Taqi Khawaja

Digitally signed by Taqi Khawaja
Date: 2024.12.10 16:19:11 -06'00'

12/10/2024

Freedom Forever LLC
43445 Buisiness Park Dr., Suite 110
Temecula, CA 92590

| | |
|---|---|
| Job Number: | 496748 |
| Project Name: | Frank Voigt |
| Project Address: | 135 Southeast Scarlett Way, Lake City, FL |

**Design Criteria:**

| | |
|---|---|
| Applicable Code = | ASCE 7-22 |
| Design Wind Speed = | 119 mph (3 Second Gust) |
| Exposure Category = | C |
| Ground Snow Load = | 0 psf |
| Module Type = | SILFAB SOLAR: SIL-380 HC |
| Module Quantity = | 21 |

To whom is may concern,

The above mentioned residential rooftop solar project has been designed to the specifications shown above. The team at Freedom Forever LLC has visited the site to observe the roof and its framing as well as gather other required information for the project. During this observation they did not see any signs of damage or distress to the roof structure which would preclude solar from being installed. Based on that review and the information provided, the calculations on the following pages were completed to determine the adequacy of the roof framing as well as the allowable attachment spacing for the PV panels. The calculations show that the roof can support the proposed PV system without structural modifications.

| Mounting Plane | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Roof Type | Trapezoidal Metal | Trapezoidal Metal | | | | | | | | |
| Framing Type | Rafter | Rafter | | | | | | | | |
| Framing Size | 2x2 @ 24 | 2x2 @ 24 | | | | | | | | |
| Upgrade Size | NA | NA | | | | | | | | |
| Attachment Type | S-5 Solarfoot | S-5 Solarfoot | | | | | | | | |
| Lag Count | N/A | N/A | | | | | | | | |
| Embedment Depth | N/A | N/A | | | | | | | | |

Sincerely,

Taqi Khawaja, PE
Freedom Forever LLC

TAQI KHAWAJA LICENSE No. 86163 STATE OF FLORIDA PROFESSIONAL ENGINEER

Signed by: Taqi Khawaja, PE
Signed on: 12/10/2024

**Wind Calculations**

Pressures based on Section 29.4.4

$p = q_h(GC_p)(\gamma_E)(\gamma_a)$

$q_h = .00256 * K_z * K_{zt} * K_d * V^2$

$K_z$ = 0.90

$K_{zt}$ = 1.0

$K_d$ = 0.85 ASCE7 Table 26.6-1

$q_z$ = 27.8 psf

| Mounting Plane | | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GC | Wind | GC | Wind | GC | Wind | GC | Wind | GC | Wind |
| Zone | 1 | -2.00 | -55.58 | -2.00 | -55.58 | | | | | | |
| | 2e | -2.00 | -55.58 | -2.00 | -55.58 | | | | | | |
| | 2r | -2.58 | -71.70 | -2.58 | -71.70 | | | | | | |
| | 2n | -2.58 | -71.70 | -2.58 | -71.70 | | | | | | |
| | 3r | -3.07 | -85.36 | -3.07 | -85.36 | | | | | | |
| | 3e | -2.58 | -71.70 | -2.58 | -71.70 | | | | | | |
| | Down | 0.47 | 13.06 | 0.47 | 13.06 | | | | | | |

| Mounting Plane | | 6 | | 7 | | 8 | | 9 | | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GC | Wind | GC | Wind | GC | Wind | GC | Wind | GC | Wind |
| Zone | 1 | | | | | | | | | | |
| | 2e | | | | | | | | | | |
| | 2r | | | | | | | | | | |
| | 2n | | | | | | | | | | |
| | 3r | | | | | | | | | | |
| | 3e | | | | | | | | | | |
| | Down | | | | | | | | | | |

**Snow Load Calculations**

Flat Roof Snow Load based on Section 7.3

$p_f = 0.7C_eC_tI_sp_g$

$p_g$ = 0 $p_f$ = 0

$C_e$ = 1.00

$C_t$ = 1.10

$I_s$ = 1.0

| Mounting Plane | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Roof Snow Load (psf) | $C_s$ | Snow | $C_s$ | Snow | $C_s$ | Snow | $C_s$ | Snow | $C_s$ | Snow |
| | 1.00 | 0.00 | 1.00 | 0.00 | | | | | | |

| Mounting Plane | 6 | | 7 | | 8 | | 9 | | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Roof Snow Load (psf) | $C_s$ | Snow | $C_s$ | Snow | $C_s$ | Snow | $C_s$ | Snow | $C_s$ | Snow |
| | | | | | | | | | | |

**Load Combinations**

Dead Load = 3 psf EM = Edge Module IM = Interior Module

**Uplift** $\gamma_E$= 1.5 $\gamma_a$= 0.56 per Figure 29.4-8

| Mounting Plane | | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.6D + 0.6W (psf) | | EM | IM | EM | IM | EM | IM | EM | IM | EM | IM |
| Zone | 1 | -26.07 | -16.78 | -26.07 | -16.78 | | | | | | |
| | 2e | -26.07 | -16.78 | -26.07 | -16.78 | | | | | | |
| | 2r | -34.15 | -22.16 | -34.15 | -22.16 | | | | | | |
| | 2n | -34.15 | -22.16 | -34.15 | -22.16 | | | | | | |
| | 3r | -41.00 | -26.73 | -41.00 | -26.73 | | | | | | |
| | 3e | -34.15 | -22.16 | -34.15 | -22.16 | | | | | | |

| Mounting Plane | | 6 | | 7 | | 8 | | 9 | | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.6D + 0.6W (psf) | | EM | IM | EM | IM | EM | IM | EM | IM | EM | IM |
| Zone | 1 | | | | | | | | | | |
| | 2e | | | | | | | | | | |
| | 2r | | | | | | | | | | |
| | 2n | | | | | | | | | | |
| | 3r | | | | | | | | | | |
| | 3e | | | | | | | | | | |

**Down Force**

| Mounting Plane | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Module Location | EM | IM | EM | IM | EM | IM | EM | IM | EM | IM |
| D+S (psf) | 2.97 | 2.97 | 2.97 | 2.97 | | | | | | |
| D+06W (psf) | 9.52 | 7.34 | 9.52 | 7.34 | | | | | | |

| Mounting Plane | 6 | | 7 | | 8 | | 9 | | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Module Location | EM | IM | EM | IM | EM | IM | EM | IM | EM | IM |
| D+S (psf) | | | | | | | | | | |
| D+06W (psf) | | | | | | | | | | |

**Lateral Parallel to Roof**

| Mounting Plane | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| D+S (psf) | 0.42 | 0.42 | | | |

| Mounting Plane | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|
| D+S (psf) | | | | | |

**Framing Check**

Lumber Species: DF

PV Load = 3 psf

| Mounting Plane | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Framing Type | Rafter | Rafter | | | |
| Framing Size | 2x2 | 2x2 | | | |
| Framing Spacing (in) | 24 | 24 | | | |
| Span (ft) | 6.66 | 6.66 | | | |
| Moment (lb-ft) | 111 | 111 | | | |
| Shear (lbs) | 66 | 66 | | | |
| Upgrade Size | NA | NA | | | |

| Mounting Plane | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|
| Framing Type | | | | | |
| Framing Size | | | | | |
| Framing Spacing (in) | | | | | |
| Span (ft) | | | | | |
| Moment (lb-ft) | | | | | |
| Shear (lbs) | | | | | |
| Upgrade Size | | | | | |

## Array Attachment Spacing

Module = SILFAB SOLAR: SIL-380 HC

| Mounting Plane | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Roofing Material | Trapezoidal Metal | Trapezoidal Metal | | | |
| Attachment Type | S-5 Solarfoot | S-5 Solarfoot | | | |
| Lag Count Per Attachment | N/A | N/A | | | |
| Min Lag Embedment (in) | N/A | N/A | | | |
| Landscape | 72 | 72 | | | |
| Portrait | 72 | 72 | | | |

| Mounting Plane | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|
| Roofing Material | | | | | |
| Attachment Type | | | | | |
| Lag Count Per Attachment | | | | | |
| Min Lag Embedment (in) | | | | | |
| Landscape | | | | | |
| Portrait | | | | | |