November 19, 2022

RE: CERTIFICATION LETTER

Project Address: ROBERTSON RESIDENCE
741 MEADOW ST,
MAMARONECK, NY, 10543

Design Criteria:

- Applicable Codes = 2020 NYSBC, 2020 NYSRC, ASCE 7-16 and 2018 NDS
- Risk Category = II
- Wind Speed = 116 mph, Exposure Category B, Partially/Fully Enclosed Method
- Ground Snow Load = 30 psf
- ROOF AR-O1: 2 x 8 @ 16" OC, Roof DL = 11 psf, Roof LL/SL = 23 psf (Non-PV), Roof LL/SL = 12.3 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 PV Solar 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 PV system meets the prescriptive compliance requirements of the applicable existing building and/or new building provisions adopted/referenced above.

Additionally, the PV module 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,

Digitally signed by MANOUCHEHR HAKHAMANESHI
Date: 2022.11.20 08:58:58 -05'00'

MIGHTY ENGINEERING CO.
DRIVEN TO EXCEED EXPECTATIONS

RESULTS SUMMARY

ROBERTSON RESIDENCE, 741 MEADOW ST,, MAMARONECK, NY, 10543

MOUNTING PLANE STRUCTURAL EVALUATION			
MOUNTING PLANE	**ROOF PITCH (deg.)**	**RESULT**	**GOVERNING ANALYSIS**
ROOF AR-O1	38°	**OK**	IEBC IMPACT CHECK

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.

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LOAD CALCULATION

ROOF AR-O1

ROBERTSON RESIDENCE, 741 MEADOW ST,, MAMARONECK, NY, 10543

PV SYSTEM DEAD LOAD (PV-DL)	
PV Module Weight	= 2.50 psf
Hardware Assembly Weight	= 0.50 psf
Total PV System Dead Load	**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 8 @ 16 in. O.C.		= 2.27 psf
Vaulted Ceiling Weight			= 3.00 psf
Miscellaneous			= 1.50 psf
Total Roof Dead Load			**R-DL = 11.30 psf**

REDUCED ROOF LIVE LOAD (Lr)	
Roof Live Load	L_o = 20.00 psf
Member Tributary Area	A_t < 200 ft^2
ROOF AR-O1 Pitch	38° or 10/12
Tributary Area Reduction Factor	R_1 = 1.00
Roof Slope Reduction Factor	R_2 = 0.73
Reduced Roof Live Load, $L_r = L_o (R_1) (R_2)$	**L_r = 14.50 psf**

SNOW LOAD	
Ground Snow Load	p_g = 30.00 psf
Effective Roof Slope	38°
Snow Importance Factor	I_s = 1.00
Snow Exposure Factor	C_e = 1.00
Snow Thermal Factor	C_t = 1.10
Minimum Flat Roof Snow Load	$p_{f\text{-}min}$ = 20.00 psf
Flat Roof Snow Load	**p_f = 23.10 psf**

SLOPED ROOF SNOW LOAD ON ROOF (Non-Slippery Surfaces)	
Roof Slope Factor	$C_{s\text{-}roof}$ = 0.98
Sloped Roof Snow Load on Roof	**$p_{s\text{-}roof}$ = 22.70 psf**

SLOPED ROOF SNOW LOAD ON PV PANEL (Unobstructed Slippery Surfaces)	
Roof Slope Factor	$C_{s\text{-}pv}$ = 0.53
Sloped Roof Snow Load on PV Panel	**$p_{s\text{-}pv}$ = 12.30 psf**

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	ROOF AR-O1
ROBERTSON RESIDENCE, 741 MEADOW ST,, MAMARONECK, NY, 10543	

	EXISTING	WITH PV PANEL	
Roof Dead Load (DL) =	11.30	14.30	psf
Roof Live Load (Lr) =	14.50	0.00	psf
Roof Snow Load (SL) =	22.70	12.30	psf

	EXISTING	WITH PV PANEL	
(DL + Lr)/Cd =	20.64	15.89	psf
(DL + SL)/Cd =	29.57	23.13	psf
Maximum Gravity Load =	29.57	23.13	psf

Load Increase (%) =	-21.76%	OK
IEBC Provision :	2018	

The requirements of section 806.2 of 2018 IEBC are met and the structure is permitted to remain unaltered.

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WIND UPLIFT CALCULATION

ROOF AR-O1

ROBERTSON RESIDENCE, 741 MEADOW ST,, MAMARONECK, NY, 10543

SITE INFORMATION			
Ultimate Wind Speed (mph) =	116.00 mph	Roof Pitch (deg.) =	38°
Risk Category =	II	Roof Type =	Gable
Exposure Category =	B	K_d =	0.85
Mean Roof Height =	23.00 ft	K_{zt} =	1
Solar Array Dead Load =	3.00 psf	K_z =	0.65

DESIGN CALCULATIONS			
Wind Velocity Press. (qh) = $0.00256*K_z*K_{zt}*K_d*K_e*V^2$ =		19.01 psf	
a (ft) =		4.50	
Array Edge Factor (γE) =		1.50	
Solar Array Pressure Eq. Factor (γa) =		0.60	
Hardware Type :	RL UNIVERSAL		
Allowable Load =	655.00 lbs	SPF, 2.5" lag embedment	
Max. X - Spacing (Zone 1 - 2r)	5.40 ft	Effective Wind Area	
Max. Y - Spacing (Zone 1 - 2r)	3.41 ft	18.41 ft²	
Max. X - Spacing (Zone 2n & 3r)	5.40 ft	Effective Wind Area	
Max. Y - Spacing (Zone 2n & 3r)	3.41 ft	18.41 ft²	
Max. X - Spacing (Zone 3e)	5.40 ft	Effective Wind Area	
Max. Y - Spacing (Zone 3e)	3.41 ft	18.41 ft²	

ROOF ZONE	GCp (-) UPLIFT	UPLIFT PRESSURE	PULLOUT FORCE
1 - 2r	-1.53	-14.34 psf	264.07 lbs
2n & 3r	-1.80	-17.02 psf	313.48 lbs
3e	-2.23	-21.43 psf	394.61 lbs

NOTE:

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