Overview   **SECTION [0101] - 1**

This report describes the structural design of a solar canopy covering a residential patio located in the City of Larkspur, California. It includes the design of a concrete slab and stem wall, steel tube frame, and attachments of solar panels to the frame. The report is divided into the following divisions and subdivisions:

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[01] Loads
    [01] Gravity
    [02] Wind and Seismic
[02] Frame
    [01] Steel tubes
    [02] Connections and clips
[03] Foundation
    [01] Slab
    [02] Stem wall
[04] References and Abbreviations
    [01] Codes and Standards
    [02] Abbreviations
    [03] Symbols
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Client:

Date:

Location:

Governing Codes   **SECTION [0101] - 2**

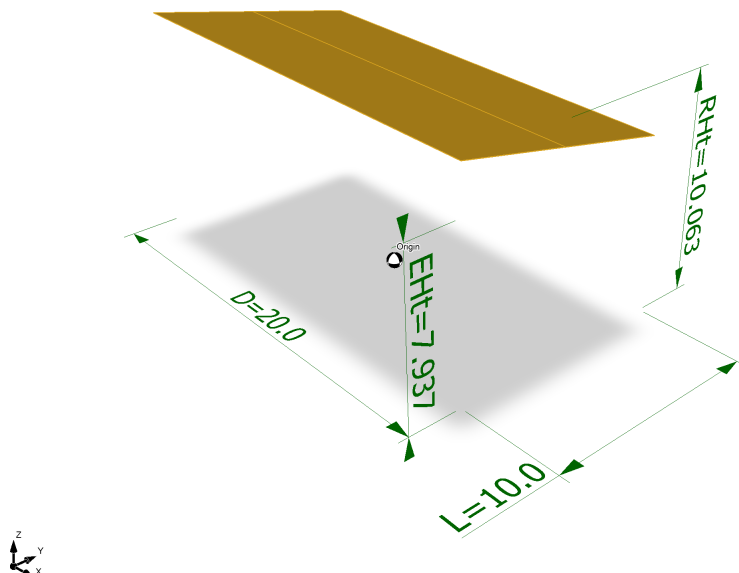**Figure 1** Wind load 1   02 - F01
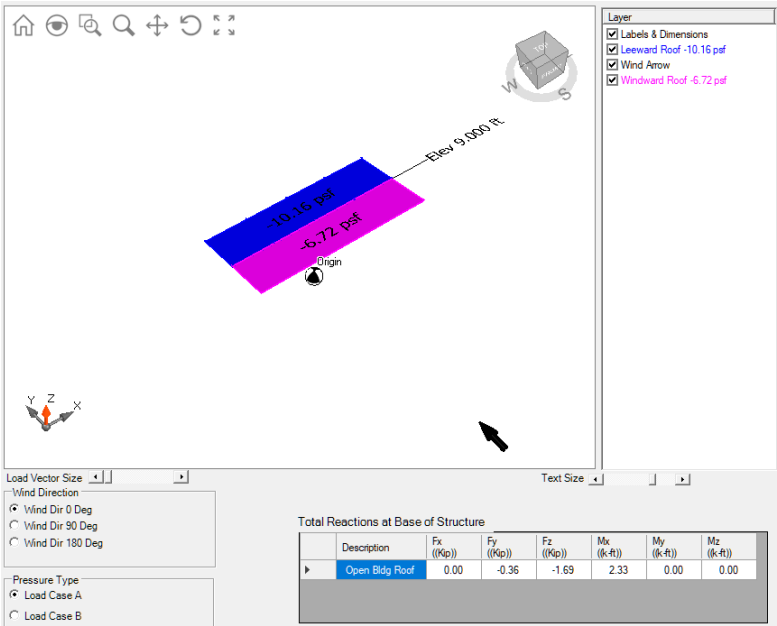

Figure 2 Wind load 2   02 - F02

The permit approval is under the jurisdiction of the City of Larkspur, California which adopted the 2019 California Building Code [CBC] and the 2019 California Residential Code [CRC] as the basis for permiting construction work. The canopy is designed for compliance with the requirements of the CBC.

Table 01 Standards   02 - T01

Category	Standard	Year
Loading	ASCE-7	2016
Concrete	ACI-318	2014
Wood-National Design Specifications	AWC-NDS	2018
Wood-Special Design Provisions for Wind and Seismic	AWC-SDPWS	2015
Wood Frame Construction Manual	AWC-WFCM	2018

Basic loads and load combinations are derived from the California Building and Residential Codes.

Table 02 Load Types   02 - T02

Sym	Load Effect	Notes
D	Dead load	See IBC 1606 and Chapter 3 of this publication
E	Combined effect of horizontal and vertical earthquake-induced forces as defined in ASCE/SEI 12.4.2	See IBC 1613, ASCE/SEI 12.4.2 and Chapter 6 of this publication

Sym	Load Effect	Notes
Em	Maximum seismic load effect of horizontal and vertical forces as set forth in ASCE/SEI 12.4.3	See IBC 1613, ASCE/SEI 12.4.3 and Chapter 6 of this publication
H	Load due to lateral earth pressures, ground water pressure or pressure of bulk materials	See IBC 1610 for soil lateral loads
L	Live load, except roof live load, including any permitted live load reduction	See IBC 1607 and Chapter 3 of this publication
Li	Roof live load including any permitted live load reduction	See IBC 1607 and Chapter 3 of this publication
R	Rain load	See IBC 1611 and Chapter 3 of this publication
W	Load due to wind pressure	See IBC 1609 and Chapter 5 of this publication

Table 03 Load Combinations   02 - T03

CBC 2019 reference	Equation
Equation 16-1	1.4(D +F)
Equation 16-2	1.2(D + F) + l.6(L + H) + 0.5(L
Equation 16-3	1.2(D + F) + l.6(Lr or S or R) + l.6H + (f1L or 0.5W)
Equation 16-4	1.2(D + F) + 1.0W + f1L +1.6H + 0.5(Lr or S or R)
Equation 16-5	1.2(D + F) + 1.0E + f1L + l.6H + f2S
Equation 16-6	0.9D+ l.0W+ l.6H
Equation 16-7	0.9(D + F) + 1.0E+ l.6H

Gravity Loads and Seismic Mass   **SECTION [0101] - 3**

Some filler text

Table 04 Roof unit dead loads   03 - T04

variable	value	[value]	description
ld1	2.0 psf	0.10 KPa	Urethane foam (4 inch thick)
ld2	1.0 psf	0.05 KPa	Three-ply roofing
ld3	5.0 psf	0.24 KPa	Doug Fir decking 2-in.
ld4	1.0 psf	0.05 KPa	Doug Fir beams 4x12 at 12 ft o.c.
_ _	_ _	_ _	Total
roofdl1	9.0 psf	0.43 KPa	Total roof unit load

Table 05 Floor unit dead loads   03 - T05

variable	value	[value]	description
ld1	3.0 psf	0.14 KPa	3/4 in. hardwood flooring
ld2	2.0 psf	0.10 KPa	1/2 in. plywood subfloor
ld3	4.0 psf	0.19 KPa	2x10 joists at 16 in. o.c.
ld4	1.5 psf	0.07 KPa	fixtures
_ _	_ _	_ _	Total
floordl1	10.5 psf	0.50 KPa	Total floor unit load

Table 06 Interior wall unit dead loads   03 - T06

variable	value	[value]	description
ld1	5.5 psf	0.26 KPa	5/8" sheet rock (2)
ld2	2 psf	0.10 KPa	2x4 studs at 16" o.c.
ld3	1.5 psf	0.07 KPa	fixtures
_ _	_ _	_ _	Total
intwalldl1	9 psf	0.43 KPa	Total interior wall unit load

Table 07 Exterior wall unit dead loads   03 - T07

variable	value	[value]	description
ld1	2.0 psf	0.10 KPa	1/2 in plywood sheathing
ld2	2.0 psf	0.10 KPa	2x4 studs at 16 in o.c.
ld3	3.0 psf	0.14 KPa	5/8 in sheet rock
ld4	1.5 psf	0.07 KPa	fixtures
_ _	_ _	_ _	Total
extwalldl1	8.5 psf	0.41 KPa	Total exterior wall unit load

Table 08 Areas   03 - T08

variable	value	[value]	description
arearf1	1700.00 sf	157.94 sM	roof area
areaflr1	1200.00 sf	111.48 sM	floor area
htwall1	9.00 ft	2.74 m	wall height
lenwall1	110.00 ft	33.53 m	interior wall length
lenwall2	155.00 ft	47.24 m	exterior wall length 2

Eq. 1 Roof weight   03 - E01

$$rfwt_1 = arearf_1 \cdot roofdl_1$$

$$15300.00 \text{psf·sf} = 9.00 \text{psf} \cdot 1700.00 \text{sf}$$

Eq. 2 Floor weight 03 - E02

$$\text{flrwt}_1 = \text{areaflr}_1 \cdot \text{floordl}_1$$

$$12600.00\text{psf·sf} = 10.50\text{psf} \cdot 1200.00\text{sf}$$

Eq. 3 Partition weight 03 - E03

$$\text{partwt}_1 = \text{htwall}_1 \cdot \text{intwalldl}_1 \cdot \text{lenwall}_1$$

$$8910.00\text{ft}^2\text{·psf} = \text{htwall}_1 \cdot \text{intwalldl}_1 \cdot 110.00\text{ft}$$

Eq. 4 Exterior wall weight 03 - E04

$$\text{exwallwt}_1 = \text{extwalldl}_1 \cdot \text{htwall}_1 \cdot \text{lenwall}_2$$

$$11857.50\text{ft}^2\text{·psf} = \text{extwalldl}_1 \cdot \text{htwall}_1 \cdot 155.00\text{ft}$$

Eq. 5 Total building weight 03 - E05

$$\text{totwt}_1 = \text{exwallwt}_1 + \text{flrwt}_1 + \text{partwt}_1 + \text{rfwt}_1$$

$$48667.50\text{psf·sf} = 11857.50\text{ft}^2\text{·psf} + 8910.00\text{ft}^2\text{·psf} + 12600.00\text{psf·sf} + 15300.00\text{psf·sf}$$

Table 09 Weights 03 - T09

variable	value	[value]	description [eq. number]
rfwt1	15.30 kip	68.06 KN	Roof weight [01]
flrwt1	12.60 kip	56.05 KN	Floor weight [02]
partwt1	8.91 kip	39.63 KN	Partition weight [03]
exwallwt1	11.86 kip	52.74 KN	Exterior wall weight [04]
totwt1	48.67 kip	216.48 KN	Total building weight [05]

Material Densities and Seismic Models SECTION [0101] - 4

Because the T&G roof is relatively more flexible, the effective floor load for seismic models is calculated as the sum of the floor and all of the partition weight.

Eq. 6 Effective model floor load 04 - E06

$$\text{eflrdl}_1 = \frac{\text{flrwt}_1 + \text{partwt}_1}{\text{areaflr}_1}$$

$$17.93\text{psf} = \frac{8910.00\text{ft}^2\text{·psf} + 12600.00\text{psf·sf}}{1200.00\text{sf}}$$

Eq. 7 Effective model floor density 04 - E07

$$\text{eflrdens}_1 = \frac{\text{eflrdl}_1}{0.5 \cdot \text{IN}}$$