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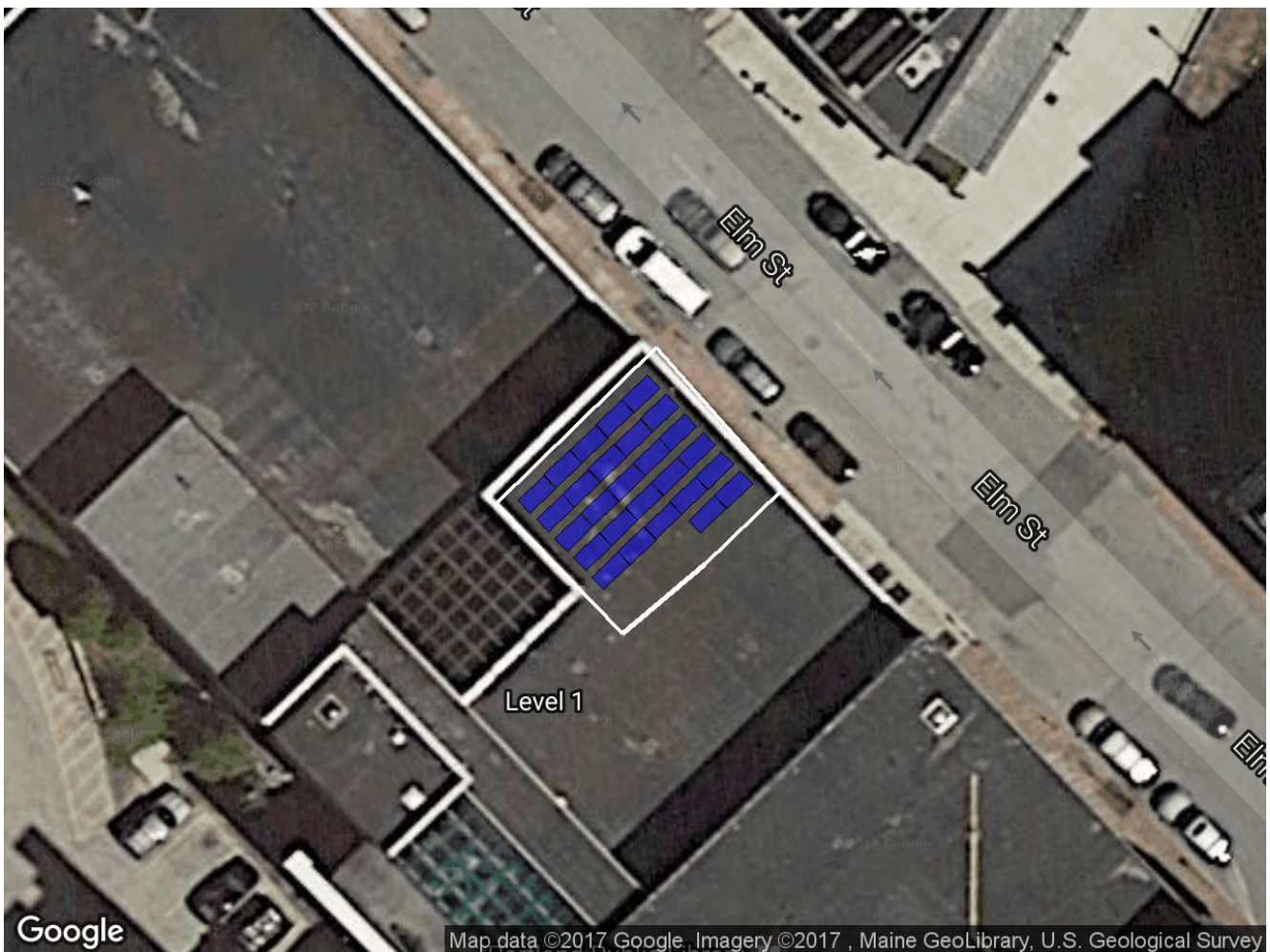
PROJECT TITLE: PORTLAND PUBLIC LIBRARY
PROJECT ID: 4E88FEEA

Name: Portland Public Library
Address: 5 Monument Way
City, State: Portland, ME, 04101
Module: Canadian Solar CS6X-305P
305 Watts

Designed by
rocky@mainegreensun.com
RM-BALLASTED FLAT ROOF
27 - 305 Watt Panels
127167 Sq Ft.
8.2 kW

INSTALLATION AND DESIGN PLAN

LAYOUT WORKSPACE 1





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ENGINEERING REPORT

Plan review

Average PSF:	6.99 lbs/ft ²
Total weight on roof:	6175 lbs
- Racking weight:	136 lbs
- Module weight:	1366 lbs
- Ballast weight:	4672 lbs
- Max Bay Load (Dead):	182 lbs
- Max Bay Load (Dead + Snow):	1013 lbs

Loads Used for Design

- Building Code:	ASCE 7-10
- Wind Speed:	115 mph
- Ground Snow Load:	50 psf
- Roof Snow Load:	37.8 psf
- Seismic (Ss):	0.24
- Wind Exposure:	B

Loads Determined by Zip

- City, State:	Portland, ME
- Wind Speed:	115 mph
- Ground Snow Load:	70 psf

Inspection

Product:	RM-BALLASTED FLAT ROOF
Module Manufacturer:	Canadian Solar
Model:	CS6X-305P
Module Watts:	305 watts
Module Length:	76.93 "
Module Width:	38.70 "
Module Thickness:	1.57 "
Module Weight:	50.60 lbs
Ballast Block Weight:	32 lbs
Max Blocks per Bucket:	4
Building Height:	50 ft
Roof Type:	EPDM
Parapet Height:	>= 2 ft





WORKSPACE 1

Average PSF:	6.99 lbs/ft ²
Total Number of Modules:	27
Total KW:	8.2 KW
Total Area:	883 ft ²
Total weight on roof:	6175 lbs
- Racking weight:	136 lbs
- Module weight:	1366 lbs
- Ballast weight:	4672 lbs

Minimum Seismic Separation (Unattached Arrays) *	
- Array to Array:	3 in
- To Obstruction or Parapet:	6 in
- To Roof Edge (no Parapet):	9 in
Max Array (Seismic) (For Unattached Arrays) *	
- NS Rows:	160
- EW Columns:	150

**In jurisdictions that follow SEAOC PV-1 methodology.*

DETAILED PARTS DESCRIPTIONS

	310710 RM Ballast Bay 10 Degree Aluminum ballast bay attaches to north and south module edges (for 10 degree tilt installations) and provides ballast placement location.	Ballast Bay 39
	310750 RM Module Clip Aluminum clip fastens module frame to ballast bay and provides bonding path from module to bay to module.	Module Clip 132
	310751 RM Hex Bolt (Module Clip) Hex bolt with integrated locking patch.	RM Hex Bolt 132
	UserSupplied Ballast Block 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 Block 146

RM10 U-BUILDER PRODUCT ASSUMPTIONS

RM10 – Ballasted Flat Roof Systems

1. Building and System Occupancy/Risk Category II
2. Building Height \leq 60 ft.
3. Roof Slope \geq 2.4° (1/2:12) and $<$ 5.6° (1-3/16:12)
4. Friction Tested Roofing Types: EDPM, PVC, TPO, and Mineral Cap
5. Required Setback from Module Edge to Building Edge for Wind Tunnel: 3 ft
6. Surrounding Building Grade: Level
7. Wind Design: Basic Wind Speed Range is 85-150 mph (ASCE 7-05) and 110-170 mph (ASCE 7-10). Wind Exposure: B or C (ASCE 7-05/ASCE 7-10).
8. Ground Snow Load (ASCE 7-05/ASCE 7-10): 0-60 psf. Results are based on uniform snow loading and do not consider unbalanced, drifting, and sliding conditions. Roof snow load reduction calculated per Section 7.3 of ASCE 7 with the following assumptions: Exposure factor = 0.9, Thermal factor = 1.2.
9. RM10 Ballast Tray Weight: ~3.5 lbs
10. Module Gaps (E/W) = 0.25 in
11. Seismic: Installations must be in seismic site class A, B, C, or D as defined in ASCE 7-05/ASCE 7-10
12. Ballast calculations are based on ASCE 7-05/ASCE 7-10 load combinations and product specific wind tunnel testing.
13. 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 to comply with ASTM 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 nominal dimensions. Ballast blocks should have weight as specified for the project in the "Inspection" section of this report.
14. Wind deflectors on the east and west edges of the array should overhang the east and west modules by six inches for Type I 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 on the north row and east and west edge columns.
15. 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.
16. The system is certified to UL2703 when properly installed. See the installation guide for more detail.

SEAO PV1-2012: Structural Seismic Requirements and Commentary for Rooftop Solar Photovoltaic Arrays

Assumptions for unattached photovoltaic arrays:

1. Importance Factor: Array (I_p) = 1.0, Building (I_e) = 1.0
2. Site Class = D
3. S = design seismic displacement of the array relative to the roof
4. Minimum Separation: Array to Array = $0.5*S$, Array to Roof Edge or Obstruction with Qualified Parapet = $1.0*S$, Array to Roof Edge with Unqualified Parapet = $1.5*S$
5. S_S = mapped MCE_R , 5 percent damped, spectral response acceleration parameter at short periods per ASCE 7-05/ASCE 7-10
6. S_{DS} = design, 5 percent damped spectral acceleration parameter at short periods per ASCE 7-05/ASCE 7-10
7. A minimum module return flange of 0.9in (when using 1-3/4 in. clip bolts) is required for all RM10 installations
8. A minimum module return flange of 0.65in (when using 2 in. clip bolts) is required for all RM10 installations
9. Coefficient of friction used for calculations per *Unirac, Inc. Roof Mount Ballast Support Coefficient of Friction Testing* report dated October 4, 2013. Roof pads are required for PVC, TPO, and EDPM roofs to attain a minimum coefficient of friction of 0.4. Mineral cap roofs do not require roof pads to attain a coefficient of 0.4.