Town of Chapel Hill
Planning Department
919-969-5040
planning@townofchapelhill.org

QUESTIONS?
Call or email us!

Chapel Hill Historic District

Certificate of Appropriateness Application

Project: 21-022

Permit:

Project Description:

Installation of 53 black solar panels flush mounted to the southernmost facing roof of the house. Via Opt 2 of DOI.Please see attached documentation for panel dimensions, location, & example photos.

STAFF REVIEW

[X] Application complete and accepted

[ ] Application not complete and returned with a notation of deficiencies

BY: Anya Grahn,
DATE: 3/25/2021

Instructions: Submit one paper copy and a digital copy of all application materials collated in one file (pdf preferred)

Deadlines: Applications are due by the close of business 30 calendar days prior to the scheduled meeting date.

Note: Only complete applications may be accepted for Certificate of Appropriateness review. Applications that are not complete will be returned with a notation of deficiencies.

A: Property Information

Property Address: 215 Friendly Lane,Chapel Hill,NC 27514 **Parcel ID Number:**

Property Owner(s): Nathaniel Lin **Email:** dr.nathaniel.lin@gmail.com

Property Owner Address: 215 Friendly Lane,Chapel Hill,NC 27514

City: Chapel Hill **State:** NC **Zip:** 27514 **Phone:** 404-680-8088

Historic District: ☐Cameron-McCauley ☐ Franklin-Rosemary ☐ Gimghoul **Zoning District:**

B: Applicant Information

Applicant: Erin Whitley Hawks **Role (owner, architect, other):** Senior Program Manager

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Address (if different from above):			
City:	**State:**	**Zip:**	
Email: erin@ncsolarnow.com		**Phone:** 919-833-9096	

C. Application Type *(check all boxes that apply)*

☑ **Minor Work** Exterior works that do not involve any substantial alterations, and do not involve additions or removals that could impair the integrity of the property and/or the district as a whole. See Design Guidelines (p. 69) for a list of minor works.

☐ **Historic District Commission Review** Includes all exterior changes to structures and features other than minor works

☐ **Site-work only (walkways, fencing, walls, etc.)**

☑ **Restoration or alteration**

☐ **New construction or additions**

☐ **Sign**

☐ **After-the-fact application** (for unauthorized work already performed).

☐ **Demolition or moving of a site feature.**

☐ **Request for review of new application after previous denial**

D. Basic information about size, scale, and lot placement.

Provide measurements in feet and square feet where applicable. Where possible, please provide accurate measurements from a licensed surveyor, architect, engineer, etc. If exact measurements are not available, please provide estimated information. Current estimated information about lots and buildings can be found on the Orange County Real Estate Data website. Information about lot placement can be found on the Chapel Hill and Orange County Interactive GIS portals.

Zoning District:	***Minimum setbacks***			***Maximum heights***			**Lot size**
	Street	**Interior**	**Solar**	**Primary**	**Secondary**		
Required by zoning			901				
Proposed			901				
	Existing	**Change +/-**	**Total**	**Total Floor Area Ratio**			
Floor Area (main structure)				**Existing**	**Proposed**	**ISA/NLA ratio**	

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Floor Area (all other)						**Existing**	**Proposed**
Impervious Surface Area (ISA)							
New Land Disturbance							

E: Applicable Design Guidelines

The Town's Design Guidelines for the Chapel Hill Historic Districts are integral to the application and review process. These guidelines supplement the required review criteria for Certificate of Appropriateness applications (provided in Section 3.6.2(e)(4) of the Land Use Management Ordinance) by providing detailed, practical considerations for how to make changes to properties while preserving the special character of their Historic District context. Please review the Design Guidelines and consider their applicability to your proposed project. (Attach additional sheets, as necessary.)

Section/Page	Topic	Brief description of the applicable aspect of your proposal
pg.37 #9	Solar Panels	The proposed installation will not compromise the architectural integrity of the residence and has been carefully designed resulting in an aesthetically pleasing PV project .
pg. 49 #9	Solar Panels	There are no front facing panels in Dr. Lin's proposed PV project to ensure minimum visibility of the panels. His garage is the front facing portion of his home and no panels will be installed on that surface. The proposed solar panels are all black, closely matching the roof color. Please specification sheets in the comprehensive application attached.

F. Checklist of Application Materials

Attach the required elements in the order indicated.	ATTACHED? TO BE COMPLETED BY APPLICANT		TO BE COMPLETED BY TOWN STAFF		
	YES	N/A	YES	N/A	NO
1. **Written description of physical changes proposed.** Describe clearly and in detail the physical changes you are proposing to make. Identify the materials to be used (siding, windows, trim, roofing, pavements, decking, fencing, light fixtures, etc.), specify their dimensions, and provide names of manufacturers, model numbers, and specifications where applicable.	☑	☐	☐	☐	☐

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2. History, context, and character information. Please include a summary of what information you have relied on to understand the relevant character and history of the district and subject property—and briefly summarize that information. At a minimum, include: ☐ Current property information for the lot and all structures, including Building Sketches and Building Details, from Orange County Real Estate Data. ☐ The entry of your property on the most recent inventory of historic resources in the relevant National Register for Historic Places filing, available via the NC State Historic Preservation Office website: for McCauley-Cameron see *West Chapel Hill*, for Franklin-Rosemary see *Chapel Hill Historic District*, for Gimghoul see *Gimghoul*. (If yours is one of the few properties in McCauley-Cameron or Franklin-Rosemary that has not yet been inventoried, please indicate that.)	☑	☐	☐	☐	☐
3. Justification of appropriateness. Attach an annotated statement explaining how the proposed change(s) meets the following standards of appropriateness that the Commission considers in making findings of fact indicating the extent to which the application is or is not congruous with the historic aspects of the historic district. If a standard is not applicable, type "not applicable". A. The height of the building in relation to the average height of the nearest adjacent and opposite buildings. B. The setback and placement on lot of the building in relation to the average setback and placement of the nearest adjacent and opposite buildings. C. Exterior construction materials, including texture and pattern. D. Architectural detailing, such as lintels, cornices, brick bond, and foundation materials. E. Roof shapes, forms, and materials. F. Proportion, shape, positioning and location, pattern, and size of any elements of fenestration. G. General form and proportions of buildings and structures. H. Appurtenant fixtures and other features such as lighting. I. Structural conditions and soundness. J. Architectural scale.	☑		☐	☐	☐
4. **Photographs** of existing conditions are required. Minimum image size 4" x 6" as printed or the digital equivalent. Maximum 2 images per page.	☑	☐	☐	☐	☐
5. Site Plan Set showing existing and proposed conditions. (Min. scale: 1 in. = 20 ft.) ☐ Site plans must show the relationships between, and dimensions of, existing and proposed buildings, additions, sidewalks, walls, fences, driveways, and/or other structures on the property, as well as property lines and applicable zoning setbacks. ☐ Include both written and drawn scales and show accurate measurements. You may also use a copy of a survey with surveyor's seal deleted. Revise the copy as needed to show existing conditions and your proposed work.	☑		☐	☐	☐

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Indicate the area of all structural footprints (existing and proposed) in square feet; also, indicate lot size in square feet.					
6. **Elevation Drawings** showing existing structural facades and proposed changes. Drawings should be submitted as 11" x 17" or 8-1/2" x 11" reductions of full-size drawings. All details should be reasonably legible. Photographs are okay for facades with no changes. ☐ Elevation drawings showing all proposed changes above current grade from front, back, and both sides. ☐ Include scale bar, written scale, and label major dimensions (including width of structures and heights from finished grade to fascia/eaves and heights to top of roofs). ☐ Label materials to be used (roofing, siding, windows, trim, light fixtures, etc.)	☑	●	☐	☐	☐
7. **Information about context** (required for all construction of new structures, proposed impervious surfaces greater than 1500 SF, additions greater than 150 SF, and/or proposed land disturbance greater than 5000 SF.) Detailed information about lots and structures can be found on the Orange County Real Estate Data website; information about lot placement can be found on the Chapel Hill and Orange County GIS portals. For each of the nearest adjacent and opposite properties, provide: ☐ The height of each building (if an estimate, indicate that). ☐ The setbacks and lots placement of each building (an image from the Town GIS database, including scale, is sufficient). ☐ The size of each lot (net land area in square feet). ☐ The size of all buildings on the nearest adjacent and opposite properties, including building footprint areas, Floor Areas (in square feet), and Floor Area Ratios. Provide current figures from Orange County Real Estate Data; indicate any corrections for accuracy you believe necessary and your basis for doing so.	☑	☐	☐	☐	☐
8. **Demolition/Relocation Information** (required only if demolition or relocation of a feature is proposed). ☐ Provide a written description of architectural features, additions, remodeling, and any alterations to the structure(s). Make note of any outbuildings on the site plan of the property. ☐ Provide a history of the structure, giving the construction date and architect or carpenter, briefly noting any significant events, persons and/or families associated with the property. Provide current exterior photographs of the property (4" x 6" as printed or the digital equivalent). If information is unknown, please provide a summary of sources consulted. ☐ If an argument about structural soundness is being made, attach a signed and sealed report from a professional engineer. ☐ As necessary, attach a statement explaining how a delay in demolition would	☐	☑	☐	☐	☐

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cause the property owner to suffer extreme hardship or be permanently deprived of all beneficial use or return from such property by virtue of the delay. Provide any records about the structure to be demolished.					
9. Mailing notification fee per Planning & Sustainability Fee Schedule. For a list of addresses, please refer to the Town's Development Notification Tool.	☑		☐	☐	☐
10. Certificate of Appropriateness fee per Planning & Sustainability Fee Schedule	☑		☐	☐	☐

G: Applicant signature

I hereby certify that I am authorized to submit this application; that all information is correct to the best of my knowledge, and all work will comply with the State Building Code and all other applicable State and local laws, ordinances, and regulations.

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I acknowledge and agree that the Historic District Commission members, Town employees, and Town agents may enter, solely in performance of their official duties and only at reasonable times, upon the applicant's property for examination or survey thereof pursuant to North Carolina General Statute 160A-400.8. However, no member, employee, or agent of the Historic District Commission may enter any private building or structure without the express consent of the owner or occupant thereof.

I understand and agree that an approved Certificate of Appropriateness is valid only for the particular application, plans, specifications and related project details presented to, and approved by, the Historic District Commission. If any of the data contained in this application, any plans or any specifications presented to the Commission are changed or altered for any reason, including, but not limited to, changes or alternations deemed practically necessary during construction, required due to subsequent Town reviews, or otherwise, a new hearing before the Historic District may be required. By signing below, the applicant agrees to notify the Development Services Center of any changes or alternations in the data contained in this application, the approved plans or the approved specifications related to the project that is the subject of this application.

Hearings on Certificate of Appropriateness applications before the Commission are quasi-judicial proceedings. Therefore, Historic District Commission members are not permitted to discuss a pending application with the applicant or other party. By signing below, the applicant agrees to refrain from speaking with or contacting any member of the Historic District Commission about an application outside of the formal evidentiary hearing on the application.

Erin Whitley Hawks Erin Whitley Hawks 3/19/2021		
Applicant (printed name)	**Signature** DocuSigned by: Nathaniel Lin 02D7CBBFD909450...	**Date** 3/24/2021
Property Owner **(if different from above)**	**Signature**	**Date**

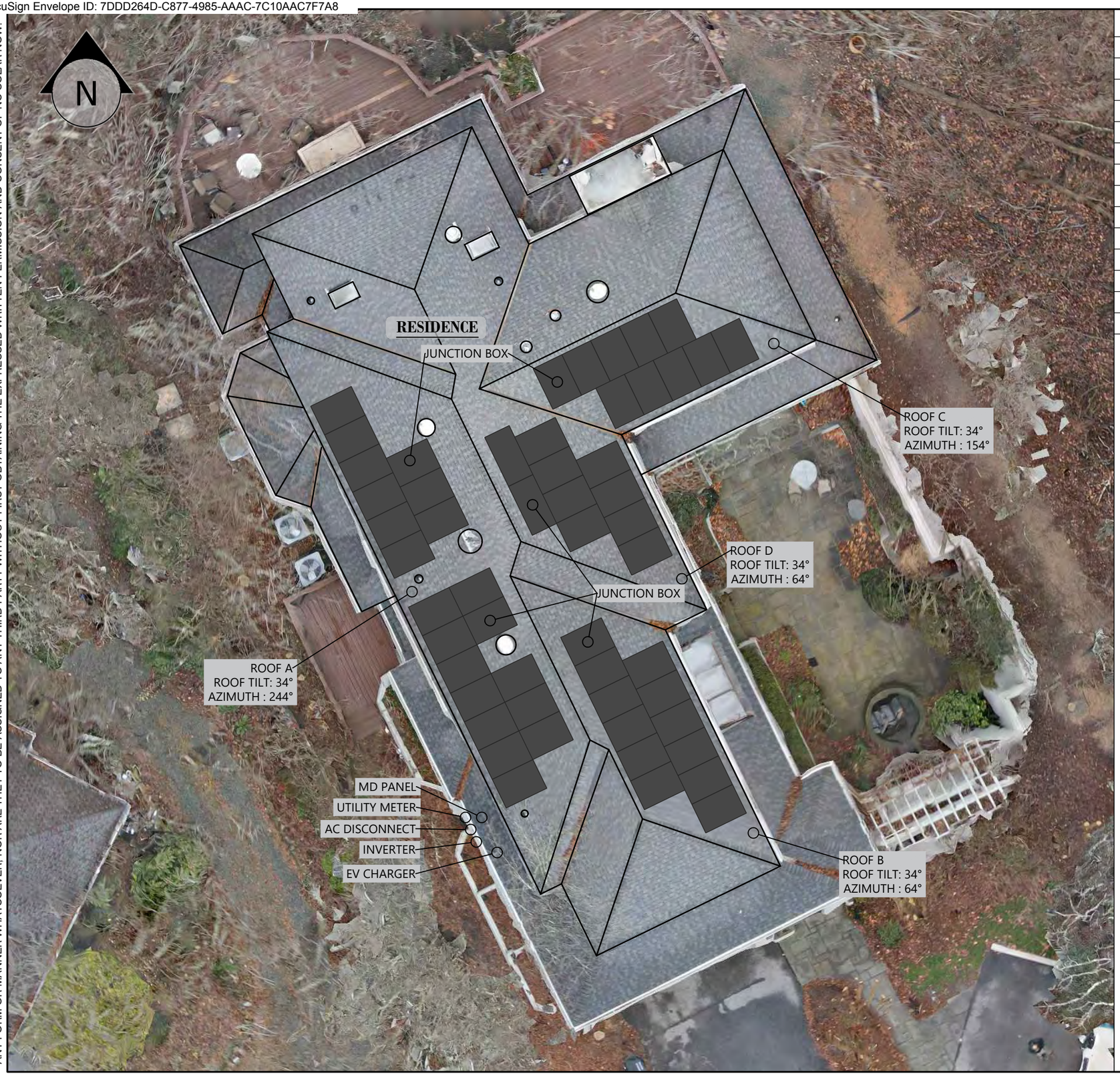
Certificate of Appropriateness Application:

Dr. Nathaniel Lin -215 Friendly Lane,Chapel Hill,NC 27514)

3.6 2(e)(4): H. Appurtenant fixtures an other features such as lighting

The proposed solar panel installation will be minimally visible from the street. Our design team has utilized several roof surfaces on Dr. Lin's home to ensure the most aesthetically pleasing installation possible in keeping with the harmony of the Historic. All 53 panels are black and closely match the roof surface to reduce any visibility from the street.

Please see attached comprehensive ARC application and approved permit set.



PV MATERIAL SUMMARY: DISTRIBUTOR

REC365AA (fulfillment)	53
P370	53
SE10000H-US000BNU4	1
SE7600H-US000BNU4	1
SE-CELL-B-R05-US-S-S2	2
XR-10-168B	23
XR-10-204B	4
XR10-BOSS-01-M1	12
UFO-CL-01-B1	130
UFO-STP-30MM-B1	48
XR-LUG-03-A1	13
4 IN QB1	99
GC66803 Geocel Sealant	6
SOLADECK 0799-5B	5

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 2/19/21

CLIENT INFO

CHU HSIEN LIN
215 FRIENDLY LANE
CHAPEL HILL,NC 27514

PROJECT INFO

DC INPUT:	19.345 kW
AC EXPORT:	17.600 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	115 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

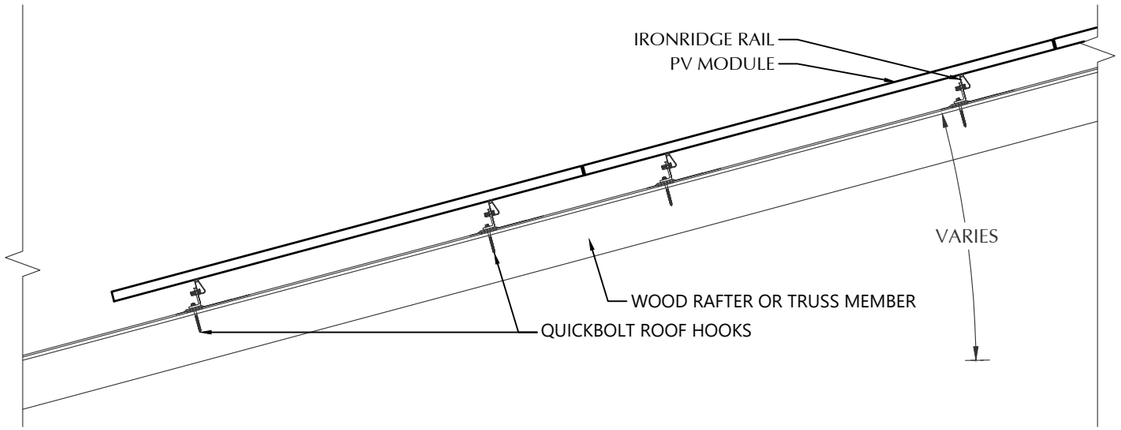
SHEET INDEX

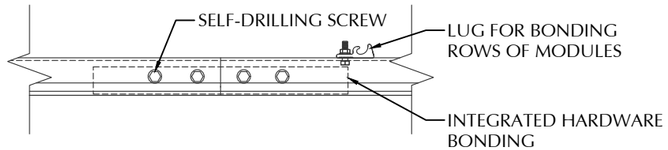
DESIGNER INFO

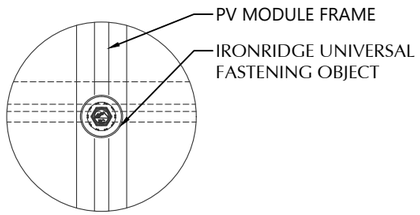
DESIGNER	CRM
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

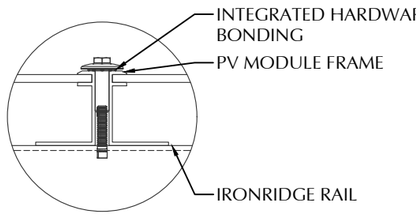
PV SYSTEM COVER PAGE

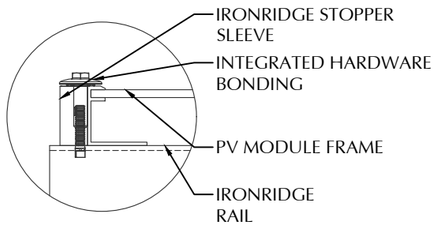
PV-1.1

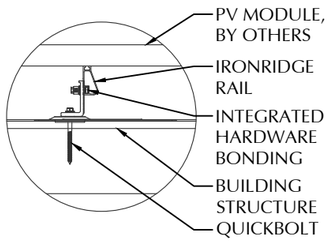




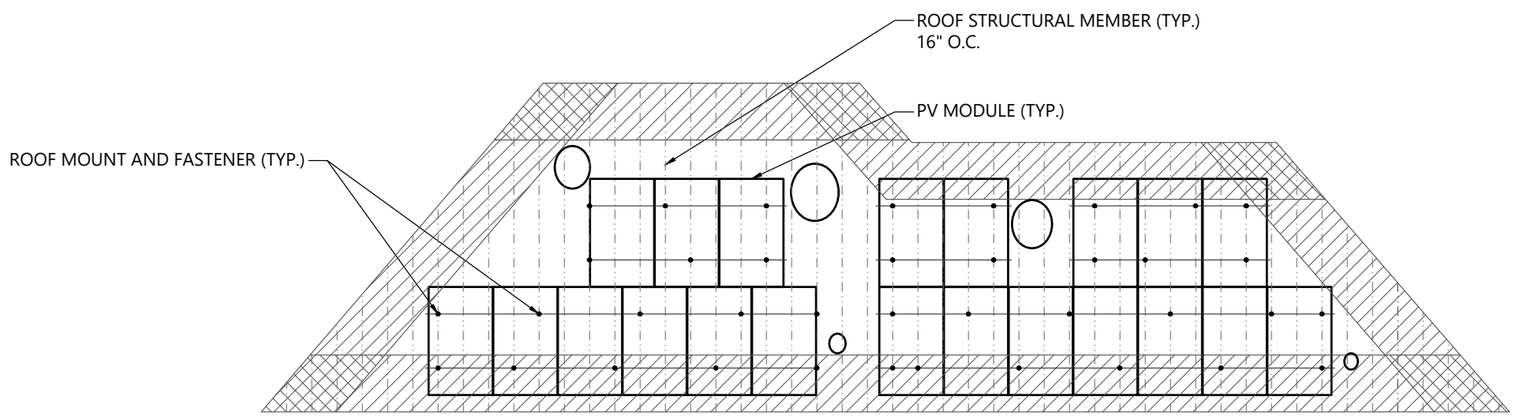








1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF A ARRAY LAYOUT
1/8" = 1'-0"

STATEMENT OF STRUCTURAL COMPLIANCE

THE EXISTING ROOF STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE ADDITIONAL LOADS OF THE PROPOSED PV SYSTEM. IN ADDITION, THE RACKING AND FASTENING SYSTEM SHALL BE CAPABLE OF SECURING THE SYSTEM TO THE STRUCTURE UNDER DESIGN CONDITIONS WHEN INSTALLED PROPERLY AND IN ACCORDANCE WITH THE RACKING AND FASTENING ARRANGEMENT DETAILED WITHIN THESE DRAWINGS.

NAME: ANDREW W. KING, PE

SIGNED:

PV MODULES

MAKE	REC
MODEL	REC365AA
WIDTH	40.00 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	43.00 LBS.
ARRAY AREA	396 SQFT.
ARRAY WEIGHT	989 LBS.

ROOF SUMMARY

STRUCTURE:	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 8
SPACING	16 IN O.C.
EFFECTIVE SPAN	173 IN
PITCH	8/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	PLYWOOD
MATERIAL	COMPOSITE
THICKNESS	8/16 IN
WEIGHT	1.42 LBS/SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.

ROOF MOUNT SUMMARY

MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	64 IN	26 IN
WIND ZONE 2	64 IN	26 IN
WIND ZONE 3	48 IN	19 IN

ROOF LOADING

GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS/SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-24.6 LBS./SQFT.
UPLIFT ZONE 2	-29.0 LBS./SQFT.
UPLIFT ZONE 3	-29.0 LBS./SQFT.
DOWNWARD	23.0 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-368 LBS.
UPLIFT ZONE 2	-434 LBS.
UPLIFT ZONE 3	-325 LBS.
DOWNWARD	344 LBS.

ROOF MOUNT & FASTENER

ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	4 IN QB1
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	SOLAR ROOF HOOK
MODEL	HANGER BOLT
MATERIAL	304 SS
SIZE	5/16-18 X 5-1/4"
GENERAL:	
WEIGHT	0.56 LBS.
FASTENERS PER MOUNT	1
MAX. PULL-OUT FORCE	960.0 LBS.
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	480.0 LBS.

MOUNTING RAILS

MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 2/19/21

CLIENT INFO

CHU HSIEN LIN
215 FRIENDLY LANE
CHAPEL HILL,NC 27514

PROJECT INFO

DC INPUT:	19.345 kW
AC EXPORT:	17.600 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	115 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

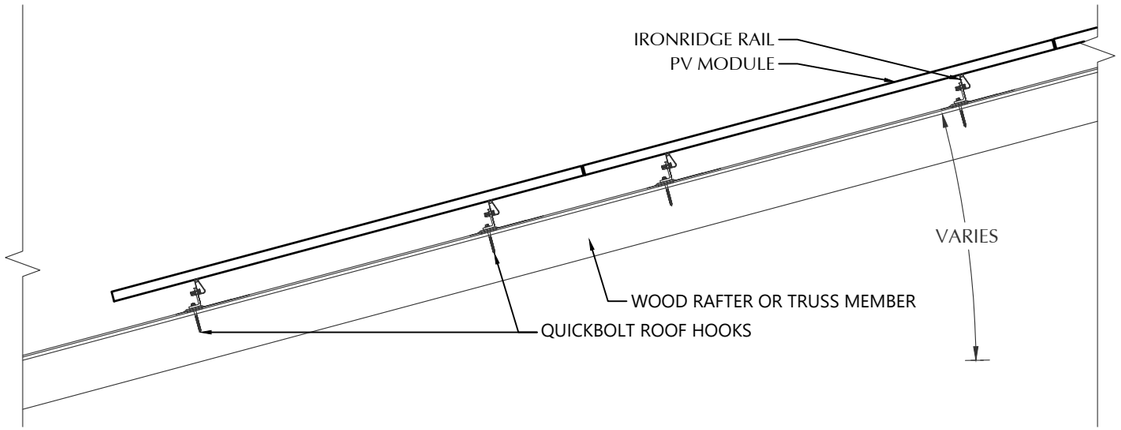
SHEET INDEX

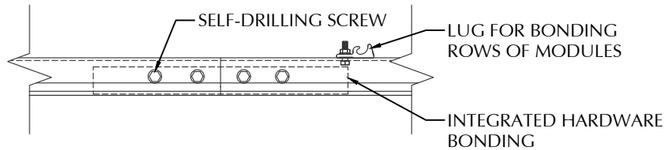
DESIGNER INFO

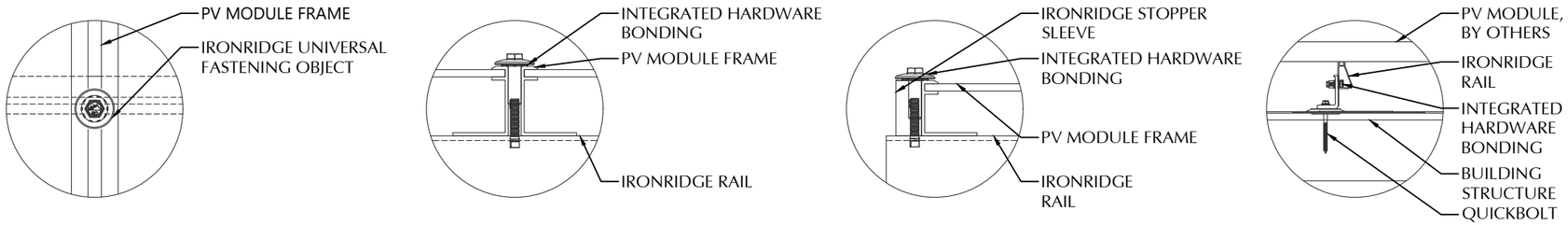
DESIGNER	CRM
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

PV SYSTEM STRUCTURAL

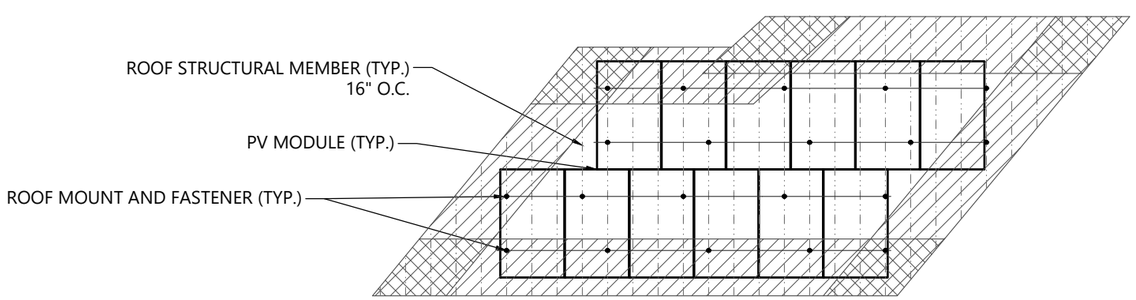
PV-2.1







1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF B ARRAY LAYOUT
1/8" = 1'-0"

STATEMENT OF STRUCTURAL COMPLIANCE

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SIGNED:

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MODEL	REC365AA
WIDTH	40.00 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	43.00 LBS.
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ARRAY WEIGHT	565 LBS.

ROOF SUMMARY

STRUCTURE:	
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SPACING	16 IN O.C.
EFFECTIVE SPAN	145 IN
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ROOF MOUNT & FASTENER

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FASTENER:	
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MODEL	XR10
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WEIGHT	0.425 LBS/IN
SPACING	34 IN

NC SOLAR NOW

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SHEET INDEX

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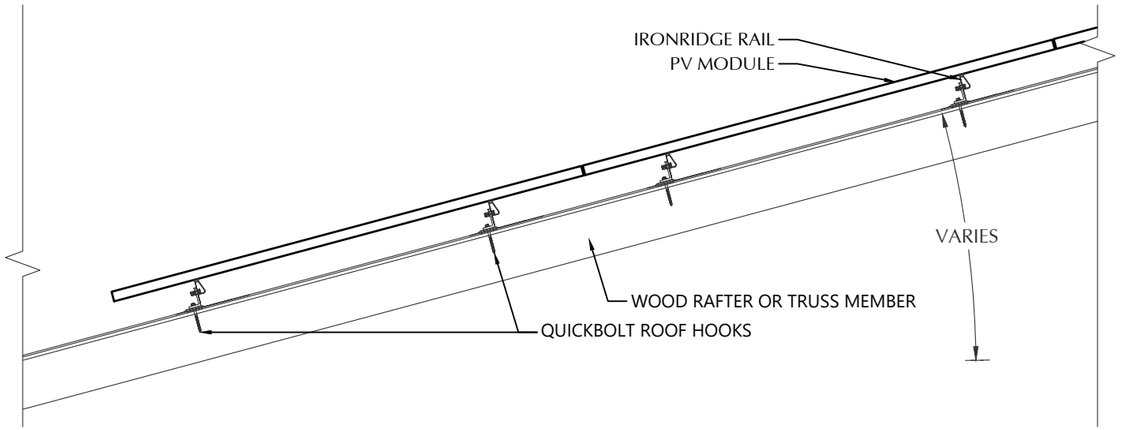
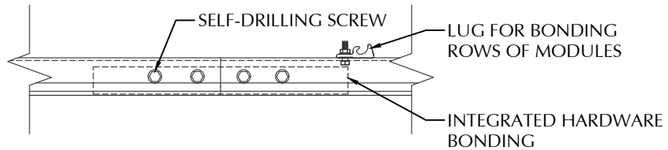
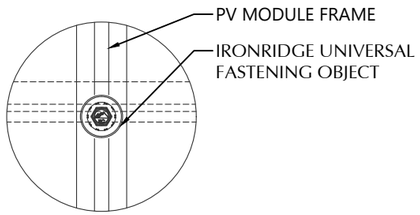
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

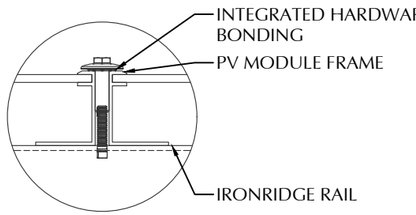
PV SYSTEM STRUCTURAL

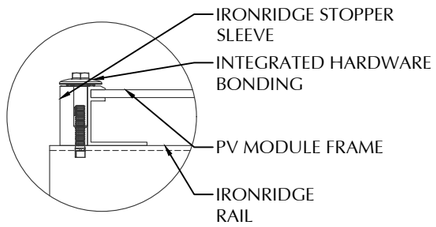
PV-2.2

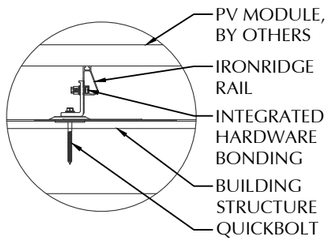




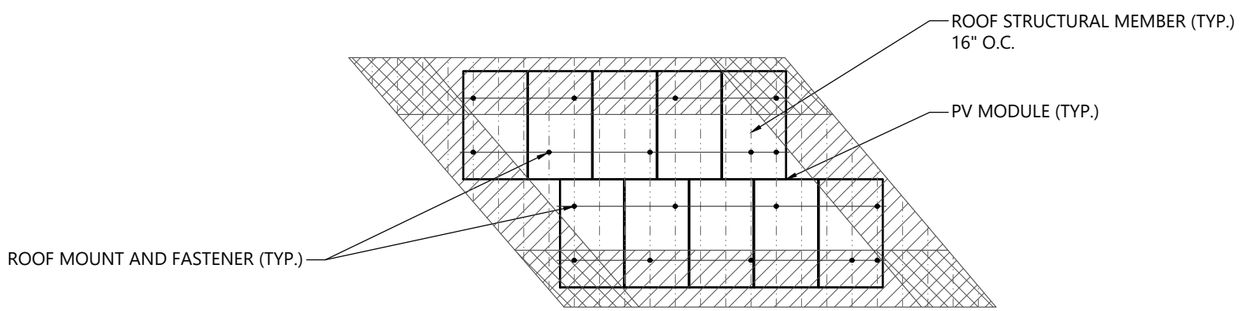








1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF C ARRAY LAYOUT
1/8" = 1'-0"

STATEMENT OF STRUCTURAL COMPLIANCE

THE EXISTING ROOF STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE ADDITIONAL LOADS OF THE PROPOSED PV SYSTEM. IN ADDITION, THE RACKING AND FASTENING SYSTEM SHALL BE CAPABLE OF SECURING THE SYSTEM TO THE STRUCTURE UNDER DESIGN CONDITIONS WHEN INSTALLED PROPERLY AND IN ACCORDANCE WITH THE RACKING AND FASTENING ARRANGEMENT DETAILED WITHIN THESE DRAWINGS.

NAME: ANDREW W. KING, PE

SIGNED:

PV MODULES

MAKE	REC
MODEL	REC365AA
WIDTH	40.00 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	43.00 LBS.
ARRAY AREA	188 SQFT.
ARRAY WEIGHT	471 LBS.

ROOF SUMMARY

STRUCTURE:	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 8
SPACING	16 IN O.C.
EFFECTIVE SPAN	130 IN
PITCH	8/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	PLYWOOD
MATERIAL	COMPOSITE
THICKNESS	8/16 IN
WEIGHT	1.42 LBS/SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.

ROOF MOUNT SUMMARY

MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	64 IN	26 IN
WIND ZONE 2	64 IN	26 IN
WIND ZONE 3	48 IN	19 IN

ROOF LOADING

GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS/SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-24.6 LBS./SQFT.
UPLIFT ZONE 2	-29.0 LBS./SQFT.
UPLIFT ZONE 3	-29.0 LBS./SQFT.
DOWNWARD	23.0 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-368 LBS.
UPLIFT ZONE 2	-434 LBS
UPLIFT ZONE 3	-325 LBS
DOWNWARD	344 LBS

ROOF MOUNT & FASTENER

ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	4 IN QB1
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	SOLAR ROOF HOOK
MODEL	HANGER BOLT
MATERIAL	304 SS
SIZE	5/16-18 X 5-1/4"
GENERAL:	
WEIGHT	0.56 LBS.
FASTENERS PER MOUNT	1
MAX. PULL-OUT FORCE	960.0 LBS.
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	480.0 LBS.

MOUNTING RAILS

MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 2/19/21

CLIENT INFO

CHU HSIEN LIN
215 FRIENDLY LANE
CHAPEL HILL,NC 27514

PROJECT INFO

DC INPUT:	19.345 kW
AC EXPORT:	17.600 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	115 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

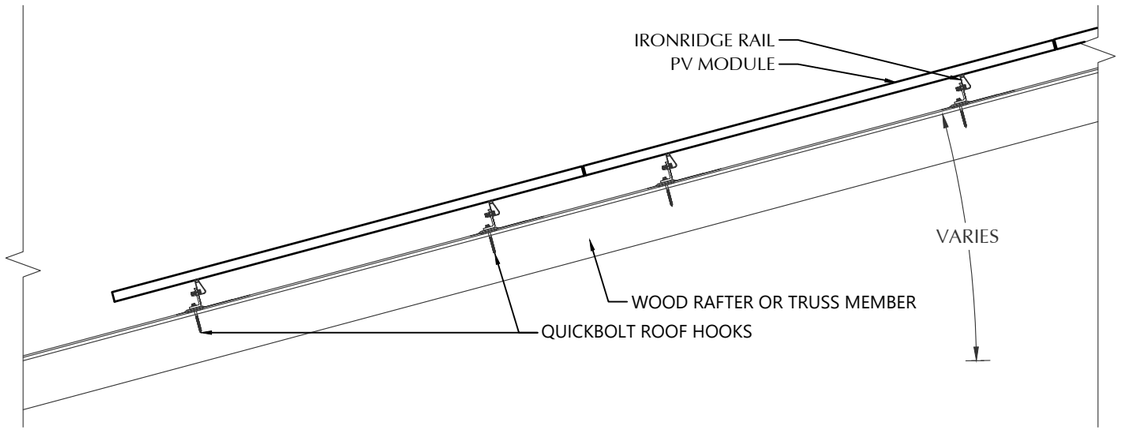
SHEET INDEX

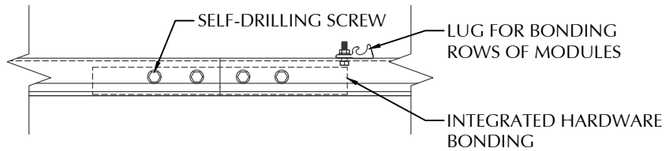
DESIGNER INFO

DESIGNER	CRM
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

PV SYSTEM STRUCTURAL

PV-2.3



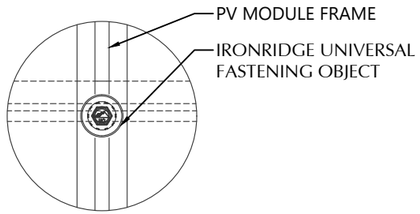


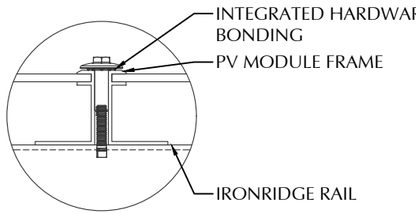
STATEMENT OF STRUCTURAL COMPLIANCE

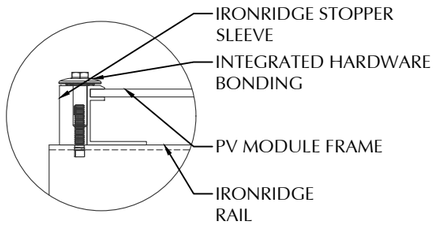
THE EXISTING ROOF STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE ADDITIONAL LOADS OF THE PROPOSED PV SYSTEM. IN ADDITION, THE RACKING AND FASTENING SYSTEM SHALL BE CAPABLE OF SECURING THE SYSTEM TO THE STRUCTURE UNDER DESIGN CONDITIONS WHEN INSTALLED PROPERLY AND IN ACCORDANCE WITH THE RACKING AND FASTENING ARRANGEMENT DETAILED WITHIN THESE DRAWINGS.

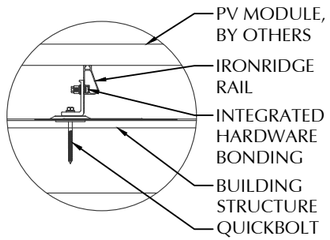
NAME: ANDREW W. KING, PE

SIGNED:

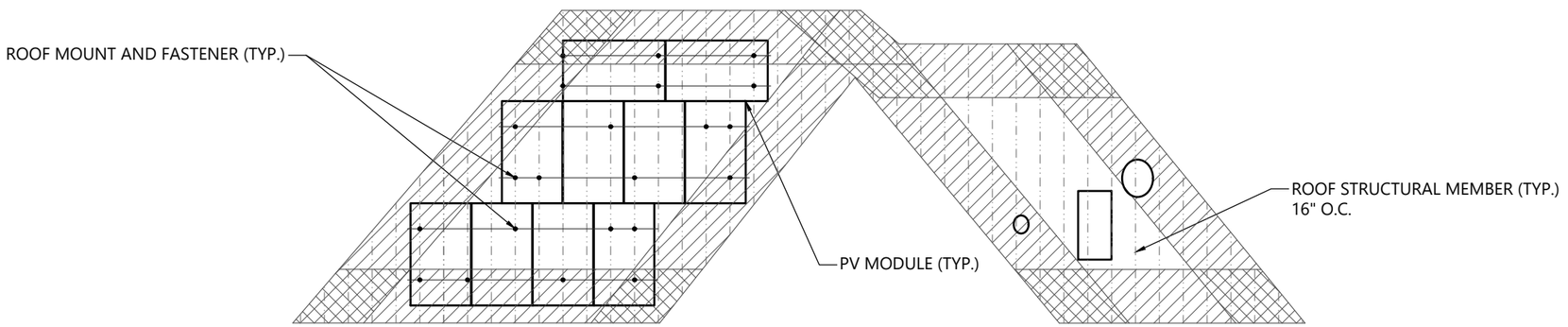








1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF D ARRAY LAYOUT
1/8" = 1'–0"

PV MODULES

MAKE	REC
MODEL	REC365AA
WIDTH	40.00 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	43.00 LBS.
ARRAY AREA	188 SQFT.
ARRAY WEIGHT	471 LBS.

ROOF SUMMARY

STRUCTURE:	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 8
SPACING	16 IN O.C.
EFFECTIVE SPAN	174 IN
PITCH	8/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	PLYWOOD
MATERIAL	COMPOSITE
THICKNESS	8/16 IN
WEIGHT	1.42 LBS/SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.

ROOF MOUNT SUMMARY

MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	PORT 64 LAND 64	PORT 26 LAND 26
WIND ZONE 2	PORT 64 LAND 64	PORT 26 LAND 26
WIND ZONE 3	PORT 48 LAND 64	PORT 26 LAND 26

ROOF LOADING

GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS/SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-24.6 LBS./SQFT.
UPLIFT ZONE 2	-29.0 LBS./SQFT.
UPLIFT ZONE 3	-29.0 LBS./SQFT.
DOWNWARD	23.0 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-324 LBS.
UPLIFT ZONE 2	-381 LBS
UPLIFT ZONE 3	-381 LBS
DOWNWARD	303 LBS

ROOF MOUNT & FASTENER

ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	4 IN QB1
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	SOLAR ROOF HOOK
MODEL	HANGER BOLT
MATERIAL	304 SS
SIZE	5/16-18 X 5-1/4"
GENERAL:	
WEIGHT	0.56 LBS.
FASTENERS PER MOUNT	1
MAX. PULL-OUT FORCE	960.0 LBS.
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	480.0 LBS.

MOUNTING RAILS

MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 2/19/21

CLIENT INFO

CHU HSIEN LIN
215 FRIENDLY LANE
CHAPEL HILL,NC 27514

PROJECT INFO

DC INPUT:	19.345 kW
AC EXPORT:	17.600 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	115 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

SHEET INDEX

DESIGNER INFO

DESIGNER	CRM
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

PV SYSTEM STRUCTURAL

PV-2.4

CONDUCTOR SCHEDULE

TAG	CURRENT CARRYING CONDUCTORS			GROUNDING CONDUCTORS			CONDUIT/RACEWAY			NOTES
	QTY.	SIZE	INSULATION	QTY.	SIZE	INSULATION	QTY.	SIZE	LOCATION	
C1	6	10 AWG	PV WIRE	1	6 AWG	BARE	-	-	FREE AIR	1
C2	6	10 AWG	THWN	1	10 AWG	THWN	1	3/4"	EXT/INT	2,4
C3	4	10 AWG	PV WIRE	1	6 AWG	BARE	-	-	FREE AIR	1
C4	4	10 AWG	THWN	1	10 AWG	THWN	1	3/4"	EXT/INT	2,4
C5	3	8 AWG	THWN	1	10 AWG	THWN	1	3/4"	EXTERIOR	2,4
C6	3	6 AWG	THWN	1	10 AWG	THWN	1	3/4"	EXTERIOR	2,4
C7	3	3 AWG	THWN	1	8 AWG	THWN	1	1-1/4"	EXTERIOR	2,4
C8	3	3 AWG	THWN	-	-	-	1	1-1/4"	EXT/INT	2,4
XC	-	-	-	-	-	-	-	-	-	3

NOTES:

1. MANUFACTURER PROVIDED, UL LISTED WIRING HARNESS FOR USE ON EXPOSED ROOFS
2. CONDUIT SIZE SHOWN IS CODE MINIMUM. LARGER SIZES ARE ALLOWED.
3. EXISTING CONDUCTORS, FIELD VERIFY
4. EQUIPMENT TERMINAL RATING SHALL BE A MINIMUM OF 75°C AT BOTH END OF CONDUCTOR
5. PLEASE REFERENCE NOTES ON PV-4 FOR ADDITIONAL DETAIL

PV MODULE

MAKE	REC
MODEL	REC365AA
NOM. POWER (PNOM)	365 WATTS
NOM. VOLT. (VMPP)	38.0 VOLTS
O.C. VOLT (VOC)	44.3 VOLTS
MAX. SYS. VOLT.	1000 VOLTS
NOM. CURR. (IMPP)	9.6 AMPS
S.C. CURR. (ISC)	10.3 AMPS
TEMP. COEF. (PMPP)	-0.26 %/C
TEMP. COEF. (Voc)	-0.24 %/C
MAX SERIES FUSE	25 AMPS
UL LIST. (Y/N)	YES

PV COMBINER PANEL

MAKE	GENERIC
MODEL	NA
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
BUS RATING	125 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	NO
MAIN BREAKER RATING	N/A

- BACKFEED INVERTER 1 WITH A 60A BREAKER AND INVERTER 2 WITH A 40A BREAKER

AC DISCONNECT

MAKE	GENERIC
MODEL	NA
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
AMP RATING	100 AMPS
UL LIST. (Y/N)	YES
FUSED (Y/N)	YES
FUSE RATING	100 A

- LOAD-BREAK RATED
- VISIBLE OPEN
- LOCKABLE IN OPEN POSITION
- INSTALL ADJACENT TO METER
- DISCONNECT TO BE READILY ACCESSIBLE TO UTILITY COMPANY PERSONNEL AT ALL TIMES
- SERVICE RATED
- PROVIDE NEUTRAL/GROUND BONDING JUMPER

MODULE OPTIMIZER

MAKE	SOLAREDGE
MODEL	P370
DC INPUT:	
NOM. POWER	370 WATTS
VOLT. RANGE	8 to 60
MAX. CURR.	11.0 AMPS
DC OUTPUT:	
NOM. POWER	370 WATTS
MAX. VOLT.	60 VOLTS
MAX. CURR.	15 AMPS
MIN-MAX STRING	8-25 OPTIMIZERS
UL LIST. (Y/N)	YES

JUNCTION BOX

MAKE	SOLADECK
MODEL	NA
PRO. RATING	NEMA 3R
VOLT. RATING	600 VOLTS
AMP RATING	120 AMPS
UL LISTING	UL 50

MD PANEL (EXISTING)

MAKE	EATON-CUTLER HAMMER
MODEL	CH40KKM200
ENCL. RATING	NEMA TYPE 1
VOLT. RATING	240
BUS RATING	200 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	YES
MAIN BREAKER RATING	200 AMPS

- BACK-FEED SOLAR OUTPUT VIA SUPPLY SIDE TAP INSIDE OF MD PANEL

EV CHARGER

MAKE	GENERIC
MODEL	NA
ENCL. RATING	NEMA 14-50
VOLT. RATING	240 VOLTS
UL LIST. (Y/N)	YES

- USE TANDEM BREAKERS TO CREATE ROOM FOR 50A EV CHARGER BREAKER IN MDP

DC/AC INVERTER 1

MAKE	SOLAREDGE
MODEL	SE10000H-US
TECHNOLOGY	TRANSFORMER-LESS
DC INPUT:	
MAX. POWER	15500 WATTS
VOLT. RANGE	350-480 VOLTS
NOM. VOLT.	400 VOLTS
MAX. CURRENT	27 AMPS
STRING INPUTS	2 STRINGS
AC OUTPUT:	
NOM. POWER	10000 WATTS
NOM. VOLT.	240 VOLTS
MAX. POWER	10000 WATTS
MAX. CURR.	42 AMPS
GFP (Y/N)	YES
GFCI (Y/N)	YES
AFCI (Y/N)	YES
DC DISC. (Y/N)	YES
RAPID SHUTDOWN	YES
FUSE RATING	15 AMPS
PORTECT. RATING	NEMA 3R

DC/AC INVERTER 2

MAKE	SOLAREDGE
MODEL	SE7600H-US
TECHNOLOGY	TRANSFORMER-LESS
DC INPUT:	
MAX. POWER	11800 WATTS
VOLT. RANGE	350-480 VOLTS
NOM. VOLT.	400 VOLTS
MAX. CURRENT	20 AMPS
STRING INPUTS	2 STRINGS
AC OUTPUT:	
NOM. POWER	7600 WATTS
NOM. VOLT.	240 VOLTS
MAX. POWER	7600 WATTS
MAX. CURR.	32 AMPS
GFP (Y/N)	YES
GFCI (Y/N)	YES
AFCI (Y/N)	YES
DC DISC. (Y/N)	YES
RAPID SHUTDOWN	YES
FUSE RATING	15 AMPS
PORTECT. RATING	NEMA 3R

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 2/19/21

CLIENT INFO

CHU HSIEN LIN
215 FRIENDLY LANE
CHAPEL HILL,NC 27514

PROJECT INFO

DC INPUT:	19.345 kW
AC EXPORT:	17.600 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	115 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

SHEET INDEX

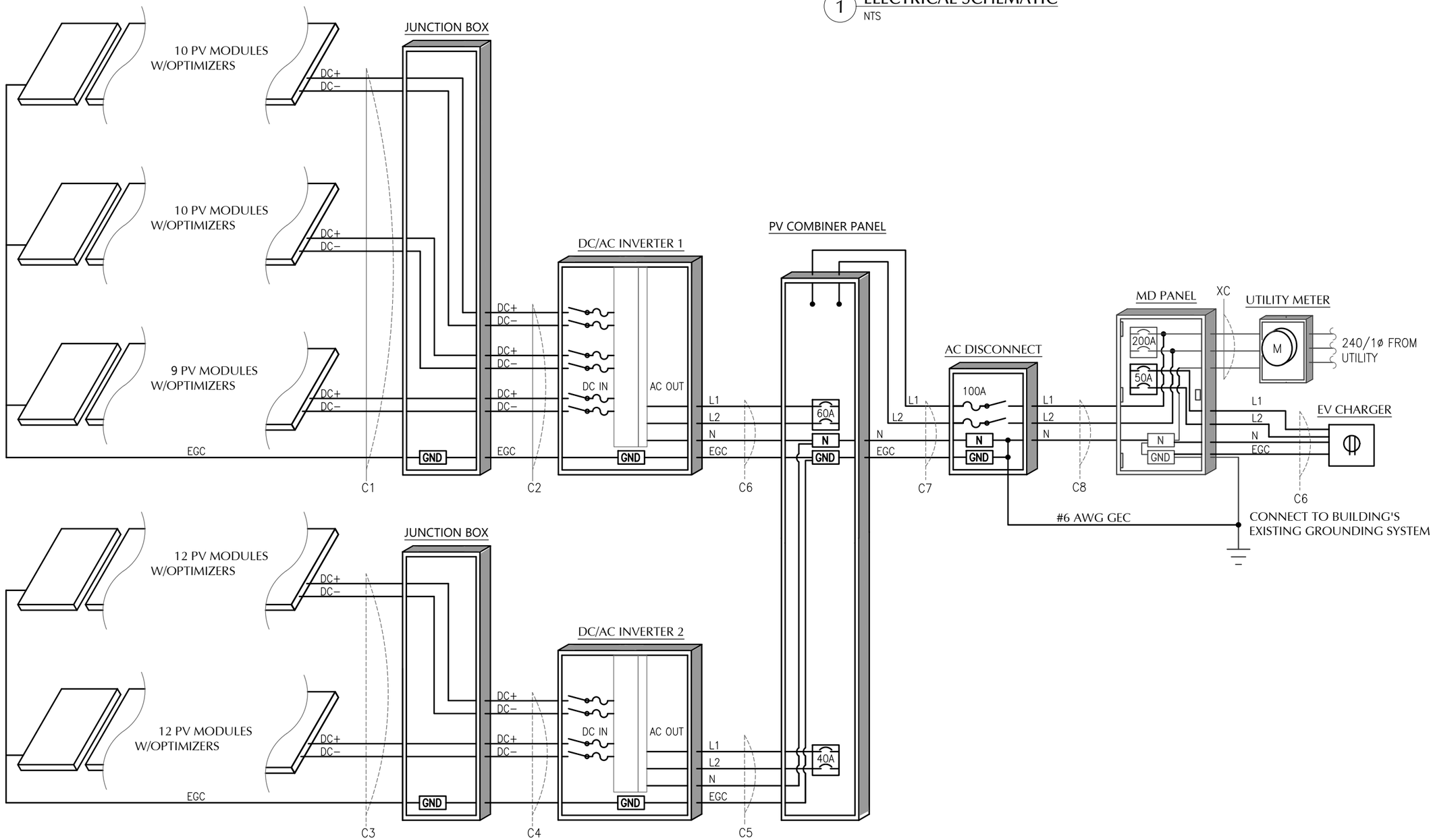
DESIGNER INFO

DESIGNER	CRM
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

PV SYSTEM ELECTRICAL

PV-3.1

1 ELECTRICAL SCHEMATIC
NTS



NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING
2/19/21

CLIENT INFO
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215 FRIENDLY LANE
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SITE CONDITIONS
WIND SPEED:	115 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

SHEET INDEX

DESIGNER INFO
DESIGNER	CRM
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

PV SYSTEM ELECTRICAL

PV-3.2

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

NEC 690.13 (B)
PLACE ON PV SYSTEM DISCONNECTING MEANS.

⚠WARNING
POWER SOURCE OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

NEC 705.12 (B)(2)(3)(b)
PLACE ADJACENT TO BACK-FED BREAKER

⚠WARNING
DUAL POWER SUPPLY
SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

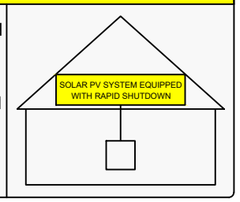
NEC 705.12 (B)(3)
PLACE ON ALL EQUIPMENT THAT IS SUPPLIED BY BOTH POWER SOURCES

WARNING: PHOTOVOLTAIC POWER SOURCE

NEC 690.31 (G)(3)&(4)
PLACE ON ALL JUNCTION BOXES, EXPOSED RACEWAYS, AND OTHER WIRING METHODS EVERY 10' AND ON EVERY SECTION SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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



NEC 690.56 (C)(1)(a)
PLACE WITHIN 3FT OF SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATIONS OF RAPID SHUTDOWN SWITCHES

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

NEC 690.56 (C)(3)
PLACE ON RAPID SHUTDOWN SWITCH OR EQUIPMENT WITH INTEGRATED RAPID SHUTDOWN *REFLECTIVE*

PV SYSTEM DISCONNECT

NEC 690.13 (B)
PLACE ON PV SYSTEM DISCONNECTING MEANS.

PHOTOVOLTAIC POWER SOURCE
OPERATING AC VOLTAGE 240 V
MAXIMUM OPERATING AC OUTPUT CURRENT 74.0 A

NEC 690.54
PLACE ON INTERCONNECTION DISCONNECTING MEANS

DIRECT CURRENT PHOTOVOLTAIC POWER SOURCE
MAXIMUM VOLTAGE 600 VDC
MAX CIRCUIT CURRENT 30.0 AMPS

NEC 690.53
PLACE ON INVERTER 2

⚠WARNING
PHOTOVOLTAIC SYSTEM COMBINER PANEL
DO NOT ADD LOADS

NEC 705.12 (B)(2)(c)
PLACE ON PV COMBINER PANEL.

DIRECT CURRENT PHOTOVOLTAIC POWER SOURCE
MAXIMUM VOLTAGE 600 VDC
MAX CIRCUIT CURRENT 45.0 AMPS

NEC 690.53
PLACE ON INVERTER 1

LABEL NOTES

1. LABELS SHOWN ARE HALF THEIR ACTUAL REQUIRED SIZE.
2. LABEL MATERIAL SHALL BE SUITABLE FOR THE EQUIPMENT ENVIRONMENT.
3. DC CONDUIT SHALL BE MARKED WITH REQUIRED LABEL EVERY 10 FEET.
4. LABELS WILL BE APPLIED IN ACCORDANCE WITH THE NEC. SOME LABELS MAY NOT BE NECESSARY.

DC WIRING NOTES

1. CONDUCTORS SHALL BE COPPER, RATED AT NOT LESS THAN 600 VOLTS FOR RESIDENTIAL CONSTRUCTION AND NOT LESS THAN 1000 VOLTS FOR COMMERCIAL CONSTRUCTION.
2. MINIMUM SIZE SHALL BE #10 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXPOSED WIRING CONDUCTOR INSULATION SHALL BE TYPE PV WIRE, USE-2, OR RHW-2 WHERE THE OUTER LAYER OF THE INSULATION IS UV, SUNLIGHT, AND MOISTURE RESISTANT.
6. EXTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THWN-2 AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT) OR RIGID POLYVINYL CHLORIDE CONDUIT(PVC). ALTERNATIVELY, METAL CLAD CABLE(MC) CAN BE USED AS WELL WHEN RATED FOR USE IN WET LOCATIONS.
7. INTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THHN-2 AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), FLEXIBLE METAL CONDUIT(FMC), OR METAL CLAD CABLE(MC).
6. USE SCHEDULE 40 PVC OUTDOORS WHERE NOT SUBJECT TO PHYSICAL DAMAGE OR BELOW FLOOR SLAB. USE SCHEDULE 80 PVC OUTDOORS WHERE SUBJECT TO PHYSICAL DAMMAGE
7. MINIMUM CONDUIT SIZE TO BE 1/2".
8. WIRING METHODS TO CONFORM TO ARTICLES 330, 334, 348, 350, 352, 356, AND 358 OF THE 2017 NEC.

AC WIRING NOTES

1. CONDUCTORS SHALL BE COPPER RATED AT NOT LESS THAN 600 VOLTS.
2. MINIMUM SIZE SHALL BE #14 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THWN AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), RIGID POLYVINYL CHLORIDE CONDUIT(PVC), LIQUID-TIGHT FLEXIBLE METAL CONDUIT(LFMC), OR LIQUID-TIGHT FLEXIBLE NON-METALLIC CONDUIT(LFNC) . ALTERNATIVELY, METAL CLAD CABLE(MC) CAN BE USED AS WELL WHEN RATED FOR USE IN WET LOCATIONS.
4. INTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THHN AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), FLEXIBLE METAL CONDUIT(FMC), METAL CLAD CABLE(MC), OR ROMEX.
5. USE SCHEDULE 40 PVC OUTDOORS WHERE NOT SUBJECT TO PHYSICAL DAMAGE OR BELOW FLOOR SLAB. USE SCHEDULE 80 PVC OUTDOORS WHERE SUBJECT TO PHYSICAL DAMMAGE
6. MINIMUM CONDUIT SIZE TO BE 1/2".
7. WIRING METHODS TO CONFORM TO ARTICLES 330, 334, 348, 350, 352, 356, AND 358 OF THE 2017 NEC.

CONSTRUCTION NOTES

1. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH THE NEC, STATE, AND LOCAL APPLICABLE CODES.
2. FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS, BEST PRACTICES, AND SPECIFICATIONS.
3. ENSURE REQUIRED MAINTENANCE ACCESS AND CLEARANCES ARE MAINTAINED.
4. WIRES SHALL BE RATED AND LABELED "SUNLIGHT RESISTANT" WHERE EXPOSED TO AMBIENT CONDITIONS.
5. FUSES 0 - 600 AMPS SHALL BE UL CLASS "RK-1" LOW PEAK DUAL ELEMENT TIME DELAY WITH 200,000 AMPERE INTERRUPTING RATING AS MANUFACTURED BY BUSSMANN, UNLESS NOTED OTHERWISE.
6. ALL TERMINALS/LUGS SHALL BE 75° RATED. ALL TERMINALS, SPLICING CONNECTORS, LUGS, ETC SHALL BE IDENTIFIED FOR USE WITH THE MATERIAL (CU/AL) OF THE CONDUCTOR AND SHALL BE PROPERLY INSTALLED.
7. PROVIDE A PULLWIRE IN ALL EMPTY CONDUITS.
8. ALL PENETRATIONS THROUGH EXTERIOR ROOFS SHALL BE FLASHED IN A WATERPROOF MANNER.
9. ALL PENETRATIONS THROUGH ATTIC FIRE BARRIERS SHALL BE SEALED WITH FIRE-BARRIER SEALANT CAULK.
10. SUPPORT ALL CONDUIT AND EQUIPMENT IN ACCORDANCE W/ NEC. ANY SUSPENDED MATERIALS SHALL BE DIRECTLY SUPPORTED BY THE BUILDING STRUCTURE.
11. METAL CONDUIT COUPLINGS CAN BE COMPRESSION TYPE, THREADED, OR BE SET-SCREW TYPE. PLASTIC CONDUIT COUPLINGS TO BE SOCKET GLUED TYPE.
12. A COMPLETE GROUNDING SYSTEM SHALL BE PRESENT OR PROVIDED AND INSTALLED IN ACCORDANCE WITH ARTICLE 250 OF THE NEC, AND AS SHOWN ON THE DRAWINGS.
13. EACH ELECTRICAL APPLIANCE SHALL BE PROVIDED WITH A NAMEPLATE GIVING THE IDENTIFYING NAME AND THE RATING IN VOLTS AND AMPERES, OR VOLTS AND WATTS. IF THE APPLIANCE IS TO BE USED ON A SPECIFIC FREQUENCY OR FREQUENCIES, IT SHALL BE SO MARKED. WHERE MOTOR OVERLOAD PROTECTION EXTERNAL TO THE APPLIANCES IS REQUIRED, THE APPLIANCE SHALL BE SO MARKED.
14. WHERE APPLICABLE, GROUNDING ELECTRODE CONDUCTOR TO BE CONTINUOUS. GROUNDING CRIMPS TO BE IRREVERSIBLE.
15. PHOTOVOLTAIC SYSTEMS SHALL BE PERMANENTLY MARKED AT VARIOUS EQUIPMENT LOCATIONS TO IDENTIFY THAT A PHOTOVOLTAIC SYSTEM IS INSTALLED AND THAT VARIOUS DANGERS ARE PRESENT.
16. EACH PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC SYSTEM DISCONNECT.
17. WHERE ALL TERMINALS OF A DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A WARNING SIGN SHALL BE MOUNTED ON OR ADJACENT TO THE DISCONNECT.
18. A PERMANENT LABEL FOR THE DIRECT-CURRENT PHOTOVOLTAIC POWER SOURCE SHALL BE PROVIDED AT THE DC DISCONNECT MEANS.
19. A PERMANENT PLAQUE OR DIRECTORY, DENOTING ALL ELECTRIC POWER SOURCES SERVING THE PREMISES, SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT LOCATIONS OF ALL POWER PRODUCTION SOURCES.
20. ALL MODULE GROUND CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH NEC SECTION 690.4 (C)
21. A NORTH CAROLINA REGISTERED DESIGN PROFESSIONAL WILL BE REQUIRED TO SEAL THE STRUCTURAL DESIGN AT THE TIME OF PERMIT APPLICATION IF ANY OF THE FOLLOWING EXIST AND ARE ATTESTED TO BY THE APPLICANT:
    I. THE WEIGHT OF THE PV SYSTEM EXCEEDS THREE (3) POUNDS PER SQUARE FOOT(PSF)
    II. THE ROOF POSSESSES MORE THAN ONE (1) LAYER OF ASPHALT SHINGLES
    III. THE ROOFING MATERIAL CONSISTS OF A TYPE OTHER THAN ASPHALT SHINGLES OR METAL
    IV. THE ROOF IS LOCATED IN A 140 MPH OR GREATER WIND ZONE

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING
2/19/21

CLIENT INFO

CHU HSIEN LIN
215 FRIENDLY LANE
CHAPEL HILL,NC 27514

PROJECT INFO

DC INPUT:	19.345 kW
AC EXPORT:	17.600 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	115 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

SHEET INDEX

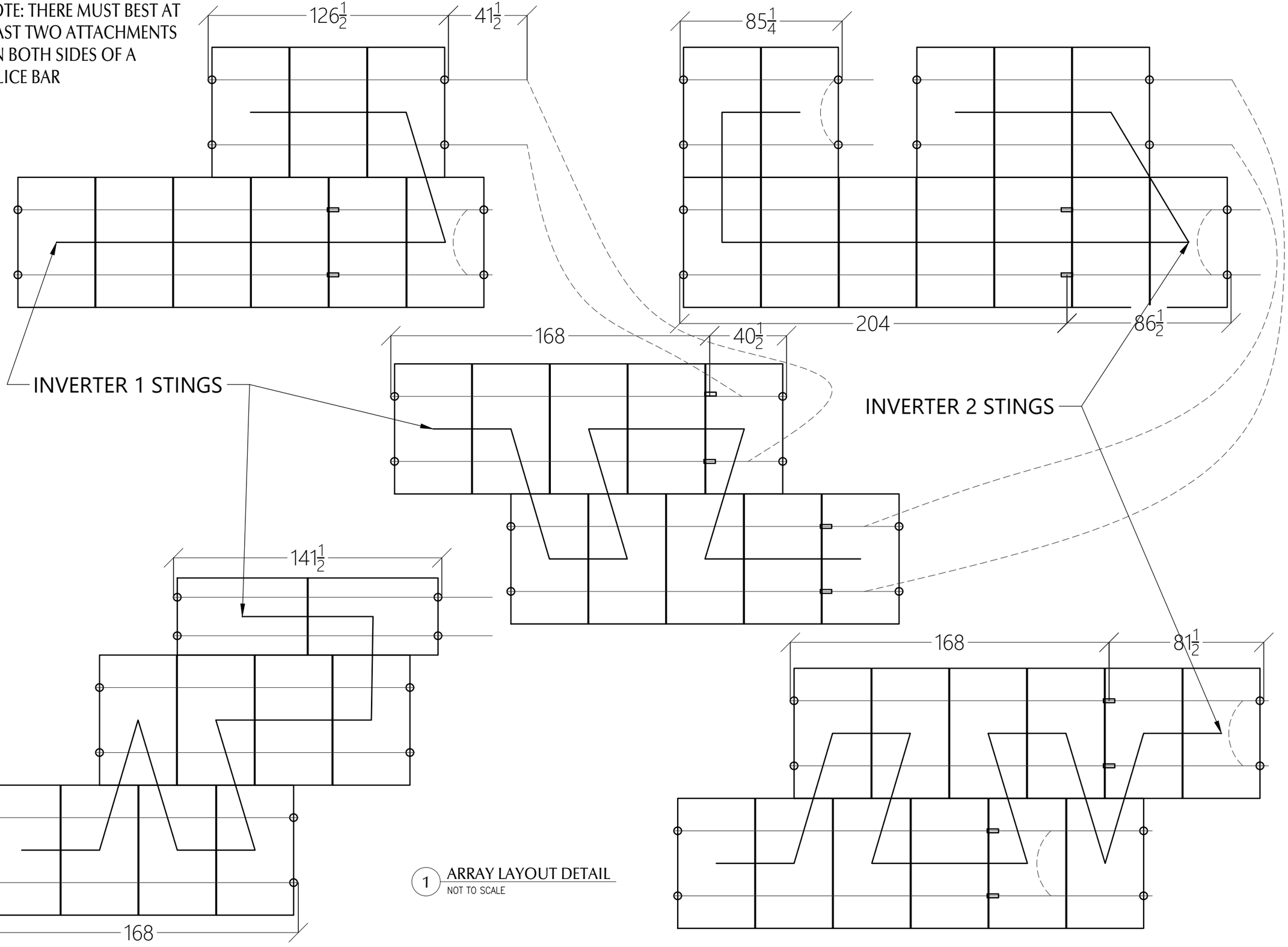
DESIGNER INFO

DESIGNER	CRM
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

PV SYSTEM EQUIPMENT LABELS

PV-4.1

NOTE: THERE MUST BEST AT LEAST TWO ATTACHMENTS ON BOTH SIDES OF A SPLICE BAR



1 ARRAY LAYOUT DETAIL
NOT TO SCALE

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING
2/19/21

CLIENT INFO

CHU HSIEN LIN
215 FRIENDLY LANE
CHAPEL HILL,NC 27514

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ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	115 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

SHEET INDEX

DESIGNER INFO

DESIGNER	CRM
ENGINEER	AWK
DATE	2/12/2021
VERSION	P1

PV SYSTEM INSTALL GUIDE

PV-5.1

Architectural Review Application

This application has been prepared for the Historic District Commission on behalf of our customer Nathaniel Lin

The purpose of this application is to obtain approval from the Historic District Commission for our proposed solar installation and to provide some general insight into the benefits and requirements of solar energy.

PREPARED BY:

Erin Hawks
NC Solar Now, Inc
erin@ncsolarnow.com
919-833-9096

Historic District Commission

March 22, 2021

Dear Architectural Board Members,

We, NC Solar Now Inc, have been contracted by Nathaniel Lin to install a photovoltaic solar system on the residential roof space located at:

215 Friendly Lane
Chapel Hill,NC 27514

Please find attached the signed community architectural review form as well as the following accompanying information; a design render of the project that indicates the location and roof design of the solar array, an explanation of why we chose the roof areas we did, a specification sheet that displays the manufacturing details of the panels we plan to install, example images from previous NC Solar Now installations using the same type of panel, information showing property value increases as a result of solar installations, and the general contractor's license for NC Solar Now.

The proposed installation of 53 black solar panels will be flush mounted to the southernmost facing roof of the house. The PV arrays will be placed on the current roof space and will not affect the existing zoning setbacks of the property. A plot plan has not been included because there will be no changes to the current surveyed property distances. There are no front facing panels in Dr. Lin's PV project to ensure minimum visibility of the panels. The solar panels will be barely visible, at most from the street. His garage is the front facing portion of his home and no panels will be installed on that surface. We have included aerial and street view photos as visual aids for easy reference. Our team has reviewed the Town of Chapel Hill Historic District Design Guidlines and LUMO to ensure that Dr. Lin's solar panel project is compliant with the HDC requirements.

We, NC Solar Now, understand and respect the need for the Historic District Commission to uphold an architectural standard within the community. After reviewing the following information, we hope the HDC will give us the opportunity to help Mr. Lin reduce his power bill, add equity to his home, and benefit the environment for decades to come by granting us permission to install a photovoltaic solar system on his roof.

We look forward to working with you to obtain approval. If you have any questions about the project please don't hesitate to reach out.

Thank you,

Erin Whitley Hawks

Erin Hawks
erin@ncsolarnow.com

Prepared by: Chance Venable
NC Solar Now, Inc.
2517 Atlantic Avenue
Raleigh, NC 27604
919.833.9096 P
919.882.1207 F

Conceptual Render

Aerial Photograph with Solar Plan Overlay

CLIENT INFO

NATHANIEL LIN
215 FRIENDLY LN
CHAPEL HILL, NC 27514

2/3/2021

DocuSigned by:
Nathaniel Lin
02D7CBBFD909450...

Module:	*REC 365W*
Quantity:	*53*
DCkW:	*19.345*
Estimated Production:	*20,204 kWh/year*

Project Information

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at https://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS - 21 PANELS CURRENT SITE CONDITIONS

8,587 kWh/Year*

System output may range from 8,224 to 8,763 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	3.36	545	N/A
February	3.86	563	N/A
March	4.81	764	N/A
April	5.59	835	N/A
May	6.02	925	N/A
June	5.97	871	N/A
July	5.69	853	N/A
August	5.33	802	N/A
September	4.91	730	N/A
October	4.07	637	N/A
November	3.58	550	N/A
December	3.08	511	N/A
Annual	**4.69**	**8,586**	**0**

Location and Station Identification

Requested Location	215 Friendly Lane,Chapel Hill,NC 27514
Weather Data Source	Lat, Lon: 35.93, -79.06 1.0 mi
Latitude	35.93° N
Longitude	79.06° W

PV System Specifications *(Residential)*

DC System Size	7.665 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	34°
Array Azimuth	244°
System Losses	25.63%
Inverter Efficiency	98%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	12.8%

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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RESULTS - 12 PANELS CLOSEST TO STREET FACING NE CURRENT SITE CONDITIONS

3,513 kWh/Year*

System output may range from 3,365 to 3,585 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	1.76	144	N/A
February	2.44	183	N/A
March	3.44	284	N/A
April	4.78	372	N/A
May	5.60	445	N/A
June	5.94	448	N/A
July	5.71	443	N/A
August	4.83	378	N/A
September	3.81	296	N/A
October	2.72	220	N/A
November	2.14	167	N/A
December	1.61	133	N/A
Annual	**3.73**	**3,513**	**0**

Location and Station Identification

Requested Location	215 Friendly Lane,Chapel Hill,NC 27514
Weather Data Source	Lat, Lon: 35.93, -79.06 1.0 mi
Latitude	35.93° N
Longitude	79.06° W

PV System Specifications *(Residential)*

DC System Size	4.38 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	34°
Array Azimuth	64°
System Losses	33.16%
Inverter Efficiency	98%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	9.2%

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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RESULTS - 10 PANELS CURRENT SITE CONDITIONS

4,882 kWh/Year*

System output may range from 4,675 to 4,982 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	4.18	347	N/A
February	4.58	342	N/A
March	5.23	425	N/A
April	5.97	457	N/A
May	6.10	481	N/A
June	6.01	451	N/A
July	5.88	453	N/A
August	5.60	433	N/A
September	5.34	406	N/A
October	4.78	382	N/A
November	4.64	365	N/A
December	4.00	339	N/A
Annual	**5.19**	**4,881**	**0**

Location and Station Identification

Requested Location	215 Friendly Lane,Chapel Hill,NC 27514
Weather Data Source	Lat, Lon: 35.93, -79.06 1.0 mi
Latitude	35.93° N
Longitude	79.06° W

PV System Specifications *(Residential)*

DC System Size	3.65 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	34°
Array Azimuth	154°
System Losses	19.98%
Inverter Efficiency	98%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	15.3%

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS - 10 PANELS NE CURRENT SITE CONDITIONS

3,222 kWh/Year*

System output may range from 3,086 to 3,288 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	1.76	132	N/A
February	2.44	168	N/A
March	3.44	261	N/A
April	4.78	341	N/A
May	5.60	408	N/A
June	5.94	411	N/A
July	5.71	406	N/A
August	4.83	346	N/A
September	3.81	271	N/A
October	2.72	202	N/A
November	2.14	153	N/A
December	1.61	122	N/A
Annual	**3.73**	**3,221**	**0**

Location and Station Identification

Requested Location	215 Friendly Lane,Chapel Hill,NC 27514
Weather Data Source	Lat, Lon: 35.93, -79.06 1.0 mi
Latitude	35.93° N
Longitude	79.06° W

PV System Specifications *(Residential)*

DC System Size	3.65 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	34°
Array Azimuth	64°
System Losses	26.57%
Inverter Efficiency	98%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	10.1%

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS - 21 PANELS POST TREE REMOVAL ESTIMATE

9,465 kWh/Year*

System output may range from 9,065 to 9,659 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	3.36	601	N/A
February	3.86	621	N/A
March	4.81	842	N/A
April	5.59	920	N/A
May	6.02	1,020	N/A
June	5.97	960	N/A
July	5.69	940	N/A
August	5.33	884	N/A
September	4.91	804	N/A
October	4.07	703	N/A
November	3.58	606	N/A
December	3.08	564	N/A
Annual	**4.69**	**9,465**	**0**

Location and Station Identification

Requested Location	215 Friendly Lane,Chapel Hill,NC 27514
Weather Data Source	Lat, Lon: 35.93, -79.06 1.0 mi
Latitude	35.93° N
Longitude	79.06° W

PV System Specifications *(Residential)*

DC System Size	7.665 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	34°
Array Azimuth	244°
System Losses	18.10%
Inverter Efficiency	98%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	14.1%

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS - 12 PANELS CLOSEST TO STREET FACING NE POST TREE REMOVAL ESTIMATE

3,614 kWh/Year*

System output may range from 3,461 to 3,688 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	1.76	148	N/A
February	2.44	188	N/A
March	3.44	292	N/A
April	4.78	383	N/A
May	5.60	458	N/A
June	5.94	461	N/A
July	5.71	456	N/A
August	4.83	388	N/A
September	3.81	304	N/A
October	2.72	227	N/A
November	2.14	172	N/A
December	1.61	137	N/A
Annual	**3.73**	**3,614**	**0**

Location and Station Identification

Requested Location	215 Friendly Lane,Chapel Hill,NC 27514
Weather Data Source	Lat, Lon: 35.93, -79.06 1.0 mi
Latitude	35.93° N
Longitude	79.06° W

PV System Specifications *(Residential)*

DC System Size	4.38 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	34°
Array Azimuth	64°
System Losses	31.28%
Inverter Efficiency	98%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	9.4%

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS - 10 PANELS POST TREE REMOVAL ESTIMATE

4,997 kWh/Year*

System output may range from 4,786 to 5,100 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	4.18	355	N/A
February	4.58	350	N/A
March	5.23	435	N/A
April	5.97	468	N/A
May	6.10	492	N/A
June	6.01	461	N/A
July	5.88	464	N/A
August	5.60	443	N/A
September	5.34	416	N/A
October	4.78	391	N/A
November	4.64	374	N/A
December	4.00	347	N/A
Annual	**5.19**	**4,996**	**0**

Location and Station Identification

Requested Location	215 Friendly Lane,Chapel Hill,NC 27514
Weather Data Source	Lat, Lon: 35.93, -79.06 1.0 mi
Latitude	35.93° N
Longitude	79.06° W

PV System Specifications *(Residential)*

DC System Size	3.65 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	34°
Array Azimuth	154°
System Losses	18.10%
Inverter Efficiency	98%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	15.6%

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS - 10 PANELS NE POST TREE REMOVAL ESTIMATE

3,306 kWh/Year*

System output may range from 3,166 to 3,374 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	1.76	136	N/A
February	2.44	172	N/A
March	3.44	267	N/A
April	4.78	350	N/A
May	5.60	419	N/A
June	5.94	421	N/A
July	5.71	417	N/A
August	4.83	355	N/A
September	3.81	278	N/A
October	2.72	208	N/A
November	2.14	157	N/A
December	1.61	125	N/A
Annual	**3.73**	**3,305**	**0**

Location and Station Identification

Requested Location	215 Friendly Lane,Chapel Hill,NC 27514
Weather Data Source	Lat, Lon: 35.93, -79.06 1.0 mi
Latitude	35.93° N
Longitude	79.06° W

PV System Specifications *(Residential)*

DC System Size	3.65 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	34°
Array Azimuth	64°
System Losses	24.69%
Inverter Efficiency	98%
DC to AC Size Ratio	1.2

Economics

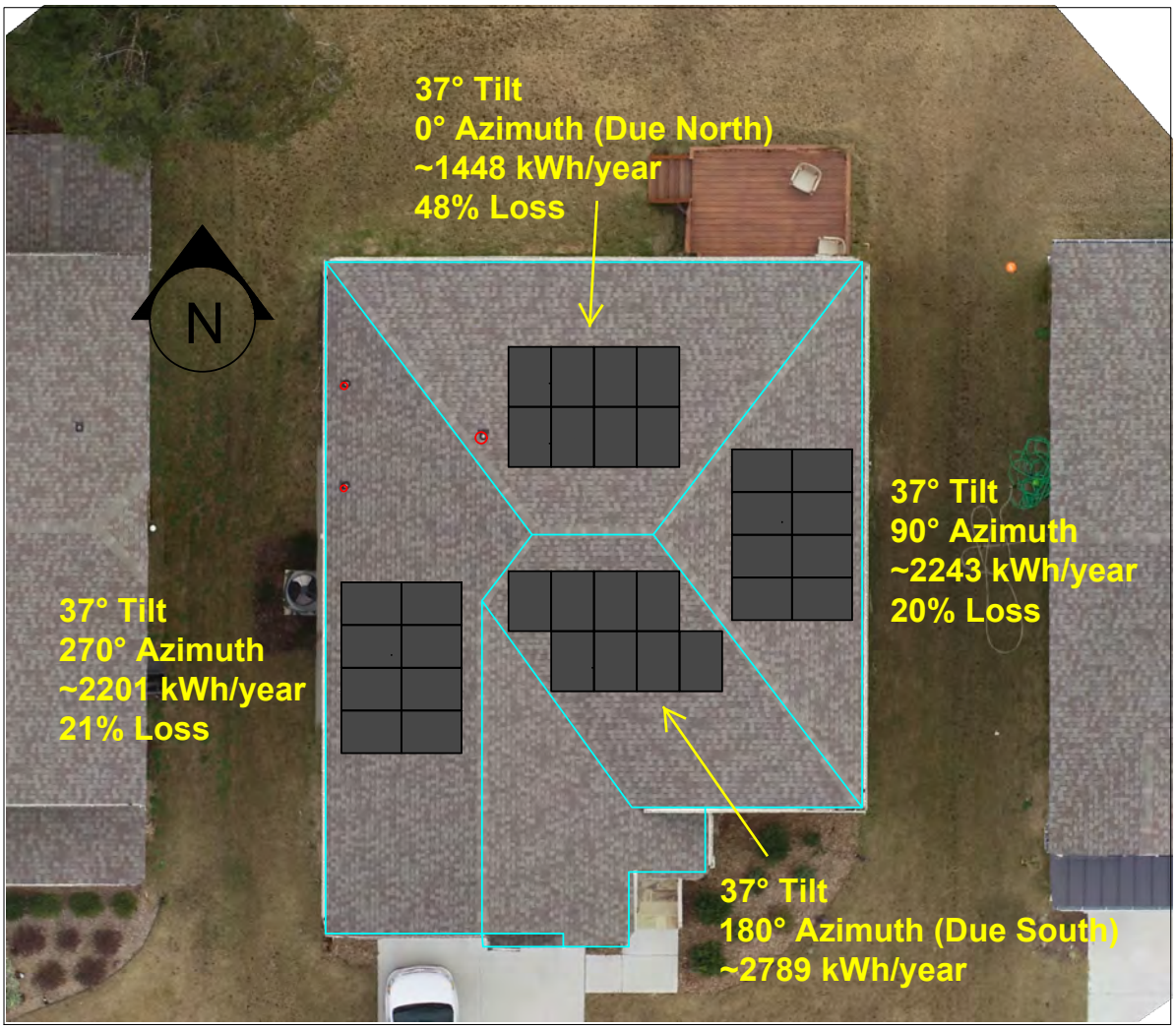
Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	10.3%

NCSOLARNOW

(8) 250 Watt Panel Roof Mounted



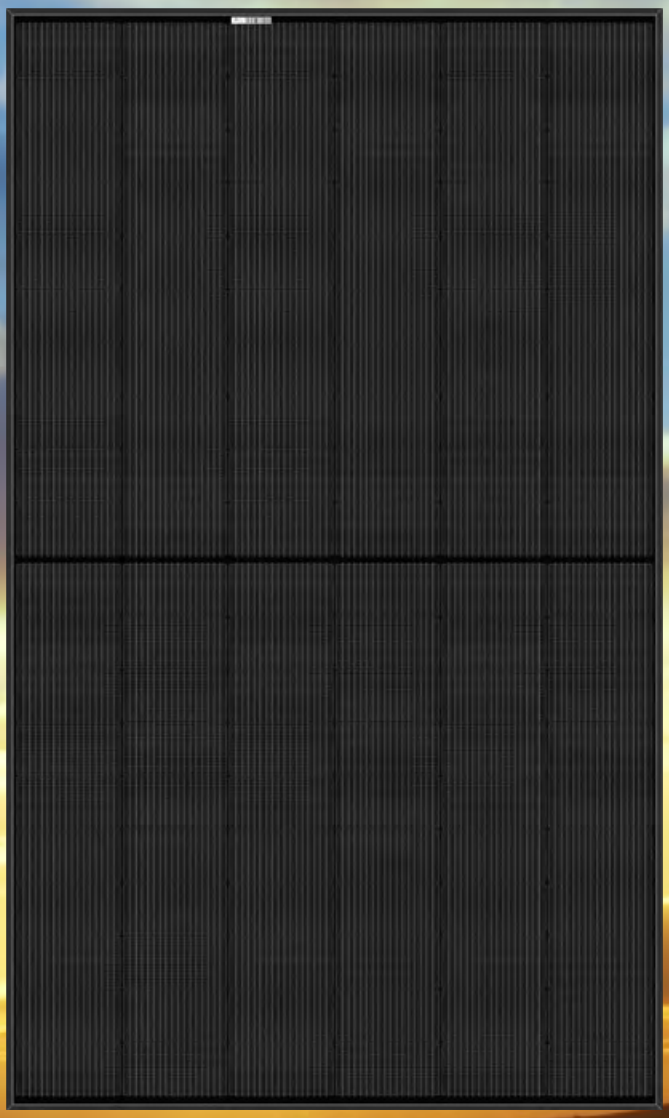
This example design render will hopefully help inform the HOA committee of the huge difference in production a solar system can have depending on what direction the panels face. The house depicted above has 8 solar panels overlaid on the south, east, west, and north roof areas of the home. The 8 panels facing due south (on the front of the house) would produce roughly 2800 kWh of electricity per year, this is the maximum production possible. The east and west roof areas each have roughly 20% less production than the panels facing due south. The rear roof (facing due north) would produce rough half of the electricity of the same panels on the south facing front roof.

The phenomenon described above occurs due the sun changing its location in the sky as the seasons progress. In summer months the sun sits directly above us in the sky and all roof areas get good sun exposure. But, as we move toward winter months the sun sits lower and lower in the sky to our south. This results in only south facing roof areas getting direct sun exposure as the north facing roof is shaded by the ridge of the roof. We use drone imagery and advanced sun tracking software to analyze each one of our customer homes in this fashion to ensure we offer them the most efficient solar system possible.

Efficiency is imperative for solar energy because it has a direct correlation to the financial benefits the customer will receive. In the above example it would take this homeowner approximately 20 years to recoup their full investment into solar energy if they were forced to install panels only on the rear roof of the house. If they were allowed to install panels on the front roof the system would produce twice as much electricity and the return on investment would be approximately 10 years! This is such a large difference in savings that it truly does not make financial sense to go solar if the only option is to install panels on a north facing roof.

SOLAR'S MOST TRUSTED

REC



REC ALPHα BLACK SERIES

375 WP POWER

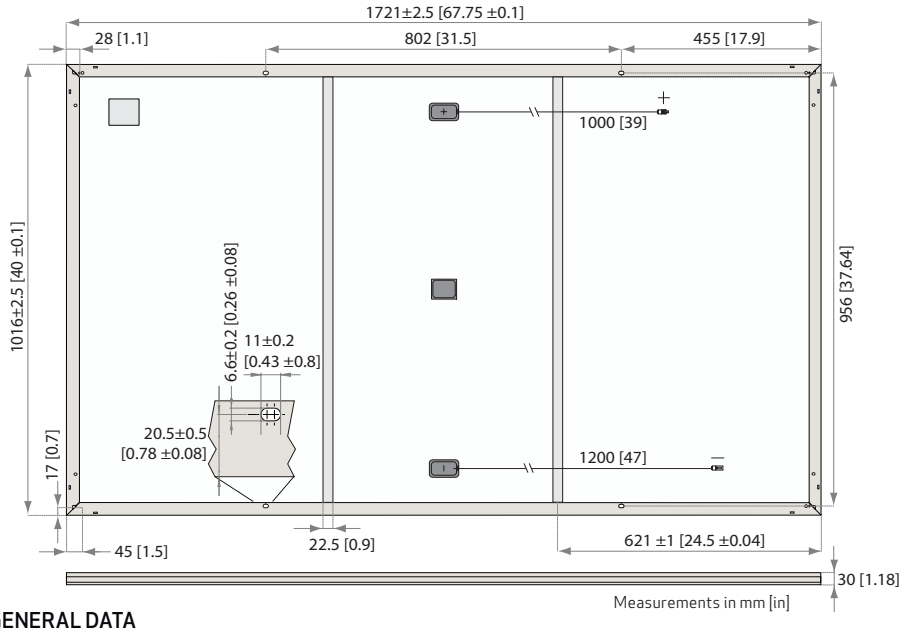
REC 25 YEAR PROTRUST WARRANTY

PRODUCT · PERFORMANCE · LABOR

ELIGIBLE FOR

EXPERIENCE α PERFORMANCE

REC ALPHA BLACK SERIES
PRODUCT DATASHEET



GENERAL DATA

Cell type:	120 half-cut cells with REC heterojunction cell technology 6 strings of 20 cells in series	Junction box:	3-part, 3 bypass diodes, IP67 rated in accordance with IEC 62790
Glass:	0.13 in (3.2 mm) solar glass with anti-reflection surface treatment	Cable:	12 AWG (4 mm²) PV wire, 39 + 47 in (1 + 1.2 m) in accordance with EN 50618
Backsheet:	Highly resistant polymeric construction (black)	Connectors:	Stäubli MC4 PV-KBT4/KST4, 12 AWG (4 mm²) in accordance with IEC 62852 IP68 only when connected
Frame:	Anodized aluminum (black)	Origin:	Made in Singapore

ELECTRICAL DATA @ STC

Product Code*: RECxxxAA Black				
Nominal Power - P_{MAX} (Wp)	360	365	370	375
Watt Class Sorting - (W)	-0/+5	-0/+5	-0/+5	-0/+5
Nominal Power Voltage - V_{MPP} (V)	37.7	38.0	38.3	38.7
Nominal Power Current - I_{MPP} (A)	9.55	9.60	9.66	9.72
Open Circuit Voltage - V_{OC} (V)	44.1	44.3	44.5	44.6
Short Circuit Current - I_{SC} (A)	10.23	10.26	10.30	10.40
Power Density (W/sq ft)	19.1	19.4	19.7	19.9
Panel Efficiency (%)	20.6	20.9	21.2	21.4

Values at standard test conditions (STC: air mass AM 1.5, irradiance 10.75 W/sq ft (1000 W/m²), temperature 77°F (25°C), based on a production spread with a tolerance of P_{MAX}, V_{OC} & I_{SC} ±3% within one watt class. * Where xxx indicates the nominal power class (P_{MAX}) at STC above.

ELECTRICAL DATA @ NMOT

Product Code*: RECxxxAA Black				
Nominal Power - P_{MAX} (Wp)	274	278	282	286
Nominal Power Voltage - V_{MPP} (V)	35.5	35.8	36.1	36.4
Nominal Power Current - I_{MPP} (A)	7.71	7.76	7.80	7.85
Open Circuit Voltage - V_{OC} (V)	41.6	41.7	41.9	42.0
Short Circuit Current - I_{SC} (A)	8.26	8.29	8.32	8.40

Nominal module operating temperature (NMOT: air mass AM 1.5, irradiance 800 W/m², temperature 68°F (20°C), windspeed 3.3 ft/s (1 m/s). * Where xxx indicates the nominal power class (P_{MAX}) at STC above.

CERTIFICATIONS

IEC 61215:2016, IEC 61730:2016, UL 1703, UL 61730	
IEC 62804	PID
IEC 61701	Salt Mist
IEC 62716	Ammonia Resistance
UL 1703	Fire Type Class 2
IEC 62782	Dynamic Mechanical Load
IEC 61215-2:2016	Hailstone (35mm)
AS4040.2 NCC 2016	Cyclic Wind Load
ISO 14001:2004, ISO 9001:2015, OHSAS 18001:2007	

WARRANTY

	Standard	REC ProTrust	
Installed by an REC Certified Solar Professional	No	Yes	Yes
System Size	All	≤25 kW	25-500 kW
Product Warranty (yrs)	20	25	25
Power Warranty (yrs)	25	25	25
Labor Warranty (yrs)	0	25	10
Power in Year 1	98%	98%	98%
Annual Degradation	0.25%	0.25%	0.25%
Power in Year 25	92%	92%	92%

See warranty documents for details. Conditions apply.

MECHANICAL DATA

Dimensions:	67.8 x 40 x 1.2 in (1721 x 1016 x 30 mm)
Area:	18.8 sq ft (1.75 m²)
Weight:	43 lbs (19.5 kg)

MAXIMUM RATINGS

Operational temperature:	-40 ... +85°C
Maximum system voltage:	1000 V
Design load (+): snow	4666 Pa (97.5 lbs/sq ft)*
Maximum test load (+):	7000 Pa (146 lbs/sq ft)*
Design load (-): wind	2666 Pa (55.6 lbs/sq ft)*
Maximum test load (-):	4000 Pa (83.5 lbs/sq ft)*
Max series fuse rating:	25 A
Max reverse current:	25 A

* Calculated using a safety factor of 1.5
*See installation manual for mounting instructions

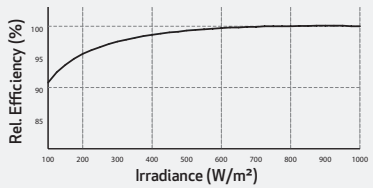
TEMPERATURE RATINGS*

Nominal Module Operating Temperature:	44°C (±2°C)
Temperature coefficient of P_{MAX}:	-0.26 %/°C
Temperature coefficient of V_{OC}:	-0.24 %/°C
Temperature coefficient of I_{SC}:	0.04 %/°C

*The temperature coefficients stated are linear values

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC:



Founded in Norway in 1996, REC is a leading vertically integrated solar energy company. Through integrated manufacturing from silicon to wafers, cells, high-quality panels and extending to solar solutions, REC provides the world with a reliable source of clean energy. REC's renowned product quality is supported by the lowest warranty claims rate in the industry. REC is a Bluestar Elkem company with headquarters in Norway and operational headquarters in Singapore. REC employs around 2,000 people worldwide, producing 1.5 GW of solar panels annually.

REC
www.recgroup.com

Specifications subject to change without notice.

Ref: PM-DS-12-01-Rev- C 01.20

Impact of roof orientation on solar savings

The direction that your roof faces, also referred to as the Azimuth angle, is the primary factor determining how much sunshine your solar panels will see over the course of the day. Solar panels are most effective when installed on south-facing roofs.

An easy way to determine the direction that your roof faces is to use Google Maps. Look up your property and use the grid to find true south, then compare your roof.

Even if your solar panels don't face directly south, they can still produce plenty of electricity, regardless of whether you live in Minnesota or California. You also can mount solar panels on roofs that face east or west, on the roof of another building (like a barn or garage), or on the ground.

Why orientation matters with rooftop solar

In general, solar panels that are oriented directly east or directly west will produce about 20 percent less electricity than if they were facing south. Even with this decrease in performance, solar panels will produce enough electricity to save you hundreds of dollars a year. You can also improve your solar panels' performance by adjusting the tilt of your panels downward. If you change the tilt from 30 degrees to 15 degrees, your production then will be only 15 percent lower than if your panels were installed in peak conditions.

Can you install solar panels on a north-facing roof?

While it is technically possible to install solar panels on the north side of your roof, they need to be mounted so that they oppose the roof's slant in order to generate electricity. This means that they won't sit flush with your roof, and will still produce relatively little electricity. Consider ground mounted solar, or installing solar panels on your garage, if you need more space for your solar energy system. You can also explore community solar, which allows you to support a larger solar project located in your area.

You don't need to live in the sunniest state in the country or have a rooftop that faces directly south to take advantage of the financial benefits of solar. The most important factor in determining your solar savings is how much you pay for electricity. By going solar, you reduce or even eliminate your utility electricity costs, so even if you aren't perfectly maximizing your electricity production, your solar investment can still pay off in a big way. Use EnergySage's Solar Calculator today to determine just how much you can save.

Recommended for you

LEARN
Impact of roof angle on electricity production

SOLAR NEWS FEED
Do solar panels cool your roof?

PROJECT OPTIONS
Browse community solar projects that serve your neighborhood

Solar Homes Sell for a Premium

Buying a solar energy system will likely increase your home's value. A recent study found that solar panels are viewed as upgrades, just like a renovated kitchen or a finished basement, and home buyers across the country have been willing to pay a premium of about $15,000 for a home with an average-sized solar array. Additionally, there is evidence homes with solar panels sell faster than those without. In 2008, California homes with energy efficient features and PV were found to sell faster than homes that consume more energy. Keep in mind, these studies focused on homeowner-owned solar arrays.

https://emp.lbl.gov/sites/default/files/lbnl-1002778.pdf

3D Mock up of how the panels will appear after installation

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Aerial View
215 Friendly Lane,Chapel Hill, NC 27514

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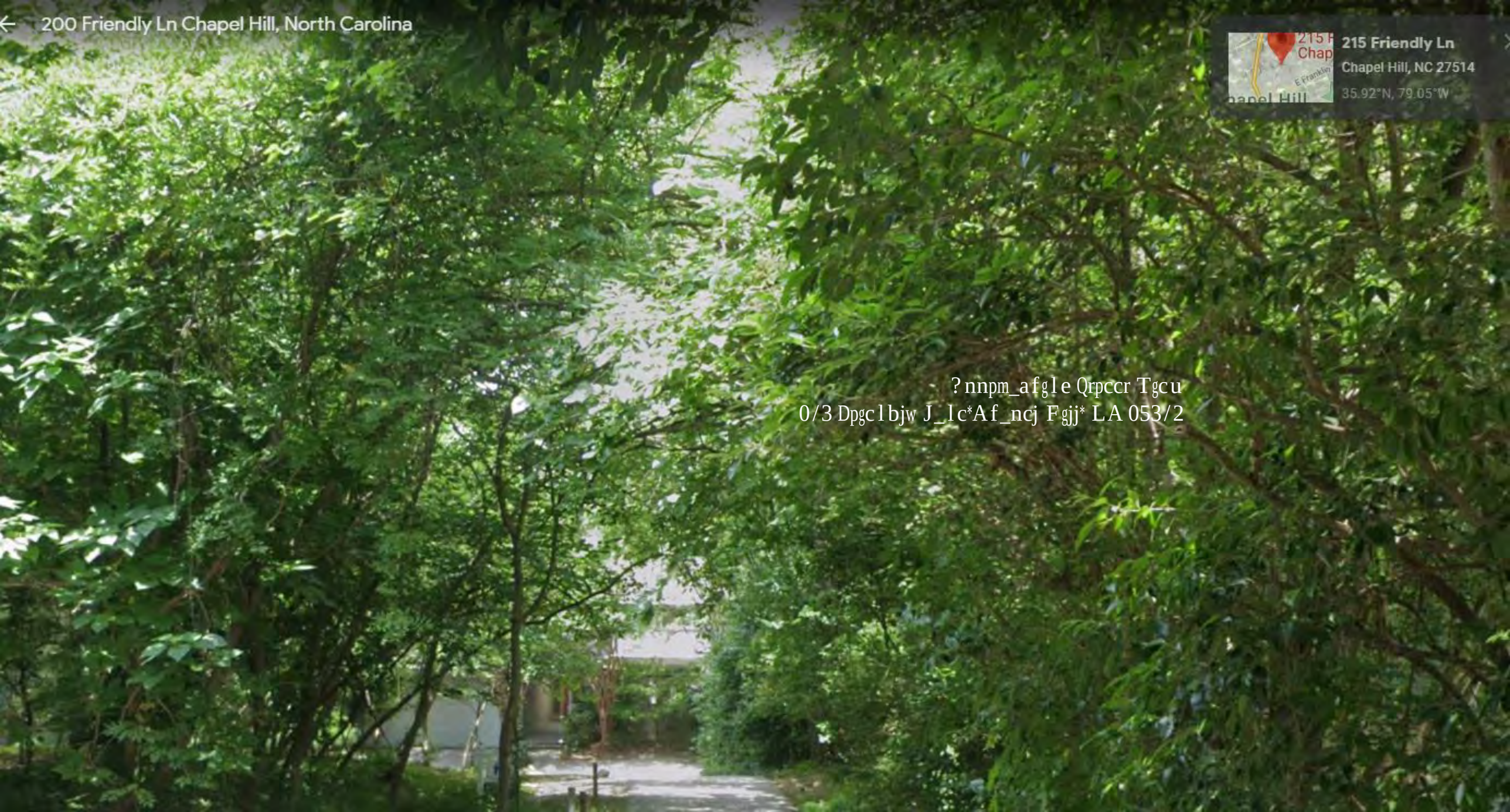
200 Friendly Ln Chapel Hill, North Carolina
215 Friendly Ln
Chapel Hill, NC 27514
35.92°N, 79.05°W
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0/3 Dpgclbjw J_lc*Af_ncj Fgjj* LA 053/2

Street view
215 Friendly Lane,Chapel Hill, NC 27514

New report says solar panels increase home value

22 REPLIES

Reading Time: 3 minutes

Installing solar panels can significantly increase your property's value, according to a new study from the Lawrence Berkeley National Lab (LBL). The report, titled "*Selling into the sun: Price premium analysis of a multi-state dataset of solar homes*" builds on previous research which concluded that homes with solar panels in California sold for more than those without.

Do solar panels add value to a house?

In addition to California, the new study investigates home pricing trends Connecticut, Florida, Massachusetts, Maryland, North Carolina, New York and Pennsylvania by analyzing the sales of over 20,000 homes in these states. LBL's analysis of the housing markets in these other states shows that the premium paid for homes with solar is not a phenomenon isolated to the Golden State. The clear takeaway: **solar panels really do add value to a home**.

If you are thinking about purchasing a solar system for your home, the study's conclusions should give you a boost of confidence that you are making a smart investment. LBL finds that homes with solar panels will benefit from a 'solar premium' when they are sold because buyers are willing to pay more for a home with solar panels.

How much does solar power increase home value?

Example: a 5 kilowatt (kW) solar system (the national average) will offer 5,000 watts of power. LBL says that each watt of solar adds about $4 to a home's value in California and about $3 per watt elsewhere. Thus, a home with solar should sell for about ($4 x 5,000W =) **$20,000** more in CA or still ($3 x 5,000W =) **$15,000** more outside of CA.

Specifically in this state analysis, prospective buyers wondering if solar panels increase home value were pleasantly surprised. What is surprising about these figures is that they are very close to what you would pay for a brand new solar system today. Our own analysis of prices for 6kW solar systems in California reveals that some of the more expensive systems cost just over $4/W. And bear in mind that these prices are what you would pay before you take into account the generous 30% Federal tax incentive that is available.

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with NC SOLAR NOW
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License Year

2021

License No.

69583

North Carolina

Licensing Board for General Contractors

This is to Certify That:

NC Solar Now Inc.
Raleigh, NC

is duly registered and entitled to practice

General Contracting

Limitation: Limited
Classification: Building

until

December 31, 2021

when this Certificate expires.

Witness our hands and seal of the Board.

Dated, Raleigh, N.C.

January 1, 2021

This certificate may not be altered.

Chairman

C. Frank Wiesner
Secretary-Treasurer

Unofficial Property Record Card - Orange County, NC

General Property Data

Parcel ID	9788483723		
Property Owner	POWER STEPHEN T	**Property Location**	215 FRIENDLY LN
		Property Use	
Mailing Address	215 FRIENDLY LN	**Most Recent Sale Date**	9/14/2016
		Legal Reference	6188/366
City	CHAPEL HILL	**Grantor**	POWER
State	NC	**Sale Price**	0
Zipcode	27514	**Land Area**	0.28 AC

Current Property Assessment

Card 1 Value	Building Value	Other Features Value	Land Value	Total Value
	701,500	0	304,000	1,005,500

Building Description

Building Style	Single Fam	**Foundation Type**	3/4 Basement	**Heating Type**	Combo H&A
# of Living Units	1	**Roof Structure**	Hip	**Heating Fuel**	N/A
Year Built	1990	**Roof Cover**	Shingle	**Air Conditioning**	100%
Finished Area (SF)	6750	**Siding**	Frame	**# of Bsmt Garages**	0
Full Baths	3	**1/2 Baths**	1	**3/4 Baths**	0
# of Other Fixtures	0				

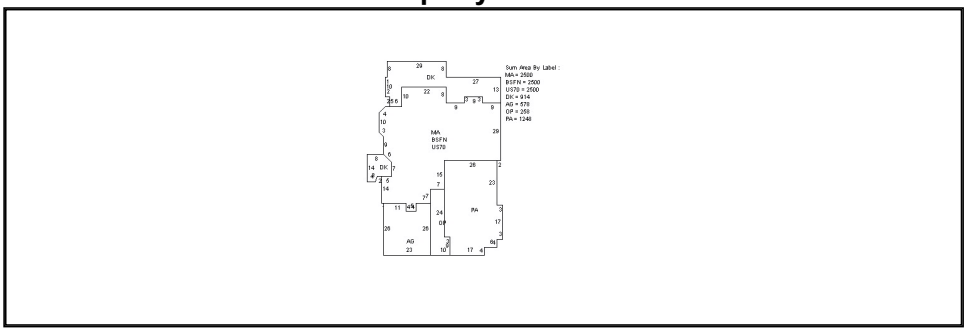
Legal Description

1 PATTERSON ETAL P48/120

Narrative Description of Property

This property contains 0.28 AC of land mainly classified as with a(n) Single Fam style building, built about 1990 , having a finished area of 6750 square feet, with Frame exterior and Shingle roof cover, with 1 unit(s).

Property Sketch



Disclaimer: This information is believed to be correct but is subject to change and is not warranteed.