

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:

- [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

Client:

Date:

Location:

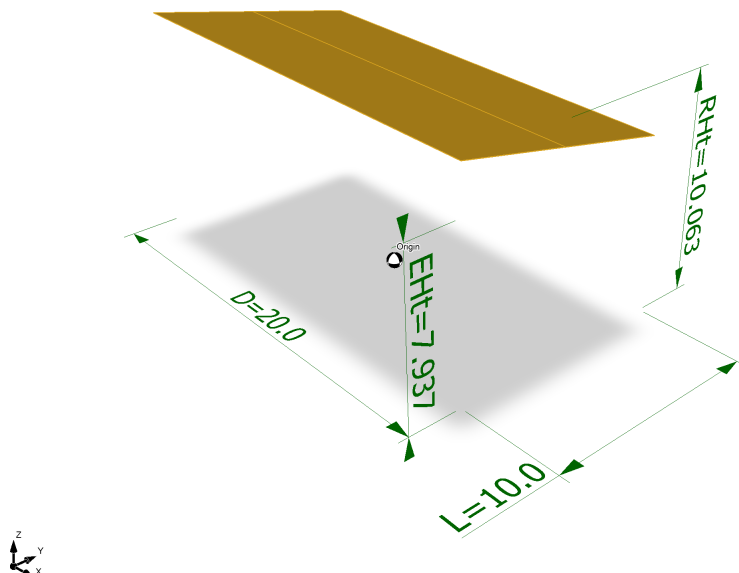
Governing Codes**SECTION [0101] - 2**

Figure 1 Wind load 1

02 - F01

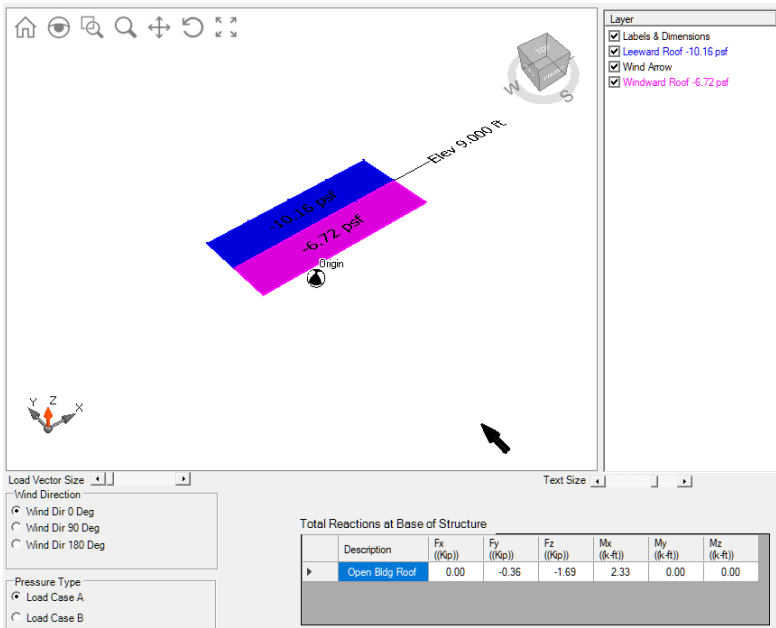


Figure 2 Wind load 2

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 permitting 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

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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	$1.2(D + F) + 1.6(L + H) + 0.5(L)$
Equation 16-3	$1.2(D + F) + 1.6(L_r \text{ or } S \text{ or } R) + 1.6H + (f_1L \text{ or } 0.5W)$
Equation 16-4	$1.2(D + F) + 1.0W + f_1L + 1.6H + 0.5(L_r \text{ or } S \text{ or } R)$
Equation 16-5	$1.2(D + F) + 1.0E + f_1L + 1.6H + f_2S$
Equation 16-6	$0.9D + 1.0W + 1.6H$
Equation 16-7	$0.9(D + F) + 1.0E + 1.6H$

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

$$rfwt_1 = arearf_1 \cdot roofdl_1$$

$$15300.00psf \cdot sf = 9.00psf \cdot 1700.00sf$$

Eq. 2 Floor weight

03 - E02

$$flrwt_1 = areaflr_1 \cdot floordl_1$$

$$12600.00psf \cdot sf = 10.50psf \cdot 1200.00sf$$

Eq. 3 Partition weight

03 - E03

$$partwt_1 = htwall_1 \cdot intwalldl_1 \cdot lenwall_1$$

$$8910.00ft^2 \cdot psf = htwall_1 \cdot intwalldl_1 \cdot 110.00ft$$

Eq. 4 Exterior wall weight

03 - E04

$$exwallwt_1 = extwalldl_1 \cdot htwall_1 \cdot lenwall_2$$

$$11857.50ft^2 \cdot psf = extwalldl_1 \cdot htwall_1 \cdot 155.00ft$$

Eq. 5 Total building weight

03 - E05

$$totwt_1 = exwallwt_1 + flrwt_1 + partwt_1 + rfwt_1$$

$$48667.50psf \cdot sf = 11857.50ft^2 \cdot psf + 8910.00ft^2 \cdot psf + 12600.00psf \cdot sf + 15300.00psf \cdot sf$$

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

$$eflrdl_1 = \frac{flrwt_1 + partwt_1}{areaflr_1}$$

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