Lomond View Designs, LLC

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Ogden, UT 84414
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Structural Calculations
for
Ogden City
(Detached Garage)
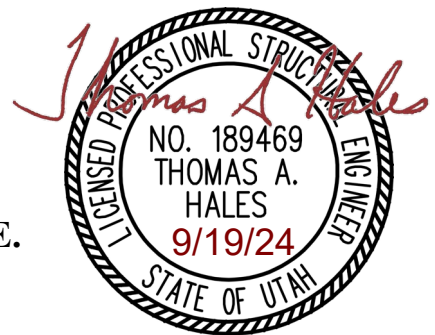for
874 E Cahoon Circle
Ogden, Utah

September 19, 2024

Prepared By:
Thomas A. Hales, Ph.D., S.E.

LICENSED PROFESSIONAL STRUCTURAL ENGINEER
NO. 189469
THOMAS A. HALES
9/19/24
STATE OF UTAH

Job # 24025 (Repeat #23098)

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DESIGN CRITERIA:

A. GOVERNING BUILDING CODE: 2021 INTERNATIONAL BUILDING CODE (IBC) AND
    2021 INTERNATIONAL RESIDENTIAL CODE (IRC)

B. GRAVITY LIVE LOADING:
  1. ROOF: 30 PSF SNOW LOAD
  2. FLOOR: 40 PSF LIVE LOAD
  3. DECK: 60 PSF LIVE LOAD

C. EARTHQUAKE: $V = Sds*I*W/R = 2/3*Sms*I*W/R$
  1. Sms = USE 1.6 (SDC = 'D2')
  2. I, IMPORTANCE FACTOR = 1.0
  3. R, BUILDING TYPE   = 6.5 (USE 6)
  4. W, WEIGHT OF STRUCTURE

D. WIND:
  1. VELOCITY: 115 MPH (LRF) * 0.775 → 90 MPH (ASD), BASIC WIND SPEED
                (IBC 1609.3.1)
  2. EXPOSURE: TYPE C
  3. IMP. FACTOR: 1.0, STANDARD OCCUPANCY

E. SOIL BEARING PRESSURE: 1500 PSF ASSUMED BY OWNER

F: SEE DRAWINGS FOR GENERAL NOTES AND CONSTRUCTION REQUIREMENTS

COLUMN AND FOOTING LOADS AND SIZES

Project: JOB #23098   **Date:** 11/14/2023
Allow. Soil Bearing Press. 1500 psf   **Engineer:** Tom Hales

CONTINUOUS FOOTINGS

Footing/Column Location: TYP. EXTERIOR WALL
Alt. Soil Bearing Pressure

COMMENT	LENGTH 1	TRIBUTARY AREA PER 1 FT.	WEIGHT	SUB TOTAL	CUM. TOT.
ROOF SNOW LOAD	13.0 ft		30 psf	390 plf	390 plf
ROOF DEAD LOAD	13.0 ft		17 psf	221 plf	611 plf

	TOTAL LOAD	611 plf	
	REQ'D FTG. WIDTH	0.4 ft	USE FC1.7

Footing/Column Location:
Alt. Soil Bearing Pressure

COMMENT	LENGTH 1	TRIBUTARY AREA PER 1 FT.	WEIGHT	SUB TOTAL	CUM. TOT.

	TOTAL LOAD	0 plf
	REQ'D FTG. WIDTH	0.0 ft

Footing/Column Location:
Alt. Soil Bearing Pressure

COMMENT	LENGTH 1	TRIBUTARY AREA PER 1 FT.	WEIGHT	SUB TOTAL	CUM. TOT.

	TOTAL LOAD	0 plf
	REQ'D FTG. WIDTH	0.0 ft

WOOD BEAM DESIGN
FOR UNIFORM LOADING CONDITIONS

Project: JOB #23098
Description: 16'-0" GARAGE DOOR HEADER

Date: 11/14/2023
Engineer: TAH

INPUT:

Length of Span - L (ft):	17
Distance from Support to Calc. Shear - d (in)	7

Roof Loads:

Trib. Length (ft):	6
Snow Load (psf):	30
Dead Load (psf):	17

Linear Loads:

Snow Load (plf):	0
Live Load (plf):	0
Dead Load (plf):	0

Floor Loads:

Trib. Length (ft):	0
Live Load (psf):	40
Dead Load (psf):	15

Total Load Deflection Criteria (Span/ Δ) - Δ: 240
Live Load Deflection Criteria (Span/ Δ) - Δ: 360

Total Load (plf):	282	plf
Total Live Load (plf):	180	plf

Beam Reactions:	DL=	867	lbs
	LL=	1530	lbs
	TL=	2397	lbs

OUTPUT:

DOUGLAS FIR-LARCH

Allowable Shear Stress - Fv (psi):	95		I (TL) (in^4):	389.66
Modulus of Elasticity - E (ksi):	1600		I (LL) (in^4):	373.08
Allowable Bending Stress - Fb (psi):	1313	2x4	A (in^2):	35.25
	1139	2x6	S (in^3) 2x4:	93.11
	1052	2x8	2x6:	107.33
	961	2x10	2x8:	116.20
	845	2x12	2x10:	127.21
			2x12:	144.67

GLUED-LAMINATED (24F-V4)

Allowable Shear Stress - Fv (psi):	190	I (TL) (in^4):	346.37
Modulus of Elasticity - E (ksi):	1800	I (LL) (in^4):	331.63
Allowable Bending Stress - Fb (psi):	2400	A (in^2):	17.63
		S (in^3):	50.94

3.125 x 12 GLB (0.77)
5.125 x 10.5 GLB (0.7)

MICRO-LAM

Allowable Shear Stress - Fv (psi):	285	EI (TL) k-in^2:	623460
Modulus of Elasticity - E (ksi):	1900	EI (LL) (k-in^2):	596930
Allowable Bending Stress - Fb (psi):	2600	Shear (lbs):	2233
		Moment (ft-lb):	10187

(2)-1.75 x 11.875 M-L (0.67)
(3)-1.75 x 9.5 M-L (0.88)

VERSA-LAM

Allowable Shear Stress - Fv (psi):	285	EI (TL) k-in^2:	623460
Modulus of Elasticity - E (ksi):	2000	EI (LL) (k-in^2):	596930
Allowable Bending Stress - Fb (psi):	2800	Shear (lbs):	2233
		Moment (ft-lb):	10187

(2)-1.75 x 11.25 V-L (0.75)
(3)-1.75 x 9.25 V-L (0.9)

NOTE: A LOAD DURATION FACTOR OF 1.0 IS USED FOR ALL BEAMS

IBC LATERAL ANALYSIS

Project: JOB #23098 **Date:** 11/14/2023
Description: MAIN LATERAL **Engineer:** Tom Hales

Seismic (V=2/3*Sms*I*W/R*(1/1.4))

I = 1
Sms=Fa*Ss 1.6 NOTE: Site Class D is assumed
R = 6
2/3*Sms*I/R/1.4) = 0.1270 (ASD)

Wind	90 mph	Basic Wind Speed		p_{s30}	p_s
Exposure =	C		A =	14.4 psf	17.4 psf
Exp Coef =	1.21		B =	9.9 psf	12.0 psf
K_{zt} =	1		C =	11.5 psf	13.9 psf
I_W =	1		D =	7.9 psf	9.6 psf
roof height =	8.0 ft	(top of wall to ridge)			

Building Info.

		Veneer			
Wall Weight =	12 psf				Total
Roof Weight =	17 psf		Weights		Weights
Seismic snow =			(pounds)	Veneer	(pounds)
Total Roof Weight =	17 psf	Wall	1188	0	10604	Dir. perp. to width
Floor to Roof Height =	9 ft	Wall	1188	0	10604	Dir. perp. to length
Building Width =	22 ft	Roof	8228		12980	Tot. Building Wt.
Building Length =	22 ft			Vmid =	1648.3
Building Height =	17 ft				
a=	3.0 ft				

Seismic Shear Forces

				SHEARWALLS 350 plf
Diaphragm Shears: (per side)	pounds	plf		req'd length
Walls perpendicular to building width:	673	31		1.9 ft
Walls perpendicular to building length:	673	31		1.9 ft
Mid-Ht Wall Shears: (per side)	pounds	plf		
Walls perpendicular to building width:	824	37		2.4 ft
Walls perpendicular to building length:	824	37		2.4 ft

USE 7/16" SHEATHING w/8d NAILS @ 6" o.c. G.F. 170plf

Wind Shear Forces

				SHEARWALLS 490 plf
Diaphragm Shears: (per side)	pounds	plf		req'd length
Walls perpendicular to building width:	1712	78	CONTROLS=>	3.5 ft
Walls perpendicular to building length:	1712	78	CONTROLS=>	3.5 ft
Mid-Ht Wall Shears: (per side)	pounds	plf		
Walls perpendicular to building width:	1712	78	CONTROLS=>	3.5 ft
Walls perpendicular to building length:	1712	78	CONTROLS=>	3.5 ft

USE 7/16" SHEATHING w/8d NAILS @ 6" o.c. G.F. 240plf

Note: Veneer is assumed to resist it's own in-plane shear.

SHEAR & OVERTURNING ANALYSIS

Project: JOB #23098   **Date:** 11/14/2023
Description: MAIN LATERAL   **Engineer:** Tom Hales
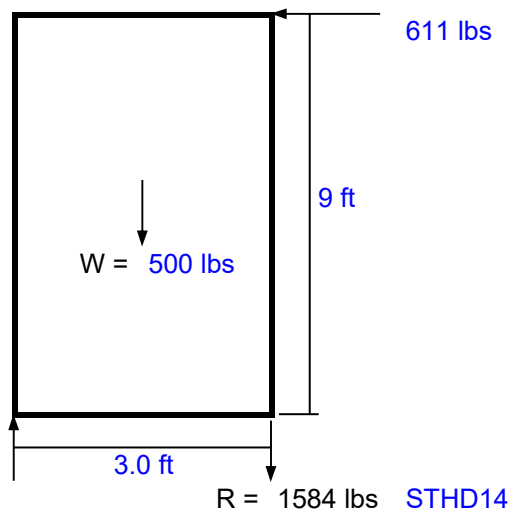
SHEAR WALL CHECK

Shear Wall Capacity: 350 plf   4"O.C. EDGE NAILING
Total Shear: 1223 lbs
Req'd Wall Lngth: 3 ft   PLENTY OF WALL AVAILABLE

WALL OVERTURNING

Description: TYP. 3'-0" FRONT WALL PIECES

611 lbs

9 ft

W = 500 lbs

3.0 ft

R = 1584 lbs   STHD14

WALL OVERTURNING

Description: 15'-0" SIDE WALL PIECE

1223 lbs

9 ft

W = 3000 lbs

9.0 ft

R = -277 lbs   NO HD REQ'D

L-2