



May 30, 2025

RE:

CERTIFICATION LETTER

Project Address:

SEAN JULIUS
4204 SE 91ST AVE.
PORTLAND, OR 97266

Design Criteria:

- Applicable Codes = 2023 ORSC, 2021 IEBC/IBC, 2021 IRC, ASCE 7-16 and 2018 NDS
- Risk Category = II
- Wind Speed = 98 mph, Exposure Category B, Partially/Fully Enclosed Method
- Ground Snow Load = 25 psf
- Roof 1 & Roof 2: 2 x 6 @ 24" OC, Roof DL = 7 psf, Roof LL/SL = 25 psf (Non-PV), Roof LL/SL = 25 psf (PV)

To Whom It May Concern,

A structural evaluation of loading was conducted for the above address based on the design criteria listed above.

Existing roof structural framing has been reviewed for additional loading due to installation of Solar PV System on the roof. The structural review applies to the sections of roof that is directly supporting the Solar PV System.

Based on this evaluation, I certify that the alteration to the existing structure by installation of the Solar PV System meets the prescriptive compliance requirements of the applicable existing building and/or new building provisions adopted/referenced above.

Additionally, the Solar PV System assembly (including attachment hardware) has been reviewed to be in accordance with the manufacturer's specifications and to meet and/or exceed the requirements set forth by the referenced codes.

Sincerely,



EXPIRES: 12/31/2026

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MOUNTING PLANE STRUCTURAL EVALUATION

MOUNTING PLANE	ROOF PITCH	RESULT	GOVERNING ANALYSIS
Roof 1 & Roof 2	34°	OK	MEMBER ANALYSIS

STANDOFF HARDWARE EVALUATION FOR WIND UPLIFT

MOUNTING PLANE	WIND UPLIFT DCR
Roof 1 & Roof 2	37.2%

Limits of Scope of Work and Liability:

The existing structure has been reviewed based on the assumption that it has been originally designed and constructed per appropriate codes. The structural analysis of the subject property is based on the provided site survey data. The calculations produced for this structure's assessment are only for the roof framing supporting the proposed PV installation referenced in the stamped planset and were made according to generally recognized structural analysis standards and procedures. All PV modules, racking and attachment components shall be designed and installed per manufacturer's approved guidelines and specifications. These plans are not stamped for water leakage or existing damage to the structural component that was not accessed during the site survey. Prior to commencement of work, the PV system installer should verify that the existing roof and connections are in suitable condition and inspect framing noted on the certification letter and inform the Engineer of Record of any discrepancies prior to installation. The installer should also check for any damages such as water damage, cracked framing, etc. and inform the Engineer of Record of existing deficiencies which are unknown and/or were not observable during the time of survey and have not been included in this scope of work. Any change in the scope of the work shall not be accepted unless such change, addition, or deletion is approved in advance and in writing by the Engineer of Record. The Engineer of Record and Barun Corp claim no responsibility for misuse and improper installation.

PV PANELS DEAD LOAD (PV-DL)

PV Panels Weight	= 2.50 psf
Hardware Assembly Weight	= 0.50 psf
Total PV Panels Weight	PV-DL = 3.00 psf

ROOF DEAD LOAD (R-DL)

Existing Roofing Material Weight	Composite Shingle Roof	1 Layer(s)	= 2.50 psf
Underlayment Weight			= 0.50 psf
Plywood/OSB Sheathing Weight			= 1.50 psf
Framing Weight	2 x 6 @ 24 in. O.C.		= 1.15 psf
No Vaulted Ceiling			= 0.00 psf
Miscellaneous			= 1.50 psf
Total Roof Dead Load			R-DL = 7.10 psf

REDUCED ROOF LIVE LOAD (Lr)

Roof Live Load	Lo = 20.00 psf
Member Tributary Area	At < 200 ft ²
Roof 1 & Roof 2 Pitch	34° or 8/12
Tributary Area Reduction Factor	R1 = 1.00
Roof Slope Reduction Factor	R2 = 0.80
Reduced Roof Live Load, Lr = Lo (R1) (R2)	Lr = 16.00 psf

SNOW LOAD

Ground Snow Load	pg = 25.00 psf
Effective Roof Slope	34°
Snow Importance Factor	Is = 1.00
Snow Exposure Factor	Ce = 1.00
Snow Thermal Factor	Ct = 1.10
Minimum Flat Roof Snow Load	pf-min = 25.00 psf
Flat Roof Snow Load	pf = 25.00 psf

SLOPED ROOF SNOW LOAD ON ROOF (Non-Slippery Surfaces)

Roof Slope Factor	Cs-roof = 1.00
Sloped Roof Snow Load on Roof	ps-roof = 25.00 psf

SLOPED ROOF SNOW LOAD ON PV PANELS (Unobstructed Slippery Surfaces)

Roof Slope Factor	Cs-PV = 1.00
Sloped Roof Snow Load on PV Panels	ps-PV = 25.00 psf

Lateral Capacity check for Ecofasten Rockit Smart slide attachments.

Attachment type =	Ecofasten RockIT Smart Slide	Number of rows in Array =	4
Attachment Max. X-spacing =	4.00 ft	Array Lateral Capacity factor =	1.25
Attachment Max. Y-spacing =	3.72 ft		
Lateral load on each attachment =	232.98 lbs		
Lateral capacity of the attachment =	251.25 lbs (Based on hardware manufacturer)		

Pass. Provided spacing is Okay.

SITE INFORMATION

Ultimate Wind Speed =	98.00 mph	Roof Pitch =	34°
Risk Category =	II	Roof Type =	Gable
Exposure Category =	B	Velocity Pressure Exposure Coefficient, Kz =	0.57
Mean Roof Height =	15.00 ft	Topographic Factor, Kzt =	1.00
Solar Array Dead Load =	3.00 psf	Wind Directionality Factor, Kd =	0.85
a =	3.00 ft	Ground Elevation Factor, Ke =	1.00

DESIGN CALCULATIONS

DESIGN CALCULATIONS			
Wind Velocity Pressure, qh =		12.01 psf	(0.00256*Kz*Kzt*Kd*Ke*(V^2))
Solar Array Pressure Equalization Factor, ya =		0.60	
Hardware Type =		Ecofasten RockIt Comp Slide	
Allowable Load =		751.36 lbs	D. Fir - L, #12 Wood Screw x 2, 2" Embedment
Array Edge Factor, yE =		1.50	Exposed Condition
Max. X - Spacing (Zone 1 - 2r) =		4.00 ft	Effective Wind Area
Max. Y - Spacing (Zone 1 - 2r) =		5.65 ft	22.60 ft²
Max. X - Spacing (Zone 2n & 3r) =		4.00 ft	Effective Wind Area
Max. Y - Spacing (Zone 2n & 3r) =		5.65 ft	22.60 ft²
Max. X - Spacing (Zone 3e) =		4.00 ft	Effective Wind Area
Max. Y - Spacing (Zone 3e) =		5.65 ft	22.60 ft²
ROOF ZONE	GCp (-) UPLIFT	UPLIFT PRESSURE	PULLOUT FORCE
1 - 2r	-1.45	-7.88 psf	178.20 lbs
2n & 3r	-1.73	-9.71 psf	219.52 lbs
3e	-2.14	-12.36 psf	279.25 lbs

NOTE:

- Wind calculation is based on ASCE 7-16, 29.4 - C&C, LC #7: 0.6DL + 0.6WL is used.



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SOFTWARE FOR WOOD DESIGN

COMPANY

PROJECT

May 30, 2025 18:28

Roof1&Roof2

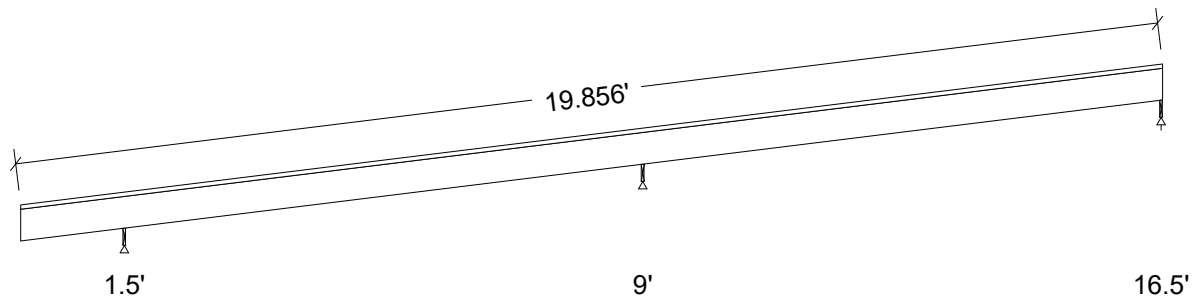
Design Check Calculation Sheet

WoodWorks Sizer

Loads:

Load	Type	Distribution	Pat- tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
DL	Dead	Full Area	No			7.10 (24.0")		psf
PV-DL	Dead	Partial Area	No	2.36	11.73	3.00 (24.0")		psf
PV-SL	Snow	Partial Area	Yes	2.36	11.73	25.00 (24.0")		psf
RF-SL1	Snow	Partial Area	Yes	0.00	2.36	25.00 (24.0")		psf
RF-SL2	Snow	Partial Area	Yes	11.73	16.50	25.00 (24.0")		psf
RF-LL1	Live	Partial Area	Yes	0.00	2.36	16.00 (24.0")		psf
RF-LL2	Live	Partial Area	Yes	11.73	16.50	16.00 (24.0")		psf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:						
Dead		99		196		54
Live		78		64		98
Snow		245		436		164
Factored:						
Total		343		633		251
Bearing:						
F'theta		776		776		776
Capacity						
Joist		1019		1065		582
Support		586		633		586
Des ratio						
Joist		0.34		0.59		0.43
Support		0.59		1.00		0.43
Load comb		#14		#17		#23
Length		0.50*		0.54		0.50*
Min req'd		0.50*		0.54**		0.50*
Cb		1.75		1.69		1.00
Cb min		1.75		1.69		1.00
Cb support		1.25		1.25		1.25
Fcp sup		625		625		625

*Minimum bearing length setting used: 1/2" for end supports and 1/2" for interior supports

**Minimum bearing length governed by the required width of the supporting member.

Lumber-soft, D.Fir-L, No.2, 2x6 (1-1/2"x5-1/2")

Supports: All - Timber-soft Beam, D.Fir-L No.2

Roof joist spaced at 24.0" c/c; Total length: 20.19'; Clear span(horz): 1.5', 7.438', 7.438'; Volume = 1.2 cu.ft.; Pitch: 8/12
Lateral support: top = continuous, bottom = at end supports; Repetitive factor: applied where permitted (refer to online help);

This section PASSES the design code check.

Roof1&Roof2

WoodWorks® Sizer

WARNING: Member length exceeds typical stock length of 18.0 ft

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 47$	$F_v' = 207$	psi	$f_v/F_v' = 0.23$
Bending (+)	$f_b = 558$	$F_b' = 1547$	psi	$f_b/F_b' = 0.36$
Bending (-)	$f_b = 783$	$F_b' = 822$	psi	$f_b/F_b' = 0.95$
Deflection:				
Interior Live	$0.11 = < L/999$	$0.60 = L/180$	in	0.18
Total	$0.14 = L/779$	$0.90 = L/120$	in	0.15
Cantil. Live	$-0.05 = L/402$	$0.24 = L/90$	in	0.22
Total	$-0.08 = L/257$	$0.36 = L/60$	in	0.23

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
F_v'	180	1.15	1.00	1.00	-	-	-	-	1.00	1.00	17
$F_b' +$	900	1.15	1.00	1.00	1.000	1.300	-	1.15	1.00	1.00	23
$F_b' -$	900	1.15	1.00	1.00	0.531	1.300	-	1.15	1.00	1.00	17
F_{cp}'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.6 million	1.00	1.00	-	-	-	-	-	1.00	1.00	13
E_{min}'	0.58 million	1.00	1.00	-	-	-	-	-	1.00	1.00	13

CRITICAL LOAD COMBINATIONS:

Shear : LC #17 = D + S (pattern: sSS)

Bending (+): LC #23 = D + 0.75(L + S) (pattern: XsX)

Bending (-): LC #17 = D + S (pattern: sSS)

Deflection: LC #13 = (live)

LC #13 = (total)

Bearing : Support 1 - LC #14 = D + S (pattern: SSs)

Support 2 - LC #17 = D + S (pattern: sSS)

Support 3 - LC #23 = D + 0.75(L + S) (pattern: XsX)

Load Types: D=dead L=live S=snow

Load Patterns: s=S/2, X=L+S or L+Lr, _=no pattern load in this span

Load combinations: ASD Basic from ASCE 7-16 2.4; all LC's listed in the Analysis report

CALCULATIONS:

$V_{max} = 281$, $V_{design} = 256$ (NDS 3.4.3.1(a)) lbs

$M(+) = 352$ lbs-ft; $M(-) = 493$ lbs-ft

$EI = 33.27e06$ lb-in²

"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.50 permanent + "live"

Bearing: Allowable bearing at an angle $F'\theta$ calculated for each support as per NDS 3.10.3

Lateral stability(-): $L_u = 18.00'$ $L_e = 27.31'$ $RB = 28.3$; L_u based on full span

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.
4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
5. SLOPED BEAMS: level bearing is required for all sloped beams.