

PROJECT TITLE	PROJECT ID	CREATED
San Diego Youth Services Conceptual Layout - V1 Field Segment 1	4AAF3E9E	Oct. 22, 2020, 8 p.m.

NAME	San Diego Youth Services	Designed by erik@sattlersolar.com
ADDRESS	3255 Wing Street	ROOFMOUNT RM5
CITY, STATE	San Diego, CA	LG
MODULE	LG LG415N2W-L5	44 - LG415N2W-L5
		981.54 ft ²
		18.26 KW

BILL OF MATERIALS

 LEGEND: ■ Base System Part ■ Accessory

PART NUMBER	PART TYPE	DESCRIPTION	QUANTITY	SUGGESTED QUANTITY	UNIT PRICE (USD)	TOTAL LIST PRICE (USD)
UserSupplied	Ballast Block	Ballast Block	148	148	0.00	0.00
310800	Ballast Bay	RM5 Bay	77	77	26.73	2058.21
310810	Wind Dam	RM5 Wind Deflector	26	26	14.15	367.90
310861	Wind Dam Clip	Kit, Wind Deflector Attachment	80	80	0.21	16.80
310820	End Clamp	RM End Clamp 32-40mm	250	250	1.94	485.00
310860	Nut	Kit 1/4 20 Clip On Nut SS 18-8	330	330	0.32	105.60

BASE SYSTEM PRICE	\$3033.51	ACCESSORIES PRICE	\$0.00	TOTAL PRICE	\$3033.51
	\$0.166 PER WATT		\$0.000 PER WATT		\$0.166 PER WATT

This design is to be evaluated to the product appropriate Unirac Code Compliant Installation Manual which references International Building Code 2009, 2012, 2015, 2018 and ASCE 7-05, ASCE 7-10, ASCE 7-16 and California Building Code 2010, 2016. The installation of products related to this design is subject to requirements in the above mentioned installation manual.

DETAILED PARTS DESCRIPTION

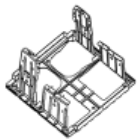
QTY



Ballast Block UserSupplied Ballast Block

148

Standard 4x8x16 inch cap blocks. Nationwide availability. Please confirm the weight of your ballast block as this will affect the total blocks required for your installation.



Ballast Bay 310800 RM5 Bay

77

Galvanized steel bay attaches to north and south module edges and provides ballast placement location.



Wind Dam 310810 RM5 Wind Deflector

26

Galvanized steel wind deflector/ fire shield.



Wind Dam Clip 310861 Kit, Wind Deflector Attachment

80

Stainless steel fender washer and 1/4-20 stainless bolt.



End Clamp 310820 RM End Clamp 32-40mm

250

Stainless steel end clamp (32-40mm) with 1/4-20 stainless bolt.



Nut 310860 Kit 1/4 20 Clip On Nut SS 18-8

330

Stainless steel clip-on 1/4-20 u-nut.

ENGINEERING REPORT

Plan review

AVERAGE PSF	6.42 psf
TOTAL NUMBER OF MODULES	44
TOTAL KW	18.26 KW
TOTAL AREA	~1185 ft ²
TOTAL WEIGHT ON ROOF	7605 lbs
RACKING WEIGHT	783 lbs
MODULE WEIGHT	2086 lbs
BALLAST WEIGHT	4736 lbs
MAX BAY LOAD (DEAD)	126 lbs

Loads Used for Design

BUILDING CODE	ASCE 7-16
BASIC WIND SPEED	100.00 mph
GROUND SNOW LOAD	0.00 psf
SEISMIC (SS)	1.22
ELEVATION	288.00 ft
WIND EXPOSURE	B
MRI	50

Loads Determined by Zip

CITY, STATE	San Diego, CA
BASIC WIND SPEED	90.00 mph
GROUND SNOW LOAD	0.00 psf

Inspection

PRODUCT	ROOFMOUNT RM5
MODULE MANUFACTURER	LG
MODEL	LG415N2W-L5
MODULE WATTS	415 watts
MODULE LENGTH	79.69"
MODULE WIDTH	40.31"
MODULE THICKNESS	1.57"
MODULE WEIGHT	47.40 lbs
BALLAST BLOCK (CMU) WEIGHT	32.0 lbs
MAX BLOCKS PER BAY	2
BUILDING HEIGHT	25.00 ft
ROOF TYPE	TPO
PARAPET HEIGHT	<= 1/2 Array Height (<= 4 inches)

Roof Area 1 - Array 1

AVERAGE PSF

6.42 psf

TOTAL NUMBER OF MODULES:	44
TOTAL KW:	18.26 KW
TOTAL AREA:	1185 ft ²
TOTAL WEIGHT ON ROOF:	7605 lbs
RACKING WEIGHT:	783 lbs
MODULE WEIGHT:	2086 lbs
BALLAST WEIGHT:	4736 lbs
ROW SPACING:	7.5"

MINIMUM SEISMIC SEPARATION (UNATTACHED ARRAYS) *

ARRAY TO ARRAY:	12.0"
TO FIXED OBJECT ON ROOF:	24.0"
TO ROOF EDGE WITH QUALIFYING PARAPET:	24.0"
TO ROOF EDGE WITHOUT QUALIFYING PARAPET:	48.0"
MAX ARRAY (SEISMIC) (FOR UNATTACHED ARRAYS) *	
MAX NUMBER OF NORTH-SOUTH ROWS:	17
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 II
2. Building Height \leq 50 ft.
3. Building Height > 50 ft: only where $(\text{longest length of building} \times \text{building height})^{0.5} \leq 50$ ft
4. Roof Slope $\geq 0^\circ$ (0:12) and $< 3^\circ$ (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 $\geq 0^\circ$ (0:12) and $\leq 7^\circ$ (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 repellent 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 II
2. Wind Design
 - a. Basic Wind Speed: 110-150 mph (ASCE 7-10)/90-180 mph (ASCE 7-16)
 - b. Exposure: B or C (ASCE 7-10/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: 0-80 psf (ASCE 7-10/ASCE 7-16)
 - b. Exposure Factor: 0.9
 - c. Thermal Factor: 1.2
 - d. Roof Snow Load: Calculation per Section 7.3 (ASCE 7-10/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 7-10/ASCE 7-16)
 - c. Importance Factor Array (Ip): 1.0
 - d. Importance Factor Building (Ie): 1.0
 - e. Site Class: D

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.

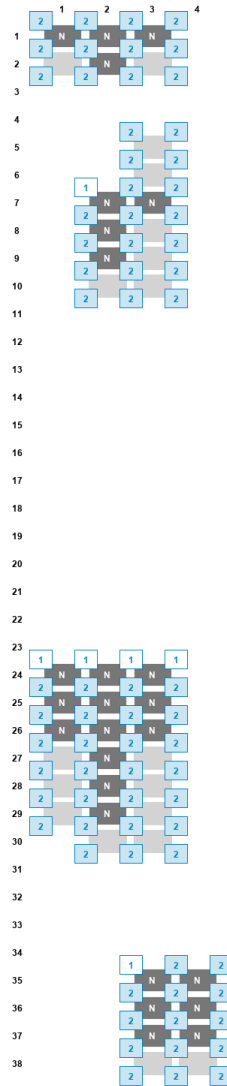
1. Wind designs for a project design life exceeding 25 years.^{1/ASCE 7-16}
2. Building assumptions and design parameters outside of U-Builder assumptions
3. Attachments
4. Risk Category III or IV projects (U-Builder can be adjusted for the correct wind, but not the seismic or snow design)
5. Wind tunnel 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.

INSTALLATION AND DESIGN PLAN

Array 1 / Roof Area 1 - Array 1



LEGEND

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

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 ~ 152.31 ft

EW DIMENSION ~ 26.56 ft

ROW	MODULES	MODULES WITH DEFLECTORS	BAYS	BALLAST BLOCKS (CMU)	BALLAST WEIGHT (LBS)
1	3	3	4	8	256
2	3	1	4	8	256
3	0	0	4	8	256
4	0	0	0	0	0
5	1	0	2	4	128
6	1	0	2	4	128
7	2	2	3	5	160
8	2	1	3	6	192
9	2	1	3	6	192
10	2	0	3	6	192
11	0	0	3	6	192
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	3	3	4	4	128
25	3	3	4	8	256
26	3	3	4	8	256
27	3	1	4	8	256
28	3	1	4	8	256

29	3	1	4	8	256
30	2	0	4	8	256
31	0	0	3	6	192
32	0	0	0	0	0
33	0	0	0	0	0
34	0	0	0	0	0
35	2	2	3	5	160
36	2	2	3	6	192
37	2	2	3	6	192
38	2	0	3	6	192
39	0	0	3	6	192
