Ellensburg Solar, LLC
PO Box 1681
Ellensburg, WA 98926
509-856-5204
Colby@ellensburgsolar.com
ELLENSL891RL & ELLENSL864RR

August 8th, 2022

Koneru Residence

Thank you for the opportunity to submit a proposal for Koneru Residence. Ellensburg Solar is the largest and most capable solar contractor in Washington who continues to provide top notch service to the entire State of WA.

We hold both our general contractor's license and our electrical contractor's license with the state of Washington. This means we do not have to subcontract any work and we own all our own equipment which ultimately provides our customers with a better short- and long-term experience "going solar".

For this quote, we have designed a 171 panel system consisting of 171 SEG 365w panels, paired with 50kw AC SolarEdge Inverter.

Sincerely,

Colby Peone

Project Manager

U-BUILDER PROJECT REPORT

VERSION: 3.1.6

PROJECT TITLE	PROJECT ID	CREATED
ROOFMOUNT RM5	0677FA5D	May 18, 2022, 6:47 a.m.

NAME	Koneru Residence
ADDRESS	6610 E Mercer Way, Mercer Island WA
CITY, STATE	Mercer Island, WA
MODULE	Custom Custom

Designed by ellensburgsolar@gmail.com

ROOFMOUNT RM5

Custom

171 - Custom

3352.33 ft^2

62.42 KW

NOTE: Installation of the project is intended to happen within the year of project designed in UBuilder. If it's past one year please rerun the design or contact Unirac Engineering Services.

UNVALIDATED MODULE SIZE: The module selected was based on a typical or custom module size. DO NOT USE this information to purchase or install without verifying the exact module dimensions.

ENGINEERING REPORT

Plan review

AVERAGE PSF	**4.46 psf**
TOTAL NUMBER OF MODULES	171
TOTAL KW	62.42 KW
TOTAL MODULE AREA	~4007 ft^2
TOTAL WEIGHT ON ROOF	17875 lbs
RACKING WEIGHT	2954 lbs
MODULE WEIGHT	7353 lbs
BALLAST WEIGHT	7568 lbs
MAX BAY LOAD (DEAD)	90 lbs

Loads Used for Design

BUILDING CODE	ASCE 7-16
BASIC WIND SPEED	100.00 mph
GROUND SNOW LOAD	30.00 psf
SEISMIC (SS)	1.365
ELEVATION	286.00 ft
WIND EXPOSURE	C
MRI	50
RISK CATEGORY	II
VELOCITY PRESSURE, QZ	21.07 psf

Inspection

PRODUCT	ROOFMOUNT RM5
MODULE MANUFACTURER	Custom
MODEL	Custom
MODULE WATTS	365 watts
MODULE LENGTH	69.09"
MODULE WIDTH	40.86"
MODULE THICKNESS	1.37"
MODULE WEIGHT	43.00 lbs
BALLAST BLOCK (CMU) WEIGHT	16.0 lbs
MAX BLOCKS PER BAY	2
BUILDING HEIGHT	30.00 ft
LONGEST BUILDING LENGTH	100.00 ft
ROOF TYPE	TPO
LONGEST BUILDING LENGTH	100.00 ft
PARAPET HEIGHT	<= 1/2 Array Height (<= 4 inches)

Roof Area 1 - Array 1

AVERAGE PSF	4.25 psf

TOTAL NUMBER OF MODULES:	60
TOTAL KW:	21.90 KW
TOTAL AREA:	1405 ft^2
TOTAL WEIGHT ON ROOF:	5964 lbs
RACKING WEIGHT:	952 lbs
MODULE WEIGHT:	2580 lbs
BALLAST WEIGHT:	2432 lbs
ROW SPACING:	7.5"

MINIMUM SEISMIC SEPARATION (UNATTACHED ARRAYS) *	
ARRAY TO ARRAY:	14.4"
TO FIXED OBJECT ON ROOF:	28.7"
TO ROOF EDGE WITH QUALIFYING PARAPET:	28.7"
TO ROOF EDGE WITHOUT QUALIFYING PARAPET:	57.5"
MAX ARRAY (SEISMIC) (FOR UNATTACHED ARRAYS) *	
MAX NUMBER OF NORTH-SOUTH ROWS:	18
MAX NUMBER OF EAST-WEST COLUMNS:	14

*See ASCE 7-16 Section 13.6.12 for more details

Roof Area 1 - Array 2

AVERAGE PSF	4.58 psf

TOTAL NUMBER OF MODULES:	51
TOTAL KW:	18.62 KW
TOTAL AREA:	1192 ft^2
TOTAL WEIGHT ON ROOF:	5459 lbs
RACKING WEIGHT:	914 lbs
MODULE WEIGHT:	2193 lbs
BALLAST WEIGHT:	2352 lbs
ROW SPACING:	7.5"

MINIMUM SEISMIC SEPARATION (UNATTACHED ARRAYS) *	
ARRAY TO ARRAY:	14.4"
TO FIXED OBJECT ON ROOF:	28.7"
TO ROOF EDGE WITH QUALIFYING PARAPET:	28.7"
TO ROOF EDGE WITHOUT QUALIFYING PARAPET:	57.5"
MAX ARRAY (SEISMIC) (FOR UNATTACHED ARRAYS) *	
MAX NUMBER OF NORTH-SOUTH ROWS:	18
MAX NUMBER OF EAST-WEST COLUMNS:	14

*See ASCE 7-16 Section 13.6.12 for more details

Roof Area 1 - Array 3

AVERAGE PSF	4.59 psf

TOTAL NUMBER OF MODULES:	30
TOTAL KW:	10.95 KW
TOTAL AREA:	702 ft^2
TOTAL WEIGHT ON ROOF:	3226 lbs
RACKING WEIGHT:	528 lbs
MODULE WEIGHT:	1290 lbs
BALLAST WEIGHT:	1408 lbs
ROW SPACING:	7.5"

MINIMUM SEISMIC SEPARATION (UNATTACHED ARRAYS) *	
ARRAY TO ARRAY:	14.4"
TO FIXED OBJECT ON ROOF:	28.7"
TO ROOF EDGE WITH QUALIFYING PARAPET:	28.7"
TO ROOF EDGE WITHOUT QUALIFYING PARAPET:	57.5"
MAX ARRAY (SEISMIC) (FOR UNATTACHED ARRAYS) *	
MAX NUMBER OF NORTH-SOUTH ROWS:	18
MAX NUMBER OF EAST-WEST COLUMNS:	14

*See ASCE 7-16 Section 13.6.12 for more details

Roof Area 1 - Array 4

AVERAGE PSF	4.56 psf

TOTAL NUMBER OF MODULES:	30
TOTAL KW:	10.95 KW
TOTAL AREA:	708 ft^2
TOTAL WEIGHT ON ROOF:	3226 lbs
RACKING WEIGHT:	560 lbs
MODULE WEIGHT:	1290 lbs
BALLAST WEIGHT:	1376 lbs
ROW SPACING:	7.5"

MINIMUM SEISMIC SEPARATION (UNATTACHED ARRAYS) *	
ARRAY TO ARRAY:	14.4"
TO FIXED OBJECT ON ROOF:	28.7"
TO ROOF EDGE WITH QUALIFYING PARAPET:	28.7"
TO ROOF EDGE WITHOUT QUALIFYING PARAPET:	57.5"
MAX ARRAY (SEISMIC) (FOR UNATTACHED ARRAYS) *	
MAX NUMBER OF NORTH-SOUTH ROWS:	18
MAX NUMBER OF EAST-WEST COLUMNS:	14

*See ASCE 7-16 Section 13.6.12 for more details

RM5 U-BUILDER PRODUCT ASSUMPTIONS

RM5 – Ballasted Flat Roof Systems

Limitations of Responsibility: It is the user's responsibility to ensure that inputs are correct for your specific project. Unirac is not the solar, electrical, or building engineer of record and is not responsible for the solar, electrical, or building design for this project.

Building Assumptions

1. Risk Category III
2. Building Height ≤ 50 ft.
3. Building Height > 50 ft: only where (longest length of building x building height)^0.5 ≤ 50 ft
4. Roof Slope ≥ 0° (0:12) and < 3° (5/8:12) for Seismic Design Category C, D, E and F. For low seismic regions Seismic Design Category A and B (provided Array Importance factor = 1.0), Roof Slope ≥ 0° (0:12) and ≤ 7° (1 1/2:12).
5. Roofing Material Types: EDPM, PVC, TPO, and Mineral Cap
6. Required Setback from Module Edge to Building Edge for Wind Tunnel: 3 ft (See Item 14)
7. Surrounding Building Grade: Level

Ballast Blocks

The installer is responsible for procuring the ballast blocks (Concrete Masonry Units – CMU) and verifying the required minimum weight needed for this design. CMU should comply with ASM standard specification for concrete roof pavers designation (C1491 or C90 with an integral water repellant suitable for the climate it is placed.
It is recommended that the blocks are inspected periodically for any signs of degradation. If degradation of the block is observed, the block should immediately be replaced. The CMU ballast block should have nominal dimensions of 4"x8"x16". The actual block dimensions are 3/8" less than the nominal dimensions. Ballast blocks should have a weight as specified for the project in the "Inspection" section of this report.

Design Parameters

1. Risk Category I to III
2. Wind Design
    a. Basic Wind Speed: 90-180 mph (ASCE 7-16)
    b. Exposure: C ASCE 7-16
    c. 25 year Design Life/50 year Design Life for ASCE 7-16
    d. Elevation: Insertion of the project at - grade elevation can result in a reduction of wind pressure. If your project is in a special case study region or in an area where wind studies have been performed, please verify with your jurisdiction to ensure that elevation effects have not already been factored into the wind speed. If elevation effects have been included in your wind speed, please select 0 ft as the project site elevation.
    e. Wind Tunnel Testing: Wind tunnel testing coefficients have been utilized for design of the system.
3. Snow Design
    a. Ground Snow Load: ASCE 7-16
    b. Exposure Factor: 0.9
    c. Thermal Factor: 1.2
    d. Roof Snow Load: Calculation per Section 7.3 ASCE 7-16
    e. Unbalanced/Drifting/Sliding: Results are based on the uniform snow loading and do not consider unbalanced, drifting, and sliding conditions
4. Seismic Design
    a. Report *SEAOC PV1-2012/ASCE 7-16 SECTION 13.6.12 – Structural Seismic Requirements and Commentary for Rooftop Solar Photovoltaic Arrays*
    b. Seismic Site Class: A, B, C, or D ASCE 7-16
    c. Importance Factor Array (Ip): 1.0
    d. Importance Factor Building (Ie): 1.0
    e. Site Class: E

Properties

1. Bay Weight: ~7.2 lbs
2. Wind Deflector Weight: ~6.4 lbs
3. Module Gaps (E/W) = 0.25 in
4. Wind Deflectors: Wind deflectors on the east and west edges of the array should overhang the east and west modules by six inches for Type 1 modules on the north rows only. Wind deflectors on the east and west edges of the array should overhang the east and west modules by six inches for Type II modules.
5. Bays: North row bays overhang the module by ~6.5 inches and south row bays overhang the module by ~12.25 inches.

Testing

1. Coefficient of Friction
2. Wind Tunnel
3. UL 2703
4. Component Testing (Bay and Clamp)

Setbacks

For the wind tunnel recommendations in U-Builder to apply, the following setbacks should be observed/followed for U-Builder wind design:

1. Modules should be placed a minimum of 3 feet from the edge of the building in any direction.
2. If the array is located near an obstruction that is 3.5 feet wide and 3.5 feet high or larger, the nearest module of the array must be located a distance from the obstruction that is greater than or equal to the height of the obstruction. Exception: When using ASCE 7-16 Building Code and using the obstruction feature in the module editor to accurately model the size and location of obstruction
3. Installations within the setbacks listed above require site specific engineering.[2]
4. The setbacks above are for wind. High seismic areas, fire access isles, mechanical equipment, etc., may require larger setbacks than listed above for wind.

Site Specific Engineering

Conditions listed below are beyond the current capabilities of U-Builder. Site specific engineering is required.

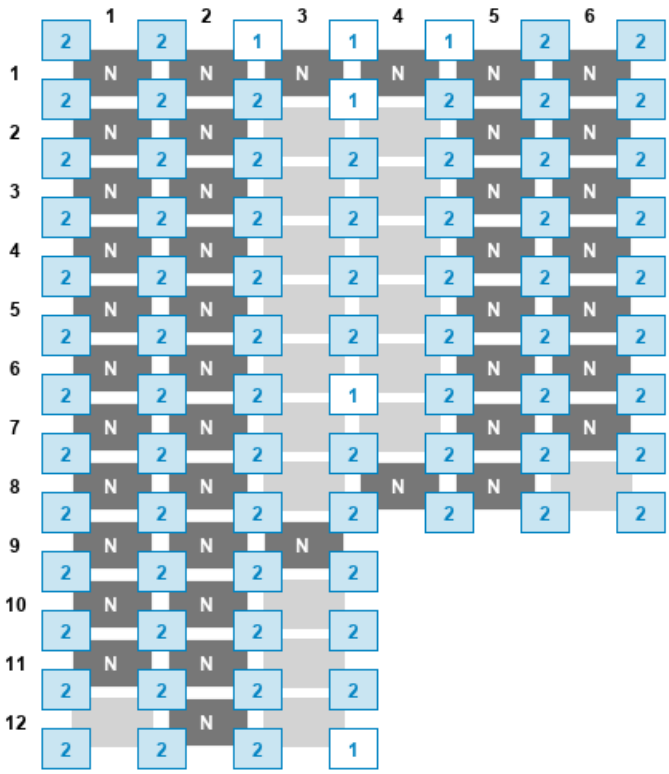
1. Wind designs for a project design life exceeding 25 years.[1]/ASCE 7-16
2. Building assumptions and design parameters outside of U-Builder assumptions
3. Attachments
4. Risk Category III or IV projects (U-Builder can be adjusted for the correct wind, but not the seismic or snow design)
5. Wind tunnel testing reduction factors are not permitted by the Authority Having Jurisdiction (AHJ).[3]
6. Seismic designs that fall outside SEAOC PV1-2012/ASCE 7-16 SECTION 13.6.12 recommendations (>3% roof slope, or AHJ's that require shake table testing or non-linear site-specific response history analysis)
7. Signed and sealed site-specific calculations, layouts, and drawings

Notes:

1. Please contact info@unirac.com.
2. Please contact EngineeringServices@unirac.com for more information.
3. Please contact Theresa Allen with PZSE Structural Engineers at theresa@pzse.com. These items will require direct coordination with PZSE to complete the requested services.
4. Mounting height is 9" on the high side, and 4.25" on the low end

INSTALLATION AND DESIGN PLAN

Roof Area 1 / Roof Area 1 - Array 1



LEGEND

N	Module with north wind deflector (for uplift)
S	Module with south wind deflector (for fire requirements - type 2)
NS	Module with both deflector types
	Module with no deflectors
1	Standard corner bay with CMU block count
4	Supplemental bay with CMU block count

NOTE

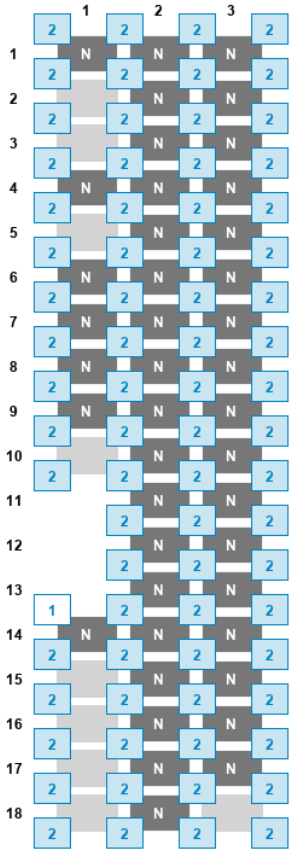
Bays in the space above and below modules are supplemental bays. You can fit a maximum of 2 blocks in each bay.
If the number of blocks in these bays is more than 2, you will need to add an additional supplemental bay.

Layout Dimensions

NS DIMENSION	~ 49.28 ft
EW DIMENSION	~ 34.55 ft

ROW	MODULES	MODULES WITH DEFLECTORS	BAYS	BALLAST BLOCKS (CMU)	BALLAST WEIGHT (LBS)
1	6	6	7	11	176
2	6	4	7	13	208
3	6	4	7	14	224
4	6	4	7	14	224
5	6	4	7	14	224
6	6	4	7	14	224
7	6	4	7	13	208
8	6	4	7	14	224
9	3	3	7	14	224
10	3	2	4	8	128
11	3	2	4	8	128
12	3	1	4	8	128
13	0	0	4	7	112

Roof Area 1 / Roof Area 1 - Array 2



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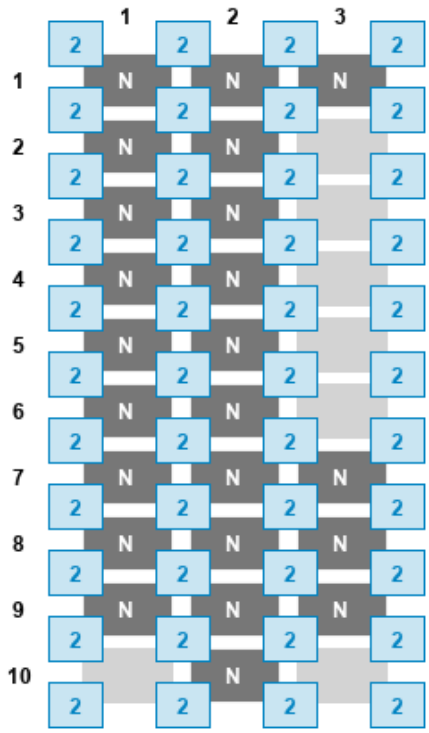
Layout Dimensions

NS DIMENSION	~ 73.46 ft
EW DIMENSION	~ 17.27 ft

ROW	MODULES	MODULES WITH DEFLECTORS	BAYS	BALLAST BLOCKS (CMU)	BALLAST WEIGHT (LBS)
1	3	3	4	8	128
2	3	2	4	8	128
3	3	2	4	8	128
4	3	3	4	8	128
5	3	2	4	8	128
6	3	3	4	8	128
7	3	3	4	8	128
8	3	3	4	8	128
9	3	3	4	8	128
10	3	2	4	8	128
11	2	2	4	8	128
12	2	2	3	6	96
13	2	2	3	6	96
14	3	3	4	7	112
15	3	2	4	8	128
16	3	2	4	8	128
17	3	2	4	8	128
18	3	1	4	8	128
19	0	0	4	8	128

Roof Area 1 / Roof Area 1 - Array 3



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NOTE

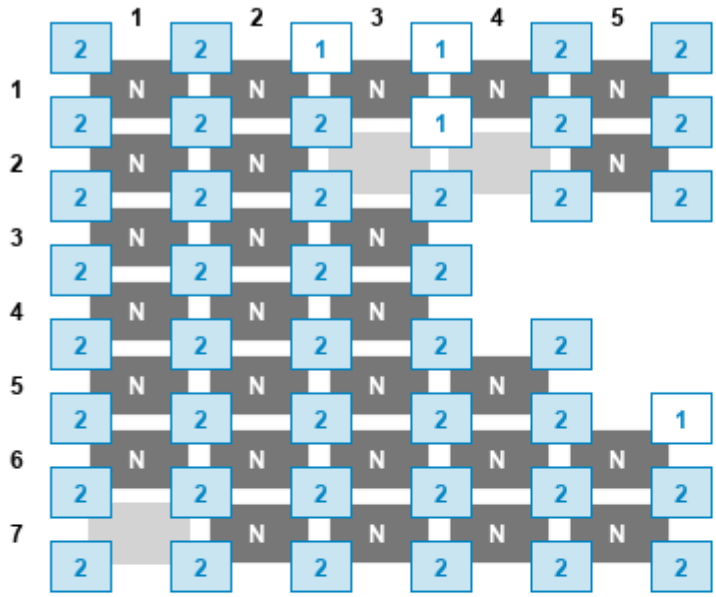
Bays in the space above and below modules are supplemental bays. You can fit a maximum of 2 blocks in each bay.
If the number of blocks in these bays is more than 2, you will need to add an additional supplemental bay.

Layout Dimensions

NS DIMENSION	~ 41.22 ft
EW DIMENSION	~ 17.27 ft

ROW	MODULES	MODULES WITH DEFLECTORS	BAYS	BALLAST BLOCKS (CMU)	BALLAST WEIGHT (LBS)
1	3	3	4	8	128
2	3	2	4	8	128
3	3	2	4	8	128
4	3	2	4	8	128
5	3	2	4	8	128
6	3	2	4	8	128
7	3	3	4	8	128
8	3	3	4	8	128
9	3	3	4	8	128
10	3	1	4	8	128
11	0	0	4	8	128

Roof Area 1 / Roof Area 1 - Array 4



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NOTE

Bays in the space above and below modules are supplemental bays. You can fit a maximum of 2 blocks in each bay.
If the number of blocks in these bays is more than 2, you will need to add an additional supplemental bay.

Layout Dimensions

NS DIMENSION	~ 29.13 ft
EW DIMENSION	~ 28.79 ft

ROW	MODULES	MODULES WITH DEFLECTORS	BAYS	BALLAST BLOCKS (CMU)	BALLAST WEIGHT (LBS)
1	5	5	6	10	160
2	5	3	6	11	176
3	3	3	6	12	192
4	3	3	4	8	128
5	4	4	5	10	160
6	5	5	6	11	176
7	5	4	6	12	192
8	0	0	6	12	192

ROOF DRAINAGE PLAN

SCALE: 1/4" = 1'-0"

2 1 0 5 10

A9

Roof Drainage Plan

PERMIT SET

KONERU RESIDENCE

6610 E Mercer Way
Mercer Island. WA 98040

7806 REGISTERED ARCHITECT PHILIP MCCULLOUGH STATE OF WASHINGTON

Date:	**2021.10.13**
Job No:	**21-041**
Project No:	
Drawn:	**DJR**
Approved:	**APM**

Revisions	Comment
2021.11.17	**Updated Plans to Structural**
2021.12.13	**Structural Backcheck 01**
2021.12.15	**Structural Backcheck 02**
2021.12.22	**Structural Backcheck 03**

MCCULLOUGH ARCHITECTS

5601 6th Ave S. Suite 371
Seattle. WA 98108
206.443.1181
mcculloughharchitects.com

Cost and Rebate Estimate

5/18/2022

JMK Homes- Koneru (Roof Mount)

Installed Cost of system	~~$ 147,690~~	*Installed cost,* ***sales tax included***
Cost of system after sales tax exemption	**$ 136,750**	*Total upfront cost*
Cost after 26% Federal tax credit	$ 101,195	*System cost less federal tax credit*

Panel Manufacturer	SEG	
Panel Wattage	365	*nameplate dc rating of one solar panel*
Number of Panels	171	*Number of panels*
Installed DC Watts of system	62,415	*DC nameplate total watts of system*
KWH produced per year	62,477	*annual kilowatt hours produced by system*
Net meter rate	$ 0.110	*current average power rate/avoided cost rate*
Annual net meter credit	$ 6,873	*amount of power produced annually*
Monthly net meter credit	$ 572.71	
Total system ROI after 25 years	**$ 332,707**	*Fed. Tax credit + power savings assuming four percent power inflation*

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Contractor # ELLENSL891RL ELLENSL864RR