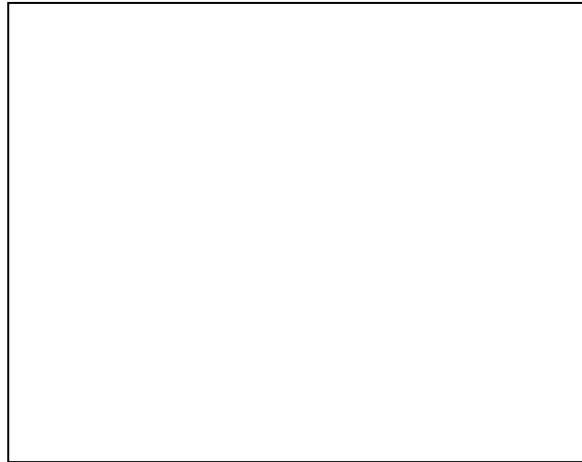




**STRUCTURAL DOCUMENTATION LETTER
for
SMR100 PV ROOF MOUNT RACKING SYSTEM
IAW 2020 NBC
PROVINCE OF BRITISH COLUMBIA**

**PREPARED FOR:
SUNMODO CORP**



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FIRM LICENSE #: 1000801
PROJECT #: U2716.0398.241
DATE: February 20, 2025

LETTER EXPIRES ON 12/31/2027 AND IS SUBJECT TO ANNUAL REVIEW AND RENEWAL

Note:

The calculations presented in this package are intended for use by the client listed above. These calculations shall not be reproduced, reused, "card filed", sold to a third party, or altered in any way without the written authorization of Vector Structural Engineering, LLC and SunModo.

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Project Number: U2716-0393-241
February 19, 2025

SunModo Corp
14800 NE 65th St
Vancouver, WA 98682

REFERENCE: **SMR Roof Mount PV Racking System**

Per the request of SunModo, we have performed a review of the SMR PV Roof Mount racking system to provide guidance for typical residential installations. The tables included in this document provide guidance regarding allowable spans for the SMR100 rails based on a variety of design snow and wind loads. This document applies to the design of the SMR100 rails only. The connection of the rails to the base structure as well as associated connecting components is not included in the scope of this review.

Design Criteria and Assumptions:

The following parameters, assumptions, limitations and code standards were used in the creation of this letter:

- **Building Codes:**
 - National Building Code of Canada, 2020 Edition (2020 NBC)
 - CSA S157-17, Strength Design in Aluminum
- **Environmental Assumptions and Limitations:**
 - Maximum Building Height: 10 m
 - 1/50 Hourly Wind Pressures: 0.35 to 1.25 kPa
 - 1/50 Snow Loads: 1.5 to 9.5 kPa
 - Exposure Category: Open & Rough
 - Importance Factor for Wind & Snow: 1.0 (Normal Importance Category)
 - Basic Roof Snow Load Factor, C_b : 1.0
 - Wind Exposure Factor, C_w : 1.0
 - Slope Factor, C_s : 1.0
 - Accumulation Factor, C_a :
 - Roof Slope $\leq 7^\circ$: 1.0
 - Roof Slopes $> 7^\circ$: 1.25
 - Topographic Factor, C_t : 1.0
 - Pressure Equalization Factor, γ_a : 1.0
 - Tributary Area for $C_g C_p$ Determination: 1 m²
 - Design is per the Ultimate Limit State (ULS) method per Table 4.1.3.2-A

Design wind calculations are in accordance with the 2020 NBC, Part 4.1.7.13, "Roof Mounted Solar Panels on Buildings of Any Height." These calculations utilize $C_g C_p$ coefficients from Figure 4.1.7.6-C, for buildings with roof slopes of 7° or less, as well as Figure 4.1.7.6-E, for single-span gabled and hip roofs with slopes greater than 7° .

Snow load calculations are performed in accordance with the 2020 NBC, Part 4.1.6, "Loads Due to Snow and Rain." Where required by the Authority Having Jurisdiction (AHJ), specified project-specific rain loads, S_r , shall be added to the project-specific snow load, S_s , to determine the appropriate table sections to be used.



Summary Tables and Instructions for Use:

The summary tables provided in this letter list the design requirements for the SMR system for a variety of configurations, PV module sizes, exposure categories, wind speeds, and snow loads. See below for descriptions of the various table sections.

- **Table Application:** These tables shall apply only to flush-mounted PV systems, with PV modules installed parallel to the roof surface with a height of no more than 250mm above the roof surface.
- **Max Module Size and Orientation:** The top left section of the tables lists the maximum allowable PV module size that can be used with that table's values. The orientation (landscape or portrait), refers to the orientation of the PV modules with respect to the SMR rails. In landscape orientation, the long side of the PV modules is parallel to the SMR rails, and in portrait orientation it is perpendicular to the SMR rails.
- **Wind and Snow Loads:** The tables are oriented with the snow load in the left-most columns and the wind loads across the top. Project-specific installations shall utilize the spans corresponding to both the project-specific demand wind pressure and snow/rain load. For intermediate values of snow and wind load, the next highest increment of the table shall be utilized.
- **Exposure Category:** Exposure categories, Open and Rough, are per the 2020 NBC, Part 4.1.7.3, Sentence 5. The project-specific Engineer of Record (EOR) is responsible for determining the appropriate exposure category to be used for project-specific installations.
- **Exposed Modules:** Exposed and unexposed PV modules are determined in accordance with the 2020 NBC, Part 4.1.7.13, Sentences 4 and 5. The project-specific EOR is responsible for determining the locations of exposed and unexposed PV modules.
- **Roof Zones:** Roof zones are determined in accordance with the 2020 NBC, Figures 4.1.7.6-C and 4.1.7.6-E. The project-specific EOR is responsible for determining the size and locations of these roof zones.



Limitations:

The following items are not included in the scope of this review:

- **PV Modules:** The structural adequacy of PV modules is not included in this review. PV modules shall be installed in accordance with manufacturer's and EOR's instructions.
- **Module Mounting Clamps and Connection Components:** All attachment components, including but not limited to, PV module mounting clamps, L-foot adaptors, and roof brackets, are not included in the scope of this letter.
- **Existing Building Structure:** The structural adequacy of any existing construction is not included in the scope of this letter.
- **All Non-Structural Elements:** All non-structural elements of the installation, including waterproofing and Electrical Engineering, are not included in the scope of this letter.
- **Installation Methods:** Racking shall be installed in accordance with manufacturer's instructions. Vector Structural Engineering is not responsible for means and methods of installation, and assumes no liability for improper installations.

Conclusions:

Vector Structural Engineering, LLC (VSE) has determined that if the SMR100 product is installed in accordance with SunModo's installation instructions and the requirements listed in this letter, then the SMR100 rails will be structurally adequate to support the design loads listed in this letter.

This conclusion is based on calculations performed by our office. Supporting calculations may be provided upon request.

VSE (or the EOR) shall supply a site-specific approval letter, signed and sealed by a licensed Professional Engineer (P.Eng), for each site-specific installation to confirm the proper interpretation and application of this letter. This letter is not valid for site-specific installations unless accompanied by a site-specific approval letter.

We hope this meets your needs. If you have any further questions regarding this matter, please call this office at your convenience.

Very truly yours,
VECTOR STRUCTURAL ENGINEERING, LLC



Max Module Size (mm): 1067 x 2083				Allowable Span (m)																										
Portrait Orientation				0.35			0.40			0.45			0.50			0.65			0.90			1.05			1.25					
1/50 Hourly Wind Pressure, q (kPa): →				r	s	c	r	s	c	r	s	c	r	s	c	r	s	c	r	s	c	r	s	c	r	s	c			
1/50 Snow Load, S _s (kPa)	Exposure Category	Roof Slope, α (°)	Roof Zone ² →	r	s	c	r	s	c	r	s	c	r	s	c	r	s	c	r	s	c	r	s	c	r	s	c	r	s	c
1.5	Open	α ≤ 7°	Exposed	1.39	1.39	1.18	1.39	1.39	1.10	1.39	1.39	1.04	1.39	1.39	0.98	1.38	1.28	0.86	1.28	1.08	0.73	1.18	1.00	0.67	1.08	0.91	0.62			
			Unexposed	1.39	1.39	1.39	1.39	1.39	1.36	1.39	1.39	1.28	1.39	1.39	1.21	1.38	1.38	1.06	1.36	1.33	0.90	1.36	1.23	0.83	1.33	1.12	0.76			
		7 < α ≤ 27	Exposed	1.25	1.25	1.23	1.25	1.25	1.25	1.15	1.24	1.24	1.24	1.19	1.02	1.23	1.04	0.89	1.08	0.88	0.76	1.00	0.82	0.70	0.91	0.75	0.64			
			Unexposed	1.25	1.25	1.25	1.25	1.25	1.25	1.24	1.24	1.24	1.24	1.24	1.24	1.23	1.23	1.10	1.22	1.09	0.93	1.21	1.00	0.86	1.12	0.92	0.79			
			Exposed	1.23	1.23	1.23	1.22	1.22	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.19	1.19	1.19	1.17	1.17	1.17	1.15	1.09	1.09	1.08	1.00	1.00			
			Unexposed	1.23	1.23	1.23	1.22	1.22	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.19	1.19	1.19	1.17	1.17	1.17	1.15	1.15	1.15	1.11	1.11	1.11			
	Rough	α ≤ 7°	Exposed	1.40	1.40	1.40	1.40	1.40	1.33	1.40	1.40	1.25	1.39	1.39	1.18	1.39	1.39	1.03	1.38	1.30	0.87	1.37	1.20	0.81	1.30	1.09	0.74			
			Unexposed	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.39	1.39	1.39	1.39	1.39	1.27	1.38	1.38	1.07	1.37	1.37	0.99	1.37	1.35	0.91			
		7 < α ≤ 27	Exposed	1.26	1.26	1.26	1.26	1.26	1.26	1.25	1.25	1.25	1.25	1.25	1.23	1.24	1.24	1.07	1.23	1.06	0.91	1.20	0.98	0.84	1.10	0.90	0.77			
			Unexposed	1.26	1.26	1.26	1.26	1.26	1.26	1.25	1.25	1.25	1.25	1.25	1.25	1.24	1.24	1.24	1.23	1.23	1.23	1.12	1.23	1.21	1.03	1.22	1.10	0.94		
			Exposed	1.24	1.24	1.24	1.24	1.24	1.24	1.23	1.23	1.23	1.23	1.23	1.23	1.22	1.22	1.22	1.20	1.20	1.20	1.18	1.18	1.18	1.17	1.17	1.17			
			Unexposed	1.24	1.24	1.24	1.24	1.24	1.24	1.23	1.23	1.23	1.23	1.23	1.23	1.22	1.22	1.22	1.20	1.20	1.20	1.18	1.18	1.18	1.17	1.17	1.17			
2	Open	α ≤ 7°	Exposed	1.22	1.22	1.18	1.22	1.22	1.10	1.22	1.22	1.04	1.22	1.22	0.98	1.21	1.21	0.86	1.20	1.08	0.73	1.18	1.00	0.67	1.08	0.91	0.62			
			Unexposed	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.06	1.20	1.20	0.90	1.20	1.20	0.83	1.19	1.12	0.76			
		7 < α ≤ 27	Exposed	1.10	1.10	1.10	1.09	1.09	1.09	1.09	1.09	1.08	1.09	1.09	1.02	1.08	1.04	0.89	1.07	0.88	0.76	1.00	0.82	0.70	0.91	0.75	0.64			
			Unexposed	1.10	1.10	1.10	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.08	1.08	1.08	1.07	1.07	0.93	1.07	1.00	0.86	1.06	0.92	0.79			
			Exposed	1.08	1.08	1.08	1.08	1.08	1.08	1.07	1.07	1.07	1.07	1.07	1.07	1.06	1.06	1.06	1.04	1.04	1.04	1.03	1.03	1.03	1.01	1.00	1.00			
			Unexposed	1.08	1.08	1.08	1.08	1.08	1.08	1.07	1.07	1.07	1.07	1.07	1.07	1.06	1.06	1.06	1.04	1.04	1.04	1.03	1.03	1.03	1.01	1.01	1.01			
	Rough	α ≤ 7°	Exposed	1.23	1.23	1.23	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.18	1.22	1.22	1.03	1.21	1.21	0.87	1.21	1.20	0.81	1.20	1.09	0.74			
			Unexposed	1.23	1.23	1.23	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.21	1.21	0.99	1.20	1.20	0.91			
		7 < α ≤ 27	Exposed	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.09	1.09	1.07	1.08	1.06	0.91	1.08	0.98	0.84	1.07	0.90	0.77			
			Unexposed	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.09	1.09	1.09	1.08	1.08	1.08	1.08	1.08	1.03	1.07	1.07	0.94			
			Exposed	1.09	1.09	1.09	1.09	1.09	1.09	1.08	1.08	1.08	1.08	1.08	1.08	1.07	1.07	1.07	1.06	1.06	1.06	1.05	1.05	1.05	1.04	1.04	1.04			
			Unexposed	1.09	1.09	1.09	1.09	1.09	1.09	1.08	1.08	1.08	1.08	1.08	1.08	1.07	1.07	1.07	1.06	1.06	1.06	1.05	1.05	1.05	1.04	1.04	1.04			
2.5	Open	α ≤ 7°	Exposed	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.04	1.10	1.10	0.98	1.09	1.09	0.86	1.09	1.08	0.73	1.08	1.00	0.67	1.08	0.91	0.62			
			Unexposed	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.09	1.09	1.06	1.09	1.09	0.90	1.08	1.08	0.83	1.08	1.08	0.76			
		7 < α ≤ 27	Exposed	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.97	0.88	0.76	0.97	0.82	0.70	0.91	0.75	0.64		
			Unexposed	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.86	0.96	0.92	0.79			
			Exposed	0.98	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93		
			Unexposed	0.98	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93		
	Rough	α ≤ 7°	Exposed	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.03	1.09	1.09	0.87	1.09	1.09	0.81	1.09	1.09	0.74			
			Unexposed	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.09	1.09	1.09	1.07	1.09	1.09	1.09	1.09	0.91			
		7 < α ≤ 27	Exposed	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.90	0.77
			Unexposed	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.97	0.94
			Exposed	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.97	0.97	0.96	0.96	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
			Unexposed	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.97	0.97	0.96	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
3	Open	α ≤ 7°	Exposed	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	0.98	1.00	1.00	0.86	1.00	1.00	0.73	1.00	1.00	0.67	0.99	0.91	0.62			
			Unexposed	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.00	1.00	1.00	1.00	1.00	0.90	1.00	1.00	0.83	0.99	0.99	0.76			
		7 < α ≤ 27	Exposed	0.91	0.91	0.91	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.89	0.89	0.88	0.76	0.89	0.82	0.70	0.88	0.75	0.64			
			Unexposed	0.91	0.91	0.91	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.89	0.89	0.89	0.89	0.89	0.86	0.88	0.88	0.79			
			Exposed	0.90	0.90	0.90	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.88	0.88	0.88	0.87	0.87	0.87	0.87	0.87	0.87	0.86	0.86	0.86			
			Unexposed	0.90	0.90	0.90	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.88	0.88	0.88	0.87	0.87	0.87	0.87	0.87	0.87	0.86	0.86	0.86			
	Rough	α ≤ 7°	Exposed	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.00	1.00	0.87	1.00	1.00	0.81	1.00	1.00	0.74			
			Unexposed	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.91			
		7 < α ≤ 27	Exposed	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.90	0.90	0.90	0.90	0.90	0.84	0.89	0.89	0.77			
			Unexposed	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.89			
			Exposed	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.89	0.89	0.89	0.88	0.88	0.88	0.88								

