BLD 18-4368. R01 PC1

DESIGN EVEREST
CONSULTING ENGINEERS

STRUCTURAL DELTA 1 CALCULATIONS FOR:

NEW SINGLE STORY RESIDENCE

REVIEWED FOR CODE COMPLIANCE
OCT 18 2018
PERMIT AND RESOURCE MANAGEMENT DEPARTMENT

PROJECT LOCATION:

4531 Brighton Dr, Santa Rosa, CA 95403

PROJECT NUMBER:

201805083

PREPARED DATE:

August 31, 2018

PREPARED BY:

PRESTON NIRATTISAI, P.E.

OFFICE

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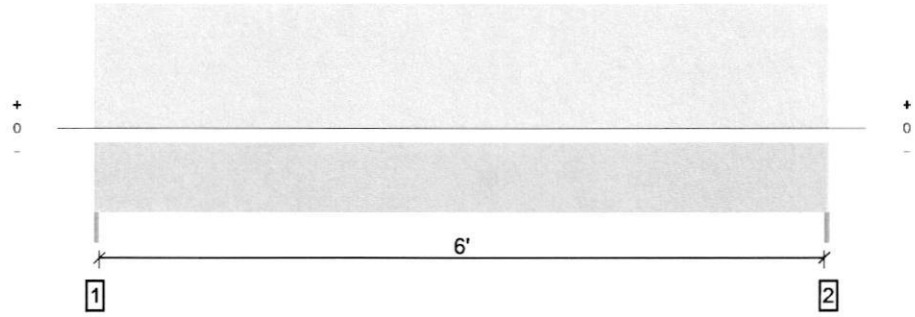
01: Headers			
Member Name	**Results**	**Current Solution**	**Comments**
Typical load bearing header	Passed	1 Piece(s) 4 x 4 Douglas Fir-Larch No. 1	
Typical load bearing header up to 4'-0"	Passed	1 Piece(s) 4 x 6 Douglas Fir-Larch No. 1	
Typical load bearing header up to 6'-0"	Passed	1 Piece(s) 4 x 8 Douglas Fir-Larch No. 1	
Typical load bearing header up to 8'-0"	Passed	1 Piece(s) 4 x 10 Douglas Fir-Larch No. 1	
Header at garage	Passed	1 Piece(s) 3 1/2" x 16" 2.2E Parallam® PSL	

Delta 1

Forte Software Operator	Job Notes
Preston Nirattisai Nirattisai Structural Engineering, Inc. (818) 639-1760 preston@nirattisai.com	#269.000

Overall Length: 6' 3"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2276 @ 0	3281 (1.50")	Passed (69%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	1745 @ 8 3/4"	3806	Passed (46%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	3557 @ 3' 1 1/2"	4152	Passed (86%)	1.25	1.0 D + 1.0 Lr (All Spans)
Vert Live Load Defl. (in)	0.069 @ 3' 1 1/2"	0.208	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Vert Total Load Defl. (in)	0.132 @ 3' 1 1/2"	0.313	Passed (L/567)	--	1.0 D + 1.0 Lr (All Spans)
Lat Member Reaction (lbs)	251 @ 6' 3"	N/A	Passed (N/A)	1.60	1.0 D + 0.6 W
Lat Shear (lbs)	218 @ 5"	4872	Passed (4%)	1.60	1.0 D + 0.6 W
Lat Moment (Ft-lbs)	393@ mid-span	2694	Passed (15%)	1.60	1.0 D + 0.6 W
Lat Deflection (in)	0.044@ mid-span	0.625	Passed (L/999+)	--	1.0 D + 0.6 W
Bi-Axial Bending	0.70	1.00	Passed (70%)	1.60	1.0 D + 0.45 W + 0.75 L + 0.75 Lr

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (5/16").
- Lateral deflection criteria: Wind (L/120)
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Trimmer - DF	1.50"	1.50"	1.50"	1089	1188	2277	None
2 - Trimmer - DF	1.50"	1.50"	1.50"	1089	1188	2277	None

Lateral Connections						
Supports	Plate Size	Plate Material	Connector	Type/Model	Quantity	Nailing
Left	2X	Douglas Fir-Larch	Nails	10d x 3" Box (End)	3	
Right	2X	Douglas Fir-Larch	Nails	10d x 3" Box (End)	3	

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 6' 3"	N/A	6.4		
1 - Uniform (PSF)	0 to 6' 3"	19'	18.0	20.0	

Lateral Load	Location	Tributary Width	Wind (1.60)	Comments
1 - Uniform (PSF)	Full Length	6'	22.3	

- ASCE/SEI 7-10 Sec. 30.4: Exposure Category (B), Mean Roof Height (33'), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (110 mph), Risk Category(II), Effective Wind Area determined using full member span and trib. width.
- 2015 IBC Table 1604.3, footnote f: Deflection checks are performed using 42% of this lateral wind load.

Weyerhaeuser Notes

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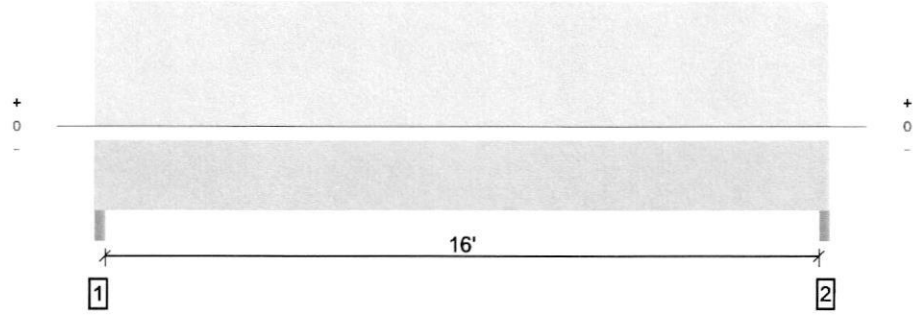
The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

Forte Software Operator	Job Notes
Preston Nirattisai Nirattisai Structural Engineering, Inc. (818) 639-1760 preston@nirattisai.com	#269.000

Overall Length: 16' 6"



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6101 @ 1 1/2"	6563 (3.00")	Passed (93%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	4930 @ 1' 7"	13533	Passed (36%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	24409 @ 8' 3"	43693	Passed (56%)	1.25	1.0 D + 1.0 Lr (All Spans)
Vert Live Load Defl. (in)	0.250 @ 8' 3"	0.542	Passed (L/779)	--	1.0 D + 1.0 Lr (All Spans)
Vert Total Load Defl. (in)	0.487 @ 8' 3"	0.813	Passed (L/400)	--	1.0 D + 1.0 Lr (All Spans)
Lat Member Reaction (lbs)	612 @ 16' 4 1/2"	N/A	Passed (N/A)	1.60	1.0 D + 0.6 W
Lat Shear (lbs)	581 @ 6 1/2"	12544	Passed (5%)	1.60	1.0 D + 0.6 W
Lat Moment (Ft-lbs)	2487@ mid-span	13234	Passed (19%)	1.60	1.0 D + 0.6 W
Lat Deflection (in)	0.661@ mid-span	1.625	Passed (L/295)	--	1.0 D + 0.6 W
Bi-Axial Bending	0.88	1.00	Passed (88%)	1.60	1.0 D + 0.45 W + 0.75 L + 0.75 Lr

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Lateral deflection criteria: Wind (L/120)

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Trimmer - DF	3.00"	3.00"	2.79"	2966	3135	6101	None
2 - Trimmer - DF	3.00"	3.00"	2.79"	2966	3135	6101	None

Lateral Connections						
Supports	**Plate Size**	**Plate Material**	**Connector**	**Type/Model**	**Quantity**	**Nailing**
Left	2X	Douglas Fir-Larch	Nails	10d x 3" Box (End)	7	
Right	2X	Douglas Fir-Larch	Nails	10d x 3" Box (End)	7	

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 16' 6"	N/A	17.5		
1 - Uniform (PSF)	0 to 16' 6"	19'	18.0	20.0	

Lateral Load	Location	Tributary Width	Wind (1.60)	Comments
1 - Uniform (PSF)	Full Length	6'	20.9	

- ASCE/SEI 7-10 Sec. 30.4: Exposure Category (B), Mean Roof Height (33'), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (110 mph), Risk Category(II), Effective Wind Area determined using full member span and trib. width.
- 2015 IBC Table 1604.3, footnote f: Deflection checks are performed using 42% of this lateral wind load.

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Delta 1

Seismic weight

Bldg area =	3370 sf		Roof wt =	18 psf
Bldg perimeter =	222 ft		Wall wt =	18 psf
Seismic wt =	76.644 k			

Base shear per ASCE 7-10 Section 12.8.1

LFRS Selection — Light-frame bearing wall system

	R = 6.5	I = 1		(Table 12.2-1)
Site coefficients	Sds = 1.614	S1 = 1.007		
	Sd1 = 1.007			(Eq 12.8-2)
				(Eq 12.8-5)
	Bldg h = 15 ft average			(Eq 12.8-6)
	T = 0.02*15^0.75 = 0.1524 s			(Eq 12.8-3)

Response coefficient

Cs = 1.614/(6.5/1) =	0.2483
Cs min = 0.044*1.614*1 =	0.0710
Cs min = 0.5*1.007/(6.5/1) =	0.0775
Cs max = 1.007/(0.152*6.5/1) =	1.0163

Delta 1

Cs min 0.0775 < Cs 0.2483 < Cs max 1.0163

V = Cs*W =	19031 lb base shear @ LRFD		
0.7*V =	13322 lb base shear @ ASD		
ρ*V =	17318 lb base shear @ ASD w/ ρ = 1.3 applied		
Bldg length Y =	40 ft	Unit shear along X =	
Governing shear =	17318 lb	17318/40 =	433 plf
Bldg length X =	83 ft	Unit shear along Y =	
Governing shear =	16892	16892/83 =	204 plf

Delta 1

Segmented shear wall design per SDPWS Sec 4.3 at ASD w/ ρ = 1.3

Wall at rear of garage		Seismic unit shear on this wall =		433 plf
TW =	6 ft			
Shear line ΣLs =	14 ft			
433*6 =	2598 lb @ ASD w/ ρ = 1.3			
vw Unit shear = 2598/14 =	186 plf			

Using Struct I, 15/32", 10d: (SDPWS Table 4.3A)

SW Type:	**1**	2	3	4	
Edge nailing:	**6**	4	3	2	in o.c.
Capacity	**680**	1020	1330	1740	plf
Capacity, ASD	**340**	510	665	870	plf

> Demand = 186 plf

Uplift T = 186*8 = 1484 lb ... use HDU2 T cap = 3075 lb

Wall adjacent to patio		Seismic unit shear on this wall =		433 plf
TW =	16 ft			
Shear line ΣLs =	9.5 ft			
433*16 =	6927 lb @ ASD w/ ρ = 1.3			
vw Unit shear = 6927/9.5 =	729 plf			

Using Struct I, 15/32", 10d: (SDPWS Table 4.3A)

SW Type:	1	**2**	3	4	
Edge nailing:	6	**4**	3	2	in o.c.
Double sided sheathing, ASD	680	**1020**	1330	1740	plf
Single sided capacity, ASD	340	**510**	665	870	plf

> Demand = 729 plf

Uplift T = 729*8 = 5834 lb ... use HDU5 T cap = 5645 lb

Delta 1

Wall at front of garage — Seismic unit shear on this wall = 433 plf

TW = 17 ft

Shear line ΣLs = 14 ft

433*17 = 7360 lb @ ASD w/ ρ = 1.3

vw Unit shear = 7360/14 = 526 plf

Using Struct I, 15/32", 10d: (SDPWS Table 4.3A)

SW Type:	1	2	**3**	4	
Edge nailing:	6	4	**3**	2	in o.c.
Capacity	680	1020	**1330**	1740	plf
Capacity, ASD	340	510	**665**	870	plf

> Demand = 526 plf

Uplift T = 526*8 = 4206 lb ... use HDU4 T cap = 4565 lb

Wall adjacent to front entrance — Seismic unit shear on this wall = 433 plf

TW = 4 ft

Shear line ΣLs = 14 ft

433*4 = 1732 lb @ ASD w/ ρ = 1.3

vw Unit shear = 1732/14 = 124 plf

Using Struct I, 15/32", 10d: (SDPWS Table 4.3A)

SW Type:	**1**	2	3	4	
Edge nailing:	**6**	4	3	2	in o.c.
Capacity	**680**	1020	1330	1740	plf
Capacity, ASD	**340**	510	665	870	plf

> Demand = 124 plf

Uplift T = 124*8 = 990 lb ... use HDU2 T cap = 3075 lb

Ext wall side of garage — Seismic unit shear on this wall = 204 plf

TW = 12 ft

Shear line ΣLs = 30 ft

204*12 = 2442 lb @ ASD w/ ρ = 1.3

vw Unit shear = 2442/30 = 81 plf

Using Struct I, 15/32", 10d: (SDPWS Table 4.3A)

SW Type:	**1**	2	3	4	
Edge nailing:	**6**	4	3	2	in o.c.
Capacity	**680**	1020	1330	1740	plf
Capacity, ASD	**340**	510	665	870	plf

> Demand = 81 plf

Uplift T = 81*8 = 651 lb ... use HDU2 T cap = 3075 lb

Wall between garage and residence — Seismic unit shear on this wall = 204 plf

TW = 41 ft

Shear line ΣLs = 26.5 ft

204*41 = 8344 lb @ ASD w/ ρ = 1.3

vw Unit shear = 8344/26.5 = 315 plf

Using Struct I, 15/32", 10d: (SDPWS Table 4.3A)

SW Type:	**1**	2	3	4	
Edge nailing:	**6**	4	3	2	in o.c.
Capacity	**680**	1020	1330	1740	plf
Capacity, ASD	**340**	510	665	870	plf

> Demand = 315 plf

Uplift T = 315*8 = 2519 lb ... use HDU2 T cap = 3075 lb

Ext wall at side of residence	Seismic unit shear on this wall =	204	plf

TW = 29.5 ft

Shear line ΣLs = 17 ft

204*29.5 = 6004 lb @ ASD w/ ρ = 1.3

vw Unit shear = 6004/17 = 353 plf

Using Struct I, 15/32", 10d: (SDPWS Table 4.3A)

SW Type:	1	**2**	3	4	
Edge nailing:	6	**4**	3	2	in o.c.
Capacity	680	**1020**	1330	1740	plf
Capacity, ASD	340	**510**	665	870	plf

> Demand = 353 plf

Uplift T = 353*8 = 2825 lb ... use HDU2 T cap = 3075 lb