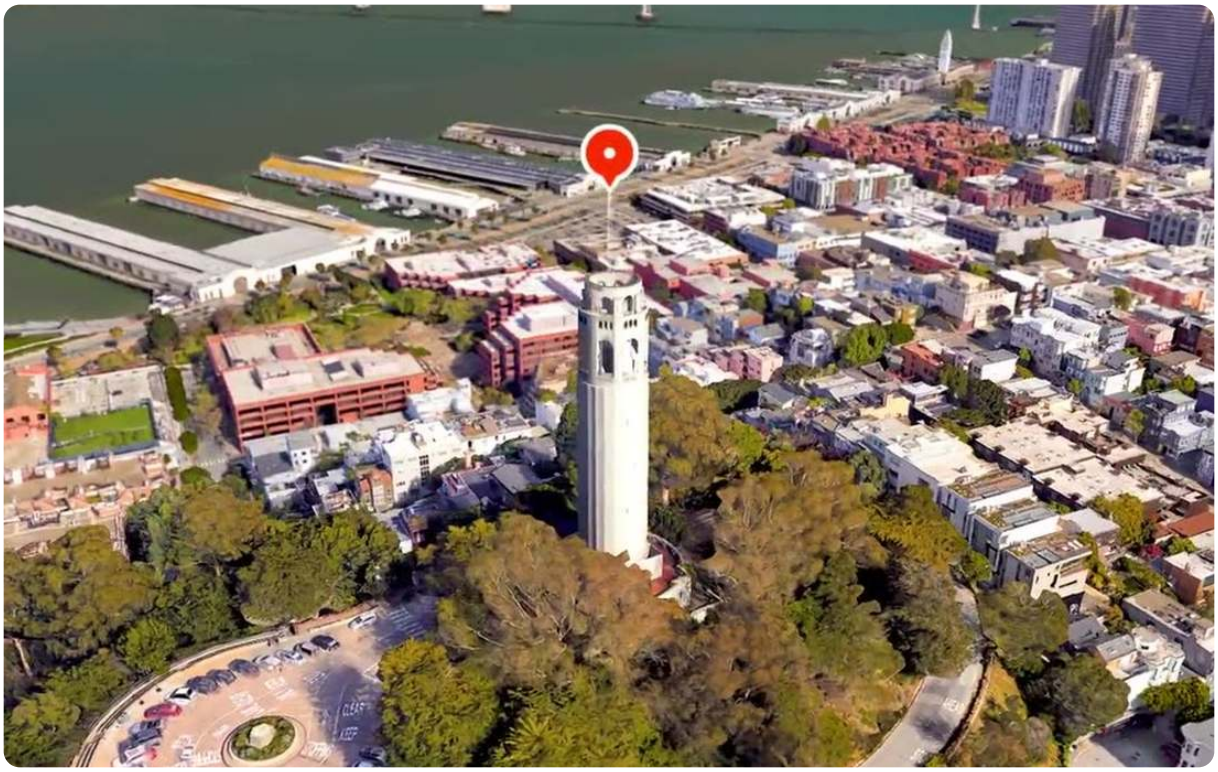


Angled aerial view. Imagery © Google.

SITE SPECIFIC HAZARD REPORT

Coit Tower

1 Telegraph Hill Boulevard
San Francisco, California 94133

Site Hazard Report and Design Criteria
Report HR SAMPLE
October 14, 2026

STATE OF CALIFORNIA
REGISTERED
PROFESSIONAL ENGINEER
THOMAS J. YATES
REPORT HR SAMPLE
PAGE 1 OF 52
SITE HAZARD REPORT ONLY 10-14-2026

Design Values at a Glance

For solar installers, solar designers and building designers. 1 Telegraph Hill Boulevard, San Francisco, California 94133.
Adopted code: 2025 California Building Code, with ASCE/SEI 7-22. Risk Category II. Tap a card for the backup.

WIND

ASCE 7-22
Chapter 26
Section 26.5

92 mph

Basic wind speed V, Risk Category II, 3 second gust

Exposure	**D**	*Section 26.7*
Topographic factor Kzt	**2.98**	*Section 26.8*
Ground elevation	**286 ft**	*Section 26.9*
Wind directionality Kd	**0.85**	*Table 26.6-1*

SEISMIC

ASCE 7-22
Chapters 11 to 13
Section 11.4

SDS 1.11 g

Design spectral acceleration, short period, Site Class Default

SD1	**1.13 g**	*Section 11.4.5*
SS / S1	**1.50 g / 0.60 g**	*Section 11.4.2*
Seismic Design Category	**D**	*Section 11.6*
Site Class	**Default**	*Chapter 20*
Ie (Risk Category II)	**1.0**	*Table 1.5-2*
PGAM	**0.58 g**	*Section 11.8.3*

SOIL

CBC 2025
Table 1806.2
Section 1806

No value given

Poor soil mapped; a geotechnical investigation is required

Lateral bearing	**100 psf per ft**	*Table 1806.2*
Sliding cohesion	**130 psf**	*Section 1806.3.2*
Soil class adopted	**Class 5, clay and silt**	*Table 1806.2*

SNOW

4 psf
Ground snow load, pg
Roof snow S = 4.0 psf
ASCE 7-22 Chapter 7

RAIN

NOT AVAILABLE
Rainfall data not available
when this was built
ASCE 7-22 Chapter 8

ICE

None
Ice from freezing rain
No ice load at this site
ASCE 7-22 Chapter 10

FLOOD

Zone X
Outside the 100-year
flood area
National flood map

TORNADO

Not required
Tornado loads apply to Risk
Category III and IV only
ASCE 7-22 Chapter 32

NEAREST FAULT

8.9 mi SW
Serra fault zone
3 mapped faults within 10 miles
Published fault mapping

Each value is worked out in the section behind it. Soil values are presumptive code values for allowable stress design, not a soil investigation; a geotechnical report governs where there is one.

Index

Tap a section to go there. The colored tab at the right edge of every page brings you back here.

GLANCE	**Design Values at a Glance** Wind, seismic, soil, snow, rain, ice, flood, tornado and faults at one look	Page 2
SUMMARY	**Hazard Summary and What the Values Mean** Every hazard at the site, in plain words	Pages 4 to 8
SITE	**Site Maps and Street Views** Location, district, block and close-up maps; street views	Pages 9 to 14
VALUES	**Design Values** Design values summary, seismic design category, wind exposure	Pages 15 to 17
AERIALS	**Angled Aerials and Street Views** Tilted aerials from four directions and above; street views	Pages 18 to 24
SNOW	**Snow, Rain and Ice** Ground snow, rainfall intensity by Risk Category, ice from freezing rain	Pages 25 to 27
SEISMIC	**Earthquake** Seismic design data and the fault map	Pages 28 to 30
WIND	**Wind** Wind speeds, tornado, exposure, hill speed-up and ground profiles	Pages 31 to 37
BUILDINGS	**Sample Buildings at This Site** Wind and earthquake forces on four example buildings	Pages 38 to 42
SOIL	**Ground, Geology and Soils** Foundation values, geology, soils, flood and subsurface records	Pages 43 to 50
CONTACT	**Questions About Your Site** Contacts, your report number and referrals	Page 51

SUMMARY

Hazard Summary

1 Telegraph Hill Boulevard, San Francisco, California 94133.

The nearest mapped earthquake fault is the Serra fault zone, 8.9 miles to the southwest, and 3 mapped faults lie within 10 miles. Strong earthquake shaking is expected here, as it is across most of coastal California (Seismic Design Category D). The property is outside the state's liquefaction, earthquake landslide and fault rupture zones. It is outside the tsunami hazard area. The national flood map places it in flood Zone X, outside the 100-year flood area. The site values for engineering here are a 92 mph wind gust and no meaningful snow. Because the property sits high on a hill, the wind speeds up as it comes over the slope, and the design wind pressure here is about 3.0 times what it would be on flat ground. Each of these is explained on the next page, and each has its own map or page later in the report.

Earthquake	At this address	Source
Nearest mapped earthquake fault	Serra fault zone, 8.9 miles SW	Published fault mapping
Mapped faults within 10 miles	3	Published fault mapping
Seismic Design Category	D (SDS 1.11 g, SD1 1.13 g)	ASCE 7-22
Alquist-Priolo fault zone	Outside	State mapping
Liquefaction zone	Outside	State mapping
Earthquake landslide zone	Outside	State mapping
Tsunami hazard area	Outside	State mapping

Wind	At this address	Source
Basic wind speed	92 mph	ASCE 7-22
Wind exposure and hill effect	Exposure D, Kzt 2.98	ASCE 7-22, terrain data

Flood	At this address	Source
Flood zone	Zone X	Flood map

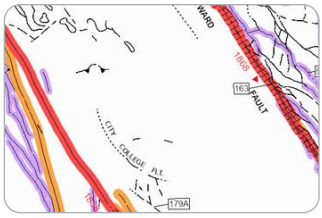
Snow and Ice	At this address	Source
Ground snow load	4 psf	ASCE 7-22
Ice thickness	Not applicable at this site	ASCE 7-22

Soil	At this address	Source
Shrink-swell clay	Not shown by the soil survey	Soil survey
Mapped soil	Urban land-Orthents	Soil survey

SUMMARY

What These Values Mean

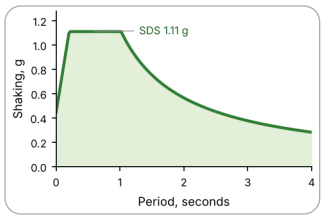
Nearest mapped earthquake fault



At this address: Serra fault zone, 8.9 miles to the SW; 3 mapped faults within 10 miles.

A fault is a break in the earth's crust where earthquakes start. Published maps show the faults that have moved in about the last 1.6 million years. Distance matters because shaking is generally stronger closer to the fault that moves. Having a fault a few miles away is common in much of California and does not by itself make a house unsafe; the map of faults near the property is later in this report.

How engineers use it: Geologists and engineers use the distance to decide whether a fault study is needed before building. The earthquake shaking values below already include the effect of the faults nearby.



Seismic Design Category, SDS and SD1

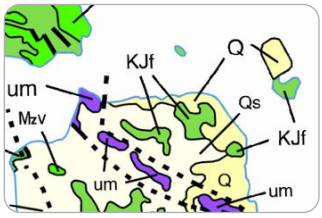
At this address: Category D, SDS 1.11 g, SD1 1.13 g.

Engineers grade every site from A to F by how hard the ground is expected to shake and how much earthquake design a new building needs. A and B are low, C is moderate, and D through F are high. SDS and SD1 are the design shaking levels, written as a fraction of the pull of gravity (g). SDS applies to short, stiff buildings like most houses; SD1 applies to taller, more flexible ones.

How engineers use it: Engineers use SDS and SD1 to size the walls, bracing, hold-downs and connections that keep a building standing in an earthquake, so it meets the building code. The category sets which earthquake details the code requires. A seismic retrofit of an existing house is designed from the same values.

Compared: Highest within 20 miles: SDS 1.83 g, 10 miles northeast. Wichita, Kansas: Category B, SDS 0.11 g. Tokyo, Japan: about 1.0 g, the Japanese code's design shaking for a severe earthquake, a comparison of size only, since the two codes measure it differently.

Alquist-Priolo fault zone



At this address: Outside.

California draws these zones along faults that could break the ground surface in an earthquake. Inside one, the state generally requires a geologic study before a new building is built, and a seller must disclose it.

How engineers use it: Inside a zone, a geologist must show that no active fault crosses the building spot before a permit is issued for a new home.

Liquefaction zone

At this address: Outside.

In strong shaking, loose, wet sand can act like a liquid for a short time, and the ground can settle or shift under a building. The state maps the areas where this is likely.

How engineers use it: Inside a zone, the building department usually requires a soil report, and engineers may call for deeper foundations, a stiffer slab or ground improvement.

SUMMARY

What These Values Mean

Earthquake landslide zone

At this address: Outside.

Areas where the state found that slopes could slide when the ground shakes.

How engineers use it: Inside a zone, a soil and slope study is usually required before building, and the foundation and retaining walls are designed for it.

Tsunami hazard area

At this address: Outside.

Low-lying ground near the coast that could flood if a tsunami came ashore. These maps are made for evacuation planning.

How engineers use it: It is used for evacuation planning, and for some larger buildings near the coast, to design for tsunami forces.

Flood zone

At this address: Zone X.

The national flood maps rate the chance of flooding. Zone X is outside the 100-year flood area. Zones that begin with A or V are inside it, and a lender making a federally backed loan there will require flood insurance. Zone D means the national flood maps have not studied the area.

How engineers use it: Engineers and builders use the zone to set how high the lowest floor must be and how the foundation is built; lenders use it to decide whether flood insurance is required.

Basic wind speed

At this address: 92 mph.

The wind gust engineers design for at this site: a three-second gust measured 33 feet above open ground. For a house, a gust this strong has about a 7 percent chance of happening in any 50-year period.

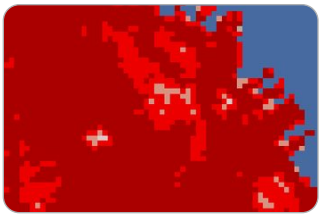
How engineers use it: Engineers use this wind speed to design the roof framing, walls, windows and doors, and the attachment of solar panels to the roof, so they stay in place in a windstorm.

Compared: Highest within 20 miles: 92 mph, 20 miles northeast. Wichita, Kansas: 110 mph.

SUMMARY

What These Values Mean

Wind exposure and hill effect



At this address: Exposure D, Kzt 2.98.

Exposure describes what surrounds the property. B is a town or suburb with buildings and trees close by, C is open country with scattered buildings, and D is next to open water. Kzt measures how much a hill or ridge speeds the wind up; 1.00 means no increase. The ground was checked in eight directions to set it.

How engineers use it: These raise or lower the wind pressure that comes from the basic wind speed. Engineers apply them in every wind calculation, from roof framing to solar panel attachments.

Ground snow load

At this address: 4 pounds per square foot.

The weight of snow on the ground, in pounds per square foot, that roofs are designed from. A value of a few pounds or less means snow is rare.

How engineers use it: Engineers use this to size rafters, roof beams, headers and solar panel racking for the weight of snow, including the deeper drifts that build up against taller walls.

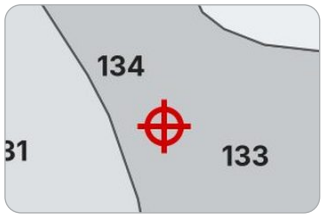
Compared: Highest within 20 miles: 12 psf, 20 miles east. Wichita, Kansas: 23 psf.

Ice thickness

At this address: None at this site.

The thickness of ice that can build up on wires, railings and towers in a freezing rain storm.

How engineers use it: It is used to design exposed railings, signs, towers and antennas for the weight of the ice and the wind on it.



Shrink-swell clay

At this address: Not shown by the soil survey.

Some clay soils swell when they get wet and shrink when they dry out, and over the years that movement can crack slabs, walks and foundations. The rating comes from published soil maps.

How engineers use it: Engineers design the foundation for the movement of the clay. Swelling clay often calls for deeper footings, a thicker reinforced slab or a post-tensioned slab, and a soil report is recommended before design.

Mapped soil

At this address: Urban land-Orthents.

The name of the soil mapped at the surface of the property. "Urban land" means the natural ground has been covered or reworked by development, so the true soil under the house is best confirmed by a soil engineer when it matters.

How engineers use it: The soil type guides the choice of foundation and the soil pressure used to size the footings. The soil survey rates this soil very limited for homes without basements. Because of this rating, hiring a geotechnical (soils) engineer before a foundation is designed is recommended.

What These Values Mean

SUMMARY

Important: Read Before Relying on This Report

This report is information to get you started. It is compiled from professional sources and the adopted building code. This information does not take the place of testing and sampling: no test pit, boring or cone penetrometer test was made, and nothing was measured at the property. Map boundaries are approximate and depend on the scale, method and date of the original mapping. For more precise ground data, APEX Engineering recommends hiring a professional soils engineer, who gathers it by geotechnical engineering methods. Contact APEX Engineering for a more thorough review wherever a value is in question, and for any question about this data or how it applies to your project.

Scope of This Report

This report gathers the natural hazards at the address and the site values for engineering at this address. APEX Engineering gathered this information carefully, drawing on decades of structural engineering expertise, from professional sources and the adopted building code. No test pit, boring or cone penetrometer test was made, no material was sampled, no strength or serviceability test was performed, and nothing was measured at the property. This report does not take the place of the Natural Hazard Disclosure statement under California law. A zone is reported where a public agency has mapped one. Risk Category II and Site Class Default are used throughout.

Engineer's Statement

The design values on the Design Values Summary page of this report are the values of ASCE 7-22 and the 2025 California Building Code for this address at Risk Category II, as determined by APEX Engineering, site values for engineering at this address.

Limitation of Liability

APEX Engineering stands behind the values in this report as stated. How the values are applied in another party's design, drawings or calculations rests with that party, unless the completed work is sent to APEX Engineering for review. On request, APEX Engineering reviews completed work for accuracy, confirming that the correct parameters were used and applied properly.

SITE

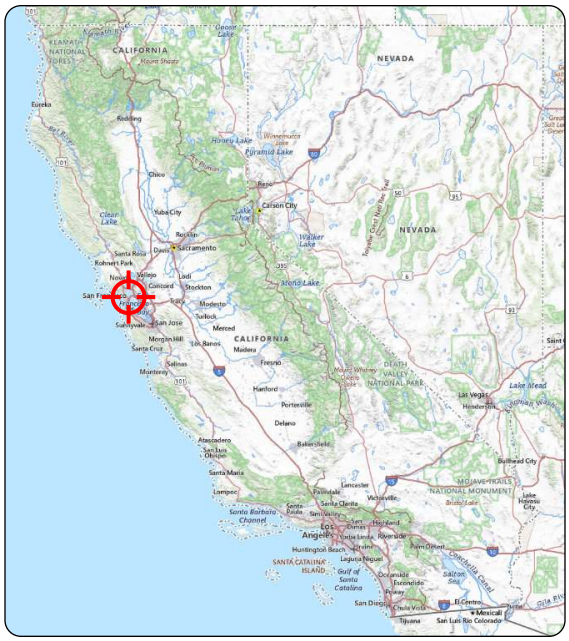
Site

Site maps, aerial views and street views

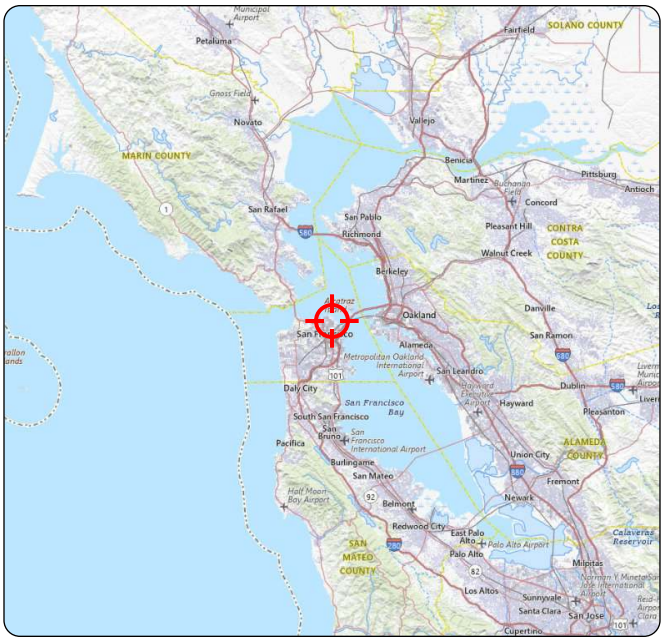
Design Values Summary

Seismic hazards and exposure

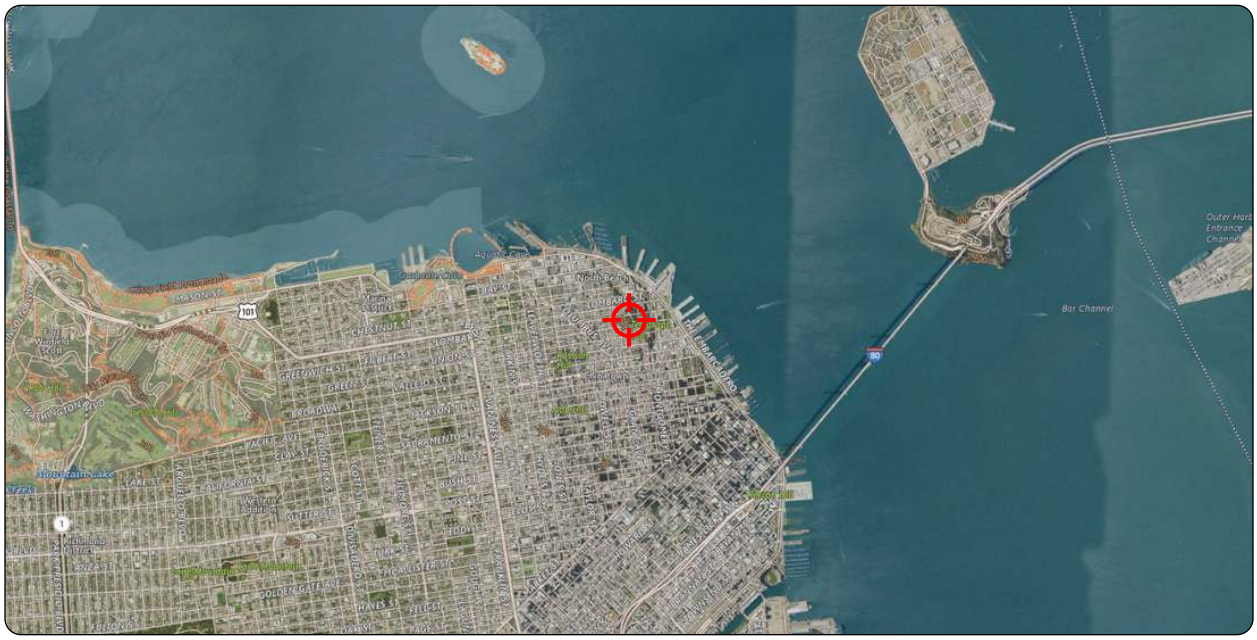
Site Location



State of California



Region, 70 miles across



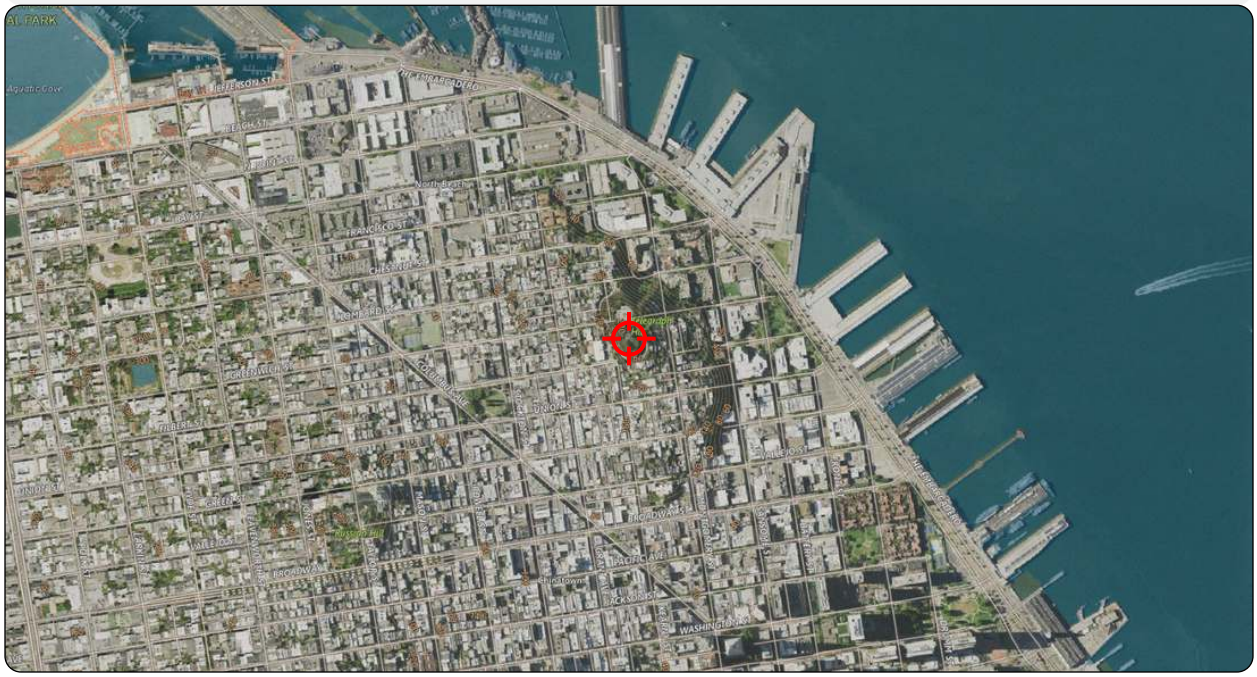
City, 8 miles across

Topographic base maps and aerial imagery.

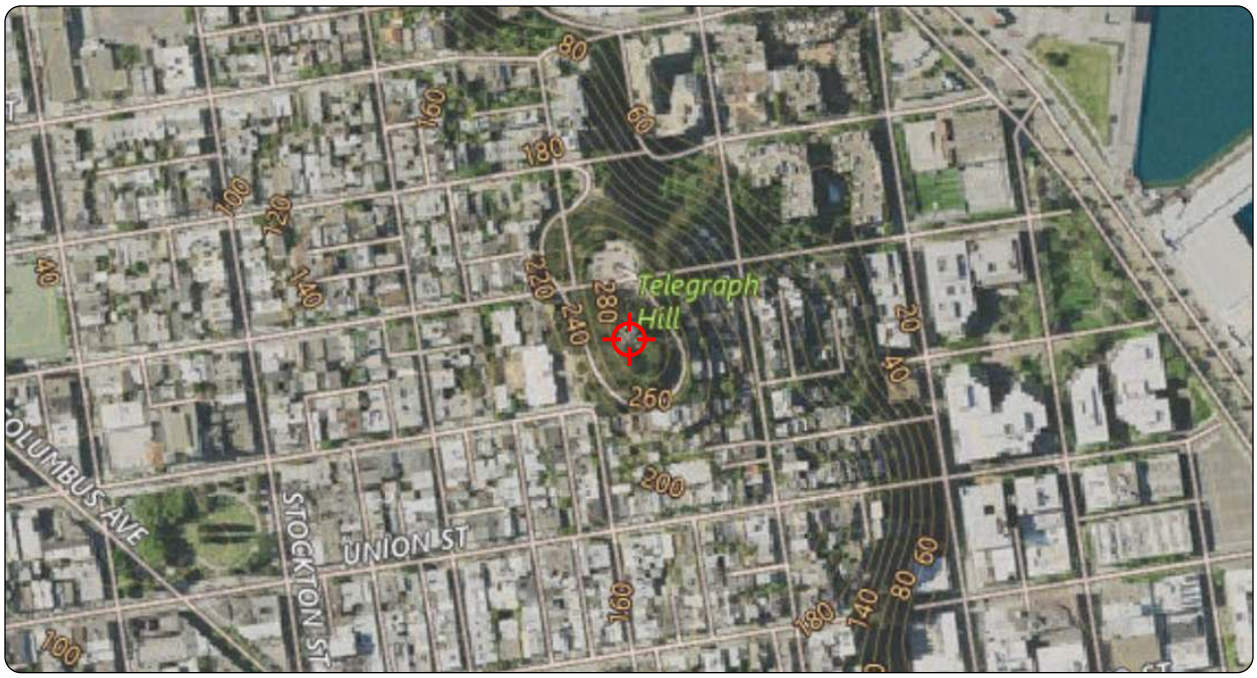
SITE

SITE

Site Map



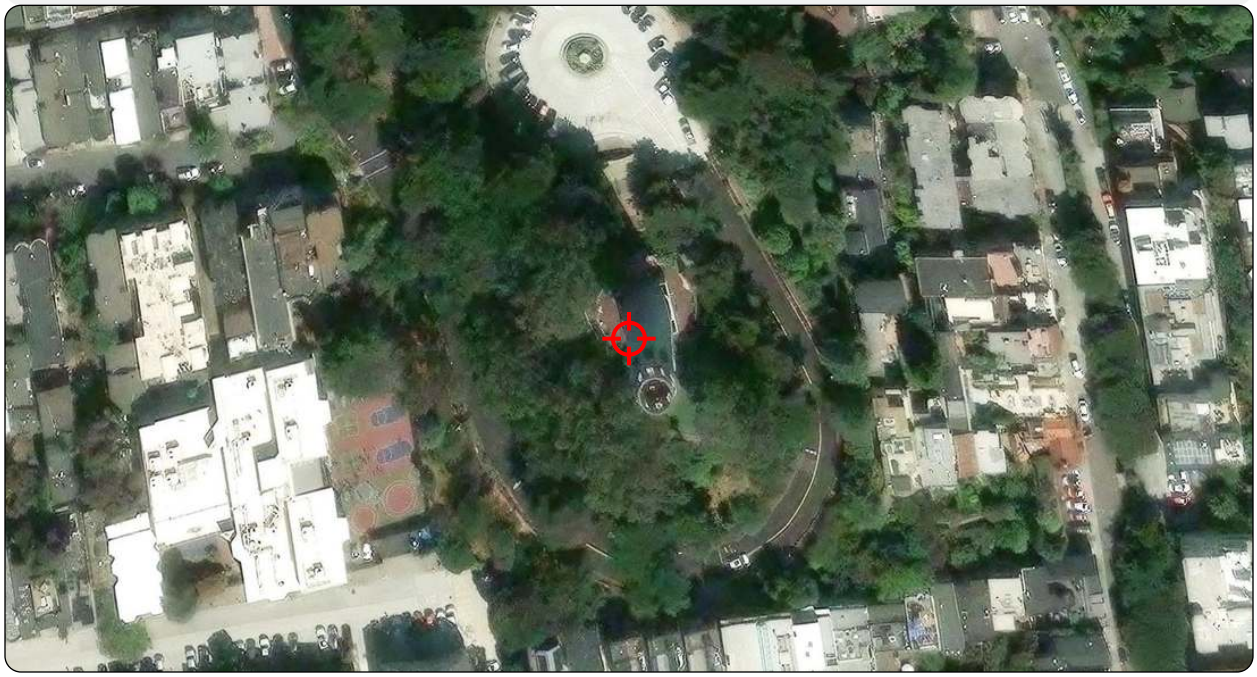
District, 2 miles across



Neighborhood, 3,500 feet across

1 Telegraph Hill Boulevard, San Francisco, California 94133. Latitude 37.80231, longitude -122.40588, point address match. Site elevation 285.8 ft (ASCE) and 299.5 ft (second survey).

Site Aerial



Block, 900 feet across

Lot, 300 feet across

Aerial imagery.

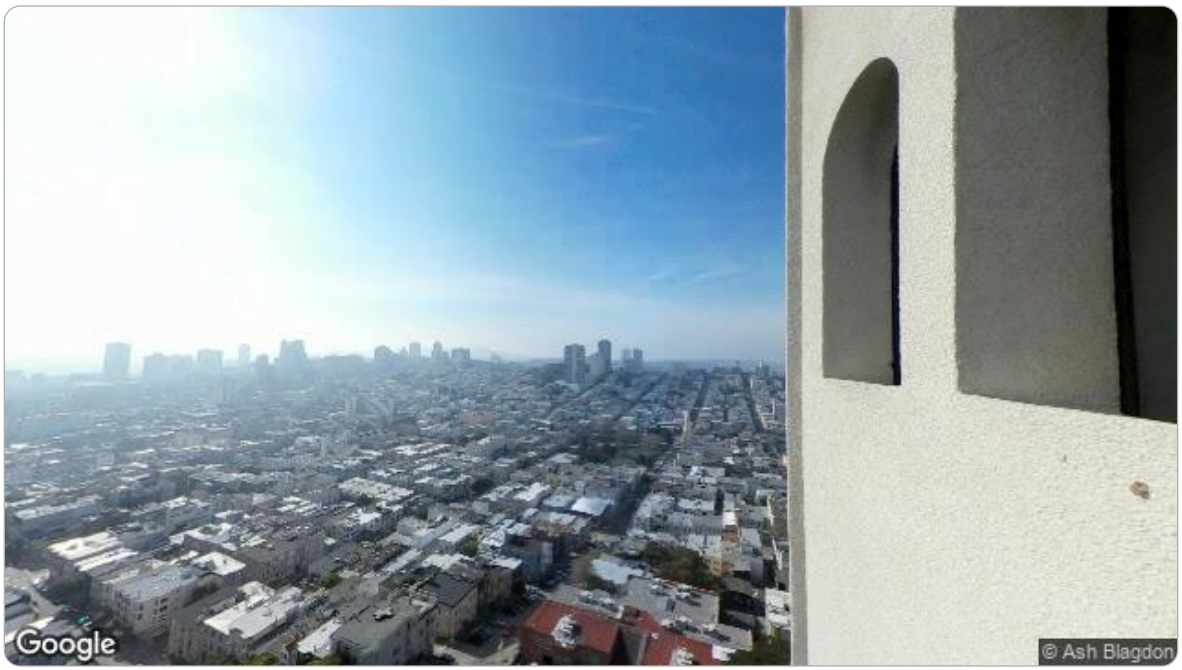
Site Close-Up

House, 150 feet across

Aerial imagery, deepest zoom level available at this site, about 4.6 inches of ground per pixel.

SITE

Street Views



Front view, zoomed out, looking W toward the site
From about 11 ft away. Image date 2017-04.

Front view, looking W toward the site
From about 11 ft away. Image date 2017-04.

Design Values Summary

1 Telegraph Hill Boulevard, San Francisco, California 94133. Latitude 37.80231, longitude -122.40588. Ground elevation 286 ft. Risk Category II.

AHJ: City of San Francisco Building Department.

Wind, Snow and Ice	Value	Basis
Basic wind speed, V	***92 mph***	*Section 26.5*
Exposure	***D (governing sector N)***	*Section 26.7*
Topographic factor, K_{zt}	***2.98 (governing direction N)***	*Section 26.8*
Tornado	***Not applicable, Risk Category II***	*Chapter 32*
Ground snow load, p_g	***4 psf***	*Chapter 7*
Prescriptive snow, $p_{g(asd)}$	***2.8 psf***	*0.7 p_g, residential code*
Engineered roof snow load, S	***4.03 psf (0.7 S = 2.82 psf)***	*Ch. 7, unheated attic*
Ice thickness, concurrent gust	***Not applicable at this site***	*Chapter 10*

Seismic	Value	Basis
Site Class (soil)	***Default***	*Chapter 20*
Seismic Design Category	***D***	*Section 11.6*
Importance factor, I_e	***1.0***	*Table 1.5-2*
S_S / S_1	***1.50 g / 0.60 g***	*Section 11.4*
S_{MS} / S_{M1}	***1.66 g / 1.70 g***	*Section 11.4*
S_{DS}	***1.11 g***	*Section 11.4*
S_{D1}	***1.13 g***	*Section 11.4*
PGA_M	***0.58 g***	*Section 11.8.3*
T_S / T_0 / T_L	***1.020 s / 0.205 s / 12 s***	*Section 11.4*
Nearest mapped fault	***Serra fault zone, 8.9 miles SW***	*Published fault mapping*

Soil and Ground	Value	Basis
Soil type adopted	***Class 5: Clay and silt***	*CBC 2025 Table 1806.2*
Vertical foundation pressure	***No value given***	*Investigation required*
Lateral bearing pressure	***100 psf per ft below grade***	*CBC 2025 Table 1806.2*
Sliding cohesion	***130 psf***	*Section 1806.3.2*
Soil survey map unit	***Urban land-Orthents***	*Soil survey*
Geologic unit	***Q: Alluvium, Pleistocene-Holocene***	*State geologic map*
Estimated V_{s30}	***733 m/s (2,410 ft/s)***	*State estimate*
Depth to bedrock / water table	***None reported / None reported***	*Soil survey*
Shrink-swell clay	***Not shown by the soil survey***	*Soil survey*
Liquefaction / landslide zone	***Outside / Outside***	*State hazard zones*
Alquist-Priolo fault zone	***Outside***	*State hazard zones*
Tsunami hazard area	***Outside***	*State tsunami map*
Flood zone	***Zone X***	*Flood map*
Shallowest groundwater on record nearby	***32 ft below ground***	*State well records*
Corrosion, concrete / steel	***not rated / not rated***	*Soil survey*
Building-site rating	***very limited***	*Soil survey*

Each value is derived on its own page in this report. Soil values are presumptive code values from published mapping, not from a soil investigation; the vertical and lateral pressures are for allowable stress design and are not increased with the ASCE 7-22 Section 2.4 combinations.

VALUES

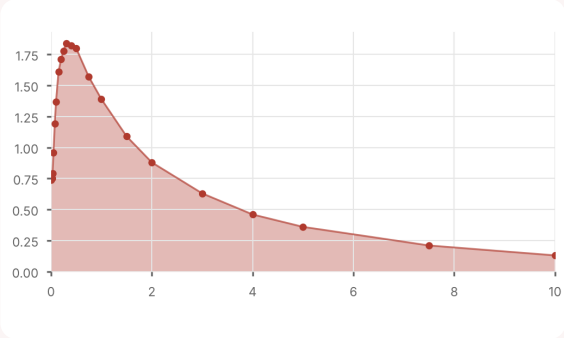
SEISMIC

Site Soil Class Default Seismic Design Category D

PGA_M 0.58	S_{MS} 1.66	S_{M1} 1.70	S_{DS} 1.11
S_{D1} 1.13	S_S 1.50	S_1 0.60	T_L 12 s

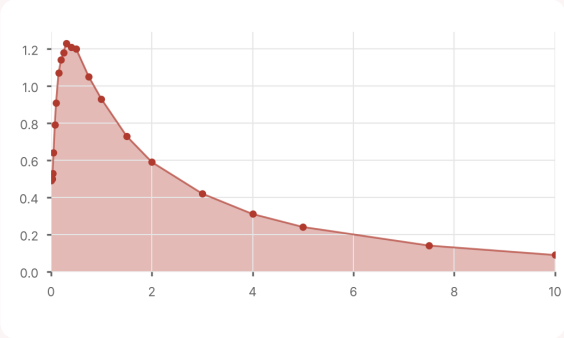
Multi-Period MCE_R Spectrum

Sa (g) vs T (s)



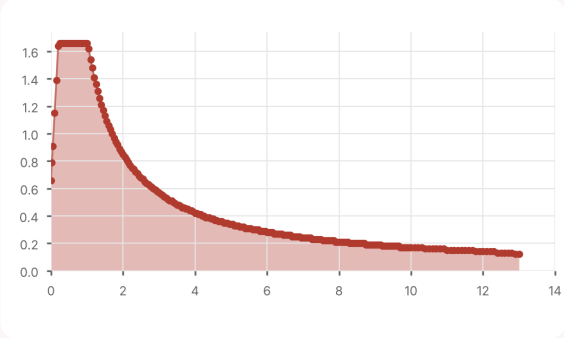
Multi-Period Design Spectrum

Sa (g) vs T (s)



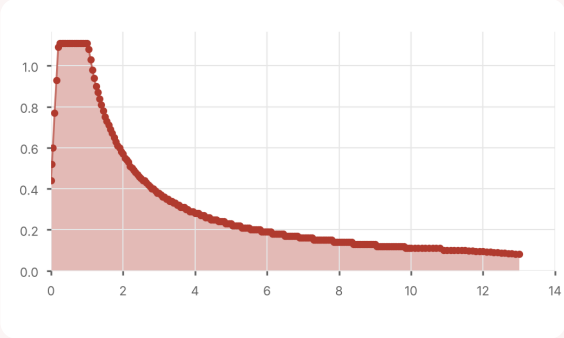
Two-Period MCE_R Spectrum

Sa (g) vs T (s)



Two-Period Design Spectrum

Sa (g) vs T (s)

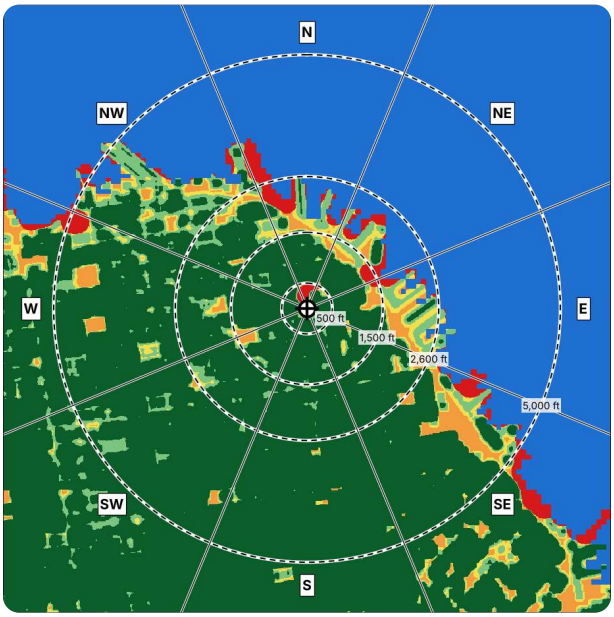


VERTICAL RESPONSE SPECTRA

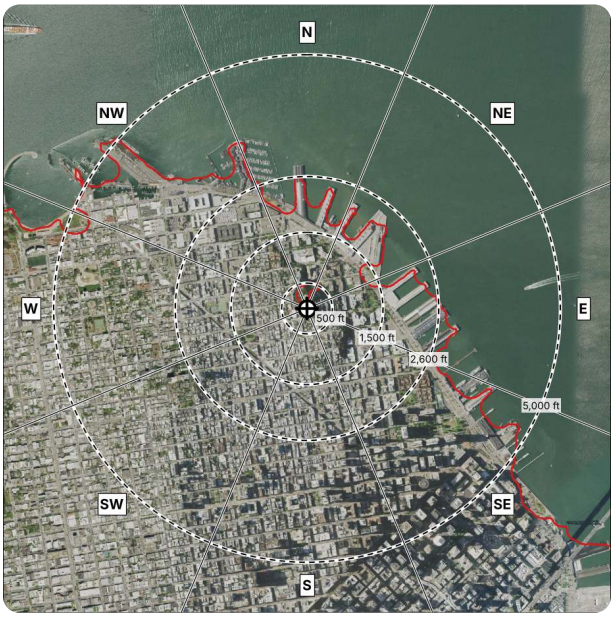
Vertical ground motion data has not yet been made available. Data source: Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2.

Exposure Analysis

Exposure D



Surface roughness of the ground. Rings at 500, 1,500, 2,600 and 5,000 ft.



Aerial at the same scale. Red outline: open patches counted.

Surface Roughness of the Ground

- **A** Not used. Deleted from ASCE 7 in 2002
- **B** z0 1.0 ft and over
- **B** z0 0.5 to 1.0 ft
- **C** z0 0.1 to 0.5 ft, not counted
- **C** z0 under 0.1 ft, not counted
- **C** Open patch counted, Commentary C26.7
- **D** Open water

z0 is the surface roughness length of the ground, worked out from building footprints with heights within 6,000 ft of the site. ASCE 7-22 Table C26.7-1: Exposure B ground has z0 of 0.5 ft and over; ground under 0.5 ft is open. Open ground is counted as an open patch only where it is large and wide enough under Commentary C26.7; streets, narrow strips and small lots stay part of Surface Roughness B and show in yellow and orange.

Exposure B, Section 26.7.3: Surface Roughness B prevails upwind for more than 1,500 ft for a mean roof height of 30 ft or less, and more than 2,600 ft or 20 times the height for taller buildings.

Exposure D, Section 26.7.3: Surface Roughness D prevails upwind for more than 5,000 ft, or the site is within 600 ft of that condition.

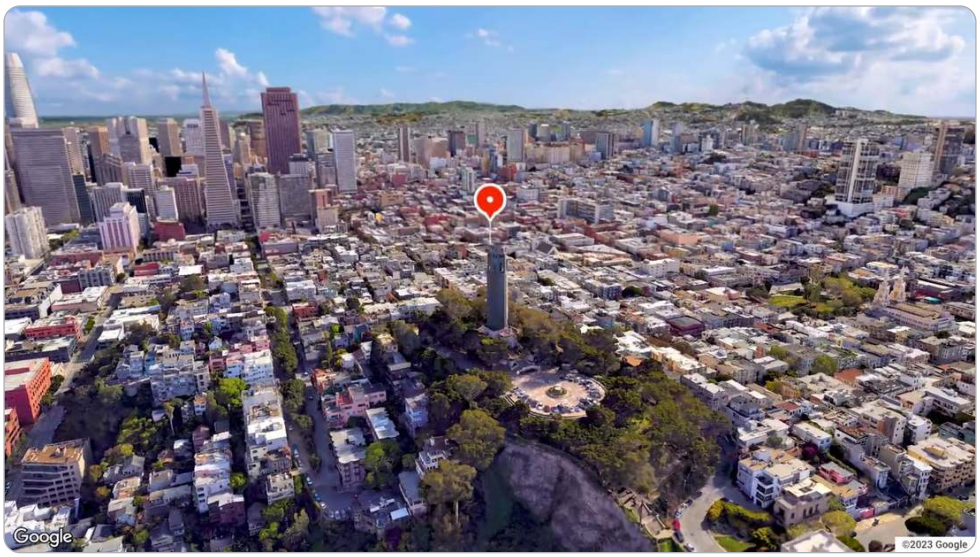
Governing sector: N, with open patches over 70% of the sector at the highest of the three radii. The calculation is in this report. EXPOSURE D.

Aerials and Street Views

Angled aerials from four directions and above

Street views around the property

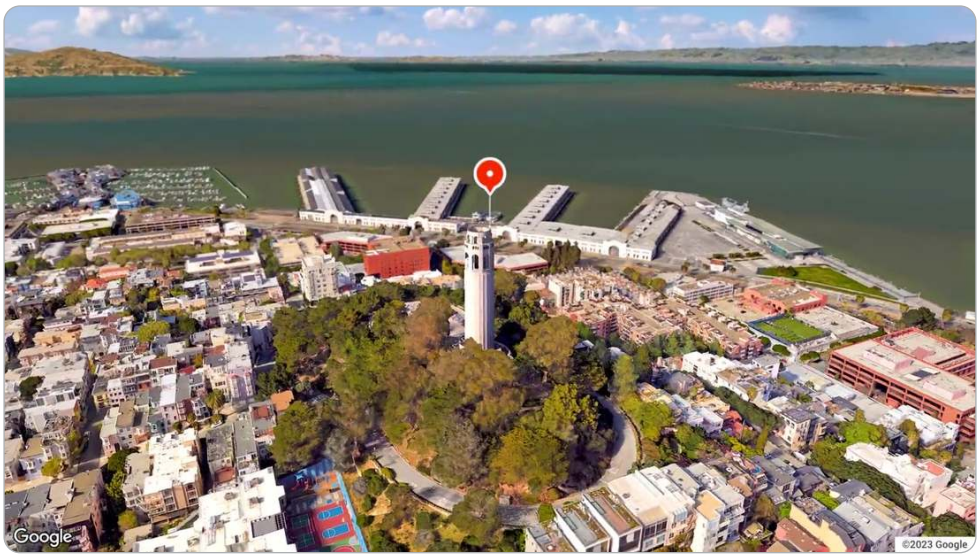
Angled Aerials



Tilted aerial view 1 of 4. 1 Telegraph Hill Boulevard, San Francisco, California 94133
Imagery © Google.

Tilted aerial view 2 of 4. 1 Telegraph Hill Boulevard, San Francisco, California 94133
Imagery © Google.

Angled Aerials



Tilted aerial view 3 of 4. 1 Telegraph Hill Boulevard, San Francisco, California 94133
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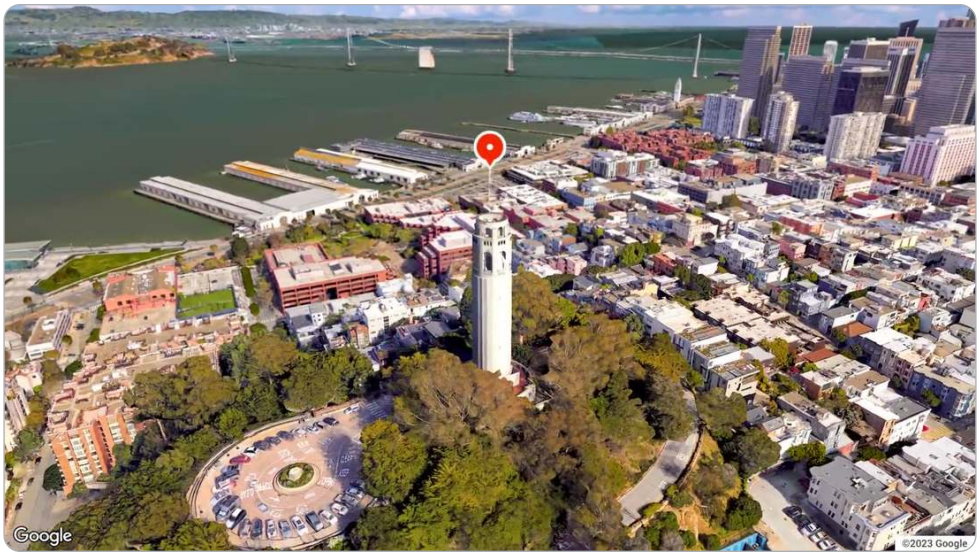


Tilted aerial view 4 of 4. 1 Telegraph Hill Boulevard, San Francisco, California 94133
Imagery © Google.

Street Views

Front view, zoomed in, looking W toward the site
From about 11 ft away. Image date 2017-04.

Front detail, left side, looking SW toward the site
From about 11 ft away. Image date 2017-04.

Street Views

Front detail, right side, looking W toward the site
From about 11 ft away. Image date 2017-04.

Roof view from the front, looking W toward the site
From about 11 ft away. Image date 2017-04.

Street Views

Far up the street, about 90 ft along, looking N toward the site
From about 90 ft away. Image date 2023-10.

Far down the street, about 90 ft along, looking S toward the site
From about 91 ft away. Image date 2016-04.

Street Views

Along the street to the left of the site, looking S
From about 11 ft away. Image date 2017-04.

Top view of the lot, 300 feet across
Straight-down aerial imagery.

Snow and Ice

Ice and Snow Data

Snow Load

ICE

ASCE/SEI 7-22 Chapter 10

Ice thickness	N/A
Concurrent temperature	N/A
3-second gust speed	N/A

Data source: ASCE/SEI 7-22, Figs. 10-2 through 10-8.

N/A
no ice

Ice thickness

SNOW

ASCE/SEI 7-22 Chapter 7

Ground snow load, p_g	4 lb/ft^2
20-year MRI value	1 lb/ft^2
Winter wind parameter	0.25
Mapped elevation	69.3 ft
Ground snow load for the IRC only, $p_{g(asd)}$	2.8 lb/ft^2

Data source: ASCE/SEI 7-22, Figures 7.6-1 and 7.6-2 A-D.

4
lb/ft^2

Ground snow load

Snow Load

Prescriptive Design, California Residential Code

Item	Value	Basis
Ground snow load, p_g	***4 psf***	*ASCE 7-22 ground snow load, Risk Category II*
Allowable stress, $p_{g(asd)}$	***2.8 psf***	*0.7 p_g, 2024 IRC Section R301.2.3*
Prescriptive limit, for reference	*70 psf*	*$p_{g(asd)}$ above 70 psf requires engineered design*

$p_{g(asd)}$ = 2.8 psf is within the 70 psf prescriptive limit.

Engineered Design, CBC 2025 Section 1608 and ASCE 7-22 Chapter 7

$p_f = 0.7\ C_e\ C_t\ p_g$

ASCE 7-22 Equation 7.3-1, flat roof snow load. The snow importance factor is no longer used; the ground snow load is mapped by Risk Category.

p_f = 0.7 (1.2) (1.2) (4) = 4.03 psf

Item	Value	Basis
Exposure factor, C_e	***1.2***	*Highest value in Table 7.3-1, sheltered roof*
Thermal factor, C_t	***1.2***	*Unheated attic, assumed on every job*
Flat roof snow load, p_f	***4.03 psf***	*Equation 7.3-1*
Minimum, low-slope roofs, p_m	***4 psf***	*Section 7.3.3: p_g, since p_g is 30 psf or less*
Slope factor, C_s	***1.0***	*No slope reduction taken*
Sloped roof snow load, p_s	***4.03 psf***	*$C_s\ p_f$, Section 7.4*
Design roof snow load, S	***4.03 psf***	*Greater of p_s and p_m, strength level*
Allowable stress, 0.7 S	***2.82 psf***	*ASCE 7-22 Section 2.4.1*

Conservative value. The attic is taken as unheated, so no building heat reaches the roof to melt snow, and the roof is taken as sheltered, the highest Ce. The product 0.7 Ce Ct is 1.01, which is why S exceeds the ground snow load. A roof-specific study with the actual Ce and slope gives a lower value, limited on a low-slope roof by the Section 7.3.3 minimum, pm = 4 psf.

Snow in the Load Combinations

Combination set	Combination	Snow term
Strength, ASCE 7-22 Section 2.3.1	***1.2D + 1.6L + 0.3S***	*1.21 psf*
	1.2D + 1.0S + (L or 0.5W)	*4.03 psf*
	1.2D + 1.0W + L + 0.3S	*1.21 psf*
Strength, seismic, Section 2.3.6	***1.2D + Ev + Eh + L + 0.15S***	*0.60 psf*
Allowable stress, Section 2.4.1	***D + 0.7S***	*2.82 psf*
	D + 0.75L + 0.75(0.7S)	*2.12 psf*
	D + 0.75L + 0.75(0.6W) + 0.75(0.7S)	*2.12 psf*
Allowable stress, seismic, Section 2.4.5	***1.0D + 0.525Ev + 0.525Eh + 0.75L + 0.1S***	*0.40 psf*
CBC 2025 Section 1605.2 alternative	***0.7S in place of S***	*2.82 psf*

S = 4.03 psf is carried into every load combination that contains snow. Each roof gravity combination is evaluated once with roof live load and once with snow.

SNOW

Seismic

Seismic Design Data

Faults

Seismic Design Data

Seismic design values for the site, reference document ASCE/SEI 7-22.

Input	Value
Latitude	*37.80231*
Longitude	*-122.40588*
Reference document	*ASCE/SEI 7-22*
Risk Category	*II*
Site Class (soil)	*Default*
Seismic Design Category	*D*

Symbol	Value	Description
S_S	***1.50 g***	*Mapped MCE_R spectral response acceleration, 0.2 s*
S_1	***0.60 g***	*Mapped MCE_R spectral response acceleration, 1.0 s*
S_{MS}	***1.66 g***	*Site-adjusted MCE_R spectral response acceleration, short period*
S_{M1}	***1.70 g***	*Site-adjusted MCE_R spectral response acceleration, 1.0 s*
S_{DS}	***1.11 g***	*Design spectral response acceleration, short period*
S_{D1}	***1.13 g***	*Design spectral response acceleration, 1.0 s*
T_L	***12 s***	*Long-period transition period*
PGA_M	***0.58 g***	*Site-adjusted peak ground acceleration*
T_S	***1.020 s***	S_{D1} / S_{DS}
T_0	***0.205 s***	$0.2\ S_{D1} / S_{DS}$

MCER: risk-targeted maximum considered earthquake.

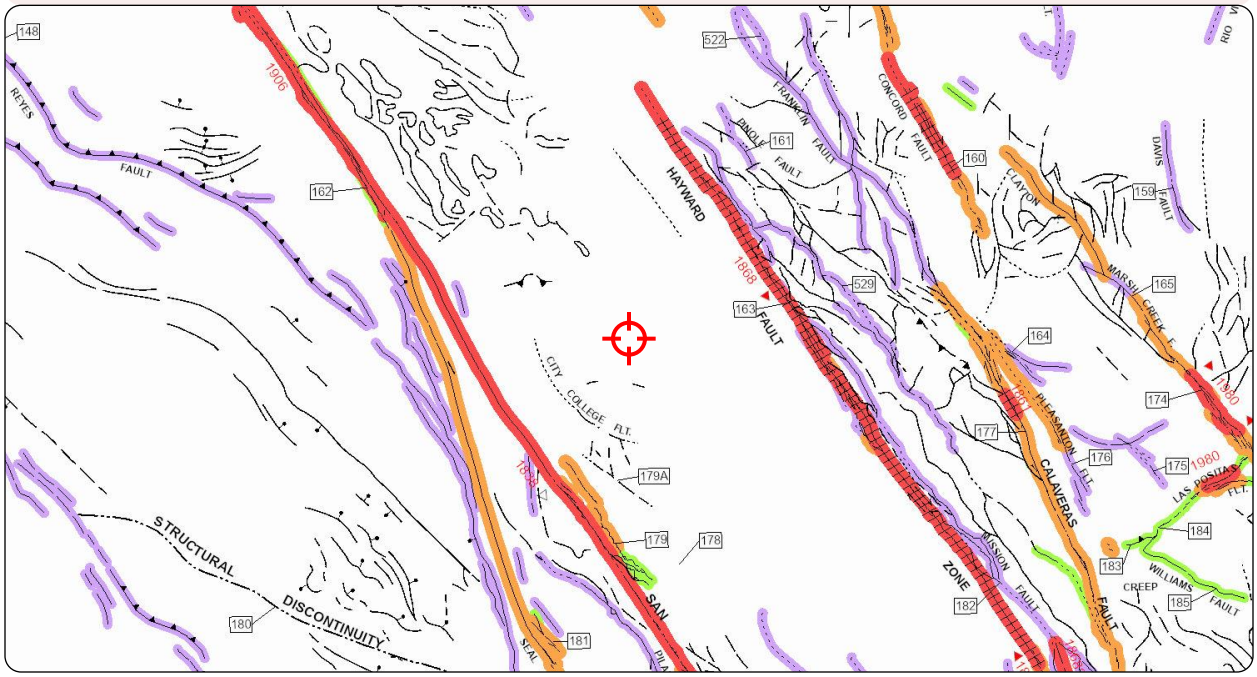
SDS and SD1 are carried onto the Design Values Summary page at the front of this report.

Names Used for Each Seismic Classification

Classification	This Site	Also Called, and Where
Site Class	***Default***	**Site Class:** *ASCE 7-22 Chapter 20; CBC 2025 Section 1603.1.5* **Site Soil Class:** *ASCE 7-22* **Soil Class:** *ASCE 7-22* **Seismic Site Class:** *Site Ground Summary page*
Seismic Design Category	***D***	**Seismic Design Category:** *ASCE 7-22 Section 11.6; CBC 2025 Section 1613.2* **SDC:** *abbreviation*

SEISMIC

Faults



Fault activity map, 80 miles across

Fault	Distance	Direction	Most recent movement	Slip rate	Sense
Serra fault zone	8.9 mi	SW	latest Quaternary	Unspecified	Reverse
Chabot fault	9.7 mi	NE	Quaternary	Unspecified	
Hayward fault zone	9.7 mi	NE	historic	Over 5.0 mm/yr	Right lateral
San Andreas fault zone	10.2 mi	SW	latest Quaternary	Over 5.0 mm/yr	Right lateral
Wildcat fault	10.3 mi	NE	Quaternary	Unspecified	
Moraga fault	10.6 mi	NE	Quaternary	Unspecified	Reverse
Miller Creek fault	13.5 mi	E	Quaternary	Unspecified	Reverse
Pinole fault	13.6 mi	NE	Quaternary	Unspecified	

Distance is from the site to the nearest mapped trace. Nearest fault shaded.

Nearest mapped Quaternary fault: Serra fault zone, 8.9 miles to the SW. The site is outside an Alquist-Priolo Earthquake Fault Zone.

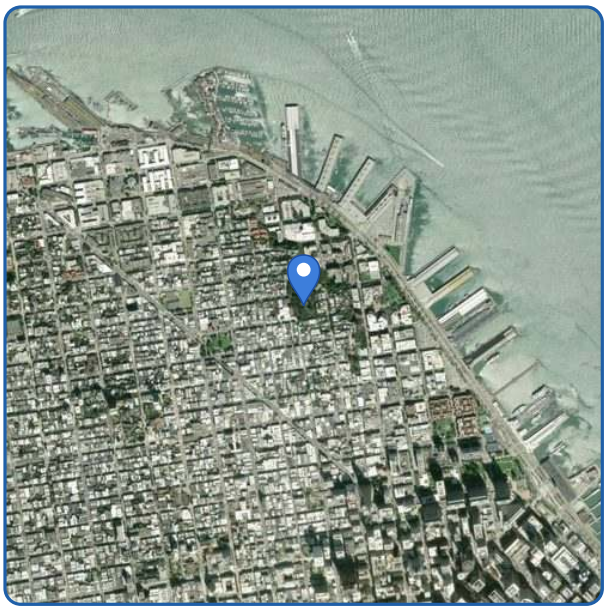
Map colors: red historic, orange Holocene, green late Quaternary, purple Quaternary. Faults are those mapped as Quaternary.

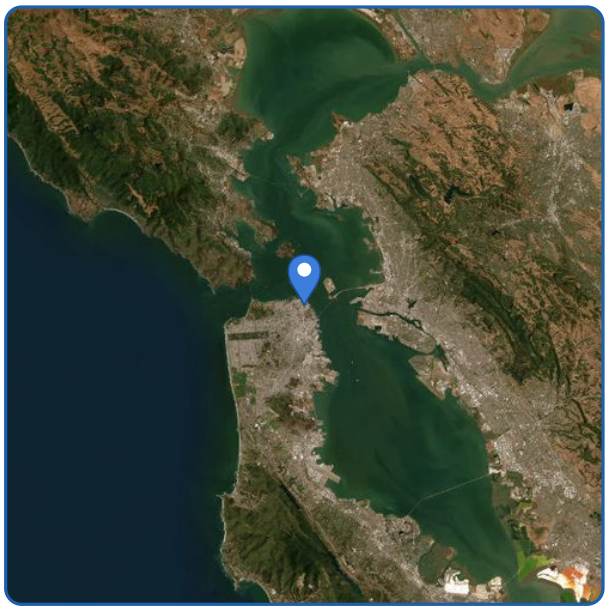
SEISMIC

Wind

Wind Data and Tornado
Exposure
Exposure Calculation
Wind Topographic Factor
Ground Profiles

ADDRESS	STANDARD	LOCATION
1 Telegraph Hill Boulevard San Francisco, California 94133	ASCE/SEI 7-22 Risk Category II Soil Class Default	Latitude 37.802310 Longitude -122.405880 Elevation 299.52 ft (NAVD 88)





WIND

3-second gust at 33 ft, Exposure C

92 mph

Risk Category II

10-year MRI	**64 mph**	1,700-year MRI	**99 mph**
25-year MRI	**70 mph**	3,000-year MRI	**103 mph**
50-year MRI	**74 mph**	10,000-year MRI	**112 mph**
100-year MRI	**79 mph**	100,000-year MRI	**129 mph**
300-year MRI	**87 mph**	1,000,000-year MRI	**147 mph**
700-year MRI	**92 mph**		

The 10, 25, 50 and 100-year MRI values are service level wind speeds; all other wind speeds are ultimate wind speeds. Data source: ASCE/SEI 7-22, Fig. 26.5-1B and Figs. CC.2-1 to CC.2-4, and Section 26.5.2.

TORNADO

ASCE/SEI 7-22 Chapter 32

Not applicable to Risk Category II. Tornado loads apply to Risk Category III and IV only.

Exposure D

B **Surface Roughness**
Exposure B

Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

C **Surface Roughness**
Exposure C

Open terrain with scattered obstructions having heights generally less than 30 ft

D **Surface Roughness**
APPLIES AT THIS SITE

Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats, and unbroken ice.

ASCE/SEI 7-22 Minimum Design Loads for Buildings and Other Structures

Section 26.7.2 Surface Roughness Categories

A ground Surface Roughness within each 45° sector shall be determined for a distance upwind of the site as defined in Section 26.7.3 from the categories defined in the following text, for the purpose of assigning an exposure category as defined in Section 26.7.3.

Surface Roughness B: Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

Surface Roughness C: Open terrain with scattered obstructions having heights generally less than 30 ft

Surface Roughness D: Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats, and unbroken ice.

Section 26.7.3 Exposure Categories

Exposure B: For buildings with a mean roof height of less than or equal to 30 ft (9.1 m), Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance greater than 1,500 ft (457 m). For buildings with a mean roof height greater than 30 ft (9.1 m), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance greater than 2,600 ft (792 m) or 20 times the height of the building, whichever is greater.

Exposure C: Exposure C shall apply for all cases where Exposures B or D do not apply.

Exposure D: Exposure D shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance greater than 5,000 ft (1,524 m) or 20 times the building height, whichever is greater. Exposure D shall also apply where the ground surface roughness immediately upwind of the site is B or C, and the site is within a distance of 600 ft (183 m) or 20 times the building height, whichever is greater, from an Exposure D condition as defined in the previous sentence. For a site located in the transition zone between exposure categories, the category resulting in the largest wind forces shall be used.

EXCEPTION: An intermediate exposure between the preceding categories is permitted in a transition zone provided that it is determined by a rational analysis method defined in the recognized literature.

Exposure Calculation

Sector	Open within 500 ft	Open within 1,500 ft	Open within 2,600 ft	D within 5,000 ft	Exposure
N	70%	8%	39%	78%	D
NE	6%	10%	53%	84%	D
E	0%	2%	14%	75%	D
SE	0%	0%	0%	8%	B
S	0%	0%	0%	0%	B
SW	0%	0%	0%	0%	B
W	0%	0%	0%	0%	B
NW	20%	2%	1%	34%	B

Percent of each 45 degree sector in counted open patches, and in Surface Roughness D. Governing sector shaded.

Sector N	Sector area, sq ft	Open patch area, sq ft	Open	Under 25%: B. Over 50%: C
Within 500 ft	97,600	68,600	70%	Exposure C
Within 1,500 ft	883,800	70,900	8%	Exposure B
Within 2,600 ft	2,654,100	1,033,400	39%	Average of B and C

Governing sector: N. The most severe exposure of the 8 sectors is applied to all wind directions. EXPOSURE D.

Open area	Nearest, ft	Area, sq ft	Min. area, sq ft	Length x width, ft	Min. width, ft	L / W	Counted
NE	1,240	65,799,200	162,400	13,410 x 7,000	269	1.92	Yes
N	140	98,800	25,000	460 x 240	112	1.96	Yes
E	1,590	88,200	227,100	470 x 190	335	2.46	No
SW	1,120	62,100	139,200	260 x 240	243	1.09	No

The 4 largest open areas with a point inside 2,600 ft, after ground narrower than the minimum width is removed. Counted: area at or over the minimum.

Check of the roughness calculation, Equation C26.7-1	z0, ft	Roughness
One-story house, 20 ft, on a 10,000 sq ft lot, no trees	0.82	B
One-story house, 25 ft, on a 10,000 sq ft lot, no trees	1.29	B
One-story house, 20 ft, in dense woods (80 percent canopy)	2.73	B
Dense woods alone, 80 percent canopy	1.91	B
One 20 ft house on one acre, no trees	0.19	C, open

Reference cases worked with the same inputs as the map. House 41 ft wide. Roughness B is z0 of 0.5 ft and over, Table C26.7-1.

Roughness, ASCE 7-22 Commentary C26.7, Equation C26.7-1: z0 = 0.5 Hob Sob / Aob, from the height and frontal area of the obstructions and the ground area they occupy, averaged over 164 ft. Buildings: footprint width times height, with height not less than 20 ft, the single-family height in the commentary example. Trees: canopy cover with 15 percent of the frontal area effective, the commentary value for deciduous trees; 25 ft height and crown width assumed. 1,877 building footprints were read.

Open patch, Commentary C26.7 item 2. An open patch has at least the minimum area of Figure C26.7-4 (about 25,000 sq ft within 500 ft of the structure, 210,000 sq ft at 1,500 ft and 415,000 sq ft at 2,600 ft, interpolated between), is at least about 164 ft, 328 ft and 500 ft in length or width at those distances, and has a length-to-width ratio between 0.5 and 2.0. Open ground is counted wherever it is wide enough to hold such a patch: about 112 ft wide within 500 ft, 324 ft at 1,500 ft and 456 ft at 2,600 ft. Narrower streets and strips are not counted. Distance is measured to the nearest point.

Sector rule, Commentary C26.7 item 4. Open patches under 25 percent of the 45 degree sector within 500 ft, 1,500 ft and 2,600 ft (or 20 times the height): Exposure B. Between 25 and 50 percent: Kz is the average of the Exposure B and C values up to 100 ft above grade, Exposure B above. Over 50 percent: Exposure C. The limits are applied as written. Roughness B is tested out to 2,600 ft and Roughness D out to 5,000 ft, the distances Section 26.7.3 sets; nothing farther is used. Roughness D is taken to prevail at 50 percent of the sector; Section 26.7 gives no number.

Wind Topographic Factor

Site: latitude 37.80231, longitude -122.40588. Elevation 285.8 ft (ASCE) and 299.5 ft (second survey). Ground elevations sampled every 120 ft out to 2 miles in 8 directions.

When Wind Speed-Up Applies, ASCE 7-22 Section 26.8.1

Wind speed-up over a hill, ridge or escarpment is included, with Kzt greater than 1.0, only where all five conditions below are met. Where any one is not met, Kzt = 1.0.

1. The feature is isolated and unobstructed upwind by similar features of comparable height for 100H or 2 miles, whichever is less.
2. The feature rises above upwind terrain features within 2 miles in any quadrant by a factor of 2 or more.
3. The structure is in the upper half of a hill or ridge, or near the crest of an escarpment (Figure 26.8-1).
4. H / Lh is 0.2 or greater.
5. H is 15 ft or greater for Exposure C and D, 60 ft or greater for Exposure B. The 15 ft threshold is used.

$Kzt = (1 + K1\ K2\ K3)^2$

ASCE 7-22 Equation 26.8-1. Kzt = 1.0 where the conditions are not all met, Section 26.8.2.

H = site elevation minus the lowest upwind ground. Lh = upwind distance to the ground H/2 below the site. Bounding value = $(1 + K1)^2$ with K1 = 1.45 H/Lh (2-D ridge, Exposure C, Figure 26.8-1), K2 = K3 = 1.0.

Dir	0.5 mi	1 mi	2 mi	H	Lh	H/Lh	1	2	3	4	5	Bound	Kzt
N	-42	-90	-62	387.2	480	0.807	met	met	met	met	met	2.976	2.98
NE	-56	-90	-49	391.7	480	0.816	met	met	met	met	met	2.976	2.98
E	3	-77	-88	386.9	720	0.537	met	met	met	met	met	2.976	2.98
SE	7	7	-60	353.9	1080	0.328	met	met	met	met	met	2.176	2.18
S	58	55	17	278.2	1200	0.232	met	met	met	met	met	1.785	1.79
SW	158	226	112	206.4	360	0.573	met	met	not met	met	met	2.976	1.00
W	36	96	9	276.4	480	0.576	met	met	met	met	met	2.976	2.98
NW	6	-59	-69	375.0	1200	0.312	met	met	met	met	met	2.112	2.11

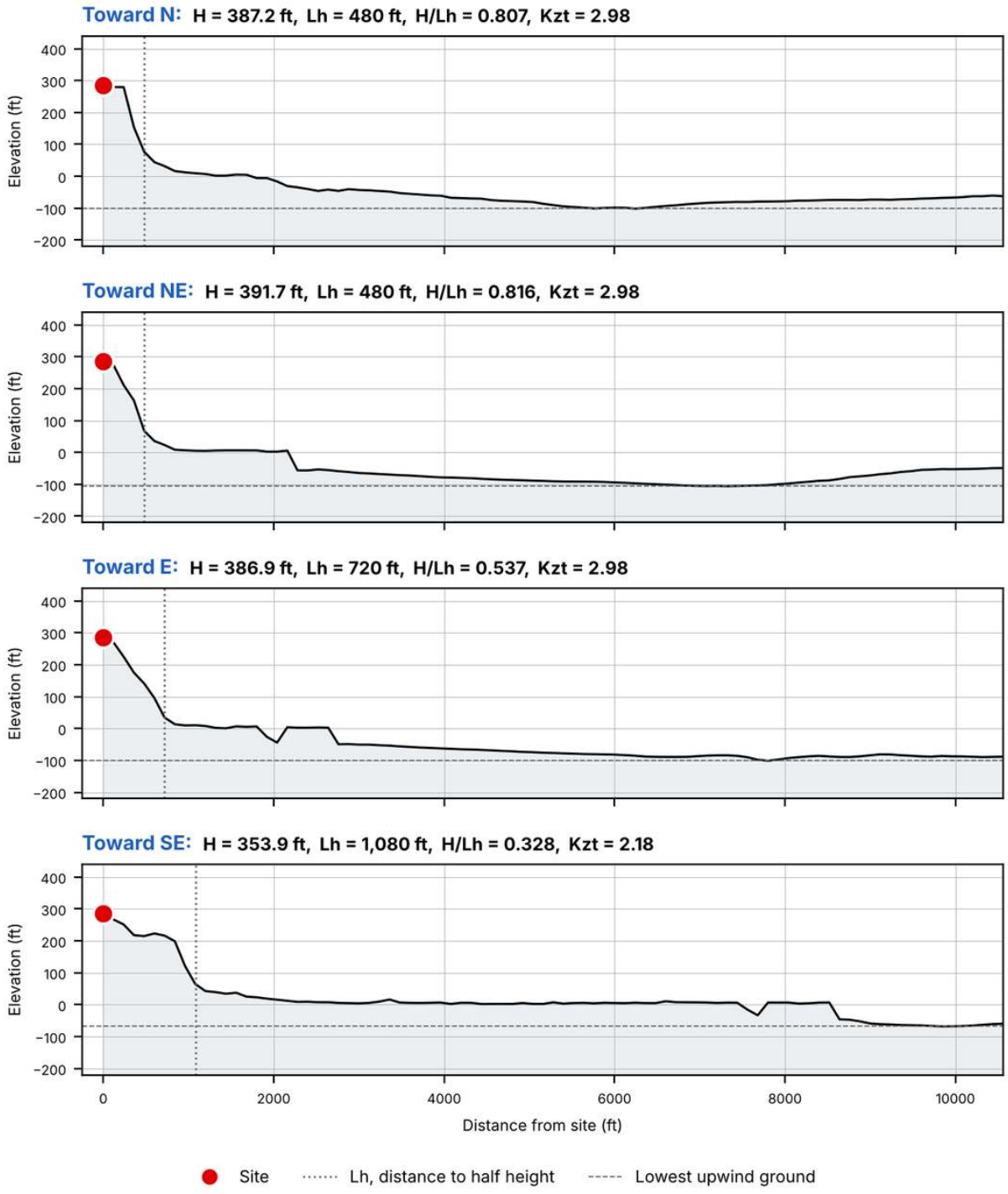
Elevations, H and Lh in feet. Columns 1 to 5 are the Section 26.8.1 conditions. Governing row shaded.

Governing direction: N, H = 387.2 ft, H/Lh = 0.807. The Section 26.8.1 conditions are all met in this direction. Kzt = 2.98 is carried into the velocity pressure for all wind directions.

The ground profile for each direction, with H and Lh as tabulated above, is on the following two pages.

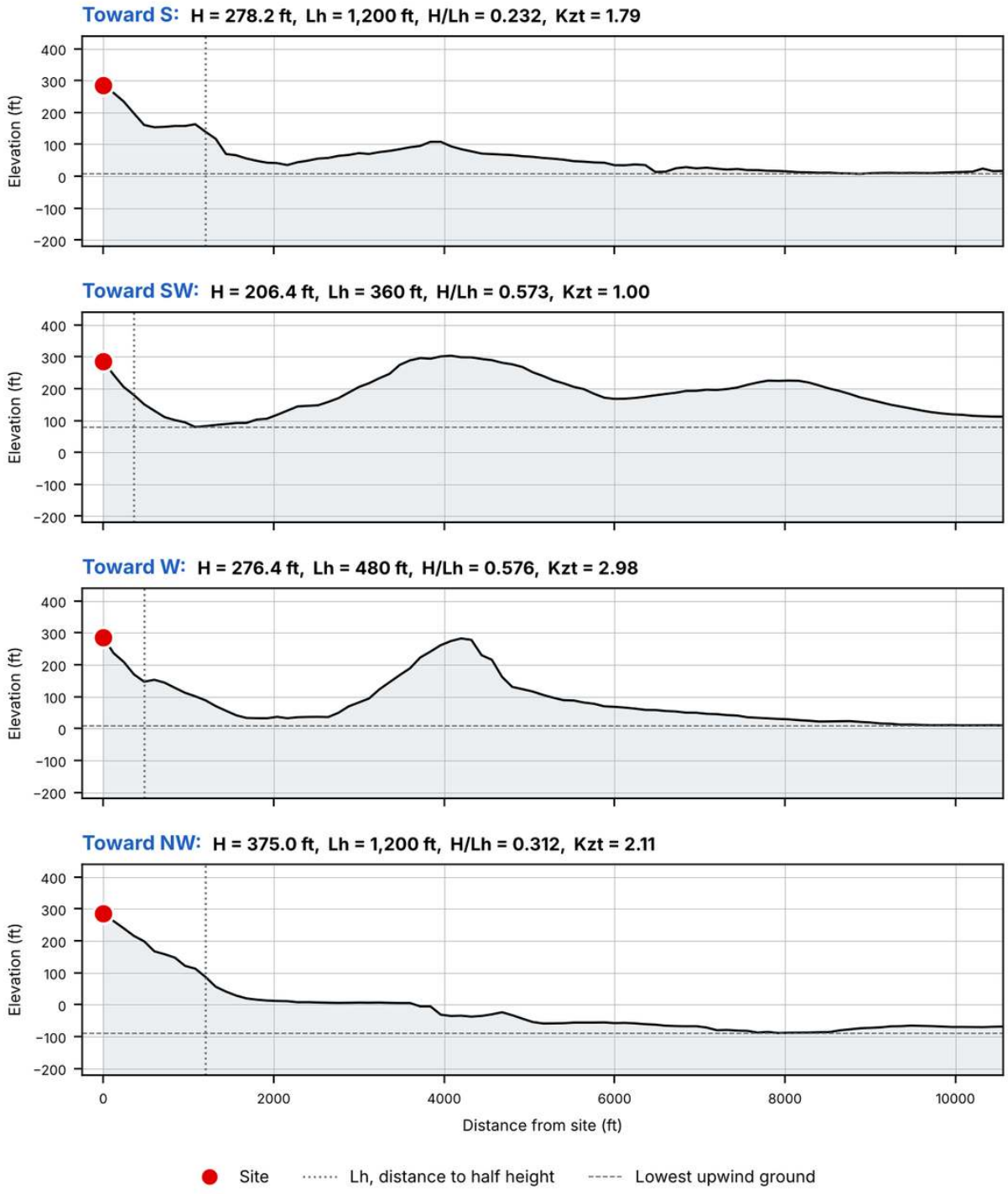
WIND

Ground Profiles



WIND

Ground Profiles



WIND

Sample Buildings at This Site

How hard would the wind push, and how hard would an earthquake shake, a typical building standing at this address? The table below works it out for four sample buildings, from a one-story house to a twenty-story tower, using this site's own design values. Each building has its own page that follows, with a small drawing of the forces.

These are sample buildings, not the building on this property. They show the design forces this site's earthquake and wind values produce on typical buildings. A real building's forces depend on its own size, weight and structure.

Sample building	Height	Weight	Earthquake base shear	Wind base shear
One-Story House	12 ft	40,000 lb	6,831 lb (17.1% of weight)	23,943 lb
Two-Story House	20 ft	60,000 lb	10,246 lb (17.1% of weight)	30,312 lb
Medium Commercial Building	39 ft	3,024 kips	559 kips (18.5% of weight)	293 kips
Twenty-Story Tower	240 ft	29,700 kips	1,451 kips (4.9% of weight)	1,423 kips

Base shear is the total sideways force at the bottom of the building, the force the walls, frames and foundation must carry to the ground. Earthquake base shear grows with a building's weight; wind base shear grows with the size of the face the wind hits. That is why wind can govern a light house while the earthquake governs a heavy concrete tower.

Site value used	Value
Design shaking, SDS / SD1 / S1	1.11 g / 1.13 g / 0.60 g
Long-period transition, TL	12 s
Basic wind speed	92 mph
Exposure / hill factor Kzt near the ground / Ke	D / 2.98 / 0.989
Risk Category / Importance	II / 1.0

Earthquake: ASCE 7-22 Section 12.8, equivalent lateral force procedure; strength level. Allowable stress design uses 0.7 times these values.
Wind: ASCE 7-22 Chapter 27 directional procedure (main wind force resisting system) and Chapter 30 (components and cladding); strength level.

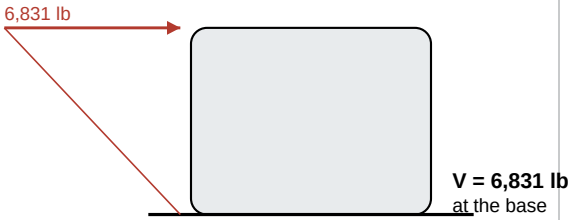
One-Story House

Wood-frame shear walls with plywood or OSB sheathing. 40 ft by 50 ft, 1 story, 12 ft tall. Flat or low-slope roof. Wind on the 40 ft face. Weight used for earthquake: 40,000 lb.

Sample building, not the building on this property. These are this site's forces on a typical building of this kind.

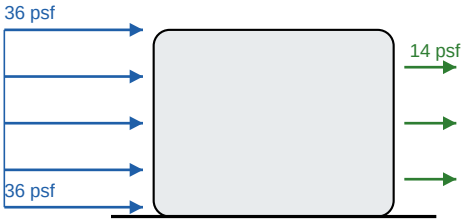
Earthquake forces by floor

Largest force at the top, where the building sways most.



Wind pressure on the walls

Push on the windward wall, pull on the far wall.
Pressure grows with height.



V = 23,943 lb at the base

Earthquake	
Approximate period, T = Cu Ta	0.18 s
Seismic response coefficient, Cs	0.171 (Eq. 12.8-2)
Response modification, R	6.5
Base shear, V = Cs W	6,831 lb

Wind	
Hill factor at roof, Kzt	2.84
Velocity pressure at roof, qh	62.8 psf
Windward wall, top / bottom	36.3 / 36.3 psf
Far (leeward) wall	13.6 psf suction
Base shear	23,943 lb

Cladding pressures (roofing, siding, windows), 10 sq ft panel

Area of the building	Inward push	Outward pull
Roof, Zone 1' (middle of the roof)	25.6 psf	57.6 psf
Roof, Zone 1	25.6 psf	100.3 psf
Roof, Zone 2 (edges)	25.6 psf	132.3 psf
Roof, Zone 3 (corners)	25.6 psf	180.3 psf
Wall, Zone 4 (field)	63.0 psf	68.3 psf
Wall, Zone 5 (corners)	63.0 psf	84.3 psf

Edges and corners of a roof or wall take the highest wind pull, so roofing and siding are fastened more closely there.

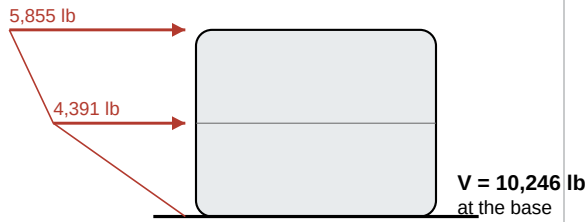
Two-Story House

Wood-frame shear walls with plywood or OSB sheathing. 30 ft by 40 ft, 2 stories, 20 ft tall. Flat or low-slope roof. Wind on the 30 ft face. Weight used for earthquake: 60,000 lb.

Sample building, not the building on this property. These are this site's forces on a typical building of this kind.

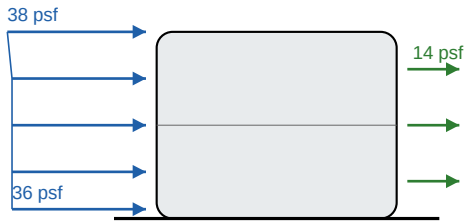
Earthquake forces by floor

Largest force at the top, where the building sways most.



Wind pressure on the walls

Push on the windward wall, pull on the far wall.
Pressure grows with height.



V = 30,312 lb at the base

Earthquake	
Approximate period, T = Cu Ta	0.26 s
Seismic response coefficient, Cs	0.171 (Eq. 12.8-2)
Response modification, R	6.5
Base shear, V = Cs W	10,246 lb

Wind	
Hill factor at roof, Kzt	2.79
Velocity pressure at roof, qh	65.0 psf
Windward wall, top / bottom	37.5 / 36.3 psf
Far (leeward) wall	14.1 psf suction
Base shear	30,312 lb

Cladding pressures (roofing, siding, windows), 10 sq ft panel

Area of the building	Inward push	Outward pull
Roof, Zone 1' (middle of the roof)	26.5 psf	59.6 psf
Roof, Zone 1	26.5 psf	103.8 psf
Roof, Zone 2 (edges)	26.5 psf	136.9 psf
Roof, Zone 3 (corners)	26.5 psf	186.6 psf
Wall, Zone 4 (field)	65.2 psf	70.7 psf
Wall, Zone 5 (corners)	65.2 psf	87.2 psf

Edges and corners of a roof or wall take the highest wind pull, so roofing and siding are fastened more closely there.

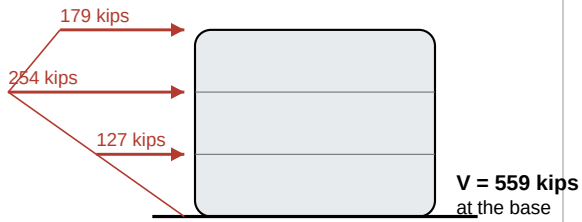
Medium Commercial Building, Three Stories

Steel special concentrically braced frames. 120 ft by 120 ft, 3 stories, 39 ft tall. Flat roof. Wind on the 120 ft face. Weight used for earthquake: 3,024 kips.

Sample building, not the building on this property. These are this site's forces on a typical building of this kind.

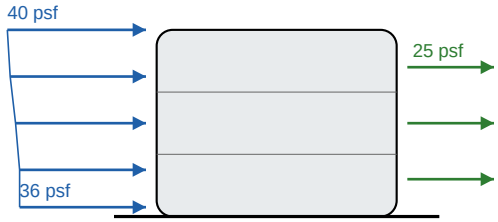
Earthquake forces by floor

Largest force at the top, where the building sways most.



Wind pressure on the walls

Push on the windward wall, pull on the far wall.
Pressure grows with height.



V = 293 kips at the base

Earthquake	
Approximate period, T = Cu Ta	0.44 s
Seismic response coefficient, Cs	0.185 (Eq. 12.8-2)
Response modification, R	6
Base shear, V = Cs W	559 kips

Wind	
Hill factor at roof, Kzt	2.64
Velocity pressure at roof, qh	68.9 psf
Windward wall, top / bottom	39.8 / 36.3 psf
Far (leeward) wall	24.9 psf suction
Base shear	293 kips

Cladding pressures (roofing, siding, windows), 10 sq ft panel

Area of the building	Inward push	Outward pull
Roof, Zone 1' (middle of the roof)	28.1 psf	63.2 psf
Roof, Zone 1	28.1 psf	110.0 psf
Roof, Zone 2 (edges)	28.1 psf	145.2 psf
Roof, Zone 3 (corners)	28.1 psf	197.8 psf
Wall, Zone 4 (field)	69.1 psf	74.9 psf
Wall, Zone 5 (corners)	69.1 psf	92.5 psf

Edges and corners of a roof or wall take the highest wind pull, so roofing and siding are fastened more closely there.

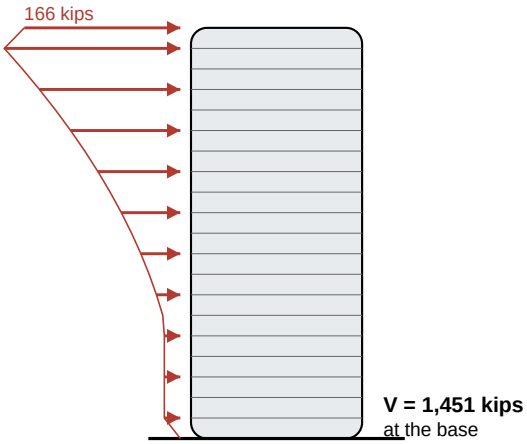
Twenty-Story Tower

Special reinforced concrete moment frames. 100 ft by 100 ft, 20 stories, 240 ft tall. Flat roof. Wind on the 100 ft face. Weight used for earthquake: 29,700 kips.

Sample building, not the building on this property. These are this site's forces on a typical building of this kind.

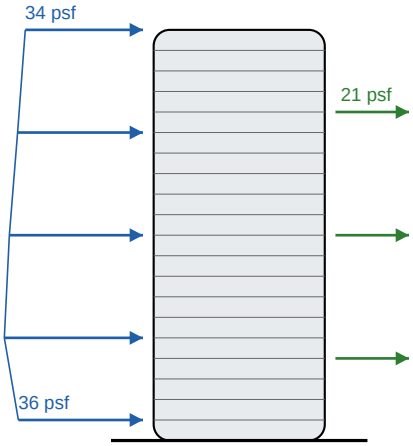
Earthquake forces by floor

Largest force at the top, where the building sways most.



Wind pressure on the walls

Push on the windward wall, pull on the far wall.
Pressure grows with height.



V = 1,423 kips at the base

Earthquake	
Approximate period, T = Cu Ta	3.11 s
Seismic response coefficient, Cs	0.049 (Eq. 12.8-5)
Response modification, R	8
Base shear, V = Cs W	1,451 kips

Wind	rigid gust factor
Hill factor at roof, Kzt	1.65
Velocity pressure at roof, qh	59.3 psf
Windward wall, top / bottom	34.3 / 36.3 psf
Far (leeward) wall	21.4 psf suction
Base shear	1,423 kips

Cladding pressures (roofing, siding, windows), 10 sq ft panel

Area of the building	Inward push	Outward pull
Roof, Zone 1 (field)		79.6 psf
Roof, Zone 2 (edges)		125.0 psf
Roof, Zone 3 (corners)		170.3 psf
Wall, Zone 4 (field)	54.4 psf	54.4 psf
Wall, Zone 5 (corners)	54.4 psf	99.8 psf

Edges and corners of a roof or wall take the highest wind pull, so roofing and siding are fastened more closely there.
A tower this tall sways in the wind; its actual design adds a dynamic gust factor not shown here.

Soil Site Data

Mapped geology, faults and soils

STRUCTURAL SITE DATA. NOT GEOTECHNICAL SITE DATA.

Compiled by APEX Engineering, the Engineer of Record, from published government mapping. Not reviewed by a geotechnical engineer. No borings, sampling or laboratory testing were performed. APEX Engineering does not hold the title Geotechnical Engineer (California Business and Professions Code Section 6736.1).

Where a geotechnical report is required for the project, that report governs.

Subsurface Information: Hire a Professional Soils Engineer

The ground information in this report is mapped information only. Nothing was measured below the ground at this property: no test pit, boring or cone penetrometer test was made. For more precise subsurface data, APEX Engineering recommends hiring a professional soils engineer, who investigates the ground by geotechnical engineering methods.

APEX Engineering works with:

Dave Cymanski, P.E., G.E., Principal Engineer
KC Engineering Co.
(707) 447-4025 office@kcengr.com
mti-kcgeotech.com

SOIL

Site Ground Summary

Item	Conclusion
Ground at the site	Soil deposit: Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated. Mostly nonmarine, but includes marine deposits near the coast (Q, Pleistocene-Holocene).
Surface soil	Urban land-Orthents, cut and fill complex, 5 to 75 percent slopes.
Depth to bedrock	None reported within the depth surveyed, about 5 to 6 ft.
Groundwater	No water table reported within the depth surveyed.
Seismic site class	Estimated Vs30 733 m/s (2,410 ft/s), the Site Class BC range. No sign of soft soil (Site Class DE, E or F). Design stays on Site Class Default.
State hazard zones	Outside the Alquist-Priolo fault zones. Outside the liquefaction and landslide zones. Outside the tsunami hazard area.
Nearest fault	Serra fault zone, 8.9 miles to the SW.
Building-site rating	Without basements: very limited. With basements: very limited. Somewhat limited: the soil has drawbacks that design can overcome. Very limited: the soil is unfavorable for that use and takes special design or major soil work.

Conditions to address for any new foundation at this site: soil the survey rates very limited for buildings, with or without basements.

The seismic design values in this report are not changed by any of the above. The maps and tables these conclusions are read from follow this page.

Presumptive Foundation Values

Allowable values from CBC 2025 Table 1806.2 for the soil class the published mapping indicates. They are for use with allowable stress design load combinations. Soil unit: Urban land-Orthents, cut and fill complex, 5 to 75 percent slopes. The soil texture is not rated, so the lowest class in the table is adopted.

Class	Material	Vertical (psf)	Lateral (psf/ft)	Friction	Cohesion
1	Crystalline bedrock	12,000	1,200	0.70	-
2	Sedimentary and foliated rock	4,000	400	0.35	-
3	Sandy gravel and gravel	3,000	200	0.35	-
4	Sand, silty sand, clayey sand, silty gravel, clayey gravel	2,000	150	0.25	-
5	Clay, sandy clay, silty clay, clayey silt, silt, sandy silt	1,500	100	-	130

Adopted class shaded. Class 3: GW, GP. Class 4: SW, SP, SM, SC, GM, GC. Class 5: CL, ML, MH, CH. Cohesion in psf.

Design Values Adopted, Class 5

Item	Value	Basis
Vertical foundation pressure	***No value given***	*Investigation required*
Building code presumptive value, for reference	*1,500 psf*	*Table 1806.2*
Lateral bearing pressure, below natural grade	***100 psf per ft***	*Table 1806.2*
Lateral bearing, upper limit (15 x tabular)	***1,500 psf***	*Section 1806.3.3*
Lateral bearing, isolated poles (2 x tabular)	***200 psf per ft***	*Section 1806.3.4*
Lateral sliding, cohesion x contact area (half the dead load at most)	***130 psf***	*Section 1806.3.2*

No vertical foundation value is given at this site. The published mapping shows soil rated very limited for buildings, and the presumptive values of Table 1806.2 are not relied on there. A geotechnical investigation by a professional soils engineer is required to set the bearing value.

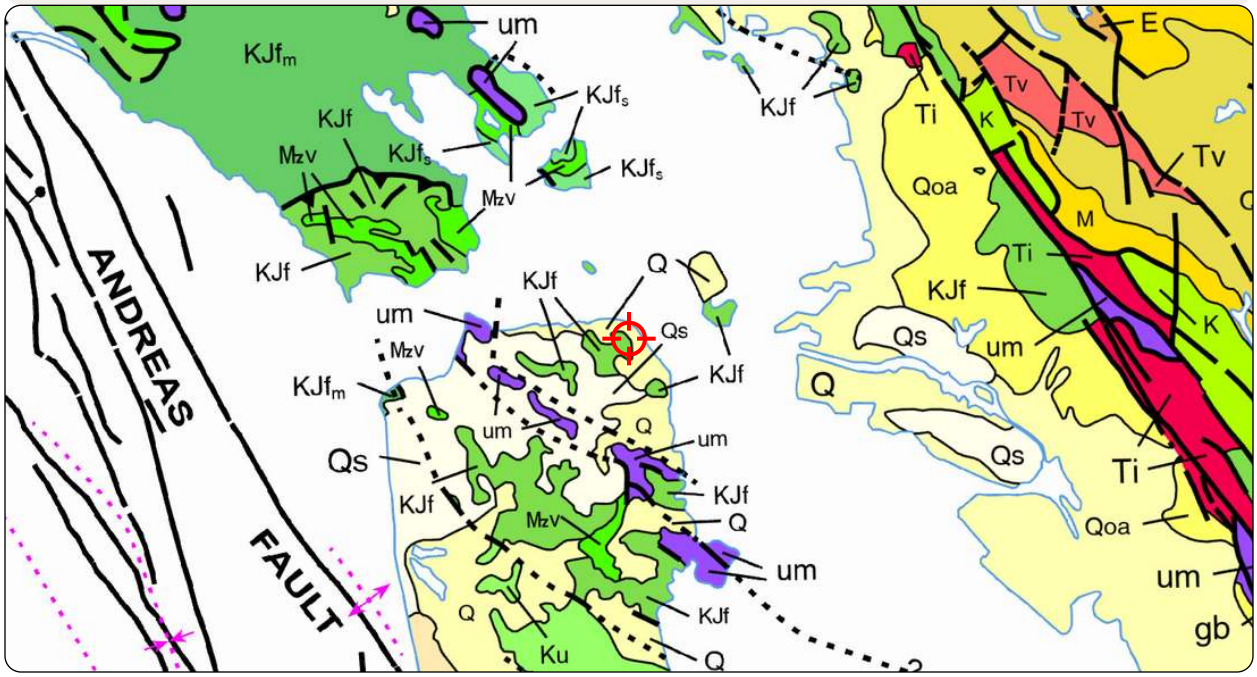
The one-third increase of Section 1806.1 is allowed only with the alternative allowable stress design load combinations of CBC 2025 Section 1605.2 that include wind or earthquake. It is not allowed with the ASCE 7-22 Section 2.4 combinations; with those, the 1,500 psf and 100 psf per ft values are used without increase.

Section 1806.3.4 applies to poles such as flagpoles and signs that are not harmed by 1/2 inch of movement at the ground surface.

ASCE 7-22 gives no bearing or lateral soil values; it sets the seismic site class, which stays at Site Class Default.

These are presumptive code values selected from published mapping, not from a soil investigation. Where a geotechnical report is prepared for the project, its values govern.

Site Geology



Geologic Map of California, 30 miles across

Item	Finding
Geologic unit	*Q: Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated.*
Age and rock type	*Pleistocene-Holocene; marine and nonmarine (continental) sedimentary rocks*
Estimated V_{s30}	*733 m/s (2,410 ft/s), the Site Class BC range of ASCE 7-22 Table 20.2-1*
Site class used in design	*Default*
Alquist-Priolo fault zone	*Outside the Alquist-Priolo Earthquake Fault Zones*
Liquefaction zone	*Outside the state liquefaction zones*
Landslide zone	*Outside the state earthquake-induced landslide zones*
Tsunami hazard area	*Outside Hazard Area*

V s30 is the state mapped estimate, not a measurement at the site; the design site class is not changed by it. Geologic unit, hazard zones and tsunami area are state mapping.

SOIL

Geologic Map Key

Unit	Age	Rock
E	Eocene	*Shale, sandstone, conglomerate, minor limestone; mostly well consolidated.*
K	Cretaceous	*Undivided Cretaceous sandstone, shale, and conglomerate; minor nonmarine rocks in Peninsular Ranges.*
KJf	Cretaceous-Jurassic	*Franciscan Complex: Cretaceous and Jurassic sandstone with smaller amounts of shale, chert, limestone, and conglomerate. Includes Franciscan melange, except where separated - see KJfm.*
KJfm	Cretaceous-Jurassic	*Melange of fragmented and sheared Franciscan Complex rocks.*
KJfs	Cretaceous-Jurassic	*Blueschist and semi-schist of Franciscan Complex.*
Ku	Upper Cretaceous	*Upper Cretaceous sandstone, shale, and conglomerate.*
M	Miocene	*Sandstone, shale, siltstone, conglomerate, and breccia; moderately to well consolidated.*
Mzv	Mesozoic	*Undivided Mesozoic volcanic and metavolcanic rocks. Andesite and rhyolite flow rocks, greenstone, volcanic breccia and other pyroclastic rocks; in part strongly metamorphosed. Includes volcanic rocks of Franciscan Complex: basaltic pillow lava, diabase, greenstone,*
P	Pliocene	*Sandstone, siltstone, shale, and conglomerate; mostly moderately consolidated.*
Q	Pleistocene-Holocene	*Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated. Mostly nonmarine, but includes marine deposits near the coast.*
Qoa	Pleistocene	*Older alluvium, lake, playa, and terrace deposits.*
QPc	Pliocene-Pleistocene	*Pliocene and/or Pleistocene sandstone, shale, and gravel deposits; mostly loosely consolidated.*
Qs	Pleistocene-Holocene	*Extensive marine and nonmarine sand deposits, generally near the coast or desert playas.*
Ti	Tertiary	*Tertiary intrusive rocks; mostly shallow (hypabyssal) plugs and dikes.*
Tv	Tertiary	*Tertiary volcanic flow rocks; minor pyroclastic deposits*
um	Mesozoic	*Ultramafic rocks, mostly serpentine. Minor peridotite, gabbro, and diabase; chiefly Mesozoic.*

Unit at the site shaded. Units shown are those inside the map view on the Site Geology page.

Lines

- contact, certain
- fault, approximately located
- fault, certain
- fault, concealed
- fault, concealed, queried
- thrust fault, certain
- anticline, concealed
- syncline, concealed

Symbols, colors and descriptions are those of the state geologic map.

SOIL

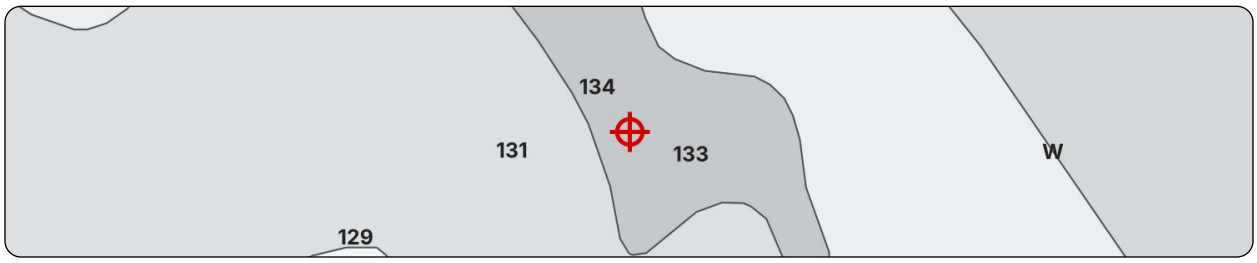
Soil Survey

Near-Surface Soil, Upper 5 to 7 Feet: Variable

THIS IS NOT A GEOTECHNICAL ENGINEERING REPORT

NEAR-SURFACE SOIL ONLY: ground surface to a depth of about 5 to 7 feet.

Published soil survey data only. No borings, sampling or laboratory testing were performed.
Structural site data compiled by APEX Engineering as Engineer of Record.
Not reviewed by a geotechnical engineer.



Soil Survey map units, 5,200 ft across

133 Urban land-Orthents, cut and fill complex, 5 to 75 percent slopes

129 Sirdrak sand, 5 to 50 percent slopes

131 Urban land

134 Urban land-Orthents, reclaimed complex, 0 to 2 percent slopes

W Water

Soil type at footing depth: Variable. The natural soil of the unit is the Orthents soil, 40 percent of the unit, beneath and between the buildings and pavement.

Depth, in.	Soil	Clay, %	Plasticity index
0 to 60	Variable		

Surface map. In contrast to the geologic map earlier in this section, which shows the deposits and rock the site is built on, the Soil survey maps the surface soil only: from the ground surface down to about 60 to 80 inches (5 to 7 feet), the depth footings bear in. Deeper ground is not described. The seismic Site Class comes from the data for the top 100 feet and is not verified by this survey.

Map units. Each number is a map unit, an area mapped as one kind of surface soil. The site is in the unit shown in bold. Urban land is ground covered by buildings and pavement, which the survey does not rate. The name after it is the natural soil beneath and between. Complex means the two are too finely mixed to map apart.

Soil Survey Values

Item	Soil survey value
Soil map unit	*133: Urban land-Orthents, cut and fill complex, 5 to 75 percent slopes*
Dominant component	*Urban land, 50 percent of the unit*
Landform	*upland slopes, uplands, urban land*
Taxonomic class	*Not classified (urban land)*
Slope	*40 percent, range 5 to 75*
Depth to bedrock, minimum	*None reported*
Depth to water table, minimum	*None reported*
Drainage class	*Well drained*
Hydrologic group and runoff	*Group D; runoff very high*
Flooding and ponding	*Flooding: none; ponding: none*
Buildings without basements	*Very limited*
Buildings with basements	*Very limited*
Corrosion of concrete and steel	*Concrete: not rated; steel: not rated*

Soil survey, mapped at 1:24,000. Survey values describe the upper 5 to 6 ft of soil.

Subsurface and Flood Records

Flood	Flood map
Flood zone at the site	Zone X. AREA OF MINIMAL FLOOD HAZARD

Well, direction	Distance, ft	Well depth, ft	Shallowest water, ft	Date	Latest water, ft	Date
Irrigation SW	11,101	59	32	2011	33	2013-04

Depth to groundwater below the ground surface. State well measurements. Shallowest on record shaded.

Shallowest groundwater on record near the site: 32 ft below the ground surface, in 2011, at a well 11,101 ft to the SW. These are measurements in wells near the site, not at the site, and deep wells can read a deeper water level than shallow ground holds.

Cone penetration sounding	Distance, ft	Direction	Depth, ft	Date	Vs30, ft/s
Sounding 1	7,362	SE	65	2003	1427
Sounding 2	8,808	W	38	1990	
Sounding 3	9,000	W	52	1990	
Sounding 4	9,239	W	65	1990	
Sounding 5	9,671	W	38	1990	

Soundings on file.

Cleanup site with subsurface reports	Distance, ft	Direction	Status
LUST Cleanup Site	823	SW	Case Closed
LUST Cleanup Site	979	NW	Case Closed
LUST Cleanup Site	1,056	W	Case Closed
Cleanup Program Site	1,101	N	Case Closed
LUST Cleanup Site	1,200	N	Case Closed
LUST Cleanup Site	1,259	NW	Case Closed

State Water Board records, copy dated October 2022. Sites are not named.

SOIL

Questions About Your Site

Every project should start here.

Know your structural site data before you begin.

Have your report number in hand, and APEX Engineering will be glad to talk.

Call APEX Engineering

(408) 379-2068

Engineers@TheStructurals.com
TheStructurals.com

Report HR SAMPLE

1 Telegraph Hill Boulevard, San Francisco, California 94133

APEX Engineering Can Help With

- Seismic and wind values for your design
- A crack or a sloping floor
- A retaining wall
- An addition or a remodel
- A foundation question
- A seismic retrofit
- Solar on a roof or on the ground

This report states the hazards at the site; it does not look at the building itself. A specific concern about your structure is addressed by APEX Engineering.

Referrals

SOLAR

For a solar project at this site, APEX Engineering recommends:

ArchKey Sprig (Sprig Electric)
(408) 298-3134
archkey.com/archkey-sprig

A-C Electric Company
(661) 410-0000
a-celectric.com

Sandbar Solar and Electric
(831) 469-8888
sandbarsolar.com

SPECIAL INSPECTION

For special inspection or materials testing:

HP Inspections, Inc.
(408) 288-8460
hpinspectionsinc.com

GEOTECHNICAL

For more precise subsurface data, a professional soils engineer:

Dave Cymanski, P.E., G.E.
(707) 447-4025
mti-kcgeotech.com

KC Engineering Co.

See every referral at TheStructurals.com/referrals.html

CONTACT