APPROVED TO PROCEED
SUBJECT TO CITY INSPECTORS 12/13/2022 DL

City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning
Engineering | Public Works
Fire | Traffic

STRUCTURAL CALCULATIONS

FOR THE

CHESHIRE RESIDENTIAL PROJECT

Plan L2-2600-3

March 14, 2022

THE APPROVED CONSTRUCTION PLANS AND ALL ENGINEERING DOCUMENTS MUST BE POSTED ON THE JOB AT ALL INSPECTIONS IN A VISIBLE AND READILY ACCESSIBLE LOCATION.

Job No. : 10-041
Location: Lot 32, Ashley Meadows
Puyallup, Washington

SEGA Engineers
Structural & Civil Consulting Engineers

22939 SE 292nd PL (360) 886-1017
Black Diamond, WA 98010

PRRNSF20220550

STATEMENT OF WORK

SEGA Engineers was asked to provide a lateral loads analysis, shear wall design, review of major framing members and foundation, and drawing red-lines for a two story wood framed single family residence. The roof framing is manufactured trusses, the floor framing is 2x dimensional or wood I-joists, and the foundation is typical concrete strip footings with a crawl space.

The application and use of these calculations is limited to a single site referenced on the cover sheet. The cover sheet should have an original signature in blue ink over the seal. The attached calculations may or may not apply to other sites and the contractor assumes all responsibility and liability for sites not expressly reviewed and approved. Please contact SEGA Engineers for use at other sites.

SEGA Engineers will use that degree of care and skill ordinarily exercised under similar circumstances by members of the engineering profession in this local. No other warranty, either expressed or implied is made in connection with our rending of professional services. For any dispute, claim, or action arising out of this design, SEGA Engineers shall have liability limited to the amount of the total fee received by SEGA Engineers.

Questions regarding the attached should be addressed to SEGA Engineers.

Greg Thesenvitz, PE/SE
SEGA Engineers

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Project L2-2600

Job No. 10-041 By: GAT

Checked Date: 06/07/21 Sht 1

Design Criteria

International Building Code (IBC), 2018

LOADS

Roof

DL	15	psf
LL	25	psf

Floor

DL	12	psf
LL	40	psf
LL (Deck)	60	psf

Wind

Risk Category	II		
Design Wind Speed	110	mph	(V_{ult})
K_{zt}	1.00		
Exposure	B		

Seismic

Design Category	D	
S_{DS}	1.00	
Response Factor	6.5	
C_S =	0.154	
Importance Factor	1.00	

Soil

Allowable Bearing	1,500	psf

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Project L2-2600

Job No. 10-041 By: GAT

Checked Date: 06/07/21 Sht 2

LOADS

ROOF

DL	Roofing (Comp)	3.5 psf	
	1/2" OSB	1.8	
	2 x @ 24"	3.5	
	Insulation	1.1	
	5/8" GWB	2.8	
	Misc.	1.5	
		14.2 psf	
LL	Snow, P_f	25 psf	(115% Load Duration)
	Reduction, Cs	0.00	(C_t = 1.1, other surfaces)
	6/12 pitch = 27 deg		
	Total Roof Load		39.2 psf

FLOOR

DL	Flooring	0.5 psf	
	3/4" Plywood	2.3	
	2 x 12 @ 16" oc	3.3	
	5/8" GWB	2.8	
	Misc.	1.5	
		10.4 psf	
LL	Residential	40 psf	
	Total Floor Load		50.4 psf

DECKS

DL	2 x Decking	4.3 psf	
	2 x 10 @ 16" oc	2.8	
	Misc	1.5	
		8.6	
LL	Residential	60 psf	
	Total Deck Load		68.6 psf

WALLS

DL	Siding	3.5	
	1/2" Plywood	1.5 psf	
	2 x 6 @ 16" oc	1.7	
	Insul	0.6	
	1/2" GWB	2.2	
			9.5 psf

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PROJECT 12-2377 / -2470 / -2483 / -2600

JOB NO. 10-041 FIGURED BY GAT

CHECKED BY DATE 06/07/21 SHEET 3 OF

FRAMING -

HDR @ GARAGE DOOR

$\lambda = 16'$

$w = (\frac{18}{2})(45psf) = 405^{plf}$

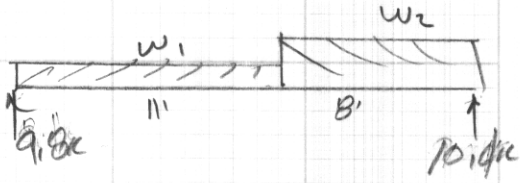
$M = \frac{(0.405^{k/ft})(16')^2}{8} = 12.4^{kft}$ — 3 1/2 x 12 GLB

$V = \frac{16}{2}(0.405^{k/ft}) = 3.2^{k}$ — ok

$\frac{E\Delta}{l/240} = 0.405(0.405^{k/ft})(16')^3 = 829 \times 10^3 k\cdot in^2$ — ok

FLOOR Bm @ GARAGE

$\lambda = 19'$



$w_1 = (\frac{18+20}{2})(45psf) + 100plf = 955^{plf}$

$w_2 = 1,000^{plf} + \frac{6}{2}(50psf) = 1,150^{plf}$

$M = (9.8^{ft})(9.8^{k}) - (9.8')(1.10^{k/ft})(\frac{9.8}{2}) = 48^{kft}/1.15 = 42^{kft}$ — 5 1/2 x 16 55 LVL

$V = 10.4^{k}/1.15 = 9^{k}$

$\frac{E\Delta}{l/240} = 0.45(20.2^{k})(19')^2 = 3636 \times 10^3 k\cdot in^2$ — OK

FINISH Bm @ DEN

$\lambda = 14'$

$w = (\frac{5}{2})(50psf) + 100plf + (\frac{18+18}{2})(45psf) = 1,035^{plf}$

$M = \frac{(1.04^{k/ft})(14')^2}{8} = 25^{k\cdot ft}$ — 3 1/2 x Nail 5 LVL; 5 1/2 x 12 GLB; 5 1/4 x 11 1/4 LVL

$V = \frac{14}{2}(1.04^{k}) = 7.3^{k}/1.15 = 6.35^{k}$ — ok

$\frac{E\Delta}{l/240} = 0.45(1.04^{k/ft})(14')^3 = 1,128 \times 10^3 k\cdot in^2$ — ok

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PROJECT L2-2600
JOB NO. 10-04 FIGURED BY GAT
CHECKED BY DATE 4/22/20 SHEET 4 OF

FRAMING - UPPER FLOOR

FLOOR JST @ KITCHEN / DINING RM

$L = 22'$

$w = (\frac{13}{2})(50psf) + 100plf + (\frac{20+18}{2})(4^{psf}) = 1,280^{plf}$

$M = \frac{(1.3^{klf})(22')^2}{8} = 7.9^{kip} / 1.15 = 6.8^{kip}$ 5 1/2 x 14.5 GLB

$V' = \frac{22}{2}(1.3^{klf}) - \frac{19.5}{12}(1.3^{klf}) = 12.2^{k} / 1.15 = 10.6^{k}$ OK

$EI_{LL} = 0.4(1.3^{klf})(22')^3 = 4,729 \times 10^3 k\cdot in^2$ 5 1/2 x 21 ←

FLUSH JST @ MASTER CLOSET

$L = 4'$

$w = (\frac{4}{2})(4^{psf}) + 100^{plf} = 190^{plf}$

$M = \frac{(0.2^{klf})(4')^2}{8} = 0.4^{kip}$

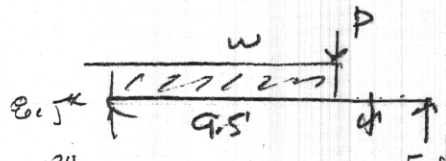
GIRDER TRUSS (3) 2x10 ←

$V = \frac{4}{2}(0.2^{klf}) = 1.4^{k}$ OK

$EI_{LL} = 0.4(0.2^{klf})(4')^3 = 24 \times 10^3 k\cdot in^2$ OK

FLUSH JST @ MASTER BATH

$L = 13.5'$



$w_1 = (\frac{4}{2})(50.5) + 100plf + (\frac{18+20}{2})(4^{psf}) = 1,305^{plf}$

$P = 1.4^{k}$

$M = (6.5')(8.5') - (6.5')(1.31^{klf})(\frac{6.5}{2}) = 27.5^{k'} / 1.15 = 24^{k'}$ 3 1/2 x 14 LVL GLB 5 1/2 x 12 GLB ←

$V = 8.5^{k} / 1.15 = 7.4$ OR 3 1/2 x 14 LVL 3 1/2 x 18 GLB ←

$EI_{LL} = 0.4(13.9^{klf})(13.5)^2 = 1,14 \times 10^3 k\cdot in^2$ OK

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Project Typical Ftg

Job No. By: GAT

Checked Date: 12/03/15 Sht. 5

Square Footing Design

Ftg 36 x 36

Design Parameters

f'_c = 2,500 psi Fy = 40,000 psi All. q = 1,500 psf

b = 6.0 in - short side of column
d = 6.0 in - long side of column

Loads:

Col DL = 2.4 kip (Service Load)
Col LL = 9.6 kip (Service Load)
Floor LL = 0 psf
Overburden = 0.0 in (120 pcf assumed)
Slab Thick. = 0.0 in (150 pcf assumed)

Size and Footing Pressure

h = 8.0 in ← Ftg. Thickness
q_n = 1.40 ksf

Req'd Area = 8.57 ft^2

Try 2.95 ft x 2.95 ft ← Min. Ftg. Size

Factored Net Soil Pressure = 2.13 ksf (1.2D + 1.6L)

Check for Two-Way Shear

Avg d = 4.00 in
V_u = 16.76 kips
b_o = 40.00 in (Critical Shear Perimeter)
B_c = 1 (Long Side/Short Side of Column)
phi V_c = 27.20 kips

Phi V_c > V_u OK

Check for One-Way Shear

V_u = 5.598 kips
Phi V_c = 12.04 kips

Phi V_c > V_u OK

Design Reinforcement

M_u = 4.71 kip-ft
A_s = 0.51 in^2 Use (3) - # 4 bars EW ← Reinforcement
a = 0.27 in 0.59 in^2
Phi M_n = 5.58 kip-ft

Phi M_n > M_u OK
A_s min = 0.51 in^2 OK

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Project L2-2600

Job No. 10-041 By: GAT

Checked Date: 07/31/13 Sht. 6

LATERAL LOADS - (Alternate ASD)

SEISMIC

Maximum Base Shear, $V = \frac{F\ S_{DS}\ W}{R}$ Eq. 12.14-11

where,

F = 1.1 Two-Story Building

S_{DS} = 1.00 S_S = 1.5 Fa = 1.00 (Table 11.4-1, S_s > 1.25)

R = 6.5 Table 12.14-1

W = Seismic Weight

For W:

W_{roof} = (44 ft) (58 ft) (16 psf) + (2) (44 ft + 58 ft) (4.5 ft) (9.5 psf) = 50 kips

W_{floor} = (40 ft) (17 ft) (14 psf) + (2) (40 ft + 17 ft) (8.5 ft) (9.5 psf) = 19 kips

W total = 68 kips

Design Base Shear , V = (.169) (68 kip) = 11.6 kip

$E = \frac{11.6\ kip}{1.4}$ = 8.3 kip

WIND

Design Wind Pressure, $p_s = \lambda\ K_{zt}\ p_{s30}$ Eq. 28.6-1, Sect. 28.6.3

where,

λ = 1.00 0 - 15 ft Exposure B Figure 28.6-1

= 1.00 20 ft

= 1.00 25 ft

K_{zt} = 1.00 Section 26.8

p_{30} = 17.7 psf 110 mph Figure 28.6-1 (ASD)

P_{0-15} = (1.00) (1.00) (17.7 psf) = 17.70 psf (x 0.6 = 10.62 psf)

P_{20} = (1.00) (1.00) (17.7 psf) = 17.70 psf (x 0.6 = 10.62 psf)

P_{25} = (1.00) (1.00) (17.7 psf) = 17.70 psf (x 0.6 = 10.62 psf)

Design Base Shear: (Wind)

$V_{f/b}$ = (50 ft) (10 ft) (17.7 psf) + (40 ft) (5 ft) (17.7 psf)

+ (40 ft) (5 ft) (17.7 psf) =15.9 x 0.6 = 9.6 kips

$V_{s/s}$ = (62 ft) (10 ft) (17.7 psf) + (44 ft) (5 ft) (17.7 psf)

+ (14 ft) (5 ft) (17.7 psf) =16.1 x 0.6 = 9.7 kips

Therefore,

Wind Loads Govern for Lateral Design - Front/Back
Wind Loads Govern for Lateral Design - Side/Side

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PROJECT L2-2600

JOB NO. 10-041 FIGURED BY GAT

CHECKED BY DATE 06/07/24 SHEET 7 OF

SHEAR WALL DESIGN

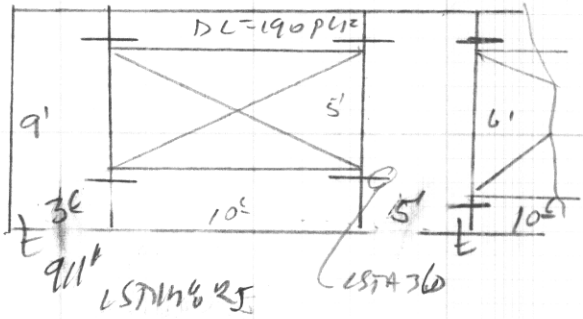
SHEAR WALL #1

ROOF: $V_R = (\frac{44'}{2})(5')(10.4^{\#/ft}) + (\frac{34}{2})(5')(10.6^{\#/ft}) + (\frac{57}{2})(10')(10.6^{\#/ft}) = 4,293^{\#}$

$l = 3.5' + 5' = 8.5'$

$q = 4,293^{\#} / 8.5' = 505^{\#/ft}$

B



SHEAR WALL #2

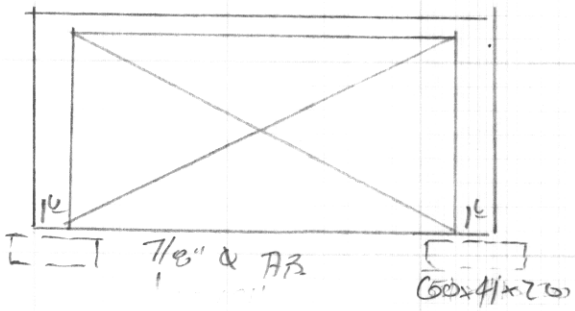
ROOF: $V_R = (\frac{44'}{2})(5')(10.4^{\#/ft}) + (\frac{57}{2})[(5')(10.6^{\#/ft}) + (10')(10.6^{\#/ft})] = 4,903^{\#}$

$l = 1.5' + 1.5' = 3'$

$q = 4,903^{\#} / 3' = 1,634^{\#/ft}$

W3W 18=B POSTAL FRAMER

$V_{ALL} = 5,150^{\#}$



SHEAR WALL #3

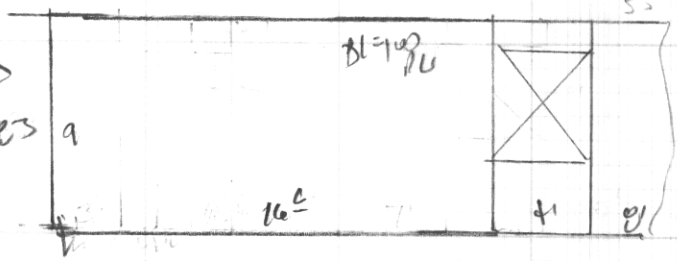
ROOF: $V_{12} = (\frac{40'}{2})[(5')(10.6^{\#/ft}) + (5')(10.4^{\#/ft})] + (\frac{44}{2})(10')(10.6^{\#/ft}) = 4,452^{\#}$

$l = 16.5' + 8.5' + 20' = 45'$

$q = 4,452^{\#} / 45' = 99^{\#/ft}$

A

$\frac{45'}{54} = 0.83$



SHEAR WALL #4 (3-CAR WOOD)

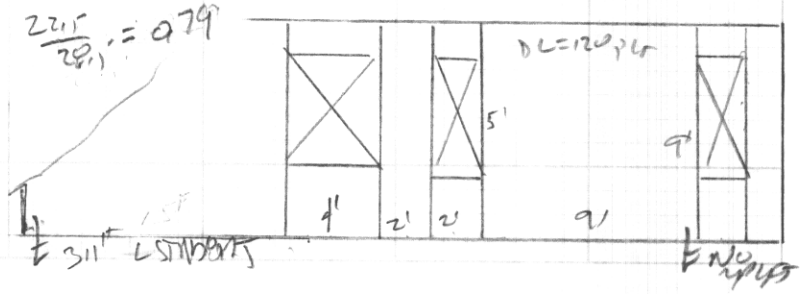
ROOF: $V_R = 4,452^{\#}$

$l = 9' + 2' + 11.5' = 22.5'$

$q = 4,452^{\#} / 22.5' = 100^{\#/ft}$

A

$\frac{22.5'}{28.1'} = 0.79$



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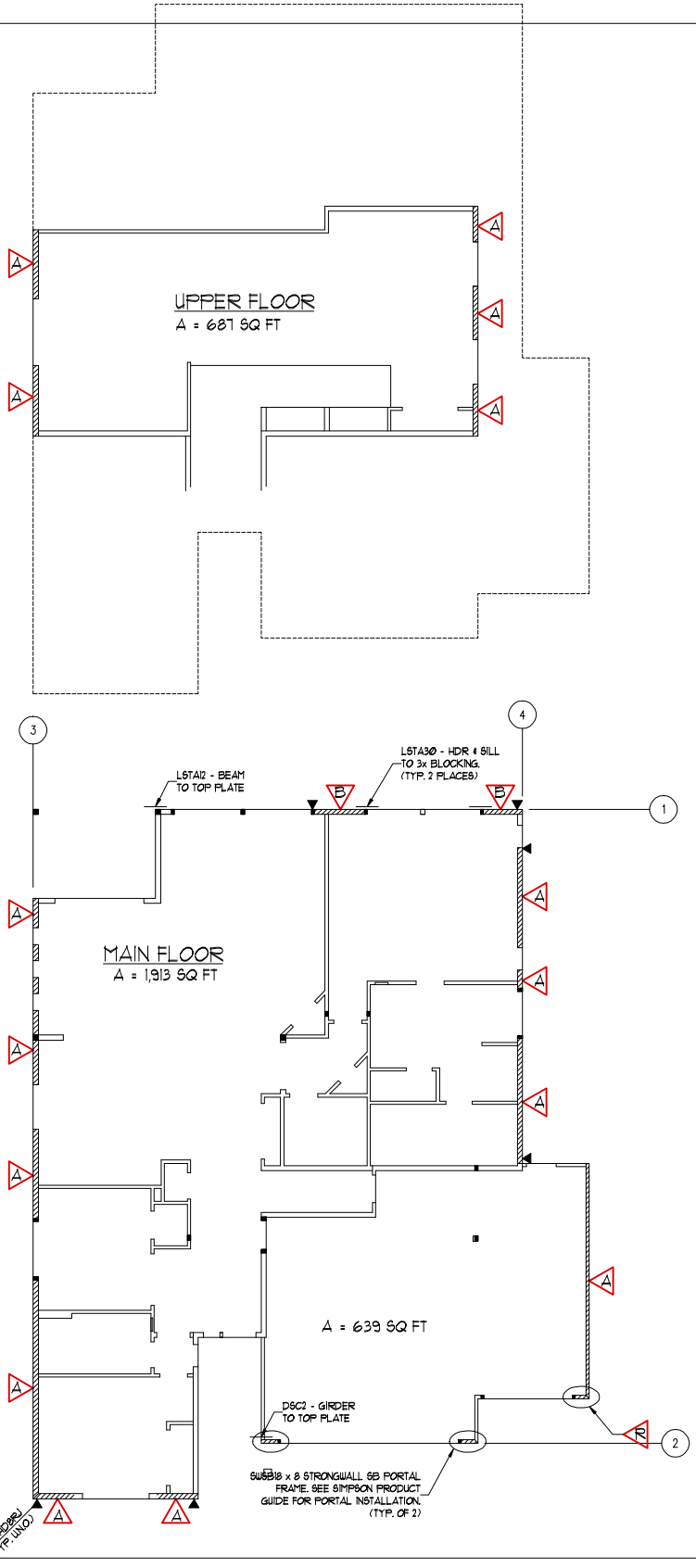
PROJECT L2-2600-3

JOB NO. 10-041 FIGURED BY GAT

CHECKED BY DATE 08/10/16 SHEET 8 OF 8

SHEAR WALL KEY PLAN



SHEAR WALL SCHEDULE

Mark	Minimum Sheathing (1)	Sheathing Nailing (1)	Anchor Bolts (2)	Remarks (4)
A	1/2" OSB or CDX	8d @ 6" o.c.	5/8" @ 60" o.c.	Q_{all} = 230 plf
B	1/2" OSB or CDX	8d @ 3" o.c.	5/8" @ 16" o.c.	Q_{all} = 450 plf Use minimum 3x studs abbutting all panel edges and stagger edge nailing.
R	See Detail 12/S2.0 for Construction			

Notes:

1) All walls designated "▷" are shear walls. Exterior walls shall be sheathed with rated sheathing (24/0, OSB or CDX) and nailed at all panel edges (Blocked) per schedule (uno). Nailing at intermediate framing to be at 12" oc. Nailing not called out shall be per IBC Table 2304.10.1.

2) Holdowns and other framing hardware by Simpson or equal to be used per plan. Ends of shear walls shall use double studs minimum (UNO).

3) Use minimum of (2) bolts per sill piece with one bolt located not more than 12" nor less than 5" from each end of the piece. Embed bolts a minimum of 7" into concrete.

4) Allowable loads are permitted to be increased by 40% for wind design in accordance with AF&PA SDPWS Table 4.3A.