B-20-0741

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

STRUCTURAL CALCULATIONS

Project: Foster Residence
Address: 2345 ~~24xx~~ West Stewart Ave
Puyallup, WA 98371
Project No.: 202012
Date: January 27, 2020

PERMIT SUBMITTAL

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

FULL SIZED LEDGIBLE COLOR PLANS ARE REQUIRED TO BE PROVIDED BY THE PERMITEE ON SITE FOR INSPECTION

ERCIN SAHIN
STATE OF WASHINGTON
50294
REGISTERED
PROFESSIONAL ENGINEER

Jan 29, 2020

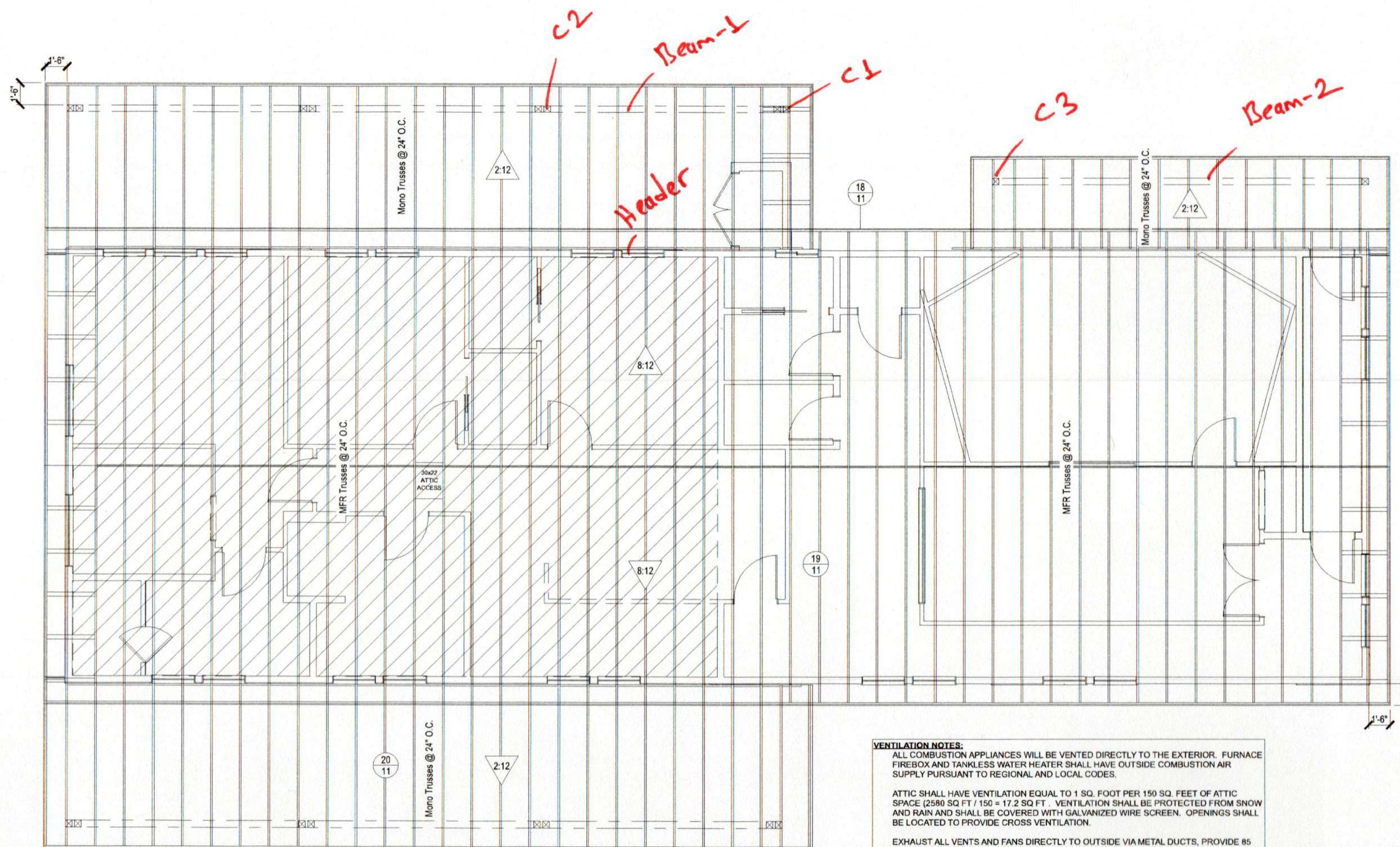
Client:
Danny Foster

Contents:

1412 Beach Drive NE Unit A | Tacoma WA, WA | 98422
253.533.0835 | tel
Structural Works, PLLC

Roof Sheathing Size Requirements

Up to 40 lbs	Up to 70lbs	Up to 130 lbs
7/16" OSB	15/32" OSB	5/8" OSB



Roof Framing Plan - PHS19.056 - Danny Foster

1/8 in = 1 ft

B-20-0741

VENTILATION NOTES:

ALL COMBUSTION APPLIANCES WILL BE VENTED DIRECTLY TO THE EXTERIOR. FURNACE FIREBOX AND TANKLESS WATER HEATER SHALL HAVE OUTSIDE COMBUSTION AIR SUPPLY PURSUANT TO REGIONAL AND LOCAL CODES.

ATTIC SHALL HAVE VENTILATION EQUAL TO 1 SQ. FOOT PER 150 SQ. FEET OF ATTIC SPACE (2580 SQ FT / 150 = 17.2 SQ FT . VENTILATION SHALL BE PROTECTED FROM SNOW AND RAIN AND SHALL BE COVERED WITH GALVANIZED WIRE SCREEN. OPENINGS SHALL BE LOCATED TO PROVIDE CROSS VENTILATION.

EXHAUST ALL VENTS AND FANS DIRECTLY TO OUTSIDE VIA METAL DUCTS, PROVIDE 85 CFM (MIN) FAN TO PROVIDE 5 AIR CHANGES PER HOUR OR 30CFM CONTINUOUS WHOLE HOUSE FAN IN LAUNDRY ROOM. PROVIDE 50 CFM FAN IN BATHS CONTAINING TUB AND / OR SHOWER. PROVIDE 100 CFM HOOD FAN FOR STOVETOP.

GARAGES SHALL BE VENTED WITH 60 SQUARE INCHES LOCATED 6" ABOVE THE FLOOR SURFACE.

UNDER FLOOR SPACES SHALL HAVE VENTILATION EQUAL TO ONE SQ. FOOT PER 150 SQ. FEET OF FLOOR SPACE. VENTS SHALL BE CAST INTO THE CONCRETE STEM WALLS AND COVERED WITH GALVANIZED WIRE SCREEN. VENTS SHALL BE LOCATED TO PROVIDE CROSS VENTILATION.

PACIFIC HOME SOURCE

Gabe Spruell
Ph: 253.312.5523

4001 72nd St. E.
Tacoma, WA 98443

Danny Foster

24XX West Stewart
Puyallup, WA 98371
253-255-3413
Parcel # - 0420203068

Roof Framing

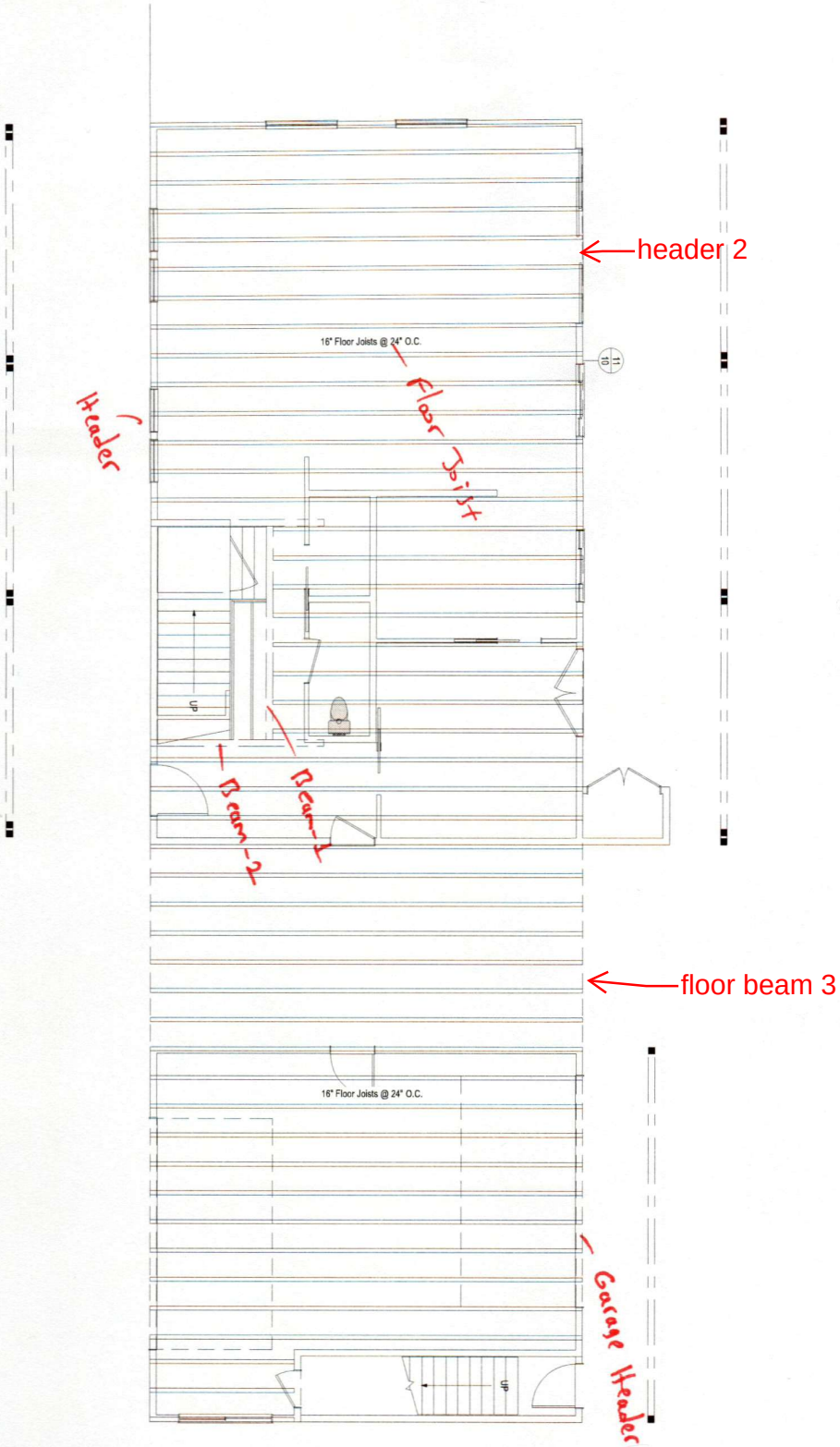
PHS Job #: 19.056

Printed On: 12/23/2019 18:32:02

Layout Sheet # 8 of 12

Sheet: 8

Upper Floor Framing Plan - PHS19.056 - Danny Foster
1/8 in = 1 ft



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Upper Floo
Framing

PHS Job #:
19.056

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12/23/2019 18:32:01

Layout Sheet #
7 of 12

Sheet:
7

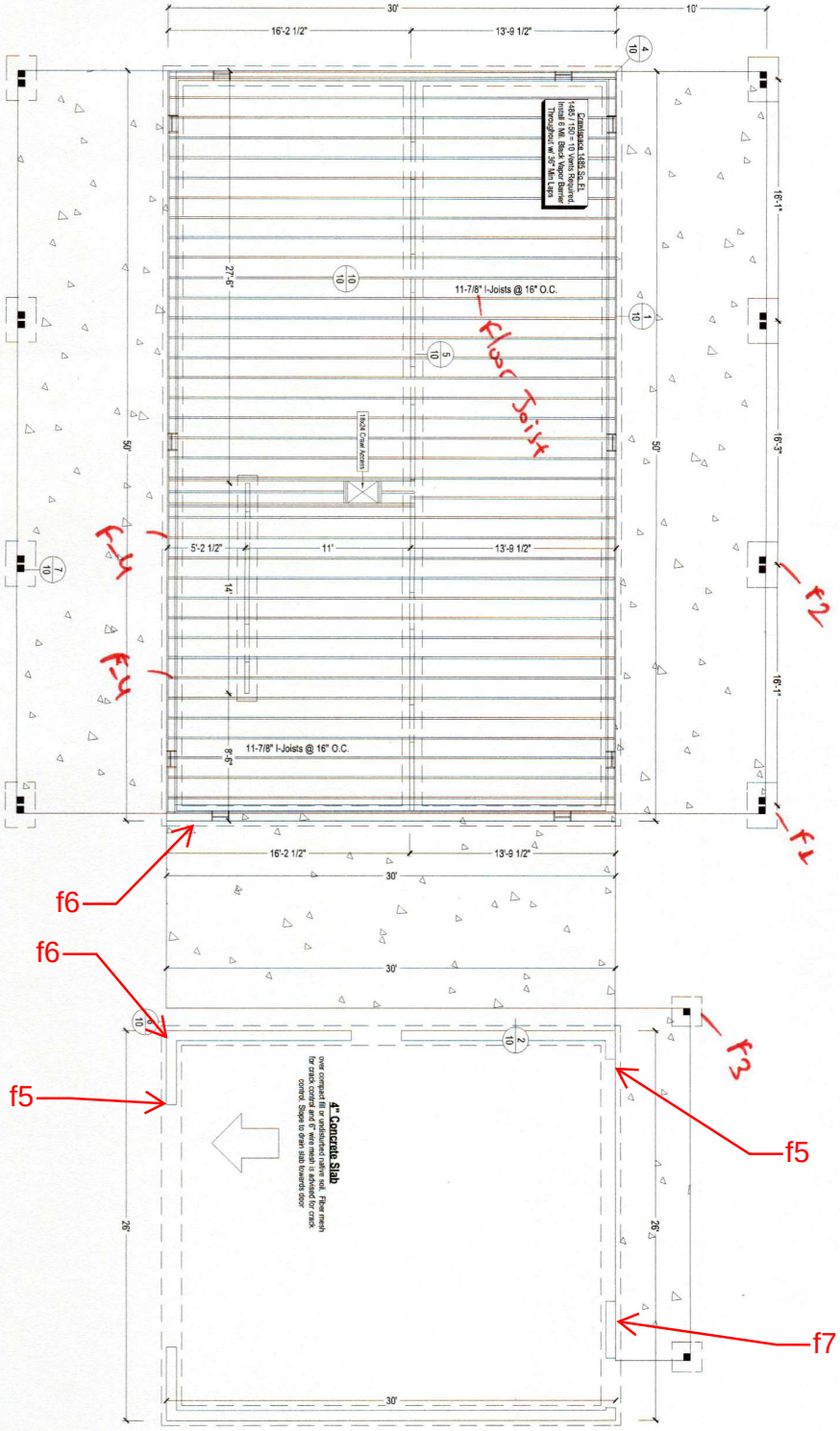
Danny Foster
24XX West Stewart
Puyallup, WA 98371
253-255-3413
Parcel # - 0420203068

PACIFIC HOME SOURCE

Gabe Spruell
Ph: 253.312.5523

4001 72nd St. E.
Tacoma, WA 98443

Foundation & Main Floor Framing Plan - PHS19.056 - Danny Foster
1/8 in = 1 ft



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Foundation & Framing

PHS Job #: 19.056
Printed On: 12/23/2019 18:32:00
Layout Sheet # 6 of 12
Sheet: 6

Danny Foster
24XX West Stewart
Puyallup, WA 98371
253-255-3413
Parcel # - 0420203068

PACIFIC HOME SOURCE
Gabe Spruell
Ph: 253.312.5523
4001 72nd St. E.
Tacoma, WA 98443

Location: Foundation
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 21.0 IN Wide x 8.0 IN Deep Continuous Footing With 8.0 IN Thick x 18.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #4 Bars
TransverseReinforcement: #4 Bars @ 12.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

Location: Roof Beam-1
Roof Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 11.5 IN x 15.67 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 16.2%
Controlling Factor: Moment

Location: Roof Beam-2
Roof Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 12.0 IN x 25.5 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 27.4%
Controlling Factor: Deflection

Location: Column-1
Column
[2015 International Building Code(2015 NDS)]
5.5 IN x 5.5 IN x 9.0 FT
#2 - Hem-Fir - Dry Use
Section Adequate By: 80.6%

Location: Column-2
Column
[2015 International Building Code(2015 NDS)]
5.5 IN x 5.5 IN x 9.0 FT
#2 - Hem-Fir - Dry Use
Section Adequate By: 61.5%

Location: Column-3
Column
[2015 International Building Code(2015 NDS)]
5.5 IN x 5.5 IN x 9.0 FT
#2 - Hem-Fir - Dry Use
Section Adequate By: 80.6%

Location: Roof Header
Roof Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 9.25 IN x 6.5 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 36.4%
Controlling Factor: Moment

Location: Upper Floor Beam-1
Uniformly Loaded Floor Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 15.0 IN x 14.75 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 399.1%
Controlling Factor: Moment

Location: Upper Floor Beam-2
Uniformly Loaded Floor Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 15.0 IN x 15.5 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 227.8%
Controlling Factor: Moment

Location: Floor Header
Uniformly Loaded Floor Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 9.25 IN x 6.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 11.5%
Controlling Factor: Moment

Location: Floor Header 2
Uniformly Loaded Floor Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 13.5 IN x 12.0 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 31.5%
Controlling Factor: Moment

Location: garage header
Combination Roof And Floor Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 16.5 IN x 16.0 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 11.7%
Controlling Factor: Moment

Location: Upper floor beam 3
Combination Roof And Floor Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 16.5 IN x 14.0 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 44.8%
Controlling Factor: Moment

Location: Main Floor Joist
Floor Joist
[2015 International Building Code(2015 NDS)]
TJI 210 / 11.875 - iLevel Trus Joist x 16.0 FT @ 16 O.C.
Section Adequate By: 71.0%
Controlling Factor: Moment

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Location: Foundation-1
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 2.0 FT x 3.0 FT x 12.00 IN
Reinforcement in Long Direction: #4 Bars @ 8.00 IN. O.C. / (3) min.
Reinforcement in Short Direction-center band (Equal to width of short side): #4 Bars @ 5.88 IN. O.C. / (4) min.
Reinforcement in Short Direction-outside bands: #4 Bars @ 0.00 IN. O.C. / (1) Each band.
Section Footing Design Adequate

Location: Foundation-2
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 2.0 FT x 3.0 FT x 12.00 IN
Reinforcement in Long Direction: #4 Bars @ 8.00 IN. O.C. / (3) min.
Reinforcement in Short Direction-center band (Equal to width of short side): #4 Bars @ 5.88 IN. O.C. / (4) min.
Reinforcement in Short Direction-outside bands: #4 Bars @ 0.00 IN. O.C. / (1) Each band.
Section Footing Design Adequate

Location: Foundation-3
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 2.0 FT x 2.0 FT x 12.00 IN
Reinforcement in Long Direction: #4 Bars @ 8.00 IN. O.C. / (3) min.
Reinforcement in Short Direction-center band (Equal to width of short side): #4 Bars @ 8.00 IN. O.C. / (3) min.
Reinforcement in Short Direction-outside bands: #4 Bars @ 0.00 IN. O.C. / () Each band.
Section Footing Design Adequate

Location: foundation 4
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 21.0 IN Wide x 8.0 IN Deep Continuous Footing With 8.0 IN Thick x 18.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #4 Bars
TransverseReinforcement: #4 Bars @ 13.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

Location: Foundation-5
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 3.5 FT x 3.5 FT x 10.00 IN
Reinforcement: #4 Bars @ 11.00 IN. O.C. E/W / (4) min.
Section Footing Design Adequate

Location: Foundation-6
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 3.5 FT x 3.5 FT x 10.00 IN
Reinforcement: #4 Bars @ 11.00 IN. O.C. E/W / (4) min.
Section Footing Design Adequate

Location: Foundation-7
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 16.0 IN Wide x 8.0 IN Deep Continuous Footing With 6.0 IN Thick x 6.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #4 Bars
TransverseReinforcement: #4 Bars @ 13.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

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Project: Model

Location: Foundation
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 21.0 IN Wide x 8.0 IN Deep Continuous Footing With 8.0 IN Thick x 18.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #4 Bars
TransverseReinforcement: #4 Bars @ 12.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

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1412 Beach Drive NE
Tacoma, WA

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500	psf
Concrete Compressive Strength:	F'c =	2500	psi
Reinforcing Steel Yield Strength:	Fy =	40000	psi
Concrete Reinforcement Cover:	c =	3	in

FOOTING SIZE

Width:	W =	21	in
Depth:	Depth =	8	in
Effective Depth to Top Layer of Steel:	d =	4.25	in

STEMWALL SIZE

Stemwall Width:	8	in
Stemwall Height:	18	in
Stemwall Weight:	150	pcf

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure:	Qu =	1240	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1400	psf
Width Required:	Wreq =	1.55	ft

Beam Shear Calculations (One Way Shear):

Beam Shear:	Vu1 =	334	lb
Allowable Beam Shear:	Vc1 =	3825	lb

Transverse Direction:

Bending Calculations:

Factored Moment:	Mu =	3140	in-lb
Nominal Moment Strength:	Mn =	0	in-lb

Reinforcement Calculations:

Concrete Compressive Block Depth:	a =	0.30	in
Steel Required Based on Moment:	As(1) =	0.02	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4)	As(2) =	0.19	in2
Controlling Reinforcing Steel:	As-reqd =	0.19	in2
Selected Reinforcement:	Trans: #4's @ 12.0 in. o.c.		
Reinforcement Area Provided:	As =	0.19	in2

Development Length Calculations:

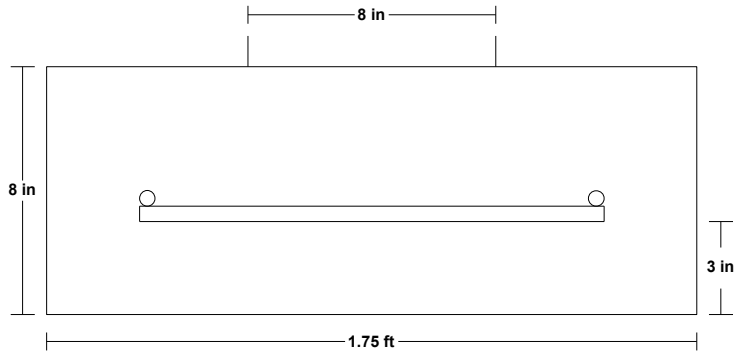
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	3.5	in

Longitudinal Direction:

Reinforcement Calculations:

Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.34	in2
Controlling Reinforcing Steel:	As-reqd =	0.34	in2
Selected Reinforcement:	Longitudinal: (2) Cont. #4 Bars		
Reinforcement Area Provided:	As =	0.39	in2

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL =	1295	plf
Dead Load:	PD =	724	plf
Total Load:	PT =	2169	plf
Ultimate Factored Load:	Pu =	3121	plf

LOAD CALCULATOR

	Live Load		Dead Load		Tributary Width	
Roof:	LL =	25 psf	DL =	15 psf	TA =	15 ft2
Second Floor:	LL =	40 psf	DL =	12 psf	TA =	15 ft2
First Floor:	LL =	40 psf	DL =	12 psf	TA =	8 ft2

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Project: Model

Location: Roof Beam-1
Roof Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 11.5 IN x 15.67 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 16.2%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.25	IN L/744
Dead Load	0.17	in
Total Load	0.43	IN L/441

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/180

REACTIONS

	A		B	
Live Load	1322	lb	1322	lb
Dead Load	912	lb	912	lb
Total Load	2234	lb	2234	lb
Bearing Length	0.65	in	0.65	in

BEAM DATA

Span Length	15.7	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	0	ft
Roof Pitch	2	:12
Roof Duration Factor	1.15	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values		Adjusted	
Bending Stress:	Fb = 875	psi	Fb' = 1006	psi
	Cd=1.15 CF=1.00			
Shear Stress:	Fv = 170	psi	Fv' = 196	psi
	Cd=1.15			
Modulus of Elasticity:	E = 1300	ksi	E' = 1300	ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625	psi	Fc - ⊥' = 625	psi

Controlling Moment: 8751 ft-lb
7.835 ft from left support
Created by combining all dead and live loads.
Controlling Shear: 2234 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd		Provided	
Section Modulus:	104.36	in3	121.23	in3
Area (Shear):	17.14	in2	63.25	in2
Moment of Inertia (deflection):	337.09	in4	697.07	in4
Moment:	8751	ft-lb	10166	ft-lb
Shear:	2234	lb	8244	lb

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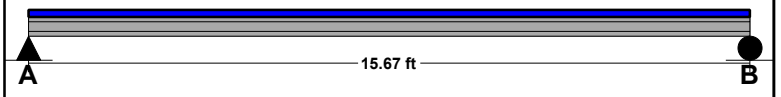

ROOF LOADING

Side One:

Roof Live Load:	LL =	25	psf
Roof Dead Load:	DL =	15	psf
Tributary Width:	TW =	4.8	ft

Side Two:

Roof Live Load:	LL =	25	psf
Roof Dead Load:	DL =	15	psf
Tributary Width:	TW =	2	ft

Wall Load: WALL = 0 plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS

Adjusted Beam Length:	Ladj =	15.67	ft
Beam Self Weight:	BSW =	14	plf
Beam Uniform Live Load:	wL =	169	plf
Beam Uniform Dead Load:	wD_adj =	116	plf
Total Uniform Load:	wT =	285	plf

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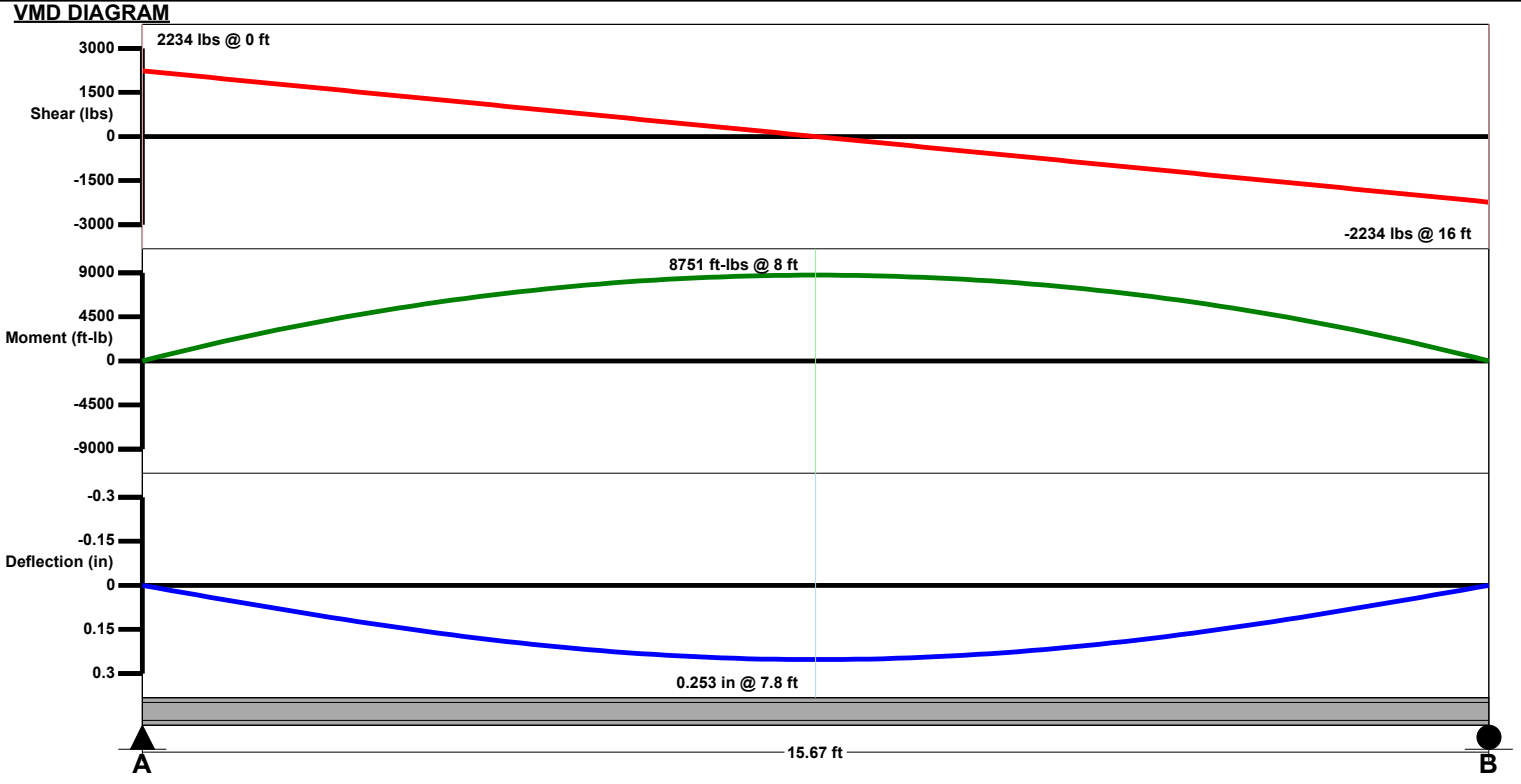
VMD DIAGRAM



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Project: Model

Location: Roof Beam-2
Roof Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 12.0 IN x 25.5 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 27.4%
Controlling Factor: Deflection

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DEFLECTIONS Center

Live Load	0.67	IN L/459
Dead Load	0.50	in
Total Load	1.17	IN L/262

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/180

REACTIONS

	A		B	
Live Load	1275	lb	1275	lb
Dead Load	958	lb	958	lb
Total Load	2233	lb	2233	lb
Bearing Length	0.62	in	0.62	in

BEAM DATA

Span Length	25.5	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	0	ft
Roof Pitch	2	:12
Roof Duration Factor	1.15	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

		Base Values		Adjusted	
Bending Stress:	Fb =	2400	psi	*Controlled by:*	
	Fb_cmpr =	1850	psi	Fb' =	2688 psi
	Cd=1.15 Cv=0.97				
Shear Stress:	Fv =	265	psi	Fv' =	305 psi
	Cd=1.15				
Modulus of Elasticity:	E =	1800	ksi	E' =	1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	650	psi	Fc - ⊥' =	650 psi

Controlling Moment: 14235 ft-lb
12.75 ft from left support
Created by combining all dead and live loads.
Controlling Shear: 2233 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd		Provided	
Section Modulus:	63.55	in3	132	in3
Area (Shear):	10.99	in2	66	in2
Moment of Inertia (deflection):	621.7	in4	792	in4
Moment:	14235	ft-lb	29567	ft-lb
Shear:	2233	lb	13409	lb

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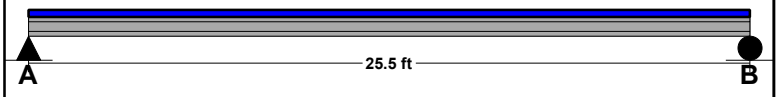

ROOF LOADING

Side One:			
Roof Live Load:	LL =	25	psf
Roof Dead Load:	DL =	15	psf
Tributary Width:	TW =	2.3	ft
Side Two:			
Roof Live Load:	LL =	25	psf
Roof Dead Load:	DL =	15	psf
Tributary Width:	TW =	1.8	ft
Wall Load:	WALL =	0	plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS

Adjusted Beam Length:	Ladj =	25.5	ft
Beam Self Weight:	BSW =	14	plf
Beam Uniform Live Load:	wL =	100	plf
Beam Uniform Dead Load:	wD_adj =	75	plf
Total Uniform Load:	wT =	175	plf

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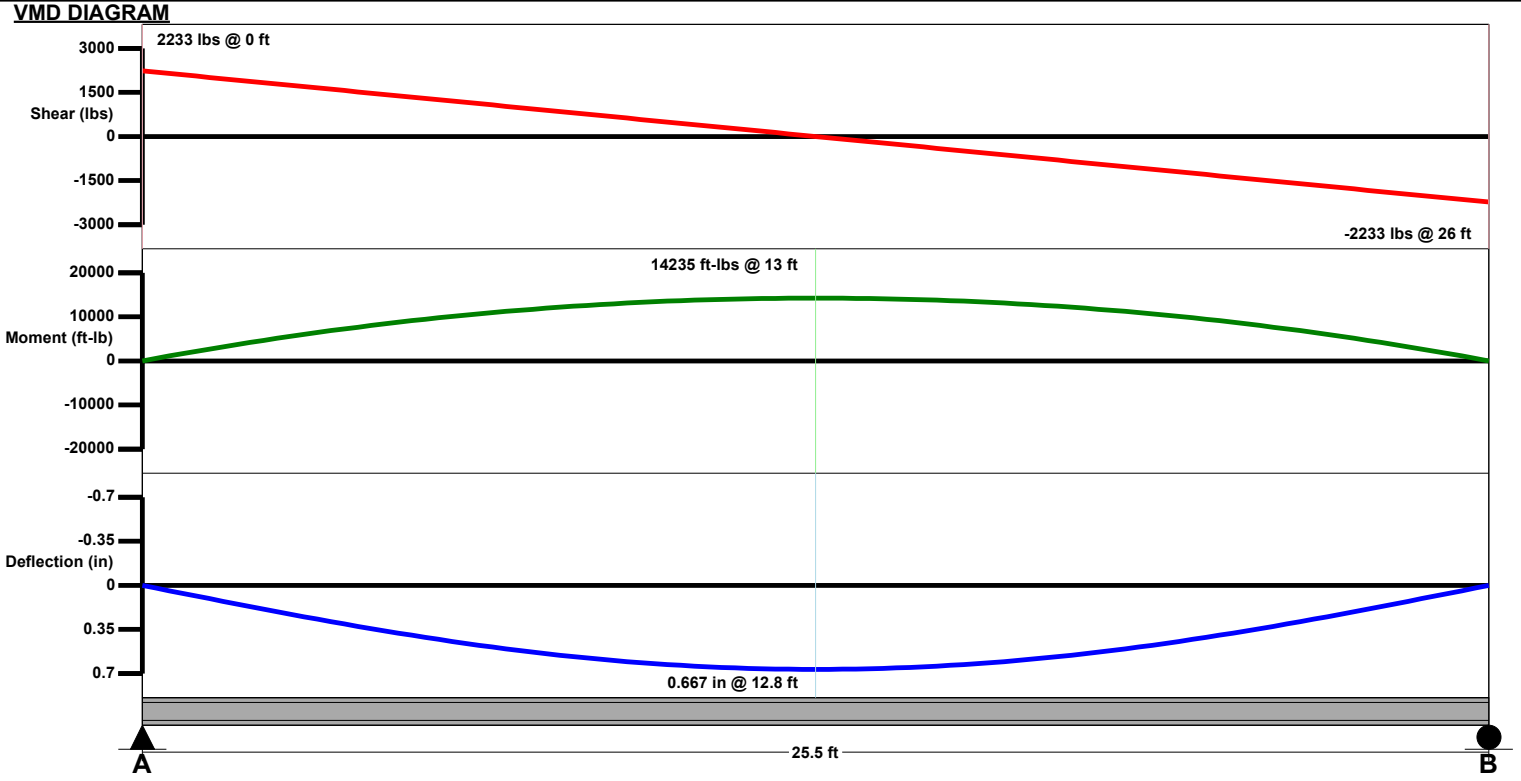
VMD DIAGRAM



B-20-0741

Project: Model

Location: Column-1
Column
[2015 International Building Code(2015 NDS)]
5.5 IN x 5.5 IN x 9.0 FT
#2 - Hem-Fir - Dry Use
Section Adequate By: 80.6%

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VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	1322	lb
Dead Load:	Vert-DL-Rxn =	963	lb
Total Load:	Vert-TL-Rxn =	2285	lb

COLUMN DATA

Total Column Length:	9	ft
Unbraced Length (X-Axis) Lx:	9	ft
Unbraced Length (Y-Axis) Ly:	9	ft
Column End Condition-K (e):	1	
Axial Load Duration Factor	1.00	

COLUMN PROPERTIES

#2 - Hem-Fir

	Base Values		Adjusted	
Compressive Stress:	Fc = 575	psi	Fc' = 388	psi
	Cd=1.00 Cp=0.84 Ci=0.80			
Bending Stress (X-X Axis):	Fbx = 575	psi	Fbx' = 460	psi
	Cd=1.00 CF=1.00 Ci=0.80			
Bending Stress (Y-Y Axis):	Fby = 575	psi	Fby' = 460	psi
	Cd=1.00 CF=1.00 Ci=0.80			
Modulus of Elasticity:	E = 1100	ksi	E' = 1045	ksi

Column Section (X-X Axis):	dx =	5.5	in
Column Section (Y-Y Axis):	dy =	5.5	in
Area:	A =	30.25	in2
Section Modulus (X-X Axis):	Sx =	27.73	in3
Section Modulus (Y-Y Axis):	Sy =	27.73	in3
Slenderness Ratio:	Lex/dx =	19.64	
	Ley/dy =	19.64	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	76	psi
Allowable Compressive Stress:	Fc' =	388	psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0	ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0	ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0	ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0	ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0	psi
Allowable Bending Stress (X-X Axis):	Fbx' =	460	psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0	psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	460	psi
Combined Stress Factor:	**CSF =**	**0.19**	

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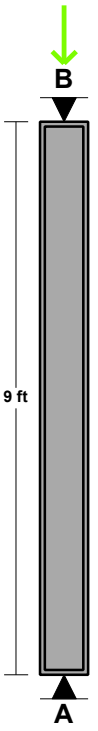

AXIAL LOADING

Live Load:	PL =	1322	lb *
Dead Load:	PD =	912	lb *
Column Self Weight:	CSW =	51	lb
Total Axial Load:	PT =	2285	lb

* Load obtained from Load Tracker. See Summary Report for details.

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Project: Model

Location: Column-2
Column
[2015 International Building Code(2015 NDS)]
5.5 IN x 5.5 IN x 9.0 FT
#2 - Hem-Fir - Dry Use
Section Adequate By: 61.5%

Structural Works, PLLC
1412 Beach Drive NE
Tacoma, WA

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VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	2644	lb
Dead Load:	Vert-DL-Rxn =	1875	lb
Total Load:	Vert-TL-Rxn =	4519	lb

COLUMN DATA

Total Column Length:	9	ft
Unbraced Length (X-Axis) Lx:	9	ft
Unbraced Length (Y-Axis) Ly:	9	ft
Column End Condition-K (e):	1	
Axial Load Duration Factor	1.00	

COLUMN PROPERTIES

#2 - Hem-Fir

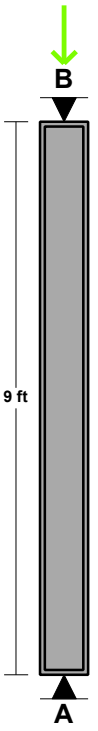
	Base Values		Adjusted	
Compressive Stress:	Fc = 575	psi	Fc' = 388	psi
	Cd=1.00 Cp=0.84 Ci=0.80			
Bending Stress (X-X Axis):	Fbx = 575	psi	Fbx' = 460	psi
	Cd=1.00 CF=1.00 Ci=0.80			
Bending Stress (Y-Y Axis):	Fby = 575	psi	Fby' = 460	psi
	Cd=1.00 CF=1.00 Ci=0.80			
Modulus of Elasticity:	E = 1100	ksi	E' = 1045	ksi

Column Section (X-X Axis):	dx =	5.5	in
Column Section (Y-Y Axis):	dy =	5.5	in
Area:	A =	30.25	in2
Section Modulus (X-X Axis):	Sx =	27.73	in3
Section Modulus (Y-Y Axis):	Sy =	27.73	in3
Slenderness Ratio:	Lex/dx =	19.64	
	Ley/dy =	19.64	

Column Calculations (Controlling Case Only):
Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	149	psi
Allowable Compressive Stress:	Fc' =	388	psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0	ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0	ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0	ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0	ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0	psi
Allowable Bending Stress (X-X Axis):	Fbx' =	460	psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0	psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	460	psi
Combined Stress Factor:	**CSF =**	**0.38**	

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	2644	lb *
Dead Load:	PD =	1824	lb *
Column Self Weight:	CSW =	51	lb
Total Axial Load:	PT =	4519	lb

* Load obtained from Load Tracker. See Summary Report for details.

B-20-0741

Project: Model

Location: Column-3
Column
[2015 International Building Code(2015 NDS)]
5.5 IN x 5.5 IN x 9.0 FT
#2 - Hem-Fir - Dry Use
Section Adequate By: 80.6%

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VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	1275	lb
Dead Load:	Vert-DL-Rxn =	1009	lb
Total Load:	Vert-TL-Rxn =	2284	lb

COLUMN DATA

Total Column Length:	9	ft
Unbraced Length (X-Axis) Lx:	9	ft
Unbraced Length (Y-Axis) Ly:	9	ft
Column End Condition-K (e):	1	
Axial Load Duration Factor	1.00	

COLUMN PROPERTIES

#2 - Hem-Fir

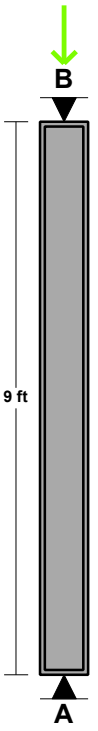
	Base Values		Adjusted	
Compressive Stress:	Fc = 575	psi	Fc' = 388	psi
	Cd=1.00 Cp=0.84 Ci=0.80			
Bending Stress (X-X Axis):	Fbx = 575	psi	Fbx' = 460	psi
	Cd=1.00 CF=1.00 Ci=0.80			
Bending Stress (Y-Y Axis):	Fby = 575	psi	Fby' = 460	psi
	Cd=1.00 CF=1.00 Ci=0.80			
Modulus of Elasticity:	E = 1100	ksi	E' = 1045	ksi

Column Section (X-X Axis):	dx =	5.5	in
Column Section (Y-Y Axis):	dy =	5.5	in
Area:	A =	30.25	in2
Section Modulus (X-X Axis):	Sx =	27.73	in3
Section Modulus (Y-Y Axis):	Sy =	27.73	in3
Slenderness Ratio:	Lex/dx =	19.64	
	Ley/dy =	19.64	

Column Calculations (Controlling Case Only):
Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	75	psi
Allowable Compressive Stress:	Fc' =	388	psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0	ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0	ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0	ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0	ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0	psi
Allowable Bending Stress (X-X Axis):	Fbx' =	460	psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0	psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	460	psi
Combined Stress Factor:	**CSF =**	**0.19**	

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	1275	lb *
Dead Load:	PD =	958	lb *
Column Self Weight:	CSW =	51	lb
Total Axial Load:	PT =	2284	lb

* Load obtained from Load Tracker. See Summary Report for details.

B-20-0741

Project: Model

Location: Roof Header
Roof Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 9.25 IN x 6.5 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 36.4%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.04	IN L/1739
Dead Load	0.03	in
Total Load	0.08	IN L/1001

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/180

REACTIONS

	A		B	
Live Load	1341	lb	1341	lb
Dead Load	990	lb	990	lb
Total Load	2331	lb	2331	lb
Bearing Length	1.07	in	1.07	in

BEAM DATA

Span Length	6.5	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	0	ft
Roof Pitch	8	:12
Roof Duration Factor	1.15	

MATERIAL PROPERTIES

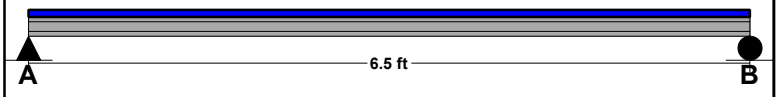
#2 - Douglas-Fir-Larch

	Base Values		Adjusted	
Bending Stress:	Fb = 900	psi	Fb' = 1242	psi
	Cd=1.15 CF=1.20			
Shear Stress:	Fv = 180	psi	Fv' = 207	psi
	Cd=1.15			
Modulus of Elasticity:	E = 1600	ksi	E' = 1600	ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625	psi	Fc - ⊥' = 625	psi

Controlling Moment: 3787 ft-lb
3.25 ft from left support
Created by combining all dead and live loads.
Controlling Shear: 2330 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd		Provided	
Section Modulus:	36.58	in3	49.91	in3
Area (Shear):	16.89	in2	32.38	in2
Moment of Inertia (deflection):	47.78	in4	230.84	in4
Moment:	3787	ft-lb	5166	ft-lb
Shear:	2330	lb	4468	lb

LOADING DIAGRAM



ROOF LOADING

Side One:

Roof Live Load:	LL =	25	psf
Roof Dead Load:	DL =	15	psf
Tributary Width:	TW =	15	ft

Side Two:

Roof Live Load:	LL =	25	psf
Roof Dead Load:	DL =	15	psf
Tributary Width:	TW =	1.5	ft

Wall Load: WALL = 0 plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS

Adjusted Beam Length:	Ladj =	6.5	ft
Beam Self Weight:	BSW =	7	plf
Beam Uniform Live Load:	wL =	413	plf
Beam Uniform Dead Load:	wD_adj =	304	plf
Total Uniform Load:	wT =	717	plf

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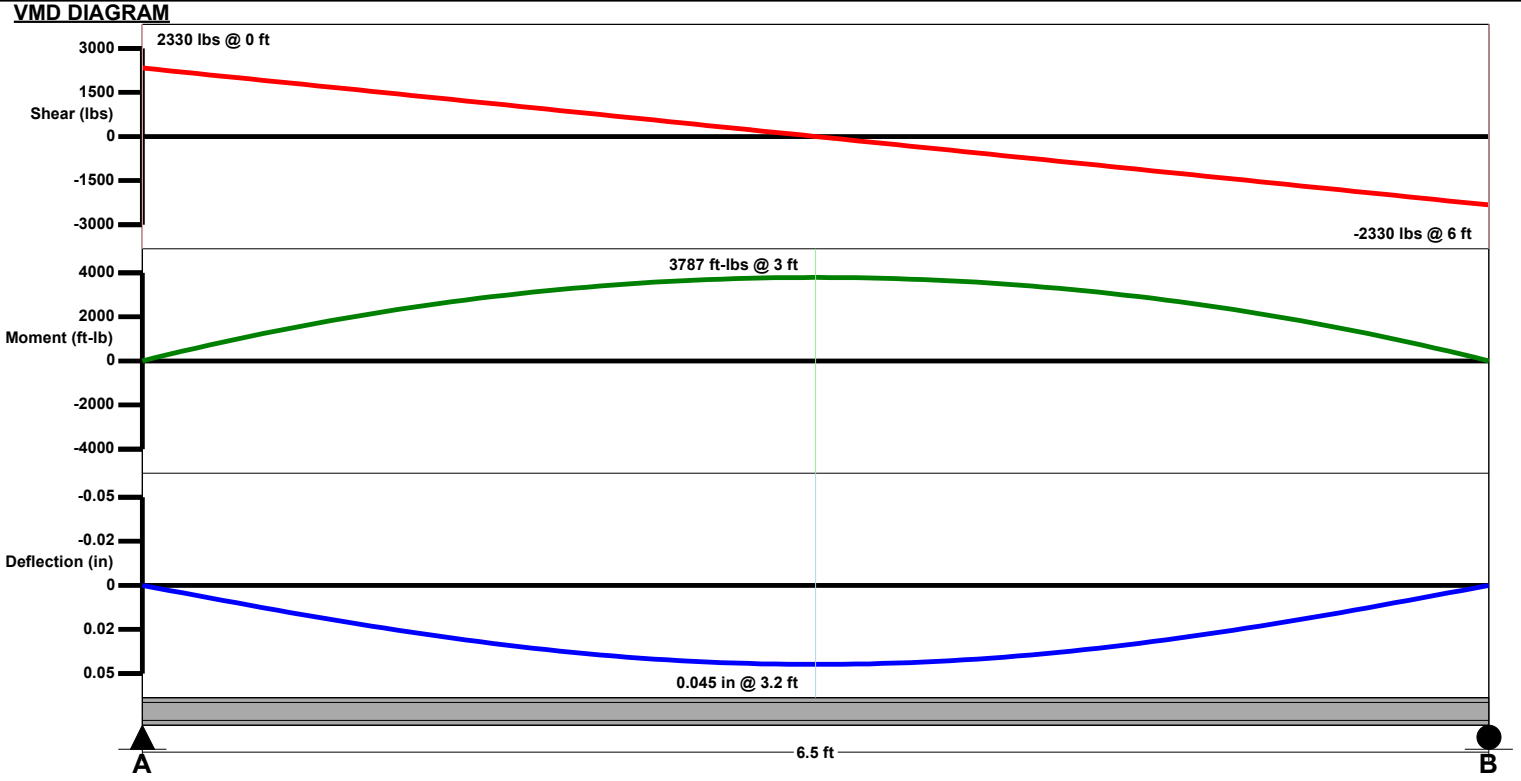
VMD DIAGRAM



B-20-0741

Project: Model

Location: Upper Floor Beam-1
Uniformly Loaded Floor Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 15.0 IN x 14.75 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 399.1%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.08	IN L/2104
Dead Load	0.03	in
Total Load	0.12	IN L/1523

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/180

REACTIONS

	A	B
Live Load	1033 lb	1033 lb
Dead Load	394 lb	394 lb
Total Load	1427 lb	1427 lb
Bearing Length	0.63 in	0.63 in

BEAM DATA

	Center
Span Length	14.75 ft
Unbraced Length-Top	0 ft
Floor Duration Factor	1.00
Camber Adj. Factor	0
Camber Required	0
Notch Depth	0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

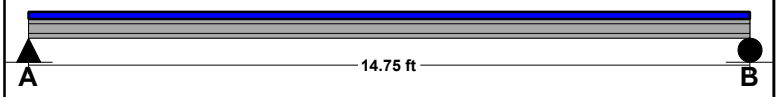
		Base Values		Adjusted	
Bending Stress:	Fb =	2400	psi	*Controlled by:*	
	Fb_cmpr =	1850	psi	Fb' =	2400 psi
	Cd=1.00				
Shear Stress:	Fv =	265	psi	Fv' =	265 psi
	Cd=1.00				
Modulus of Elasticity:	E =	1800	ksi	E' =	1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	650	psi	Fc - ⊥' =	650 psi

Controlling Moment: 5259 ft-lb
7.375 ft from left support
Created by combining all dead and live loads.

Controlling Shear: 1426 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	26.3 in3	131.25 in3
Area (Shear):	8.07 in2	52.5 in2
Moment of Inertia (deflection):	168.45 in4	984.38 in4
Moment:	5259 ft-lb	26250 ft-lb
Shear:	1426 lb	9275 lb

LOADING DIAGRAM



FLOOR LOADING

		Side 1		Side 2	
Floor Live Load	FLL =	40	psf	0	psf
Floor Dead Load	FDL =	12	psf	0	psf
Floor Tributary Width	FTW =	3.5	ft	0	ft
Wall Load	WALL =	0	plf		

BEAM LOADING

Beam Total Live Load:	wL =	140 plf
Beam Total Dead Load:	wD =	42 plf
Beam Self Weight:	BSW =	11 plf
Total Maximum Load:	wT =	193 plf

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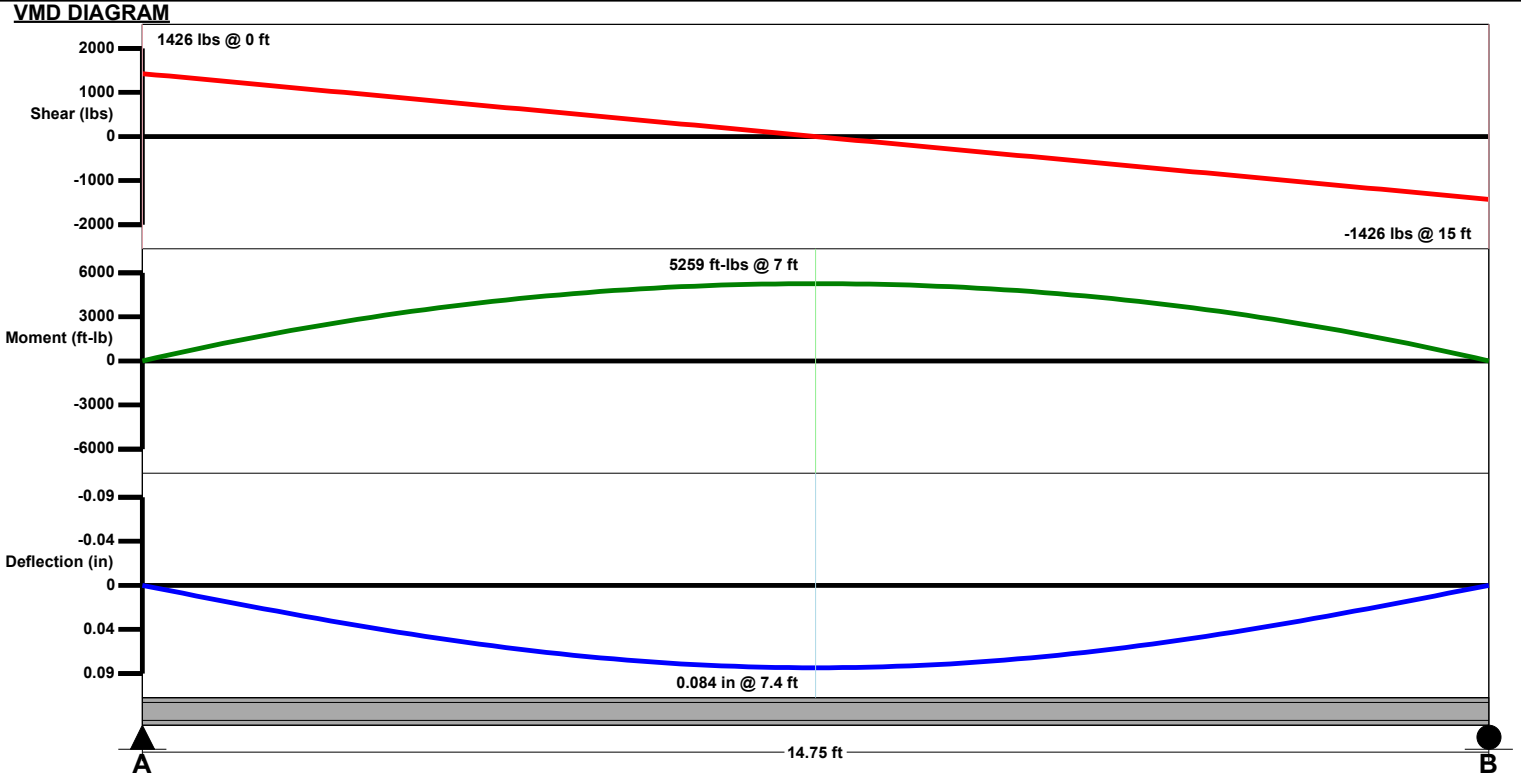
VMD DIAGRAM



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Project: Model

Location: Upper Floor Beam-2
Uniformly Loaded Floor Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 15.0 IN x 15.5 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 227.8%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.12	IN L/1592
Dead Load	0.05	in
Total Load	0.17	IN L/1098

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/180

REACTIONS

	A	B
Live Load	957 lb	901 lb
Dead Load	450 lb	429 lb
Total Load	1407 lb	1330 lb
Bearing Length	0.62 in	0.58 in

BEAM DATA Center

Span Length	15.5 ft
Unbraced Length-Top	0 ft
Floor Duration Factor	1.00
Camber Adj. Factor	1
Camber Required	0.05
Notch Depth	0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

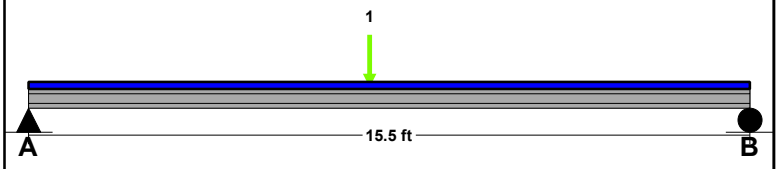
		Base Values		Adjusted	
Bending Stress:	Fb =	2400	psi	*Controlled by:*	
	Fb_cmpr =	1850	psi	Fb' =	2400 psi
	Cd=1.00				
Shear Stress:	Fv =	265	psi	Fv' =	265 psi
	Cd=1.00				
Modulus of Elasticity:	E =	1800	ksi	E' =	1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	650	psi	Fc - ⊥' =	650 psi

Controlling Moment: 8009 ft-lb
7.75 ft from left support
Created by combining all dead and live loads.

Controlling Shear: 1407 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	40.04 in3	131.25 in3
Area (Shear):	7.97 in2	52.5 in2
Moment of Inertia (deflection):	222.54 in4	984.38 in4
Moment:	8009 ft-lb	26250 ft-lb
Shear:	1407 lb	9275 lb

LOADING DIAGRAM



FLOOR LOADING

		Side 1		Side 2	
Floor Live Load	FLL =	40	psf	0	psf
Floor Dead Load	FDL =	15	psf	0	psf
Floor Tributary Width	FTW =	1.3	ft	0	ft
Wall Load	WALL =	0	plf		

BEAM LOADING

Beam Total Live Load:	wL =	53	plf
Beam Total Dead Load:	wD =	20	plf
Beam Self Weight:	BSW =	11	plf
Total Maximum Load:	wT =	85	plf

POINT LOADS - CENTER SPAN

Load Number	One *
Live Load	1033 lb
Dead Load	394 lb
Location	7.33 ft

* Load obtained from Load Tracker. See Summary Report for details.

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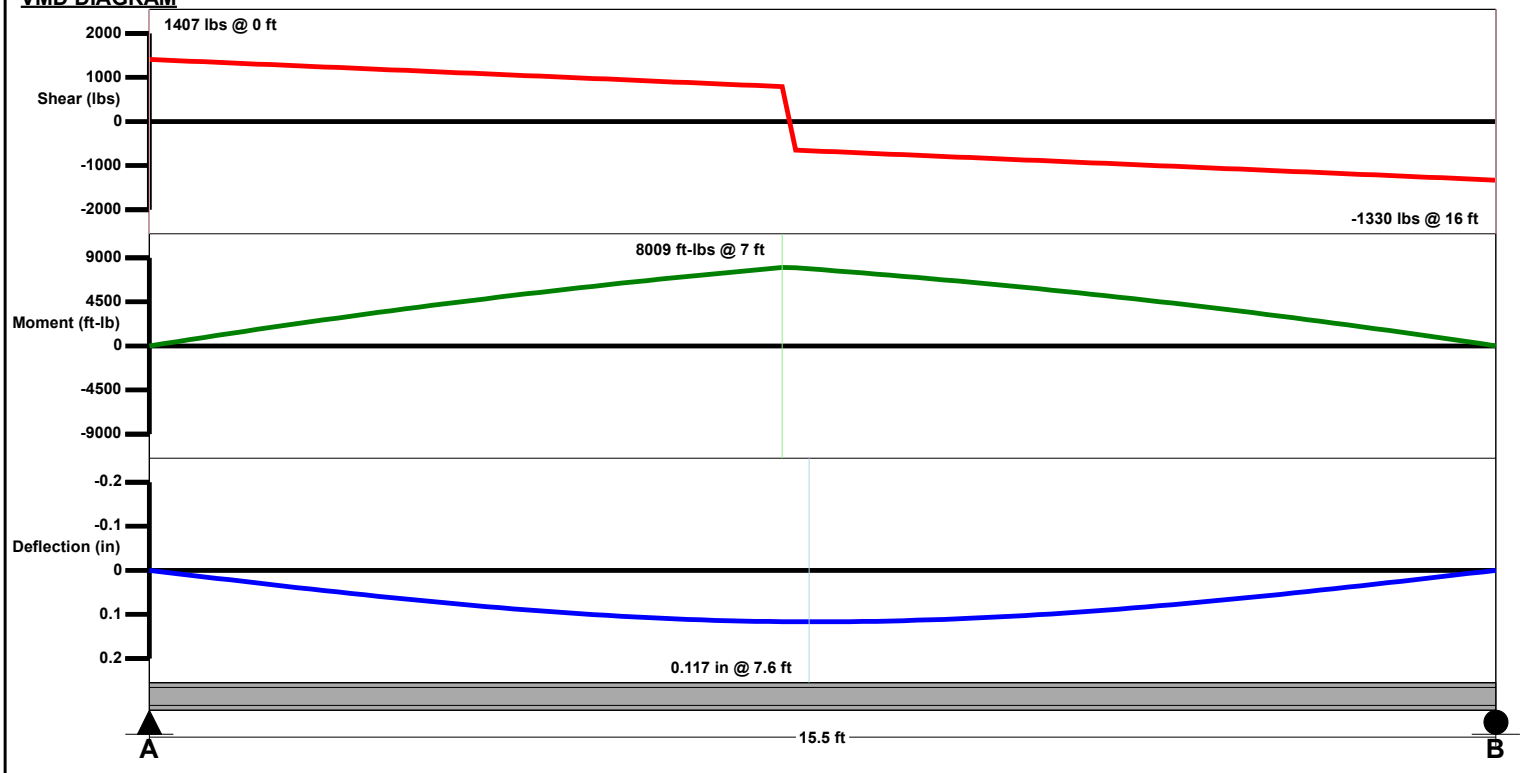
VMD DIAGRAM



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Project: Model

Location: Floor Header
Uniformly Loaded Floor Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 9.25 IN x 6.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 11.5%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.05	IN L/1520
Dead Load	0.02	in
Total Load	0.07	IN L/1019

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/180

REACTIONS

	A		B	
Live Load	1800	lb	1800	lb
Dead Load	885	lb	885	lb
Total Load	2685	lb	2685	lb
Bearing Length	1.23	in	1.23	in

BEAM DATA Center

Span Length	6	ft
Unbraced Length-Top	0	ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

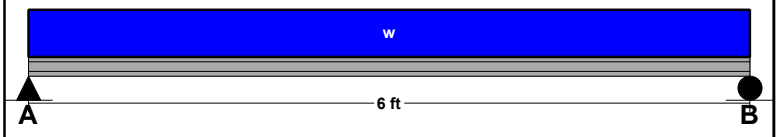
	Base Values		Adjusted	
Bending Stress:	Fb = 900	psi	Fb' = 1080	psi
	Cd=1.00 CF=1.20			
Shear Stress:	Fv = 180	psi	Fv' = 180	psi
	Cd=1.00			
Modulus of Elasticity:	E = 1600	ksi	E' = 1600	ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625	psi	Fc - ⊥' = 625	psi

Controlling Moment: 4028 ft-lb
3.0 ft from left support
Created by combining all dead and live loads.

Controlling Shear: -2685 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd		Provided	
Section Modulus:	44.75	in3	49.91	in3
Area (Shear):	22.38	in2	32.38	in2
Moment of Inertia (deflection):	54.67	in4	230.84	in4
Moment:	4028	ft-lb	4492	ft-lb
Shear:	-2685	lb	3885	lb

LOADING DIAGRAM



FLOOR LOADING

		Side 1		Side 2	
Floor Live Load	FLL =	40	psf	0	psf
Floor Dead Load	FDL =	12	psf	0	psf
Floor Tributary Width	FTW =	15	ft	0	ft
Wall Load	WALL =	108	plf		

BEAM LOADING

Beam Total Live Load:	wL =	600	plf
Beam Total Dead Load:	wD =	288	plf
Beam Self Weight:	BSW =	7	plf
Total Maximum Load:	wT =	895	plf

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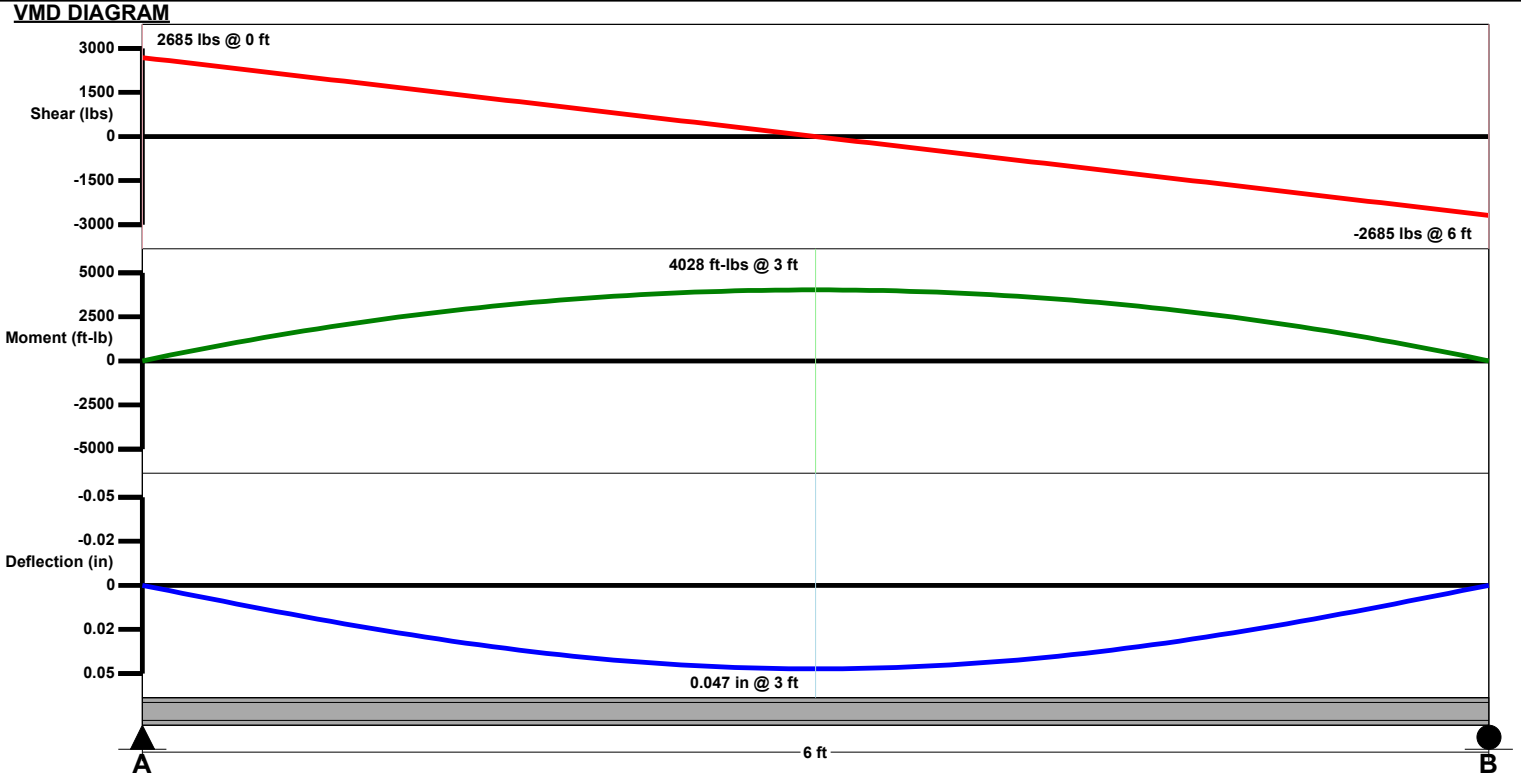
VMD DIAGRAM



B-20-0741

Project: Model

Location: Floor Header 2
Uniformly Loaded Floor Beam
[2015 International Building Code(2015 NDS)]
3.5 IN x 13.5 IN x 12.0 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 31.5%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.22	IN L/665
Dead Load	0.11	in
Total Load	0.32	IN L/444

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/180

REACTIONS A B

	A		B	
Live Load	3600	lb	3600	lb
Dead Load	1789	lb	1789	lb
Total Load	5389	lb	5389	lb
Bearing Length	2.37	in	2.37	in

BEAM DATA Center

Span Length	12	ft
Unbraced Length-Top	0	ft
Floor Duration Factor	1.00	
Camber Adj. Factor	0	
Camber Required	0	
Notch Depth	0.00	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

		Base Values			Adjusted	
Bending Stress:	Fb =	2400	psi	*Controlled by:*		
	Fb_cmpr =	1850	psi	Fb' =	2400	psi
	Cd=1.00					
Shear Stress:	Fv =	265	psi	Fv' =	265	psi
	Cd=1.00					
Modulus of Elasticity:	E =	1800	ksi	E' =	1800	ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	650	psi	Fc - ⊥' =	650	psi

Controlling Moment: 16168 ft-lb
6.0 ft from left support
Created by combining all dead and live loads.
Controlling Shear: 5389 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd		Provided	
Section Modulus:	80.84	in3	106.31	in3
Area (Shear):	30.51	in2	47.25	in2
Moment of Inertia (deflection):	388.74	in4	717.61	in4
Moment:	16168	ft-lb	21263	ft-lb
Shear:	5389	lb	8348	lb

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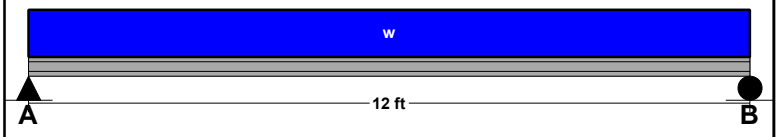

FLOOR LOADING

		Side 1		Side 2	
Floor Live Load	FLL =	40	psf	0	psf
Floor Dead Load	FDL =	12	psf	0	psf
Floor Tributary Width	FTW =	15	ft	0	ft
Wall Load	WALL =	108	plf		

BEAM LOADING

Beam Total Live Load:	wL =	600	plf
Beam Total Dead Load:	wD =	288	plf
Beam Self Weight:	BSW =	10	plf
Total Maximum Load:	wT =	898	plf

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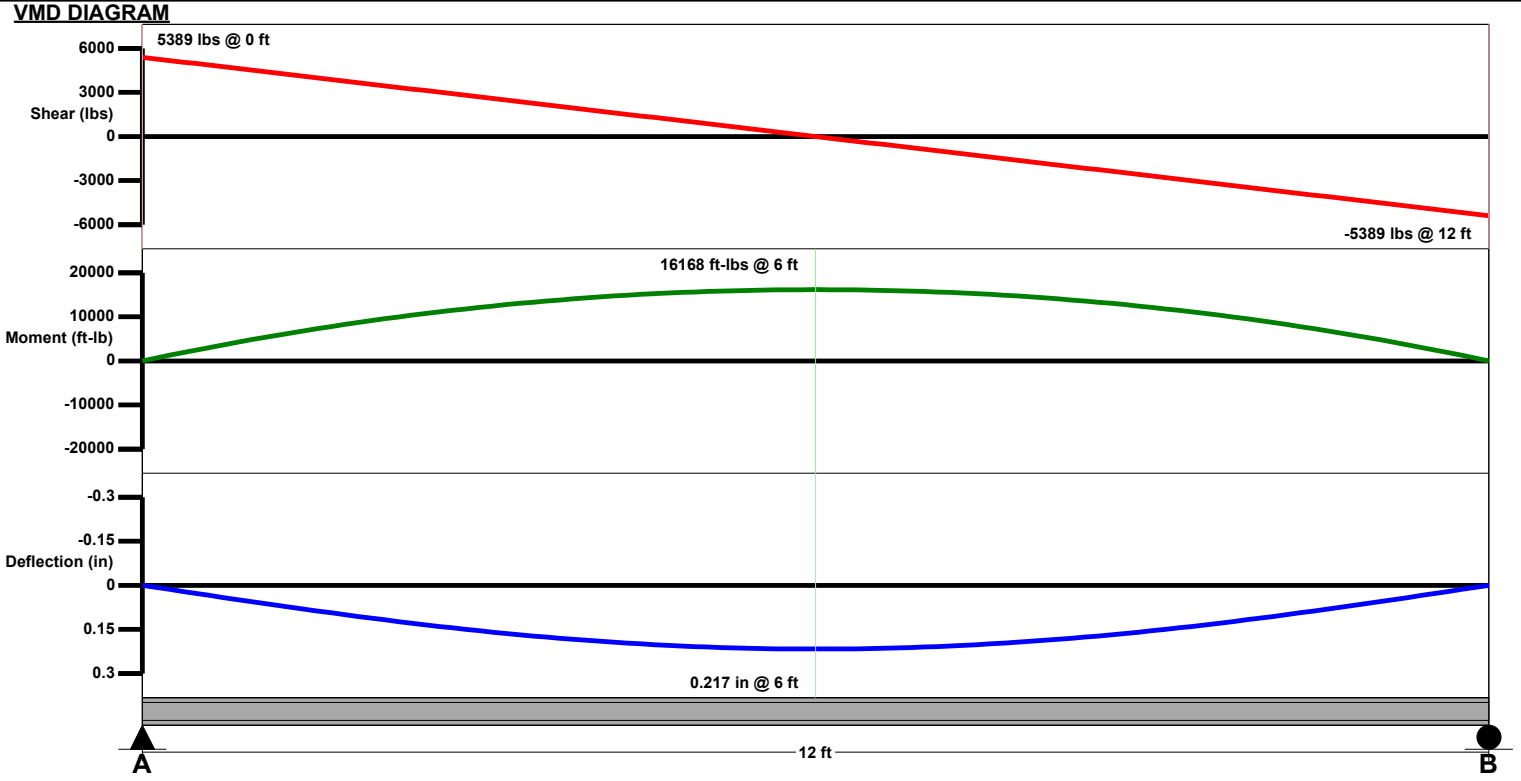
VMD DIAGRAM



B-20-0741

Project: Model

Location: garage header
Combination Roof And Floor Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 16.5 IN x 16.0 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 11.7%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.40	IN L/477
Dead Load	0.23	in
Total Load	0.63	IN L/304

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS A B

Live Load	8100	lb	8100	lb
Dead Load	4601	lb	4601	lb
Total Load	12701	lb	12701	lb
Bearing Length	3.55	in	3.55	in

BEAM DATA Center

Span Length	16	ft
Unbraced Length-Top	0	ft
Roof Pitch	8	:12
Floor Duration Factor	1.00	
Roof Duration Factor	1.15	
Camber Adj. Factor	1	
Camber Required	0.23	
Notch Depth	0.00	

MATERIAL PROPERTIES

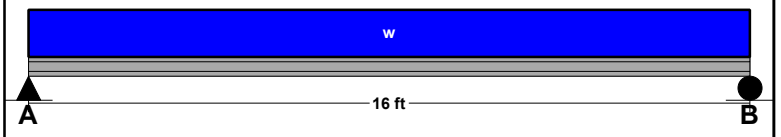
24F-V4 - Visually Graded Western Species

	Base Values		Adjusted	
Bending Stress:	Fb = 2400 psi		*Controlled by:*	
	Fb_cmpr = 1850 psi		Fb' = 2728	psi
	Cd=1.15 Cv=0.99			
Shear Stress:	Fv = 265 psi		Fv' = 305	psi
	Cd=1.15			
Modulus of Elasticity:	E = 1800 ksi		E' = 1800	ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 650 psi		Fc - ⊥' = 650	psi

Controlling Moment: 50804 ft-lb
8.0 ft from left support
Created by combining all dead and live loads.
Controlling Shear: 12701 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	223.49 in3	249.56 in3
Area (Shear):	62.52 in2	90.75 in2
Moment of Inertia (deflection):	1625.48 in4	2058.89 in4
Moment:	50804 ft-lb	56731 ft-lb
Shear:	12701 lb	18437 lb

LOADING DIAGRAM



ROOF LOADING

		Side 1	Side 2
Roof Live Load	RLL =	25 psf	0 psf
Roof Dead Load	RDL =	15 psf	0 psf
Roof Tributary Width	RTW =	16.5 ft	0 ft

FLOOR LOADING

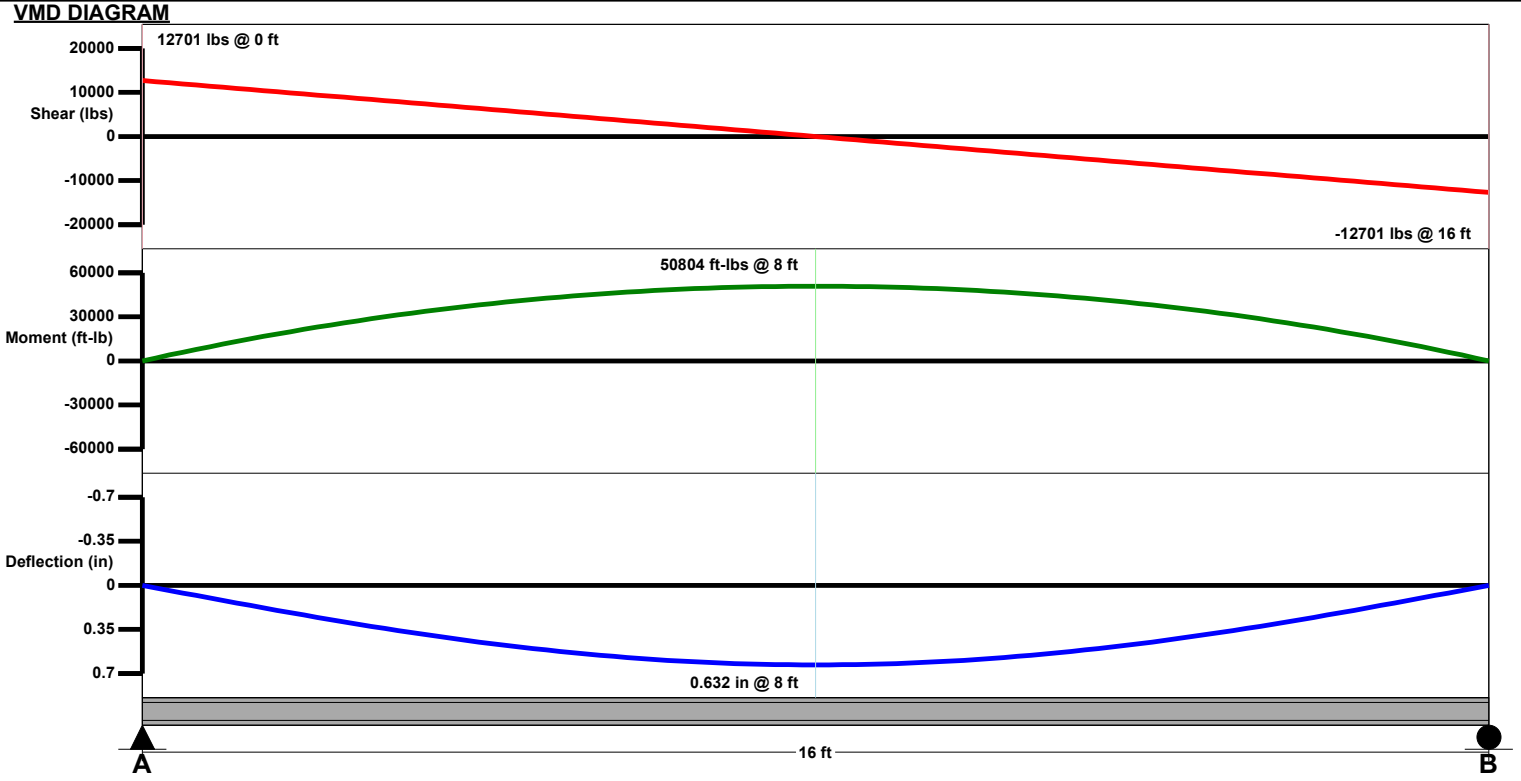
		Side 1	Side 2
Floor Live Load	FLL =	40 psf	0 psf
Floor Dead Load	FDL =	10 psf	0 psf
Floor Tributary Width	FTW =	15 ft	0 ft
Wall Load	WALL =	108 plf	

BEAM LOADING

Roof Uniform Live Load:	wL-roof =	413	plf
Roof Uniform Dead Load:	wD-roof =	297	plf
Floor Uniform Live Load:	wL-floor =	600	plf
Floor Uniform Dead Load:	wD-floor =	150	plf
Beam Self Weight:	BSW =	20	plf
Combined Uniform Live Load:	wL =	1013	plf
Combined Uniform Dead Load:	wD =	575	plf
Combined Uniform Total Load:	wT =	1588	plf

B-20-0741

VMD DIAGRAM



B-20-0741

Project: Model

Location: Upper floor beam 3
Combination Roof And Floor Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 16.5 IN x 14.0 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 44.8%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.24	IN L/712
Dead Load	0.14	in
Total Load	0.38	IN L/445

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

	A		B	
Live Load	7088	lb	7088	lb
Dead Load	4236	lb	4236	lb
Total Load	11324	lb	11324	lb
Bearing Length	3.17	in	3.17	in

BEAM DATA Center

Span Length	14	ft
Unbraced Length-Top	0	ft
Roof Pitch	8	:12
Floor Duration Factor	1.00	
Roof Duration Factor	1.15	
Camber Adj. Factor	1	
Camber Required	0.14	
Notch Depth	0.00	

MATERIAL PROPERTIES

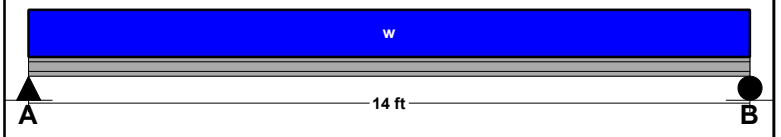
24F-V4 - Visually Graded Western Species

	Base Values		Adjusted	
Bending Stress:	Fb = 2400 psi		*Controlled by:*	
	Fb_cmpr = 1850 psi		Fb' = 2760 psi	
	Cd=1.15			
Shear Stress:	Fv = 265 psi		Fv' = 305 psi	
	Cd=1.15			
Modulus of Elasticity:	E = 1800 ksi		E' = 1800 ksi	
Comp. ⊥ to Grain:	Fc - ⊥ = 650 psi		Fc - ⊥' = 650 psi	

Controlling Moment: 39632 ft-lb
7.0 ft from left support
Created by combining all dead and live loads.
Controlling Shear: 11323 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	172.31 in3	249.56 in3
Area (Shear):	55.73 in2	90.75 in2
Moment of Inertia (deflection):	1109.52 in4	2058.89 in4
Moment:	39632 ft-lb	57399 ft-lb
Shear:	11323 lb	18437 lb

LOADING DIAGRAM



ROOF LOADING

		Side 1	Side 2
Roof Live Load	RLL =	25 psf	0 psf
Roof Dead Load	RDL =	15 psf	0 psf
Roof Tributary Width	RTW =	16.5 ft	0 ft

FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	0 psf
Floor Dead Load	FDL =	12 psf	0 psf
Floor Tributary Width	FTW =	15 ft	0 ft
Wall Load	WALL =	108 plf	

BEAM LOADING

Roof Uniform Live Load:	wL-roof =	413 plf
Roof Uniform Dead Load:	wD-roof =	297 plf
Floor Uniform Live Load:	wL-floor =	600 plf
Floor Uniform Dead Load:	wD-floor =	180 plf
Beam Self Weight:	BSW =	20 plf
Combined Uniform Live Load:	wL =	1013 plf
Combined Uniform Dead Load:	wD =	605 plf
Combined Uniform Total Load:	wT =	1618 plf

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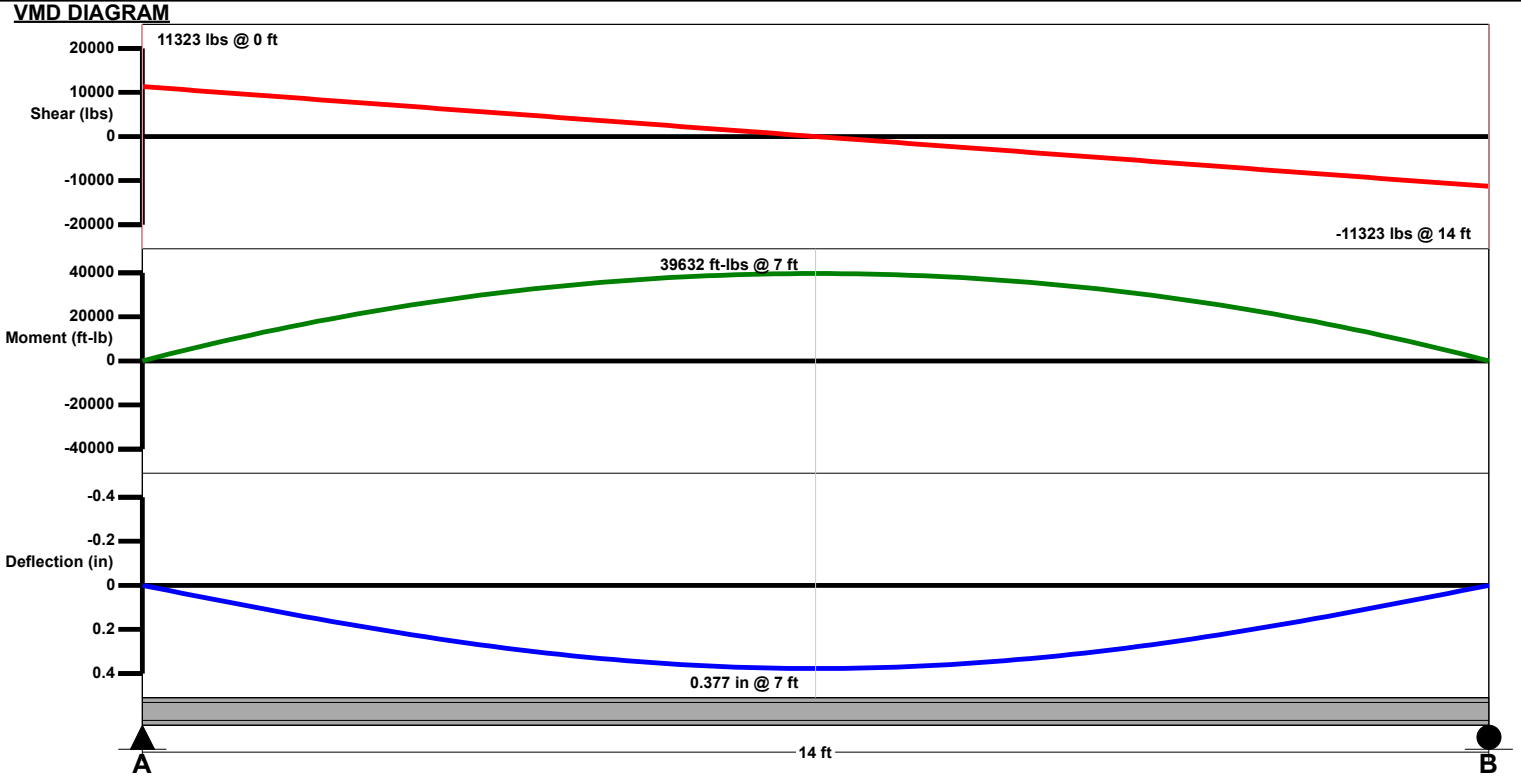
VMD DIAGRAM



B-20-0741

Project: Model

Location: Main Floor Joist
Floor Joist
[2015 International Building Code(2015 NDS)]
TJI 210 / 11.875 - iLevel Trus Joist x 16.0 FT @ 16 O.C.
Section Adequate By: 71.0%
Controlling Factor: Moment

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DEFLECTIONS Center

Live Load	0.28	IN L/685
Dead Load	0.08	in
Total Load	0.36	IN L/527

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/180

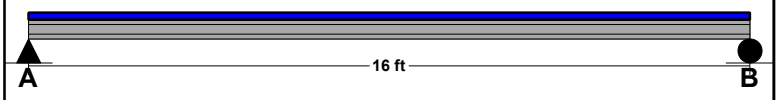
REACTIONS A B

	A		B	
Live Load	427	lb	427	lb
Dead Load	128	lb	128	lb
Total Load	555	lb	555	lb
Bearing Length	3.50	in	3.50	in
Web Stiffeners	No		No	

SUPPORT LOADS A B

	A		B	
Live Load	320	plf	320	plf
Dead Load	96	plf	96	plf
Total Load	416	plf	416	plf

LOADING DIAGRAM



I-JOIST PROPERTIES

TJI 210 / 11.875 - iLevel Trus Joist

	Base Values	Adjusted
Moment Cap:	Mcap = 3795 ft-lb	Mcap' = 3795 ft-lb
	Cd = 1.00	
Shear Stress:	Vcap = 1655 lb	Vcap' = 1655 lb
	Cd = 1.00	
Reaction A:	Rcap = 1460 lb	Rcap' = 1460 lb
Reaction B:	Rcap = 1460 lb	Rcap' = 1460 lb
E.I.:	EI = 315 lb-in2	EI' = 315 lb-in2

Controlling Moment: 2219 ft-lb
8.0 Ft from left support of span 3 (Right Span)
Created by combining all dead and live loads.
Controlling Shear: 555 lb
At left support of span 2 (Center Span)
Created by combining all dead and live loads.

Comparisons with required sections:

	Req'd	Provided
E.I.:	166 in2-lb E6	315 in2-lb xE6
Moment:	2219 ft-lb	3795 ft-lb
Shear:	555 lb	1655 lb

JOIST DATA Center

Span Length	16	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	0	ft

Floor sheathing applied to top of joists-top of joists fully braced.
Floor Duration Factor 1.00

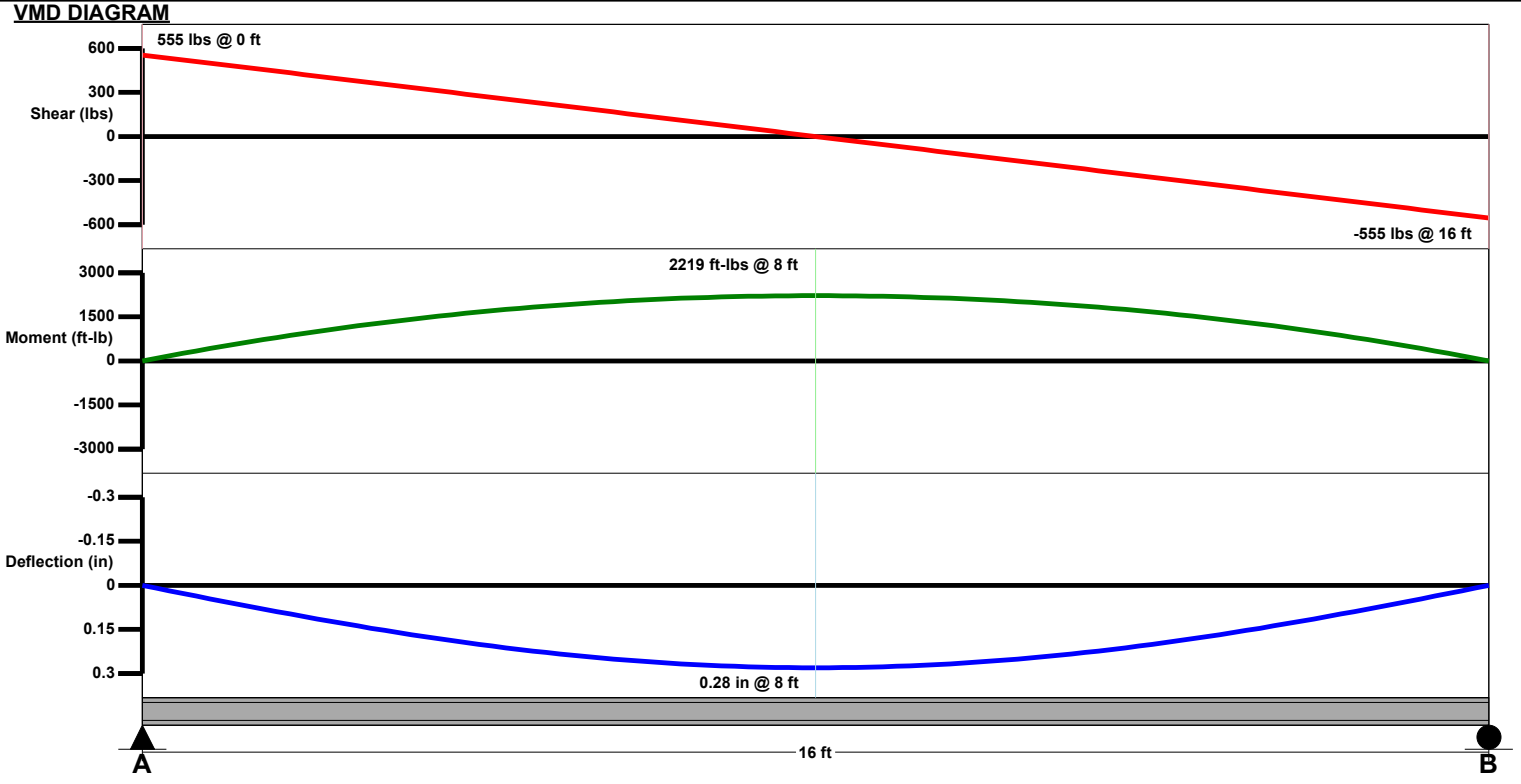
JOIST LOADING

Uniform Floor Loading Center

Live Load	LL =	40	psf
Dead Load	DL =	12	psf
Total Load	TL =	52	psf
TL Adj. For Joist Spacing	wT =	69.3	plf

B-20-0741

VMD DIAGRAM



B-20-0741

Project: Model

Location: Foundation-1
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 2.0 FT x 3.0 FT x 12.00 IN
Reinforcement in Long Direction: #4 Bars @ 8.00 IN. O.C. / (3) min.
Reinforcement in Short Direction-center band (Equal to width of short side): #4 Bars @ 5.88 IN. O.C. / (4) min.
Reinforcement in Short Direction-outside bands: #4 Bars @ 0.00 IN. O.C. / (1) Each band.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs = 1500	psf
Concrete Compressive Strength:	F'c = 2500	psi
Reinforcing Steel Yield Strength:	Fy = 40000	psi
Concrete Reinforcement Cover:	c = 3	in

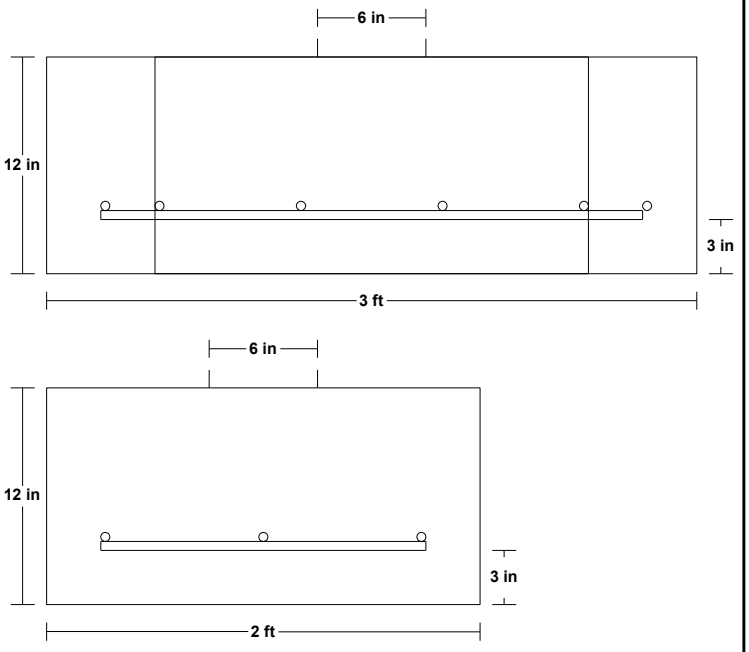
FOOTING SIZE

Width:	W = 2	ft
Length:	L = 3	ft
Depth:	Depth = 12	in
Effective Depth to Top Layer of Steel:	d = 8.25	in

COLUMN AND BASEPLATE SIZE

Column Type:	Wood
Column Width:	m = 6 in
Column Depth:	n = 6 in

LOADING DIAGRAM



FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	381	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1350	psf
Required Footing Area:	Areq =	1.69	sf
Area Provided:	A =	6.00	sf
Baseplate Bearing:			
Bearing Required:	Bear =	3271	lb
Allowable Bearing:	Bear-A =	99450	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	886	lb
Allowable Beam Shear:	Vc1 =	14850	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	57	in
Punching Shear:	Vu2 =	2502	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	105806	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	137363	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	70538	lb
Controlling Allowable Punching Shear:	vc2 =	70538	lb

FOOTING LOADING

Live Load:	PL = 1322	lb *
Dead Load:	PD = 963	lb *
Total Load:	PT = 2285	lb *
Ultimate Factored Load:	Pu = 3271	lb
Footing plus soil above footing weight:	Wt = 580	lb

* Load obtained from Load Tracker. See Summary Report for details.

Short Direction:

Bending Calculations:			
Factored Moment:	Mu =	9812	in-lb
Nominal Moment Strength:	Mn =	336668	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.62	in
Steel Required Based on Moment:	As(1) =	0.03	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.86	in2
Controlling Reinforcing Steel:	As-reqd =	0.86	in2
Selected Reinforcement:	Short Dir: #4's @ 5.9 in. o.c.(5) Min.		
Reinforcement Area Provided:	As =	1.18	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	9	in

Long Direction:

Bending Calculations:			
Factored Moment:	Mu =	14719	in-lb
Nominal Moment Strength:	Mn =	170049	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.46	in
Steel Required Based on Moment:	As(1) =	0.05	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.58	in2
Controlling Reinforcing Steel:	As-reqd =	0.58	in2
Selected Reinforcement:	Long Dir: #4's @ 8.0 in. o.c.(3) Min.		
Reinforcement Area Provided:	As =	0.59	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	15	in

Project: Model

Location: Foundation-2
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 2.0 FT x 3.0 FT x 12.00 IN
Reinforcement in Long Direction: #4 Bars @ 8.00 IN. O.C. / (3) min.
Reinforcement in Short Direction-center band (Equal to width of short side): #4 Bars @ 5.88 IN. O.C. / (4) min.
Reinforcement in Short Direction-outside bands: #4 Bars @ 0.00 IN. O.C. / (1) Each band.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs = 1500	psf
Concrete Compressive Strength:	F'c = 2500	psi
Reinforcing Steel Yield Strength:	Fy = 40000	psi
Concrete Reinforcement Cover:	c = 3	in

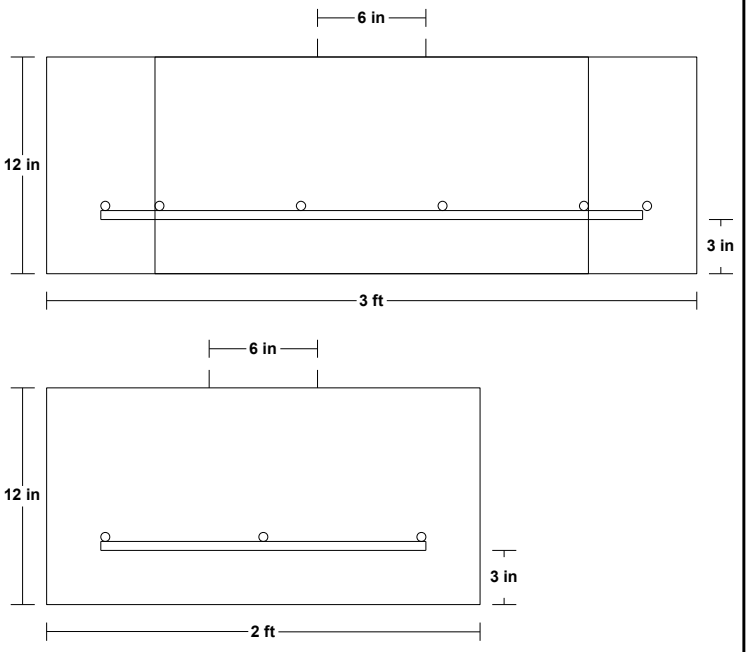
FOOTING SIZE

Width:	W = 2	ft
Length:	L = 3	ft
Depth:	Depth = 12	in
Effective Depth to Top Layer of Steel:	d = 8.25	in

COLUMN AND BASEPLATE SIZE

Column Type:	Wood
Column Width:	m = 6 in
Column Depth:	n = 6 in

LOADING DIAGRAM



FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	753	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1350	psf
Required Footing Area:	Areq =	3.35	sf
Area Provided:	A =	6.00	sf
Baseplate Bearing:			
Bearing Required:	Bear =	6480	lb
Allowable Bearing:	Bear-A =	99450	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	1755	lb
Allowable Beam Shear:	Vc1 =	14850	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	57	in
Punching Shear:	Vu2 =	4957	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	105806	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	137363	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	70538	lb
Controlling Allowable Punching Shear:	vc2 =	70538	lb

FOOTING LOADING

Live Load:	PL = 2644	lb *
Dead Load:	PD = 1875	lb *
Total Load:	PT = 4519	lb *
Ultimate Factored Load:	Pu = 6480	lb
Footing plus soil above footing weight:	Wt = 580	lb

* Load obtained from Load Tracker. See Summary Report for details.

Short Direction:

Bending Calculations:			
Factored Moment:	Mu =	19441	in-lb
Nominal Moment Strength:	Mn =	336668	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.62	in
Steel Required Based on Moment:	As(1) =	0.07	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.86	in2
Controlling Reinforcing Steel:	As-reqd =	0.86	in2
Selected Reinforcement:	Short Dir: #4's @ 5.9 in. o.c.(5) Min.		
Reinforcement Area Provided:	As =	1.18	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	9	in

Long Direction:

Bending Calculations:			
Factored Moment:	Mu =	29162	in-lb
Nominal Moment Strength:	Mn =	170049	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.46	in
Steel Required Based on Moment:	As(1) =	0.1	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.58	in2
Controlling Reinforcing Steel:	As-reqd =	0.58	in2
Selected Reinforcement:	Long Dir: #4's @ 8.0 in. o.c.(3) Min.		
Reinforcement Area Provided:	As =	0.59	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	15	in

Project: Model

Location: Foundation-3
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 2.0 FT x 2.0 FT x 12.00 IN
Reinforcement in Long Direction: #4 Bars @ 8.00 IN. O.C. / (3) min.
Reinforcement in Short Direction-center band (Equal to width of short side): #4 Bars @ 8.00 IN. O.C. / (3) min.
Reinforcement in Short Direction-outside bands: #4 Bars @ 0.00 IN. O.C. / () Each band.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500	psf
Concrete Compressive Strength:	F'c =	2500	psi
Reinforcing Steel Yield Strength:	Fy =	40000	psi
Concrete Reinforcement Cover:	c =	3	in

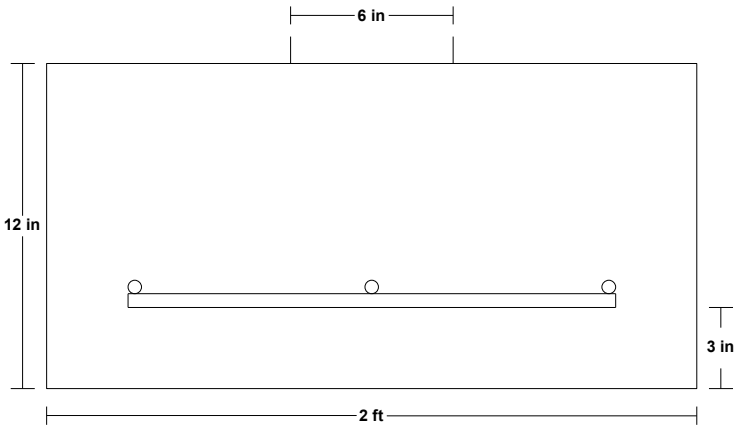
FOOTING SIZE

Width:	W =	2	ft
Length:	L =	2	ft
Depth:	Depth =	12	in
Effective Depth to Top Layer of Steel:	d =	8.25	in

COLUMN AND BASEPLATE SIZE

Column Type:	Wood		
Column Width:	m =	6	in
Column Depth:	n =	6	in

LOADING DIAGRAM



FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure:	Qu =	558	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1350	psf
Required Footing Area:	Areq =	1.65	sf
Area Provided:	A =	4.00	sf

Baseplate Bearing:

Bearing Required:	Bear =	3190	lb
Allowable Bearing:	Bear-A =	99450	lb

Beam Shear Calculations (One Way Shear):

Beam Shear:	Vu1 =	498	lb
Allowable Beam Shear:	Vc1 =	14850	lb

Punching Shear Calculations (Two Way Shear):

Critical Perimeter:	Bo =	57	in
Punching Shear:	Vu2 =	2065	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	105806	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	137363	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	70538	lb
Controlling Allowable Punching Shear:	vc2 =	70538	lb

FOOTING LOADING

Live Load:	PL =	1275	lb *
Dead Load:	PD =	958	lb *
Total Load:	PT =	2233	lb *
Ultimate Factored Load:	Pu =	3190	lb
Footing plus soil above footing weight:	Wt =	387	lb

* Load obtained from Load Tracker. See Summary Report for details.

Short Direction:

Bending Calculations:

Factored Moment:	Mu =	9569	in-lb
Nominal Moment Strength:	Mn =	169965	in-lb

Reinforcement Calculations:

Concrete Compressive Block Depth:	a =	0.46	in
Steel Required Based on Moment:	As(1) =	0.03	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.58	in2
Controlling Reinforcing Steel:	As-reqd =	0.58	in2
Selected Reinforcement:	Short Dir: #4's @ 8.0 in. o.c.(3) Min.		
Reinforcement Area Provided:	As =	0.59	in2

Development Length Calculations:

Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	9	in

Note: Plain concrete adequate for bending, therefore adequate development length not required.

Long Direction:

Bending Calculations:

Factored Moment:	Mu =	9569	in-lb
Nominal Moment Strength:	Mn =	170049	in-lb

Reinforcement Calculations:

Concrete Compressive Block Depth:	a =	0.46	in
Steel Required Based on Moment:	As(1) =	0.03	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.58	in2
Controlling Reinforcing Steel:	As-reqd =	0.58	in2
Selected Reinforcement:	Long Dir: #4's @ 8.0 in. o.c.(3) Min.		
Reinforcement Area Provided:	As =	0.59	in2

Development Length Calculations:

Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	9	in

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Project: Model

Location: foundation 4
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 21.0 IN Wide x 8.0 IN Deep Continuous Footing With 8.0 IN Thick x 18.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #4 Bars
TransverseReinforcement: #4 Bars @ 13.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500	psf
Concrete Compressive Strength:	F'c =	2500	psi
Reinforcing Steel Yield Strength:	Fy =	60000	psi
Concrete Reinforcement Cover:	c =	3	in

FOOTING SIZE

Width:	W =	21	in
Depth:	Depth =	8	in
Effective Depth to Top Layer of Steel:	d =	4.25	in

STEMWALL SIZE

Stemwall Width:	8	in
Stemwall Height:	18	in
Stemwall Weight:	150	pcf

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure:	Qu =	1358	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1400	psf
Width Required:	Wreq =	1.7	ft

Beam Shear Calculations (One Way Shear):

Beam Shear:	Vu1 =	368	lb
Allowable Beam Shear:	Vc1 =	3825	lb

Transverse Direction:

Bending Calculations:

Factored Moment:	Mu =	3455	in-lb
Nominal Moment Strength:	Mn =	0	in-lb

Reinforcement Calculations:

Concrete Compressive Block Depth:	a =	0.41	in
Steel Required Based on Moment:	As(1) =	0.02	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4)	As(2) =	0.17	in2
Controlling Reinforcing Steel:	As-reqd =	0.17	in2
Selected Reinforcement:	Trans: #4's @ 13.0 in. o.c.		
Reinforcement Area Provided:	As =	0.17	in2

Development Length Calculations:

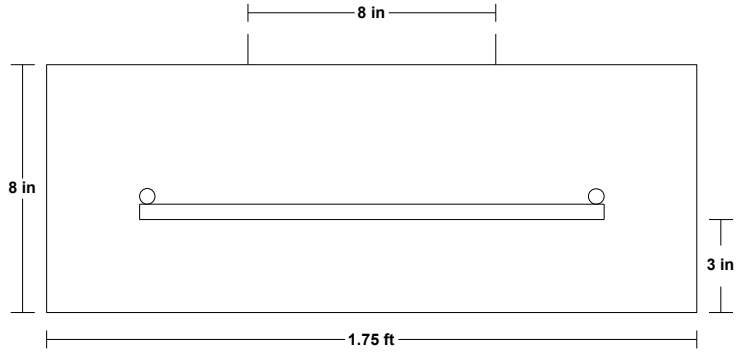
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	3.5	in

Longitudinal Direction:

Reinforcement Calculations:

Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.3	in2
Controlling Reinforcing Steel:	As-reqd =	0.3	in2
Selected Reinforcement:	Longitudinal: (2) Cont. #4 Bars		
Reinforcement Area Provided:	As =	0.39	in2

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL =	1458	plf
Dead Load:	PD =	769	plf
Total Load:	PT =	2376	plf
Ultimate Factored Load:	Pu =	3434	plf

LOAD CALCULATOR

	Live Load		Dead Load		Tributary Width	
Roof:	LL =	25 psf	DL =	15 psf	TA =	21.5 ft2
Second Floor:	LL =	40 psf	DL =	10 psf	TA =	15 ft2
First Floor:	LL =	40 psf	DL =	10 psf	TA =	8 ft2

Project: Model

Location: Foundation-5
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 3.5 FT x 3.5 FT x 10.00 IN
Reinforcement: #4 Bars @ 11.00 IN. O.C. E/W / (4) min.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500	psf
Concrete Compressive Strength:	F'c =	2500	psi
Reinforcing Steel Yield Strength:	Fy =	60000	psi
Concrete Reinforcement Cover:	c =	3	in

FOOTING SIZE

Width:	W =	3.5	ft
Length:	L =	3.5	ft
Depth:	Depth =	10	in
Effective Depth to Top Layer of Steel:	d =	6.25	in

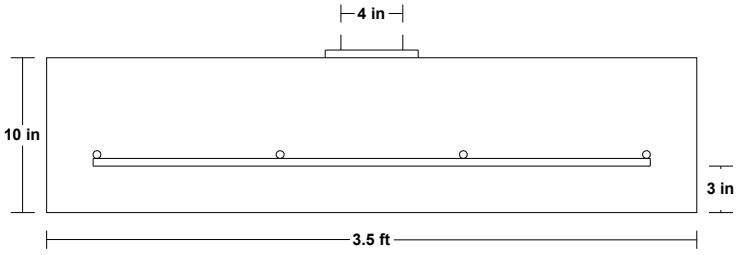
COLUMN AND BASEPLATE SIZE

Column Type:	Steel		
Column Width:	m =	4	in
Column Depth:	n =	4	in
Baseplate Width:	bsw =	6	in
Baseplate Length:	bsl =	6	in

FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	1037	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1375	psf
Required Footing Area:	Areq =	9.24	sf
Area Provided:	A =	12.25	sf
Baseplate Bearing:			
Bearing Required:	Bear =	18481	lb
Allowable Bearing:	Bear-A =	99450	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	5390	lb
Allowable Beam Shear:	Vc1 =	19688	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	45	in
Punching Shear:	Vu2 =	17155	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	63281	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	79688	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	42188	lb
Controlling Allowable Punching Shear:	vc2 =	42188	lb
Bending Calculations:			
Factored Moment:	Mu =	75300	in-lb
Nominal Moment Strength:	Mn =	253752	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.53	in
Steel Required Based on Moment:	As(1) =	0.23	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.76	in2
Controlling Reinforcing Steel:	As-reqd =	0.76	in2
Selected Reinforcement:	#4's @ 11.0 in. o.c. e/w (4) Min.		
Reinforcement Area Provided:	As =	0.79	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	15.5	in

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL =	8100	lb *
Dead Load:	PD =	4601	lb *
Total Load:	PT =	12701	lb *
Ultimate Factored Load:	Pu =	18481	lb
Footing plus soil above footing weight:	Wt =	987	lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: Model

Location: Foundation-6
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 3.5 FT x 3.5 FT x 10.00 IN
Reinforcement: #4 Bars @ 11.00 IN. O.C. E/W / (4) min.
Section Footing Design Adequate

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Tacoma, WA

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500	psf
Concrete Compressive Strength:	F'c =	2500	psi
Reinforcing Steel Yield Strength:	Fy =	60000	psi
Concrete Reinforcement Cover:	c =	3	in

FOOTING SIZE

Width:	W =	3.5	ft
Length:	L =	3.5	ft
Depth:	Depth =	10	in
Effective Depth to Top Layer of Steel:	d =	6.25	in

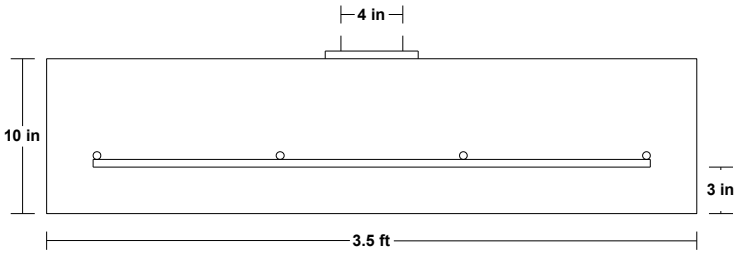
COLUMN AND BASEPLATE SIZE

Column Type:	Steel		
Column Width:	m =	4	in
Column Depth:	n =	4	in
Baseplate Width:	bsw =	6	in
Baseplate Length:	bsl =	6	in

FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	924	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1375	psf
Required Footing Area:	Areq =	8.24	sf
Area Provided:	A =	12.25	sf
Baseplate Bearing:			
Bearing Required:	Bear =	16424	lb
Allowable Bearing:	Bear-A =	99450	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	4790	lb
Allowable Beam Shear:	Vc1 =	19688	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	45	in
Punching Shear:	Vu2 =	15246	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	63281	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	79688	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	42188	lb
Controlling Allowable Punching Shear:	vc2 =	42188	lb
Bending Calculations:			
Factored Moment:	Mu =	66918	in-lb
Nominal Moment Strength:	Mn =	253752	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.53	in
Steel Required Based on Moment:	As(1) =	0.20	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.76	in2
Controlling Reinforcing Steel:	As-reqd =	0.76	in2
Selected Reinforcement:	#4's @ 11.0 in. o.c. e/w (4) Min.		
Reinforcement Area Provided:	As =	0.79	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	15.5	in

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL =	7088	lb *
Dead Load:	PD =	4236	lb *
Total Load:	PT =	11324	lb *
Ultimate Factored Load:	Pu =	16424	lb
Footing plus soil above footing weight:	Wt =	987	lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: Model

Location: Foundation-7
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 16.0 IN Wide x 8.0 IN Deep Continuous Footing With 6.0 IN Thick x 6.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #4 Bars
TransverseReinforcement: #4 Bars @ 13.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500	psf
Concrete Compressive Strength:	F'c =	2500	psi
Reinforcing Steel Yield Strength:	Fy =	60000	psi
Concrete Reinforcement Cover:	c =	3	in

FOOTING SIZE

Width:	W =	16	in
Depth:	Depth =	8	in
Effective Depth to Top Layer of Steel:	d =	4.25	in

STEMWALL SIZE

Stemwall Width:	6	in
Stemwall Height:	6	in
Stemwall Weight:	150	pcf

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure:	Qu =	1221	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1400	psf
Width Required:	Wreq =	1.16	ft

Beam Shear Calculations (One Way Shear):

Beam Shear:	Vu1 =	111	lb
Allowable Beam Shear:	Vc1 =	3825	lb

Transverse Direction:

Bending Calculations:

Factored Moment:	Mu =	4716	in-lb
Nominal Moment Strength:	Mn =	0	in-lb

Reinforcement Calculations:

Concrete Compressive Block Depth:	a =	0.41	in
Steel Required Based on Moment:	As(1) =	0.02	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4)	As(2) =	0.17	in2
Controlling Reinforcing Steel:	As-reqd =	0.17	in2
Selected Reinforcement:	Trans: #4's @ 13.0 in. o.c.		
Reinforcement Area Provided:	As =	0.17	in2

Development Length Calculations:

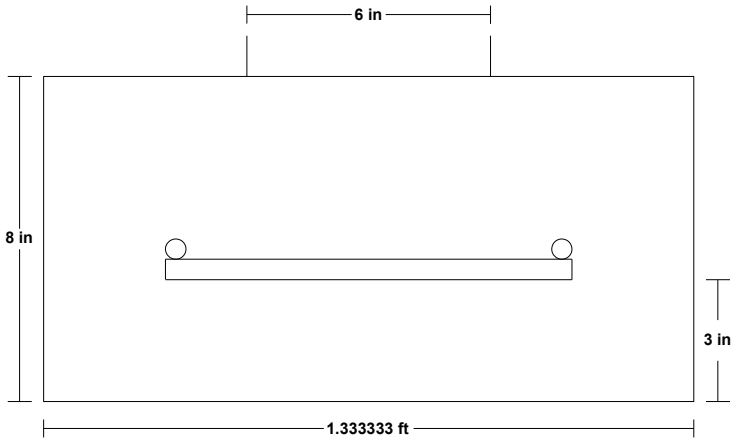
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	5	in

Longitudinal Direction:

Reinforcement Calculations:

Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.23	in2
Controlling Reinforcing Steel:	As-reqd =	0.23	in2
Selected Reinforcement:	Longitudinal: (2) Cont. #4 Bars		
Reinforcement Area Provided:	As =	0.39	in2

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL =	1013	plf
Dead Load:	PD =	578	plf
Total Load:	PT =	1628	plf
Ultimate Factored Load:	Pu =	2358	plf

LOAD CALCULATOR

	Live Load		Dead Load		Tributary Width	
Roof:	LL =	25 psf	DL =	15 psf	TA =	16.5 ft2
Second Floor:	LL =	40 psf	DL =	10 psf	TA =	15 ft2
First Floor:	LL =	40 psf	DL =	10 psf	TA =	0 ft2

B-20-0741

Hazards by Location

Search Information

Address: 24xx west stewart puyallup, wa 98371

Coordinates: 47.19337030000001, -122.2955868

Elevation: 50 ft

Timestamp: 2020-01-18T05:32:35.875Z

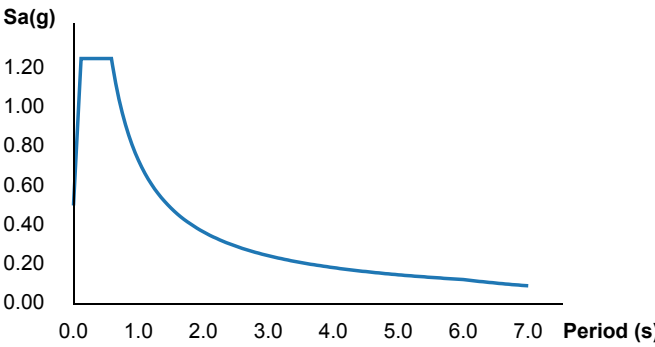
Hazard Type: Seismic

Reference Document: ASCE7-10

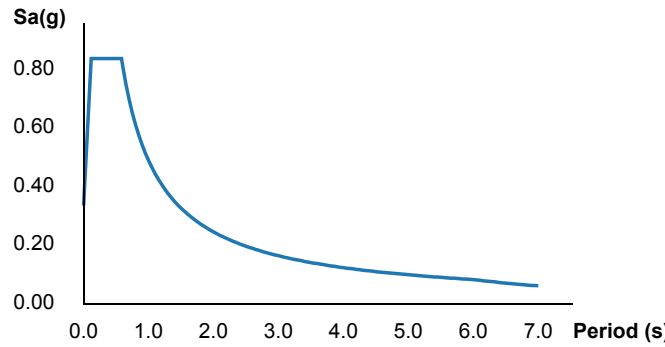
Risk Category: II

Site Class: D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	1.253	MCE_R ground motion (period=0.2s)
S_1	0.482	MCE_R ground motion (period=1.0s)
S_{MS}	1.253	Site-modified spectral acceleration value
S_{M1}	0.732	Site-modified spectral acceleration value
S_{DS}	0.836	Numeric seismic design value at 0.2s SA
S_{D1}	0.488	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2s
F_v	1.518	Site amplification factor at 1.0s
CR_S	0.996	Coefficient of risk (0.2s)
CR_1	0.959	Coefficient of risk (1.0s)
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA

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PGA_M	0.5	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.253	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.258	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.482	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.503	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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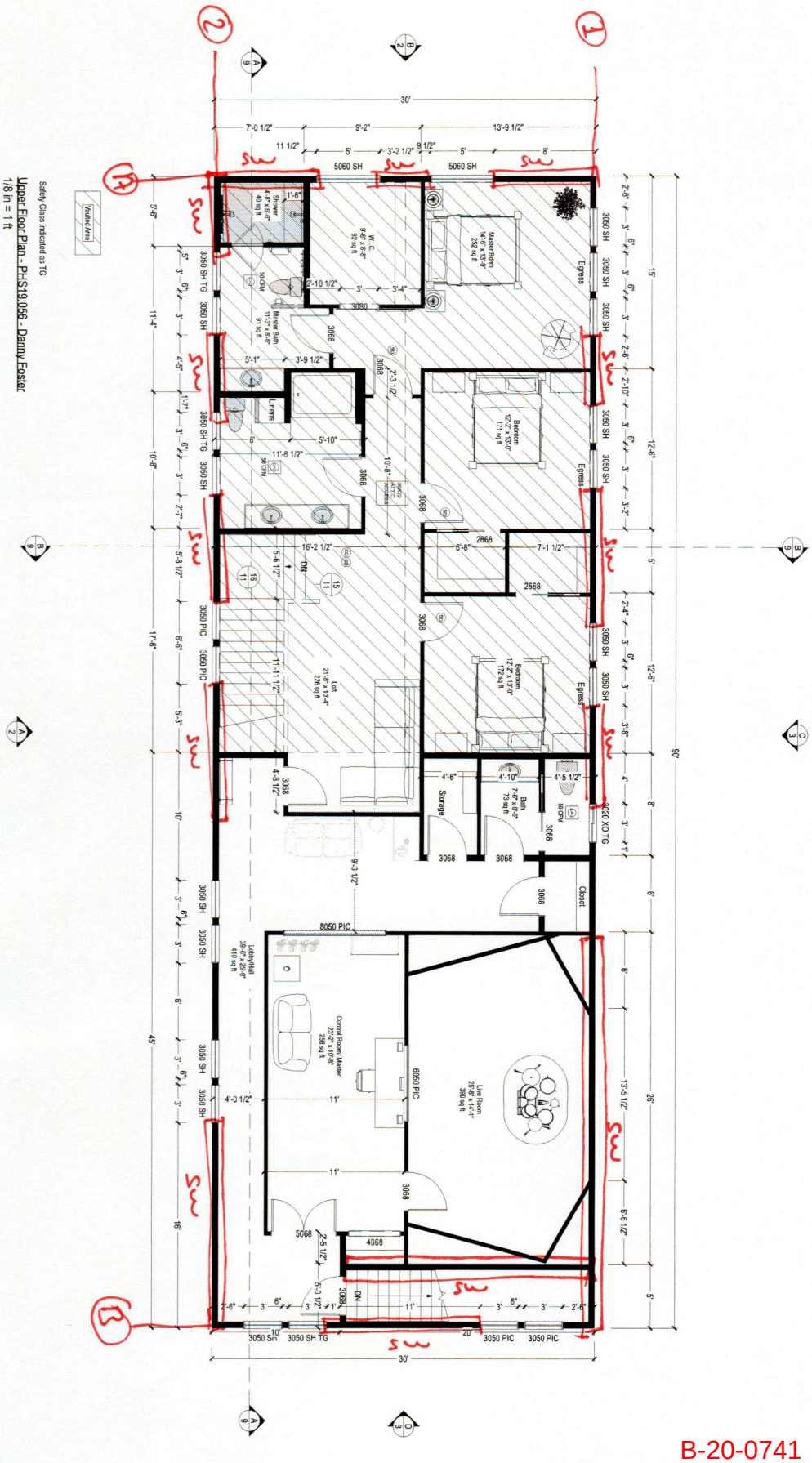


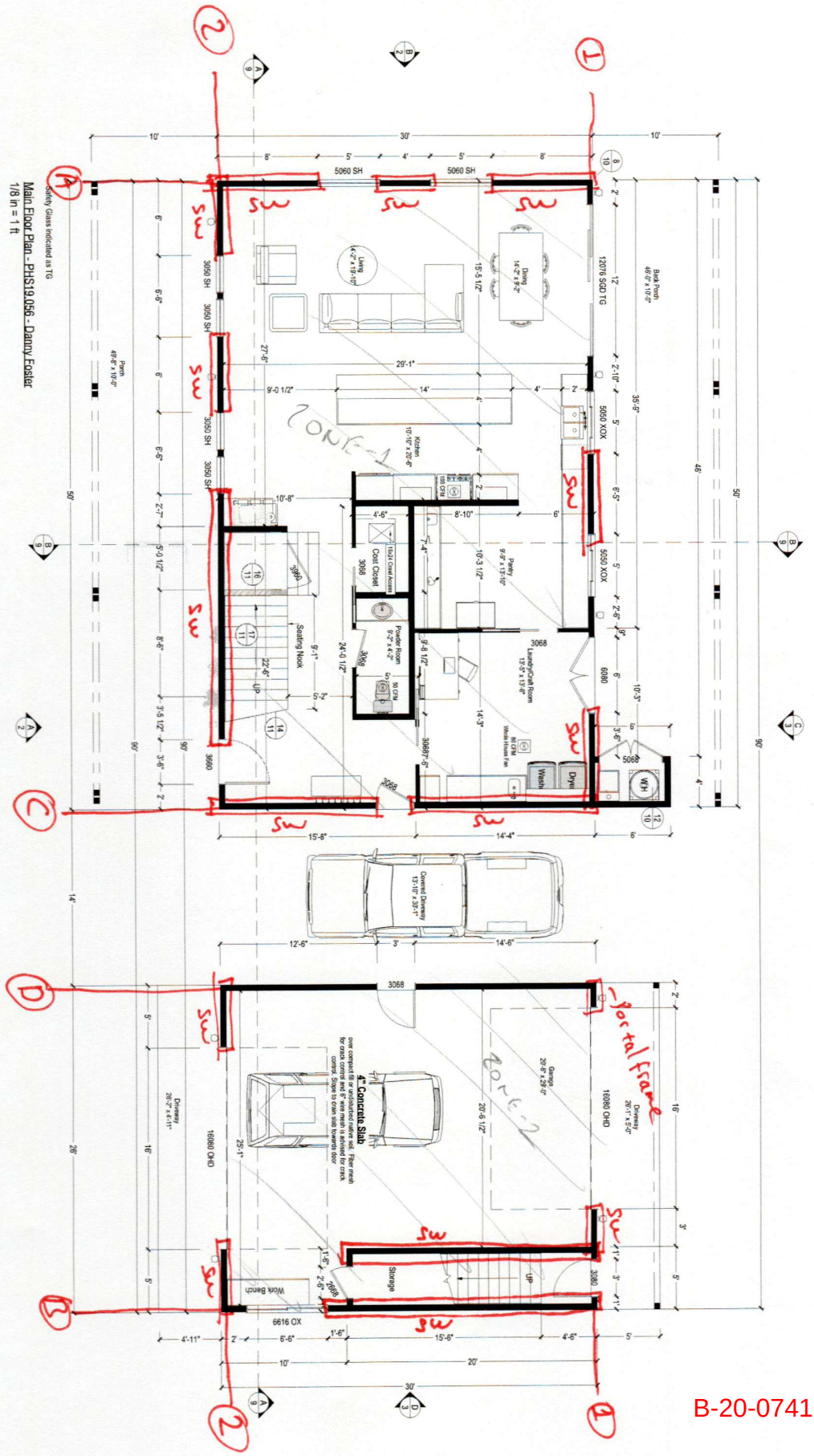
B-20-0741

Upper Floor Plan

PHS Job #: 19.056
Printed On: 12/23/2019 8:32:00
Layout Sheet # 5 of 12
Sheet: 5

Danny Foster
24XX West Stewart
Puyallup, WA 98371
253-255-3413
Parcel # - 0420203068

PACIFIC HOME SOURCE
Gabe Spruell
Ph: 253.312.5523
4001 72nd St. E.
Tacoma, WA 98443



Floor Plan

PHS Job #: 19.056
Printed On: 12/23/2019 10:31:59
Layout Sheet # 4 of 12
Sheet: 4

Danny Foster
24XX West Stewart
Puyallup, WA 98371
253-255-3413
Parcel # - 0420203068

PACIFIC HOME SOURCE
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Ph: 253.312.5523
4001 72nd St. E.
Tacoma, WA 98443

LATERAL FORCE DESIGN

Seismic Force

Roof Seismic Force

w_{DL} = 15 PSF
w_{LL} = 25 PSF
w_{wL} = 12 PSF

Estimated roof area: 3070 ft²

2nd floor wall length: 240 ft h = 9'

S_{DS} = 0.836 F = 1.1 R = 6.5

$$V_{roof} = \frac{S_{DS} \times F}{R} w_t$$

$$V_{roof} = \frac{0.836 \times 1.1}{6.5} w_t$$

V_{roof} = 0.142 w_t (Ultimate)

V_{roof} = 0.0994 w_t (ASD)

$w_t = 3070 \times 15 + 240 \times \frac{9}{2} \times 12 = 59010$ lb

V_{roof} = 0.142 × 59010 = 8379 lb (Ultimate)

V_{roof} = 0.0994 × 59010 = 5866 lb (ASD)

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Structural Works, Pllc
Consulting Engineering

JOB _____

SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____

PROJECT NO. _____

2nd Floor Seismic Force

Zone-1 Seismic Force

2nd floor area: $1524\ ft^2$ — w_{DL}: 15PSF

1st floor roof area: $610\ ft^2$ — w_{FDL}: 12PSF

1st floor wall length: 160ft h=9' — w_{WL}: 12PSF

V_{2nd} = 0.142 wt (ultimate)

V_{2nd} = 0.0994 wt (ASD)

$wt = 1524 \times 12 + 2 \times 610 \times 15 + 160 \times 9 \times 12 = 53868\ lb$

$V_{2nd} = 0.142 \times 53868 = 7649\ lb$ (Ultimate)

$V_{2nd} = 0.0994 \times 53868 = 5354\ lb$ (ASD)

Zone-2 Seismic Force

2nd floor area: $780\ ft^2$ — w_{DL}: 15PSF

1st floor roof area: $185\ ft^2$ — w_{FDL}: 12PSF

1st floor wall length: 112 ft h = 9.6' — w_{WL}: 12PSF

V_{2nd} = 0.142 wt (Ultimate)

V_{2nd} = 0.0994 wt (ASD)

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$W_L = 780 \times 12 + 185 \times 15 + 112 \times \left(\frac{9}{2} + \frac{9.6}{2}\right) \times 12 = 24634$ lb

$V_{wind} = 0.142 \times 24634 = 3498$ lb (Ultimate)

$V_{wind} = 0.099 \times 24634 = 2449$ lb (ASD)

Wind force

Exposure: B V: 110 mph from WFCM 2015 Table 2.5A

Roof wind force: 208 PLF

Floor wind force: 135 PLF

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SHEAR WALL DESIGN

Second Floor Shear wall Design

Gridline A wall

$V_E = \frac{5866}{2} = 2933$ lb

$V_w = 208 \times \frac{93}{2} = 9672$ lb ← wind govern

$L = 8' + 8' + 4' = 20'$

$v = \frac{9672}{20} = 483.6$ PLF USE [SW2]

$T' = 483.6 \times 9 = 4352.4$ lb

$R_L' = \frac{1}{2} \times 0.6 \times 8 \times 12 \times 9 = 259$ lb

$T_{net} = 4352.4 - 259 = 4093.4$ lb USE [HDU5 · HOLDOWN]

Gridline B wall

$V_E = 2933$ lb

$V_w = 9672$ lb ← wind govern

$L = 12'$

$v = \frac{9672}{12'} = 806$ PLF USE [SW1]

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$T' = 806 \times 9 = 7254$ lb

$R' = \frac{1}{2} \times 0.6 \times 19 \times 12 \times 9 = 616$ lb

$T'_{net} = 7254 - 616 = 6638$ lb USE [1-HDU 5 HOLDOWN]

Gridline 1 wall

$V_E = 2933$ lb

$V_W = 208 \times \frac{33}{2} = 3432$ lb ← wind govern

$L = 5.3' + 10.5' + 7.7' + 26' = 49.5'$

$v = \frac{3432}{49.5} = 69.3$ PLF USE [SW1]

$T' = 69.3 \times 9 = 623.7$ lb

$R_c' = \frac{1}{2} \times 0.6 \times 26 \times (15 \times 15 + 12 \times 9) = 2597.4$ lb

$T'_{net} < 0$ [NO REQ'D HOLDOWN]

Gridline 2 wall

$V_E = 2933$ lb

$V_W = 3432$ lb ← wind govern

$L = 5.9' + 6' + 8.3' + 10' + 16' = 43.2'$

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$v = \frac{3432}{43.2} = 79.4$ PLF USE [SW1]

$T' = 79.4 \times 9 = 714.6$ lb

$R_t' = \frac{1}{2} \times 0.6 \times 16 \times (15 \times 15 + 12 \times 9) = 1598.4$ lb

$T'_{net} < 0$ [NO REQ'D HOLDOWN]

First Floor Shear wall Design

Zone-1 Shear wall Design

Gridline A wall

$V_E = 2933 + \frac{5354}{2} = 5610$ lb

$V_w = 9672 + 135 \times \frac{50}{2} = 13047$ lb ← wind govern

$L = 8' + 8' + 4' = 20'$

$v = \frac{13047}{20} = 652$ PLF USE [SW3]

$T' = 652 \times 9 = 5625$ lb

$R_t' = \frac{1}{2} \times 0.6 \times 8 \times 12 \times 9 = 259$ lb

$T_{net} = 5625 - 259 = 5366$ lb USE [HDU8 HOLDOWN]

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Gridline C wall

$V_E = \frac{5354}{2} = 2677$ lb

$V_W = 135 \times \frac{50}{2} = 3375$ lb ← wind govern

$L = 12.4' + 14.4' = 26.8'$

$v = \frac{3375}{26.8} = 126$ PLF USE [SW1]

$T' = 126 \times 9 = 1134$ lb

$R_L' = \frac{1}{2} \times 0.6 \times 14.4 \times 12 \times 9 = 187$ lb

$T'_{net} = 1134 - 187 = 947$ lb USE [HDR2 HTOL00 WN]

Gridline 1 wall

Gridline 1 walls's roof lateral force is shared between Zone-1 and Zone-2 walls according to their area ratio.

$V_E = 2933 \times \left(\frac{1524}{1524+780}\right) + \frac{5354}{2} = 4617$ lb ← seismic govern

$V_W = 3432 \times \left(\frac{1524}{1524+780}\right) + 135 \times \frac{30}{2} = 4294$ lb

$L = 6.4' + 6.9' = 13.3'$

$v = \frac{4617}{13.3} = 347$ PLF USE [SW2]

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$T' = 347 \times 9 = 3123$ lb

$R' = \frac{1}{2} \times 0.6 \times 6.9 \times (15 \times 12 + 12 \times 9) \times (1 - 0.14 \times 0.836) = 526$ lb

$T'_{net} = 3123 - 526 = 2597$ lb USE [sthd14 HOLDOWN]

Gridline 2 wall

Gridline 2 wall's roof lateral force is shared between zone-1 and zone-2 wall according to their area ratio.

$V_{f2} = 2933 \times \left(\frac{1524}{1524+780}\right) + \frac{535}{2} = 4617$ lb ← seismic govern

$V_w = 3432 \times \left(\frac{1524}{1524+780}\right) + 135 \times \frac{30}{2} = 4296$ lb

$L = 6' + 6' + 19.5' = 31.5'$

$v = \frac{4617}{31.5} = 146.5$ PLF USE [SW1]

$T' = 146.5 \times 9 = 1318.5$ lb

$R' = \frac{1}{2} \times 0.5 \times 19.5 \times (15 \times 12 + 12 \times 9) \times (1 - 0.14 \times 0.836) = 1487.6$ lb

$T'_{net} < 0$ [NO REQ'D HOLDOWN]

Zone -2 Shear wall Design

Gridline B wall

$V_R = 2933 + \frac{2449}{2} = 4157.5$ lb

$V_w = 9672 + 135 \times \frac{26}{2} = 11427$ lb ← wind govern

$L = 21.5 + 19.5 = 41'$

$v = \frac{11427}{41} = 279$ PLF USE [SW1]

$T' = 279 \times 9.6 = 2678.4$ lb

$R_L' = \frac{1}{2} \times 0.6 \times 21.5 \times 12 \times 9.6 = 743$

$T_{net} = 2678.4 - 743 = 1935.4$ lb USE [HDU2 HOLDOWN]

Gridline D wall

$V_R = \frac{2449}{2} = 1224.5$ lb

$V_w = 135 \times \frac{26}{2} = 1755$ lb ← wind govern

$L = 12.4' + 14.4' = 26.8'$

$v = \frac{1755}{26.8} = 66$ PLF USE [SW1]

$T' = 66 \times 9.6 = 633.6$ lb

$R_L' = \frac{1}{2} \times 0.6 \times 14.4 \times 12 \times 9.6 = 498$ lb

$T_{net} = 633.6 - 498 = 135.6$ lb NEGLIGIBLE [NO REQ'D HOLDOWN]

Gridline 1 wall

$V_E = 2933 \times \left(\frac{780}{1524+780}\right) + \frac{2449}{2} = 2217\,lb$

$V_W = 3432 \times \left(\frac{780}{1524+780}\right) + 135 \times \frac{30}{2} = 3187\,lb \leftarrow$ wind govern

Portal frame capacity for 9.6m height = 625 x 1.4 = 875 lb (TT-100F)

$L = 3.88' > 9.6/3.5 = 2.74'$

$v = \frac{3187-875}{3.88} = 596\ PLF$ USE [SW2]

$T' = 596 \times 9.6 = 5721.6\,lb$

$R_L' = \frac{1}{2} \times 0.6 \times 3.88 \times (15 \times 12 + 12 \times 9.6) = 344\,lb$

$T'_{net} = 5721.6 - 344 = 5377.6\,lb$ USE [HDU 8 HOLDOWN]

Gridline 2 wall

$V_E = 2217\,lb$

$V_W = 3187\,lb \leftarrow$ wind govern

$L = 4.9' + 4.9' = 9.8'$

$v = \frac{3187}{9.8} = 325\ PLF$ USE [SW1]

$T' = 325 \times 9.6 = 3120\,lb$

$R_L' = \frac{1}{2} \times 0.6 \times 4.9 \times (15 \times 12 + 12 \times 9.6) = 434\,lb$

$T'_{net} = 3120 - 434 = 2686\,lb$ USE [HDU 5 HOLDOWN]