd course and lower flashing edge is above the butt-edge of 1st course. Mark center for drilling.



4 If attaching with lag bolt use a 7/32" bit (Lag). Use a 1/8" bit (ST) for attaching with the structural screw. Drill pilot hole into roof and rafter, taking care to drill square to the roof. Do not use mount as a drill guide. Drill a 2" deep hole into rafter.



5 Clean off any sawdust, and fill hole with sealant compatible with roofing materials.



6 Place L-foot onto elevated flange and rotate L-foot to desired orientation.



7 Prepare lag bolt or structural screw with sealing washer. Using a 1/2-inch socket on an impact gun, drive prepared lag bolt through L-foot until L-foot can no longer easily rotate. **DO NOT over-torque.** NOTE: Structural screw can be driven with T-30 hex head bit.



8 You are now ready for the rack of your choice. Follow all the directions of the rack manufacturer as well as the module manufacturer. NOTE: Make sure top of L-Foot makes solid contact with racking.

All roofing manufacturers' written instructions must also be followed by anyone modifying a roof system. Consult the roof manufacturer's specs and instructions prior to working on the roof.



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REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

DATE: 9/9/2020

PROJECT NAME & ADDRESS

MASAKO S GREEN
RESIDENCE
15519 PIEDMONT STREET,
DETROIT, MI 48223

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-12

Quick Mount PV®
RESPECT THE ROOF

Apr-2019 Rev 6

September 20, 2020

PowerHome Solar
919 N. Main St
 Mooresville, NC 28115

RE: Green Residence
15519 Piedmont Street, Detroit, MI 48223
Client Project #: 15519GREE
PFE Project #: 204137

On behalf of PowerHome Solar, Penn Fusion Engineering LLC (PFE) performed a structural analysis of the roof at the above referenced location. The purpose of our analysis was to determine if the existing roof system is structurally sufficient to support the new photovoltaic modules in addition to the code required design loads. Information used for this analysis was determined by a site survey performed by a representative of PFE and is isolated only to the areas where the modules are intended to be placed. If any discrepancies are found by the contractor during installation, please contact PFE.

System Specifications:

Panel Specs: (12) Silfab – SIL
Racking System: Quick Mount PV – QRail Light

The modules are to be located on the following roof planes:

Mounting Plane	Rafter Size	Rafter Spacing	Horizontal Span	Collar Ties	Collar Tie Spacing	Sheathing	Shingle Type	Number of Shingle Layers	Ceiling Profile
1	2x6	16"	13ft. 10in.	N/A	0"	CDX 1/2"	Asphalt Shingles	1	Flat
2	2x6	16"	13ft. 10in.	N/A	0"	CDX 1/2"	Asphalt Shingles	1	Flat

The roof design has been analyzed in accordance with the 2015 Michigan Residential Code with design loads as follows:

Ground Snow (Pg): 20 psf
Wind Speed (V): 115 mph

Mounting Plane 1

The calculations for these structural members are attached. It has been determined by this office that the roof, as specified above, is adequate to support the new PV modules in addition to the code required design loading.

Attach the module rail brackets to the roof with 5/16" lag bolts at 48 on center maximum with staggered penetration such that load is distributed evenly among roof members. Provide a minimum of 2" of penetration into the wood members.

Mounting Plane 2

The calculations for these structural members are attached. It has been determined by this office that the roof, as specified above, is adequate to support the new PV modules in addition to the code required design loading.

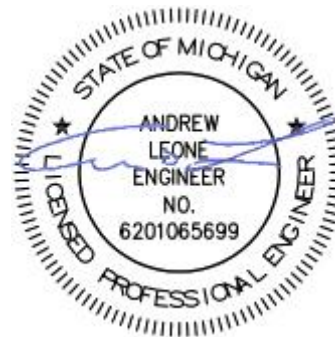
Attach the module rail brackets to the roof with 5/16" lag bolts at 48 on center maximum with staggered penetration such that load is distributed evenly among roof members. Provide a minimum of 2" of penetration into the wood members.

This office has determined that the installation of the PV System as specified above will meet the structural requirements of the 2015 Michigan Residential Code and ASCE7-10 when installed in accordance with the manufacture's instructions.

If you have any questions regarding this analysis, please feel free to contact us.

Best Regards,
Penn Fusion Engineering LLC

Andrew D. Leone, P.E.
Principal



Client Name: PowerHome Solar
 PFE Project Number: 204137
 Client Project Number: 15519GREE
 Project: Green Residence
 Address: 15519 Piedmont Street
 Detroit, MI 48223
 Description: Mounting Plane 1
 Calculations By: ADL
 Date: September 20, 2020

Roof Construction

2x6 Rafters at 16" on center

A=	8.25 in ²
Ix=	20.8 in ⁴
Sx=	7.56 in ³
Wood Species=	Doug-Fir Larch #2
Fb=	900 psi
Fv=	180 psi
E=	1600000 psi
Roof Slope=	30 °
Rafter Span=	13.86 ft
Ceiling Attached to Rafters?:	No

Design Criteria

Ground Snow (P _g):	20 psf
Design Wind Speed:	115 mph
Live Load:	20 psf
Dead Load:	4.7 psf
PV Modules:	3.46 psf

Wind Calculations

Directionality Factor (K _d):	0.85
Topographic Factor (K _{zt}):	1
Velocity Pressure Exposure Coefficient (K _e):	0.7
Importance Factor (I):	1
Velocity Pressure (q _z):	20.14 psf
Tributary Square Footage on Component:	10.83 ft ²
Component Roof Pressures:	21.69 / -27.66 psf

Snow Load Calculations

Exposure Factor (C _e):	1
Thermal Factor (C _t):	1
Importance Factor (I):	1
Flat Roof Snow Loads (P _f):	14 psf
Roof Slope Factor (C _s):	1
Sloped Snow Loads (P _s):	14 psf
Unbalanced Snow Load:	20 psf

Member Calculations

Bending

M_d :	901.4 ft*lb		
f_b :	1430.31 psi		
Load Duration Factor (C_d):	1.15		
Stability Factor (C_L):	1		
Wet Service Factor (C_M):	1		
Temperature Factor (C_T):	1		
Size Factor (C_F):	1.3		
Flat Use Factor (C_{fu}):	1		
Incising Factor (C_i):	1		
Repetitive Member Factor (C_r):	1.15		
F_b :	900 psi		
F'_b :	1547.33 psi	1430.31 <= 1547.33	OK in Bending

Shear

V_d :	260.21 lb		
f_v :	47.31 psi		
Load Duration Factor (C_d):	1.15		
Wet Service Factor (C_M):	1		
Temperature Factor (C_T):	1		
Size Factor (C_F):	1.3		
Flat Use Factor (C_{fu}):	1		
Incising Factor (C_i):	1		
F_v :	180 psi		
F'_v :	207 psi	47.31 <= 207	OK in Shear

Deflection

Live Load Deflection (Δ_L):	0.66 in	L/250	OK in Live Load Deflection
Total Load Deflection (Δ_T):	0.94 in	L/178	OK in Total Load Deflection

Uplift Calculation

Tributary Square Footage on Component:	10.83 ft ²
Uplift Pressure:	-27.66 psf
Uplift per Lag:	-299.64 lbs
Lag Screw Diameter:	5/16 in
Allowable Withdrawal per Inch:	490.99 lbs/in
Minimal Screw Penetration:	0.61 in

Install 5/16" diameter lag screws @ 48 on center with minimum penetration of 2" into rafter.

Client Name: PowerHome Solar
 PFE Project Number: 204137
 Client Project Number: 15519GREE
 Project: Green Residence
 Address: 15519 Piedmont Street
 Detroit, MI 48223
 Description: Mounting Plane 2
 Calculations By: ADL
 Date: September 20, 2020

Roof Construction

2x6 Rafters at 16" on center

A=	8.25 in ²
Ix=	20.8 in ⁴
Sx=	7.56 in ³
Wood Species=	Doug-Fir Larch #2
Fb=	900 psi
Fv=	180 psi
E=	1600000 psi
Roof Slope=	30 °
Rafter Span=	13.86 ft
Ceiling Attached to Rafters?:	No

Design Criteria

Ground Snow (P _g):	20 psf
Design Wind Speed:	115 mph
Live Load:	20 psf
Dead Load:	4.7 psf
PV Modules:	3.46 psf

Wind Calculations

Directionality Factor (K _d):	0.85
Topographic Factor (K _{zt}):	1
Velocity Pressure Exposure Coefficient (K _e):	0.7
Importance Factor (I):	1
Velocity Pressure (q _z):	20.14 psf
Tributary Square Footage on Component:	10.83 ft ²
Component Roof Pressures:	21.69 / -27.66 psf

Snow Load Calculations

Exposure Factor (C _e):	1
Thermal Factor (C _t):	1
Importance Factor (I):	1
Flat Roof Snow Loads (P _f):	14 psf
Roof Slope Factor (C _s):	1
Sloped Snow Loads (P _s):	14 psf
Unbalanced Snow Load:	20 psf

Member Calculations

Bending

M_d :	901.4 ft*lb		
f_b :	1430.31 psi		
Load Duration Factor (C_d):	1.15		
Stability Factor (C_L):	1		
Wet Service Factor (C_M):	1		
Temperature Factor (C_T):	1		
Size Factor (C_F):	1.3		
Flat Use Factor (C_{fu}):	1		
Incising Factor (C_i):	1		
Repetitive Member Factor (C_r):	1.15		
F_b :	900 psi		
F'_b :	1547.33 psi	1430.31 <= 1547.33	OK in Bending

Shear

V_d :	260.21 lb		
f_v :	47.31 psi		
Load Duration Factor (C_d):	1.15		
Wet Service Factor (C_M):	1		
Temperature Factor (C_T):	1		
Size Factor (C_F):	1.3		
Flat Use Factor (C_{fu}):	1		
Incising Factor (C_i):	1		
F_v :	180 psi		
F'_v :	207 psi	47.31 <= 207	OK in Shear

Deflection

Live Load Deflection (Δ_L):	0.66 in	L/250	OK in Live Load Deflection
Total Load Deflection (Δ_T):	0.94 in	L/178	OK in Total Load Deflection

Uplift Calculation

Tributary Square Footage on Component:	10.83 ft ²
Uplift Pressure:	-27.66 psf
Uplift per Lag:	-299.64 lbs
Lag Screw Diameter:	5/16 in
Allowable Withdrawal per Inch:	490.99 lbs/in
Minimal Screw Penetration:	0.61 in

Install 5/16" diameter lag screws @ 48 on center with minimum penetration of 2" into rafter.