Version #74.1 - 2
RU

November 2, 2018

RE: CERTIFICATION LETTER

Project/Job # 604008
Project Address: Guzinski Residence
8917 Wheeler Dr
Orland Park, IL 60462

AHJ Orland Park village
SC Office Chicago-Temp

Design Criteria:

- Applicable Codes = 2015 IEBC/IBC, 2015 IRC, ASCE 7-10, and 2015 NDS
- Risk Category = II
- Wind Speed = 115 mph, Exposure Category C, Partially/Fully Enclosed Method
- Ground Snow Load = 30 psf
- MP1: Roof DL = 8.5 psf, Roof LL/SL = 30 psf
- MP3: Roof DL = 7.5 psf, Roof LL/SL = 30 psf
- MP5: Roof DL = 7.5 psf, Roof LL/SL = 30 psf

Note: Per IBC 1613.1; Seismic check is not required because Ss = 0.18493 < 0.4g and Seismic Design Category (SDC) = B < D

To Whom It May Concern,

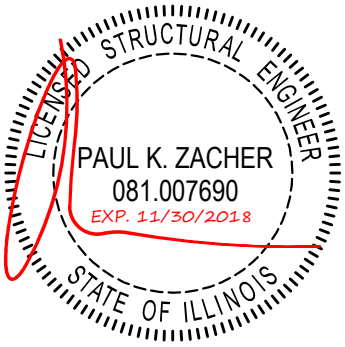
A jobsite survey of the existing framing system of the address indicated above was performed by a site survey team from Tesla. Structural evaluation was based on site observations and the design criteria listed above.

Based on this evaluation, I certify that the alteration to the existing structure by installation of the PV system, with upgrades specified in the plans, meets the requirements of the applicable existing building and/or new building provisions adopted/referenced above.

Additionally, I certify that the PV module assembly including all standoffs supporting it have been reviewed to be in accordance with the manufacturer's specifications and to meet and/or exceed all requirements set forth by the referenced codes for loading.

The PV assembly hardware specifications are contained in the plans/docs submitted for approval.

Paul Zacher, P.E.
Professional Engineer
T: 916.961.3960 x101
email: paul@pzse.com



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HARDWARE DESIGN AND STRUCTURAL ANALYSIS RESULTS SUMMARY TABLES

Landscape Hardware	Hardware - Landscape Modules' Standoff Specifications					
	X-X Spacing	X-X Cantilever	Y-Y Spacing	Y-Y Cantilever	Configuration	Uplift DCR
MP1	48"	24"	41"	NA	Staggered	31.6%
MP3	48"	24"	41"	NA	Staggered	28.0%
MP5	48"	24"	41"	NA	Staggered	28.0%

Portrait Hardware	Hardware - Portrait Modules' Standoff Specifications					
	X-X Spacing	X-X Cantilever	Y-Y Spacing	Y-Y Cantilever	Configuration	Uplift DCR
MP1	48"	20"	62"	NA	Staggered	47.8%
MP3	48"	20"	62"	NA	Staggered	42.3%
MP5	48"	20"	62"	NA	Staggered	42.3%

Mounting Plane	Roof Pitch	Qualification Results
	(Degrees)	Member Evaluation Results
MP1	26°	Member Analysis OK
MP3	26°	Member Analysis OK
MP5	26°	Member Analysis OK

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STRUCTURE ANALYSIS - LOADING SUMMARY AND MEMBER CHECK - MP1

Member Loading Summary					
Roof Pitch	**6/12**	**Initial**	**Pitch Adjust**	**Non-PV Areas**	**PV Areas**
Roof Dead Load	**DL**	8.5 psf	x 1.11	9.5 psf	9.5 psf
PV Dead Load	**PV-DL**	3.0 psf	x 1.11		3.3 psf
Roof Live Load	**RLL**	20.0 psf	x 0.90	18.0 psf	
Live/Snow Load	**LL/SL**[1,2]	30.0 psf	x 1 l x 1	30.0 psf	30.0 psf
Total Load (Governing LC)	**TL**			**39.5 psf**	**42.8 psf**

Notes: 1. ps = Cs*pf; Cs -roof, Cs -pv per ASCE 7 [Figure 7-2] 2. pf = 0.7 (C_e) (C_t) (I_s) p_g ; C_e=0.9, C_t=1.1, I_s=1.0

Member Analysis Results Summary					
Governing Analysis	**Max Moment**	**@ Location**	**Capacity**	**DCR**	**Result**
(-) Bending Stress (psi)	**-659.5**	**17.0 ft**	**-649.9**	**101%**	**Pass**

ZEP HARDWARE DESIGN CALCULATIONS - MP1

Mounting Plane Information			
Roofing Material		Comp Roof	
Roof Slope		26°	
Framing Type / Direction		Y-Y Rafters	
PV System Type		SolarCity SleekMount™	
Zep System Type		ZS Comp	
Standoff (Attachment Hardware)		Comp Mount SRV	
Spanning Vents		No	

Wind Design Criteria			
Design Code	IBC 2015	ASCE 7-10	
Wind Design Method		Partially/Fully Enclosed Method	
Ultimate Wind Speed	V-Ult	115 mph	Fig. 1609A
Exposure Category		C	Section 26.7
Roof Style		Gable Roof	Fig. 30.4-2A/B/C-5A/B
Mean Roof Height	h	25 ft	Section 26.2

Wind Pressure Calculation Coefficients			
Wind Pressure Exposure	K_z	0.95	Table 30.3-1
Topographic Factor	K_{zt}	1.00	Section 26.8
Wind Directionality Factor	K_d	0.85	Section 26.6-1
Importance Factor	I	NA	
Velocity Pressure	**q_h**	**qh = 0.00256 (Kz) (Kzt) (Kd) (V^2) 27.2 psf**	**Equation 30.3-1**

		Wind Pressure	
Ext. Pressure Coefficient (Up)	GCp (Up)	-0.88	Fig. 30.4-2A/B/C-5A/B
Ext. Pressure Coefficient (Down)	GCp (Down)	0.45	Fig. 30.4-2A/B/C-5A/B
Design Wind Pressure	p	p = qh (GCp)	Equation 30.4-1
Wind Pressure Up	**$p_{(up)}$**	**-23.8 psf**	
Wind Pressure Down	**$p_{(down)}$**	**16.0 psf**	

ALLOWABLE STANDOFF SPACINGS

		X-Direction	Y-Direction
Max Allowable Standoff Spacing	Landscape	48''	41''
Max Allowable Cantilever	Landscape	24''	NA
Standoff Configuration	Landscape	Staggered	
Max Standoff Tributary Area	Trib	14 sf	
PV Assembly Dead Load	W-PV	3.0 psf	
Net Wind Uplift at Standoff	T-actual	-173 lbs	
Uplift Capacity of Standoff	T-allow	548 lbs	
Standoff Demand/Capacity	DCR	31.6%	

		X-Direction	Y-Direction
Max Allowable Standoff Spacing	Portrait	48''	62''
Max Allowable Cantilever	Portrait	20''	NA
Standoff Configuration	Portrait	Staggered	
Max Standoff Tributary Area	Trib	21 sf	
PV Assembly Dead Load	W-PV	3.0 psf	
Net Wind Uplift at Standoff	T-actual	-262 lbs	
Uplift Capacity of Standoff	T-allow	548 lbs	
Standoff Demand/Capacity	DCR	47.8%	

STRUCTURE ANALYSIS - LOADING SUMMARY AND MEMBER CHECK - MP3

Member Loading Summary					
Roof Pitch	**6/12**	**Initial**	**Pitch Adjust**	**Non-PV Areas**	**PV Areas**
Roof Dead Load	**DL**	7.5 psf	x 1.11	8.3 psf	8.3 psf
PV Dead Load	**PV-DL**	3.0 psf	x 1.11		3.3 psf
Roof Live Load	**RLL**	20.0 psf	x 0.90	18.0 psf	
Live/Snow Load	**LL/SL[1,2]**	30.0 psf	x 1 l x 1	30.0 psf	30.0 psf
Total Load (Governing LC)	**TL**			**38.3 psf**	**41.7 psf**

Notes: 1. ps = Cs*pf; Cs -roof, Cs -pv per ASCE 7 [Figure 7-2] 2. pf = 0.7 (C_e) (C_t) (I_s) p_g ; C_e=0.9, C_t=1.1, I_s=1.0

Member Analysis Results Summary					
Governing Analysis	**Max Moment**	**@ Location**	**Capacity**	**DCR**	**Result**
(+) Bending Stress (psi)	**1,408.5**	**8.2 ft**	**1,461.4**	**96%**	**Pass**

ZEP HARDWARE DESIGN CALCULATIONS - MP3

Mounting Plane Information			
Roofing Material		Comp Roof	
Roof Slope		26°	
Framing Type / Direction		Y-Y Rafters	
PV System Type		SolarCity SleekMount™	
Zep System Type		ZS Comp	
Standoff (Attachment Hardware)		Comp Mount SRV	
Spanning Vents		No	

Wind Design Criteria			
Design Code	IBC 2015	ASCE 7-10	
Wind Design Method		Partially/Fully Enclosed Method	
Ultimate Wind Speed	V-Ult	115 mph	Fig. 1609A
Exposure Category		C	Section 26.7
Roof Style		Gable Roof	Fig. 30.4-2A/B/C-5A/B
Mean Roof Height	h	15 ft	Section 26.2

Wind Pressure Calculation Coefficients			
Wind Pressure Exposure	K_z	0.85	Table 30.3-1
Topographic Factor	K_{zt}	1.00	Section 26.8
Wind Directionality Factor	K_d	0.85	Section 26.6-1
Importance Factor	I	NA	
Velocity Pressure	**q_h**	**qh = 0.00256 (Kz) (Kzt) (Kd) (V^2) 24.4 psf**	**Equation 30.3-1**

		Wind Pressure	
Ext. Pressure Coefficient (Up)	GCp (Up)	-0.88	Fig. 30.4-2A/B/C-5A/B
Ext. Pressure Coefficient (Down)	GCp (Down)	0.45	Fig. 30.4-2A/B/C-5A/B
Design Wind Pressure	p	p = qh (GCp)	Equation 30.4-1
Wind Pressure Up	**$p_{(up)}$**	**-21.4 psf**	
Wind Pressure Down	**$p_{(down)}$**	**16.0 psf**	

ALLOWABLE STANDOFF SPACINGS

		X-Direction	Y-Direction
Max Allowable Standoff Spacing	Landscape	48"	41"
Max Allowable Cantilever	Landscape	24"	NA
Standoff Configuration	Landscape	Staggered	
Max Standoff Tributary Area	Trib	14 sf	
PV Assembly Dead Load	W-PV	3.0 psf	
Net Wind Uplift at Standoff	T-actual	-153 lbs	
Uplift Capacity of Standoff	T-allow	548 lbs	
Standoff Demand/Capacity	DCR	28.0%	

		X-Direction	Y-Direction
Max Allowable Standoff Spacing	Portrait	48"	62"
Max Allowable Cantilever	Portrait	20"	NA
Standoff Configuration	Portrait	Staggered	
Max Standoff Tributary Area	Trib	21 sf	
PV Assembly Dead Load	W-PV	3.0 psf	
Net Wind Uplift at Standoff	T-actual	-232 lbs	
Uplift Capacity of Standoff	T-allow	548 lbs	
Standoff Demand/Capacity	DCR	42.3%	

STRUCTURE ANALYSIS - LOADING SUMMARY AND MEMBER CHECK - MP5

Member Loading Summary					
Roof Pitch	**6/12**	**Initial**	**Pitch Adjust**	**Non-PV Areas**	**PV Areas**
Roof Dead Load	**DL**	7.5 psf	x 1.11	8.3 psf	8.3 psf
PV Dead Load	**PV-DL**	3.0 psf	x 1.11		3.3 psf
Roof Live Load	**RLL**	20.0 psf	x 0.90	18.0 psf	
Live/Snow Load	**LL/SL**[1,2]	30.0 psf	x 1 l x 1	30.0 psf	30.0 psf
Total Load (Governing LC)	**TL**			**38.3 psf**	**41.7 psf**

Notes: 1. ps = Cs*pf; Cs -roof, Cs -pv per ASCE 7 [Figure 7-2] 2. pf = 0.7 (C_e) (C_t) (I_s) p_g ; C_e=0.9, C_t=1.1, I_s=1.0

Member Analysis Results Summary					
Governing Analysis	**Max Moment**	**@ Location**	**Capacity**	**DCR**	**Result**
(+) Bending Stress (psi)	**1,122.1**	**7.6 ft**	**1,461.4**	**77%**	**Pass**

ZEP HARDWARE DESIGN CALCULATIONS - MP5

Mounting Plane Information			
Roofing Material		Comp Roof	
Roof Slope		26°	
Framing Type / Direction		Y-Y Rafters	
PV System Type		SolarCity SleekMount™	
Zep System Type		ZS Comp	
Standoff (Attachment Hardware)		Comp Mount SRV	
Spanning Vents		No	

Wind Design Criteria			
Design Code	IBC 2015	ASCE 7-10	
Wind Design Method		Partially/Fully Enclosed Method	
Ultimate Wind Speed	V-Ult	115 mph	Fig. 1609A
Exposure Category		C	Section 26.7
Roof Style		Gable Roof	Fig. 30.4-2A/B/C-5A/B
Mean Roof Height	h	15 ft	Section 26.2

Wind Pressure Calculation Coefficients			
Wind Pressure Exposure	K_z	0.85	Table 30.3-1
Topographic Factor	K_{zt}	1.00	Section 26.8
Wind Directionality Factor	K_d	0.85	Section 26.6-1
Importance Factor	I	NA	
Velocity Pressure	**q_h**	**qh = 0.00256 (Kz) (Kzt) (Kd) (V^2) 24.4 psf**	**Equation 30.3-1**

		Wind Pressure	
Ext. Pressure Coefficient (Up)	GCp (Up)	-0.88	Fig. 30.4-2A/B/C-5A/B
Ext. Pressure Coefficient (Down)	GCp (Down)	0.45	Fig. 30.4-2A/B/C-5A/B
Design Wind Pressure	p	p = qh (GCp)	Equation 30.4-1
Wind Pressure Up	**$p_{(up)}$**	**-21.4 psf**	
Wind Pressure Down	**$p_{(down)}$**	**16.0 psf**	

ALLOWABLE STANDOFF SPACINGS

		X-Direction	Y-Direction
Max Allowable Standoff Spacing	Landscape	48''	41''
Max Allowable Cantilever	Landscape	24''	NA
Standoff Configuration	Landscape	Staggered	
Max Standoff Tributary Area	Trib	14 sf	
PV Assembly Dead Load	W-PV	3.0 psf	
Net Wind Uplift at Standoff	T-actual	-153 lbs	
Uplift Capacity of Standoff	T-allow	548 lbs	
Standoff Demand/Capacity	DCR	28.0%	

		X-Direction	Y-Direction
Max Allowable Standoff Spacing	Portrait	48''	62''
Max Allowable Cantilever	Portrait	20''	NA
Standoff Configuration	Portrait	Staggered	
Max Standoff Tributary Area	Trib	21 sf	
PV Assembly Dead Load	W-PV	3.0 psf	
Net Wind Uplift at Standoff	T-actual	-232 lbs	
Uplift Capacity of Standoff	T-allow	548 lbs	
Standoff Demand/Capacity	DCR	42.3%	