MKM & Associates
structural engineering

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5880 Commerce Blvd., Suite 105
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(707) 578-8185

January 30, 2020 *File # 190767*

STRUCTURAL CALCULATIONS

for

Keegan Remodel
5985 Lone Pine Road
Sebastopol, CA 95472

BUILDING PLAN CHECK
★ APPROVED ★
FEB 26 2020
PERMIT AND RESOURCE MANAGEMENT DEPARTMENT

MKM PROJECT MANAGER:

Mark Douglas

DESIGNER:

Leff Construction Design & Build

REGISTERED PROFESSIONAL ENGINEER
ERIC N. KREAGER
No. SE 3266
Exp. 3-31-21
STRUCTURAL
STATE OF CALIFORNIA

1/30/2020

CS013020ELD_190767 BPA

2819-2019-12/19

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Keegan Remodel

5985 Lone Pine Road, Sebastopol, CA 95472

File # 190767
Date 1/30/2020
PE ELD | PM MD

DESIGN CRITERIA

CALIFORNIA BUILDING CODE 2019 EDITION
CODE 2019 EDITION

VERTICAL LOADS

		Dead		Live	
Roof	(Comp)	16	psf	20*	psf
Roof	( )		psf		psf
Floor	( )		psf		psf
Floor	( )		psf		psf
Deck	( )		psf		psf
Exterior Walls	(Wood)	15	psf	* Reducible for roof pitch and tributary area.	
Exterior Walls	( )		psf		
Interior Walls	(Gyp)	10	psf		

LATERAL LOADS

Wind: Envelope Procedure

Speed: V_{ult}= 95 mph Exposure C

Earthquake: Equivalent Lateral Force Procedure

SDC= D2 (California Building Code)

SDC= D (California Residential Code)

V = $C_S W$ = .154W (Strength Level)

E_v= $0.2 S_{DS} D$ = .200D (Strength Level)

FOUNDATION DESIGN

Foundation design is based on minimum footing dimensions as set forth in Table R403.1 in the California Residential Code. Soil is assumed to have an allowable soil bearing pressure of 1500 psf per Table R401.4.1. MKM & Associates has not reviewed site soils conditions and is not responsible for soil bearing capacities, general site stability or soil suitability for the proposed project. A review by a Geotechnical Engineer may be desirable by the Owner or required by the Building Official.

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Keegan Residence Remodel
5985 Lone Pine Rd.

Job	190767	
Date	1/30/2020	
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BUILDING DEAD LOADS:

ROOF (FLAT)		
Label	Type	Dead Load (psf)
Roofing		
Plywood		
Framing @ 24"o.c.		
Insulation		
Sheet Rock		
	Fire Sprinklers	
	Miscellaneous	
	Total (psf) =	**0.0**

ROOF (SLOPED)		
Roof Slope	5 and 12	
Label	Type	Dead Load (psf)
Roofing	Asphalt Shingles	5.4
Plywood	23/32"	2.5
Framing @ 24"o.c.	2x8	1.6
Insulation	R30 Batts	0.8
Sheet Rock	none	0.0
Decking	2" T&G	4.3
	Fire Sprinklers	
	Miscellaneous	1.4
	Total (psf) =	**16.0**

FLOOR		
Label	Type	Dead Load (psf)
Flooring		
Overlay		
Plywood		
Framing @ 16"o.c.		
Insulation		
Sheet Rock		
	Fire Sprinklers	
	Miscellaneous	
	Total (psf) =	**0.0**

EXTERIOR DECK		
Label	Type	Dead Load (psf)
Flooring		
Overlay		
Plywood		
Framing @ 16"o.c.		
Insulation		
Sheet Rock		
	Miscellaneous	
	Total (psf) =	**0.0**

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STUD WALL DESIGN - EXTERIOR WALLS

110 mph Wind Exposure C -- Deflection limit = l/360

2016 CBC, 2015 NDS

Job #

Date 12/16

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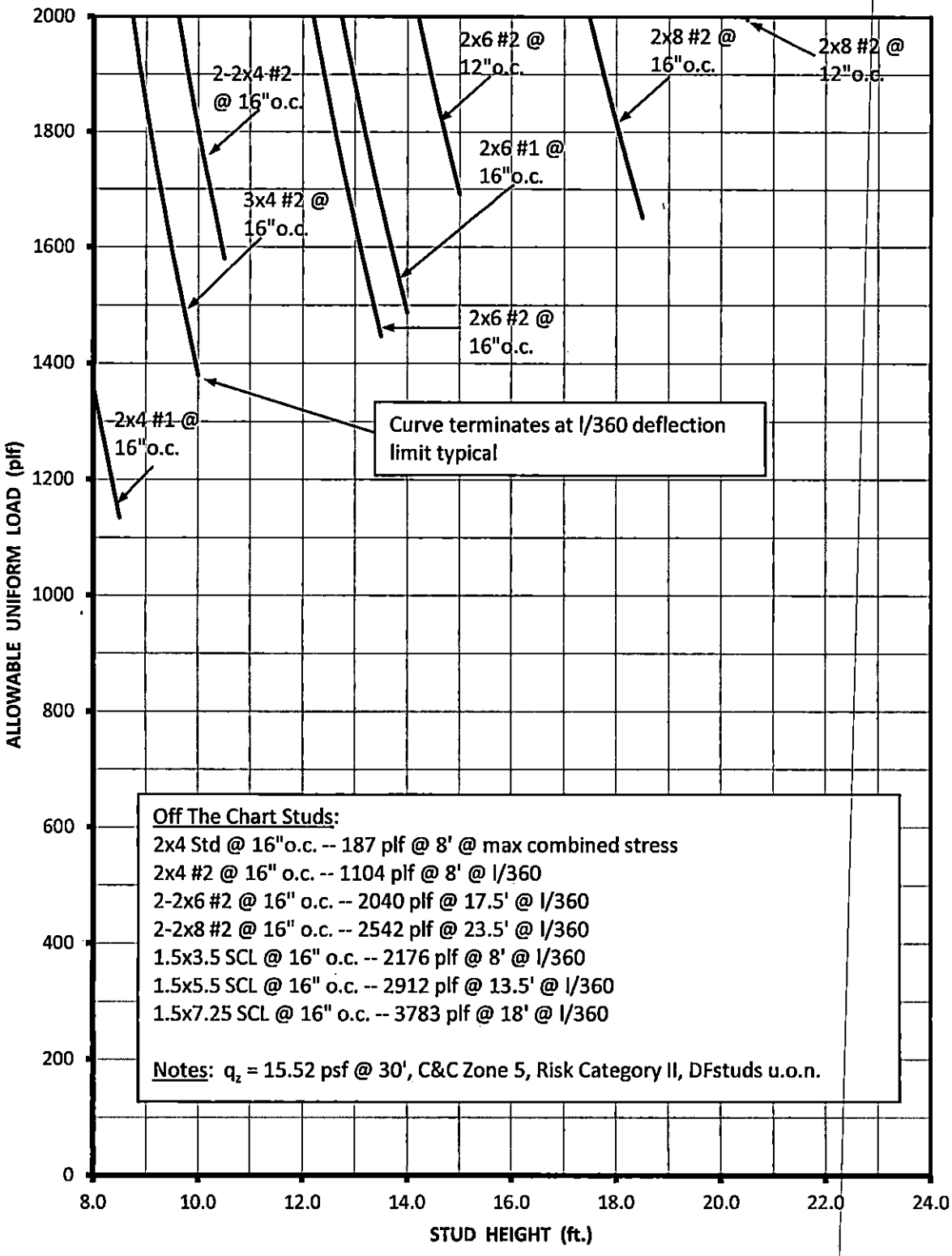

Off The Chart Studs:

2x4 Std @ 16"o.c. -- 187 plf @ 8' @ max combined stress
2x4 #2 @ 16" o.c. -- 1104 plf @ 8' @ l/360
2-2x6 #2 @ 16" o.c. -- 2040 plf @ 17.5' @ l/360
2-2x8 #2 @ 16" o.c. -- 2542 plf @ 23.5' @ l/360
1.5x3.5 SCL @ 16" o.c. -- 2176 plf @ 8' @ l/360
1.5x5.5 SCL @ 16" o.c. -- 2912 plf @ 13.5' @ l/360
1.5x7.25 SCL @ 16" o.c. -- 3783 plf @ 18' @ l/360

Notes: q_z = 15.52 psf @ 30', C&C Zone 5, Risk Category II, DFstuds u.o.n.

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MOMENT AND SHEAR CAPACITIES
2016 CBC (2015 NDS)

File #

Date 4/18

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DOUGLAS FIR LARCH		A / S	MOMENT CAPACITY (ft.lbs)			SHEAR CAPACITY (lbs.)		
SIZE	GRADE	I	1.00	1.15	1.25	1.00	1.15	1.25
4X6	NO. 1	19.25	1912	2198	2390	2310	2657	2888
		17.65						
	NO. 2	48.53	1720	1979	2151	2310	2657	2888
4x8	NO. 1	25.38	3322	3820	4152	3045	3502	3806
		30.66						
	NO. 2	111.15	2989	3438	3737	3045	3502	3806
4x10	NO. 1	32.38	4991	5740	6239	3885	4468	4856
		49.91						
	NO. 2	230.84	4492	5166	5615	3885	4468	4856
4x12	NO. 1	39.38	6768	7783	8459	4725	5434	5906
		73.83						
	NO. 2	415.28	6091	7004	7614	4725	5434	5906
4x14	NO. 1	46.38	8534	9814	10668	5565	6400	6956
		102.41						
	NO. 2	678.48	7681	8833	9601	5565	6400	6956
6x6	S. S.	30.25	3466	3986	4333	3428	3943	4285
		27.73						
	NO. 1	76.26	2773	3189	3466	3428	3943	4285
6x8	S. S.	41.25	6445	7412	8057	4675	5376	5844
		51.56						
	NO. 1	193.36	5156	5930	6445	4675	5376	5844
6x10	S. S.	52.25	11031	12685	13788	5922	6810	7402
		82.73						
	NO. 1	392.96	9307	10703	11634	5922	6810	7402
6x12	S. S.	63.25	16164	18588	20205	7168	8244	8960
		121.23						
	NO. 1	697.07	13638	15684	17048	7168	8244	8960
6x14	S. S.	74.25	21985	25283	27482	8415	9677	10519
		167.06						
	NO. 1	1127.67	18550	21333	23188	8415	9677	10519
6x16	S. S.	85.25	28541	32822	35676	9662	11111	12077
		220.23						
	NO. 1	1706.78	24081	27693	30101	9662	11111	12077

STRESSES (psi)*:

	4x #1:	4x #2:	6x6 & 6x8 S.S.:	6x6 & 6x8 #1:	6x10 to 6x16 S.S.:	6x10 to 6x16 #1:
Fb:	1000	900	1500	1200	1600	1350
Fv:	180	180	170	170	170	170

SIZE FACTOR FOR 4x's:

4x6, 4x8:	4x10:	4x12:	4x14:
1.3	1.2	1.1	1.0

SIZE FACTOR FOR 6x's: C = (12/d)^(1/9) ≤ 1

2807-2016 Beam Capacities
2807-2013-12/16P

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POST CAPACITY CHART
2016 CBC (2015 NDS)

Job	
Date 1/17	
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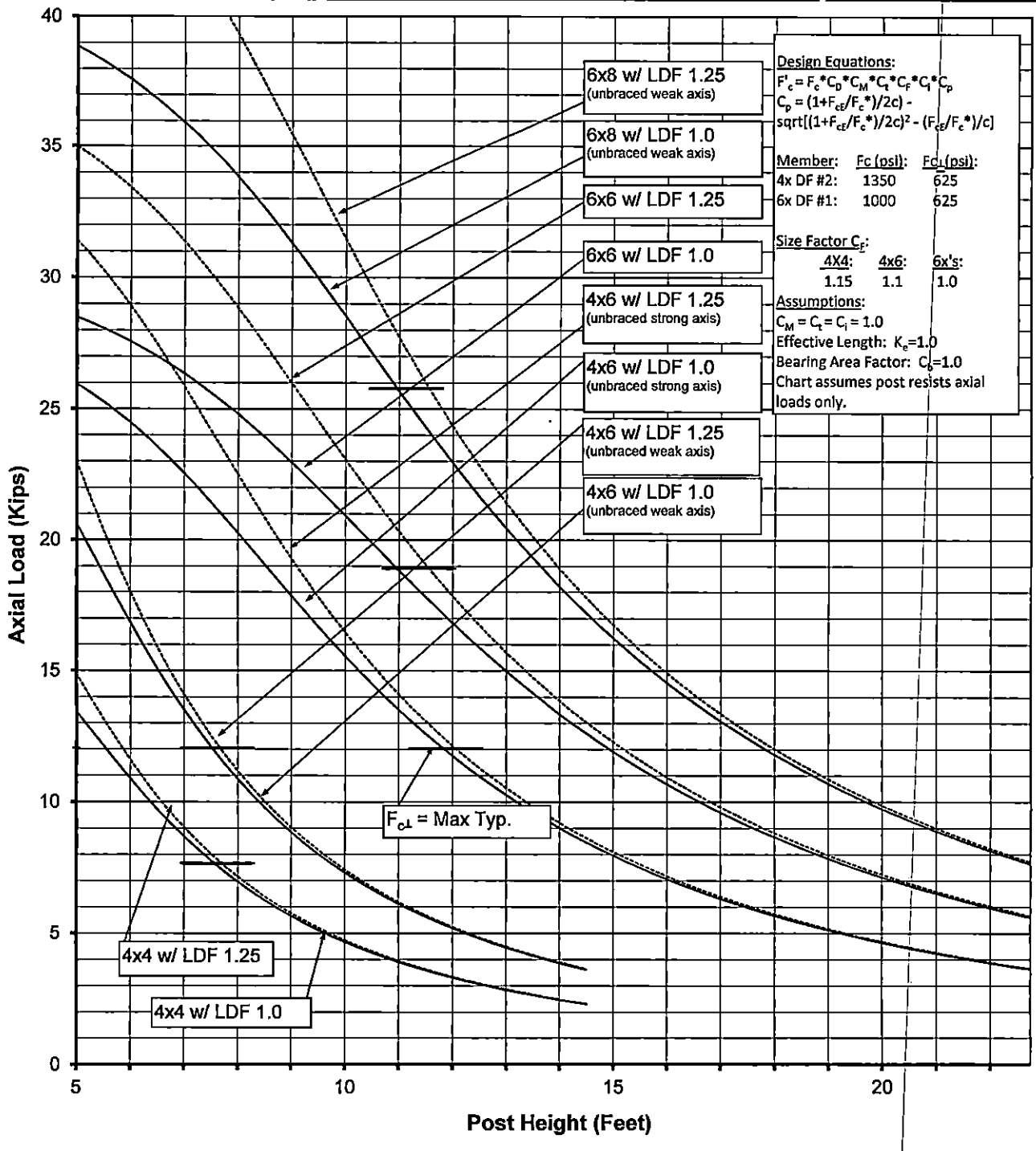

Design Equations:

$F'_c = F_c * C_D * C_M * C_t * C_F * C_i * C_p$

$C_p = (1+F_{cE}/F_c^*)/2c) - \sqrt{[(1+F_{cE}/F_c^*)/2c)^2 - (F_{cE}/F_c^*)/c]}$

Member:	Fc (psi):	$F_{c\perp}$ (psi):
4x DF #2:	1350	625
6x DF #1:	1000	625

Size Factor C_F:

4X4:	4x6:	6x's:
1.15	1.1	1.0

Assumptions:

$C_M = C_t = C_i = 1.0$

Effective Length: K_e=1.0

Bearing Area Factor: C_b=1.0

Chart assumes post resists axial loads only.

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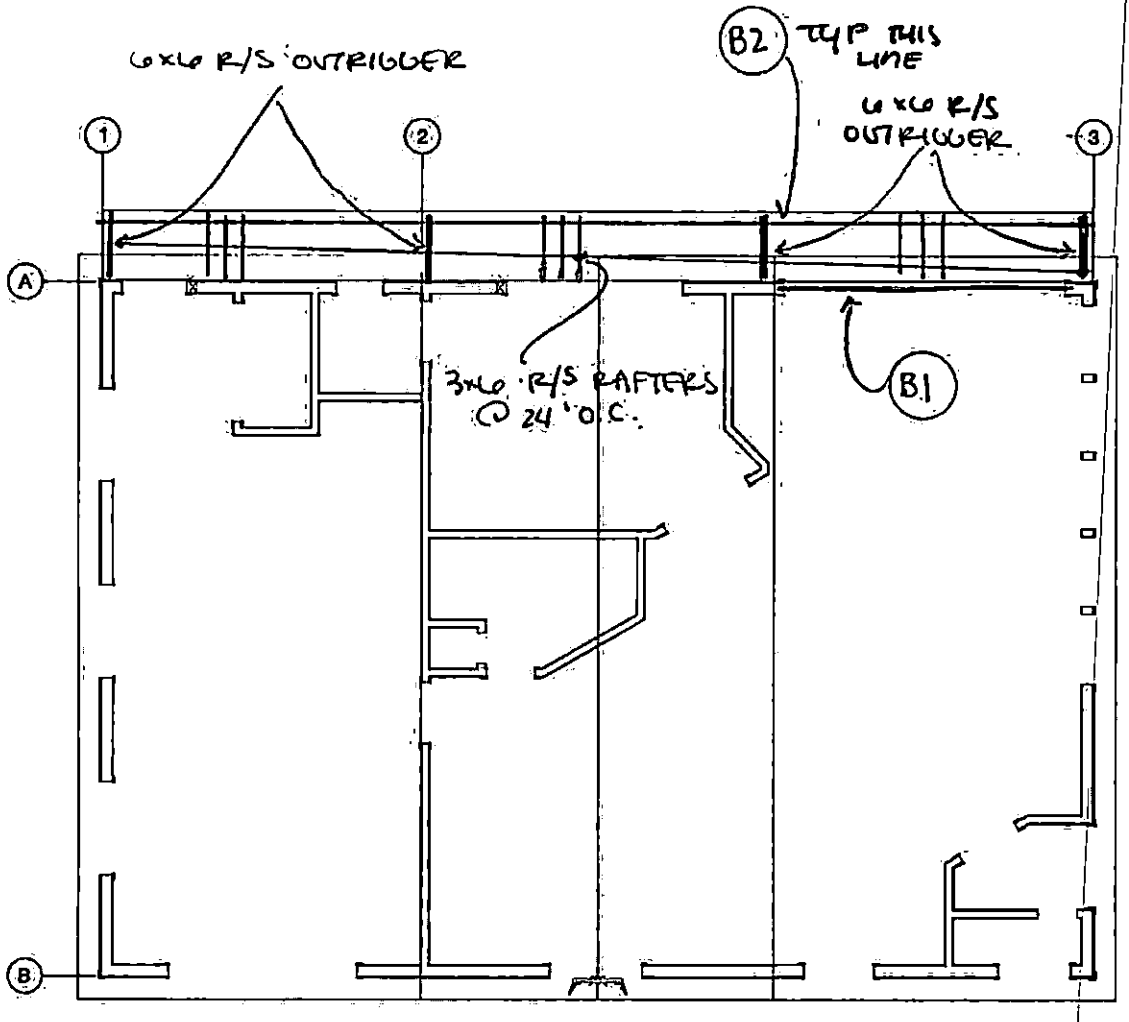
KEEGAN RESIDENCE REMODEL

VERTICAL SYSTEM: ROOF FRAMING KEY PLAN
5985 LONE PINE ROAD
SEBASTAPOL, CA 95472

Job	190767	
Date	1/30/2020	
PE ELD		of



SCALE: 1/8" = 1'-0"

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Project Title: Keegan Residence Remodel
Engineer: ELD
Project ID: 190767
Project Descr:

Wood Beam

Lic. # : KW-06005908 — Licensee : MKM ASSOCIATES

Description : B1- Line A Header

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-16

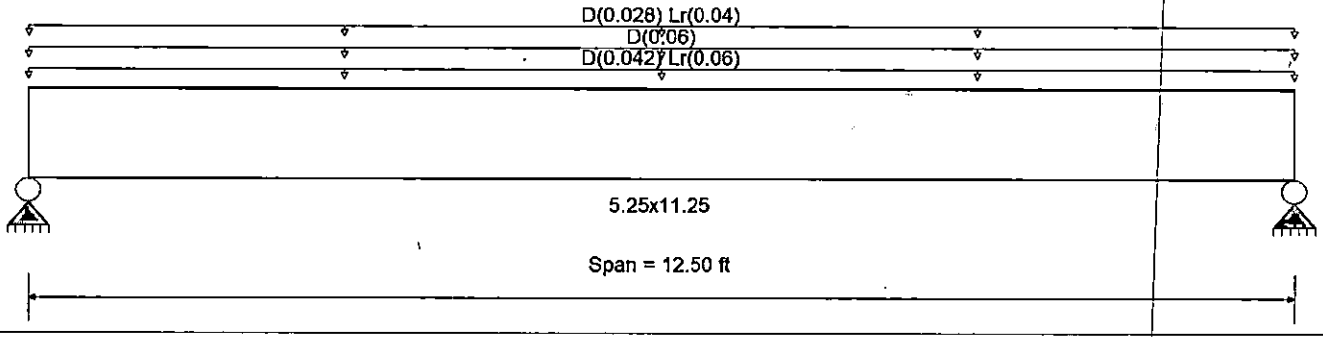
Wood Species : 3-1/2-7 SCL
Wood Grade : Manufactured

Fb +	2800 psi
Fb -	2800 psi
Fc - Prll	2750 psi
Fc - Perp	700 psi
Fv	285 psi
Ft	200 psi

E : Modulus of Elasticity

Ebend- xx	2000 ksi
Eminbend - xx	1000 ksi
Density	35.02 pcf

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, Lr = 0.020 ksf, Tributary Width = 3.0 ft, (Roof)
Uniform Load : D = 0.010 ksf, Tributary Width = 6.0 ft, (Wall)
Uniform Load : D = 0.0140, Lr = 0.020 ksf, Tributary Width = 2.0 ft, (Awning)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	**0.148** : 1	Maximum Shear Stress Ratio	=	**0.093** : 1
Section used for this span		**5.25x11.25**	Section used for this span		**5.25x11.25**
fb : Actual	=	517.17 psi	fv : Actual	=	33.13 psi
FB : Allowable	=	3,500.00 psi	Fv : Allowable	=	356.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	6.250 ft	Location of maximum on span	=	11.588 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.044 in	Ratio =	3382 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.108 in	Ratio =	1384 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

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Project Title: Keegan Residence Remodel
Engineer: ELD
Project ID: 190767
Project Descr:

Wood Beam

Lic. # : KW-06005908 — Licensee : MKM ASSOCIATES

Description : B2- Knee Brace Beam

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

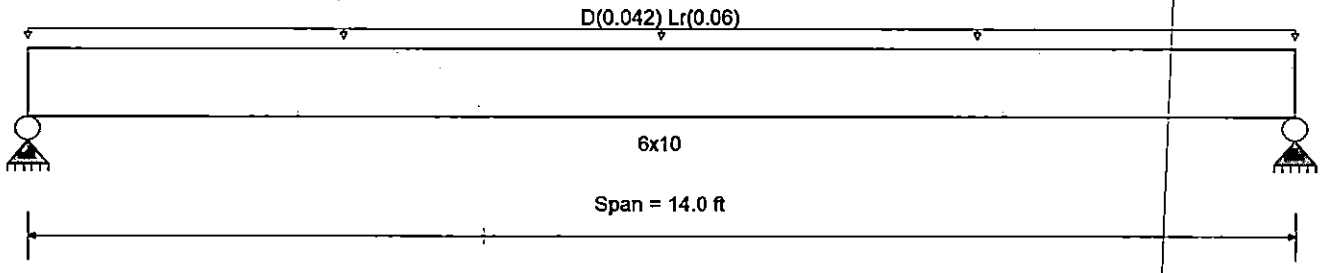
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-16

Wood Species : Spruce - Pine - Fir (South)
Wood Grade : No.2

		E : Modulus of Elasticity	
Fb +	575 psi	Ebend- xx	1000 ksi
Fb -	575 psi	Eminbend - xx	370 ksi
Fc - Prll	375 psi		
Fc - Perp	335 psi		
Fv	125 psi		
Ft	300 psi	Density	22.47 pcf

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, Lr = 0.020 ksf, Tributary Width = 3.0 ft, (Awning)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	**0.545** : 1	Maximum Shear Stress Ratio	=	**0.126** : 1
Section used for this span		**6x10**	Section used for this span		**6x10**
fb : Actual	=	391.46 psi	fv : Actual	=	19.71 psi
FB : Allowable	=	718.75 psi	Fv : Allowable	=	156.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	7.000 ft	Location of maximum on span	=	13.234 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.133 in	Ratio =	1265 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.244 in	Ratio =	689 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

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Project Title: Keegan Residence Remodel
Engineer: ELD
Project ID: 190767
Project Descr:

Wood Beam

Description : B2- Knee Brace Beam Pt Load

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

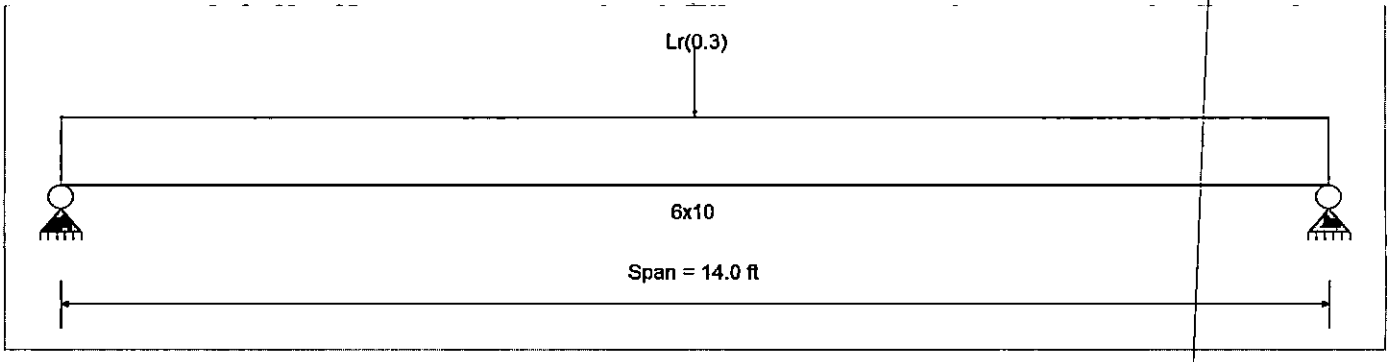
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-16

Wood Species : Spruce - Pine - Fir (South)
Wood Grade : No.2

Fb +	575.0 psi	*E : Modulus of Elasticity*	
Fb -	575.0 psi	Ebend- xx	1,000.0ksi
Fc - Prll	375.0 psi	Eminbend - xx	370.0ksi
Fc - Perp	335.0 psi		
Fv	125.0 psi		
Ft	300.0 psi	Density	22.470pcf

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Point Load : Lr = 0.30 k @ 7.0 ft, (LL)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	**0.252** 1	Maximum Shear Stress Ratio	=	**0.037** : 1
Section used for this span		**6x10**	Section used for this span		**6x10**
fb : Actual	=	181.28psi	fv : Actual	=	5.77 psi
FB : Allowable	=	718.75psi	Fv : Allowable	=	156.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	7.000ft	Location of maximum on span	=	13.234 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.076 in	Ratio =	2215 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.094 in	Ratio =	1789 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

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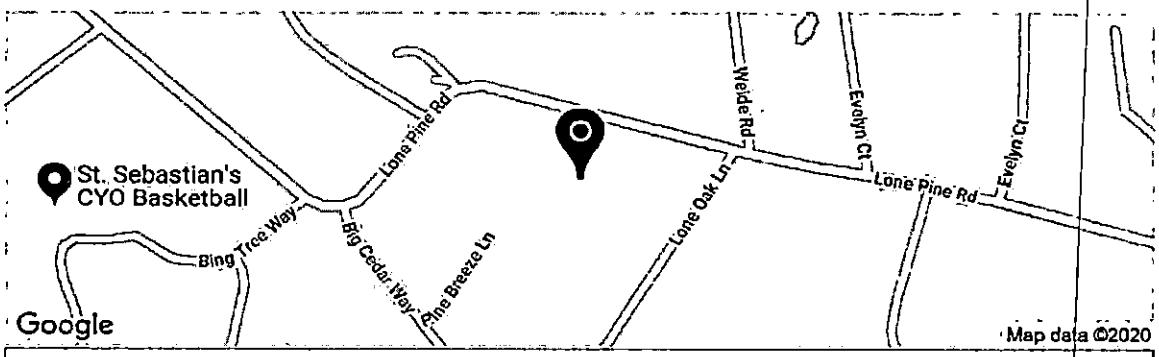
Keegan Residence Remodel 5985 Lone Pine Rd.	Job 190767
	Date 1/30/2020
	PE ELD | of

OSHPD

Keegan Residence Remodel

5985 Lone Pine Rd, Sebastopol, CA 95472, USA

Latitude, Longitude: 38.365528, -122.797037



Date	1/29/2020, 4:01:12 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.5	MCE_R ground motion. (for 0.2 second period)
S_1	0.6	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.5	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site modified spectral acceleration value
S_{DS}	1	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.515	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.566	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	1.628	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.768	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.631	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.696	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.515	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.921	Mapped value of the risk coefficient at short periods
C_{R1}	0.903	Mapped value of the risk coefficient at a period of 1 s

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Keegan Residence Remodel
5985 Lone Pine Rd.

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Date	1/30/2020	
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Code(s) Used: 2019 CBC, ASCE 7-16

Risk Category =	II		(CBC, Tables 1604.5)
Importance Factor, I =	1.00		(ASCE 7, Table 1.5-2)
Seismic Force Resisting System	Light-frame (wood) sheathed walls		
Response Modification Coefficient, R =	6.5		(ASCE 7, Table 12.2-1)
Max ground acceleration for 0.2 spectral response, S_s =	1.500g		(CBC, Figure 1613.3.3(1))
Site Class =	D		(ASCE 7, Table 20.3-1)
Site Coefficient, F_a =	1.00		(ASCE 7, Table 11.4-1)
$S_{MS} = F_a * S_S$ =	1.5		(ASCE 7, Eq. 11.4-1)
$S_{DS} = 2/3(S_{MS})$ =	1.000g		(ASCE 7, Eq. 11.4-3)
Seismic Response Coefficient, $C_s = S_{DS}/(R/I)$ =	0.154		(ASCE 7, Eq. 12.8-2)
S_1 =	0.600g		(CBC, Figure 1613.3.3(2))
F_v =	1.70		(ASCE 7, Table 11.4-2)
SM1=Fv*S1	1.020g		(ASCE 7, Eq. 11.4-2)
$S_{D1} = 2/3(S_{M1})$ =	0.680g		(ASCE 7, Eq. 11.4-4)
h_n =	18	ft	
C_t =	0.020		(ASCE 7, Table 12.8-2)
x =	0.75		(ASCE 7, Table 12.8-2)
$T_a = C_t h_n^x$ =	0.175	sec	(ASCE 7, Eq. 12.8-7)
$T_s = S_{D1}/S_{DS}$ =	0.680		(ASCE 7, Sec 11.4.6)
T_L =	8	sec	(ASCE 7, Figure 22-14)
Cs need not exceed the following			(ASCE 7, 12.8.1.1)
$C_s = S_{D1}/(T*R/I)$ (for $Ta \le T_L$) =	0.60		(ASCE 7, Eq. 12.8-3)
$C_s = (S_{D1}*T_L)/(T^2*R/I)$ (for $T_a > T_L$) =			(ASCE 7, Eq. 12.8-4)
C_s shall not be less than the following			
$C_s = 0.044 S_{DS} I \ge 0.01$ =	0.04		(ASCE 7, Eq. 12.8-5)
$C_s = 0.5*S_1/(R/I)$ (for $S_1 \ge 0.6g$) =	0.0462		(ASCE 7, Eq. 12.8-6)
Base Shear			Strength Design Level
$V = C_s * W$ =	0.154	W	(ASCE 7, Eq. 12.8-1)
Vertical Seismic Load Effect			Strength Design Level
$E_v = 0.2 S_{DS} D$ =	0.200	D	(ASCE 7, Eq. 12.4-4)

Seismic Design Category (CRC)	D2	(CRC, Table R301.2.2.1.1
Seismic Design Category (CBC)	D	(ASCE 7, Tables 11.6)

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5985 Lone Pine Rd.

Job	190767	
Date	1/30/2020	
PE	ELD	of

Story Distribution and Diaphragm Coefficient Calculator - Strength Design Basis

k= 1 C_s= 0.15 $V=C_sW$= 6.52

Level	h_x (ft.)	h_x^k (ft.)	A_x (sq.ft.)	w_x (psf)	W_x (kips)	$\Sigma(W_i)$ (kips)	$W_xh_x^k$ (kip-ft.)	$C_{vx} = \frac{(W_xh_x^k)}{\Sigma(W_ih_i^k)}$	$F_x=C_{vx}V$ (kips)	$\Sigma(F_i)$ (kips)	$\frac{F_x}{W_x}$	$\frac{\Sigma(F_i)}{\Sigma(W_i)}$
Roof	18	18	1800	24	42	42	763	1.000	6.52	6.52	0.154	0.200
			Totals:		42		763	1.000	6.52			

Allowable Stress Values

Level	Seismic Coefficient	Collector Coefficient	Diaphragm Coefficient	ρ
Roof	0.108	0.140	0.140	1

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KEEGAN RESIDENCE REMODEL

LATERAL LAYOUT - LOWER LEVEL
5985 LONE PINE ROAD
SEBASTAPOL, CA 95472

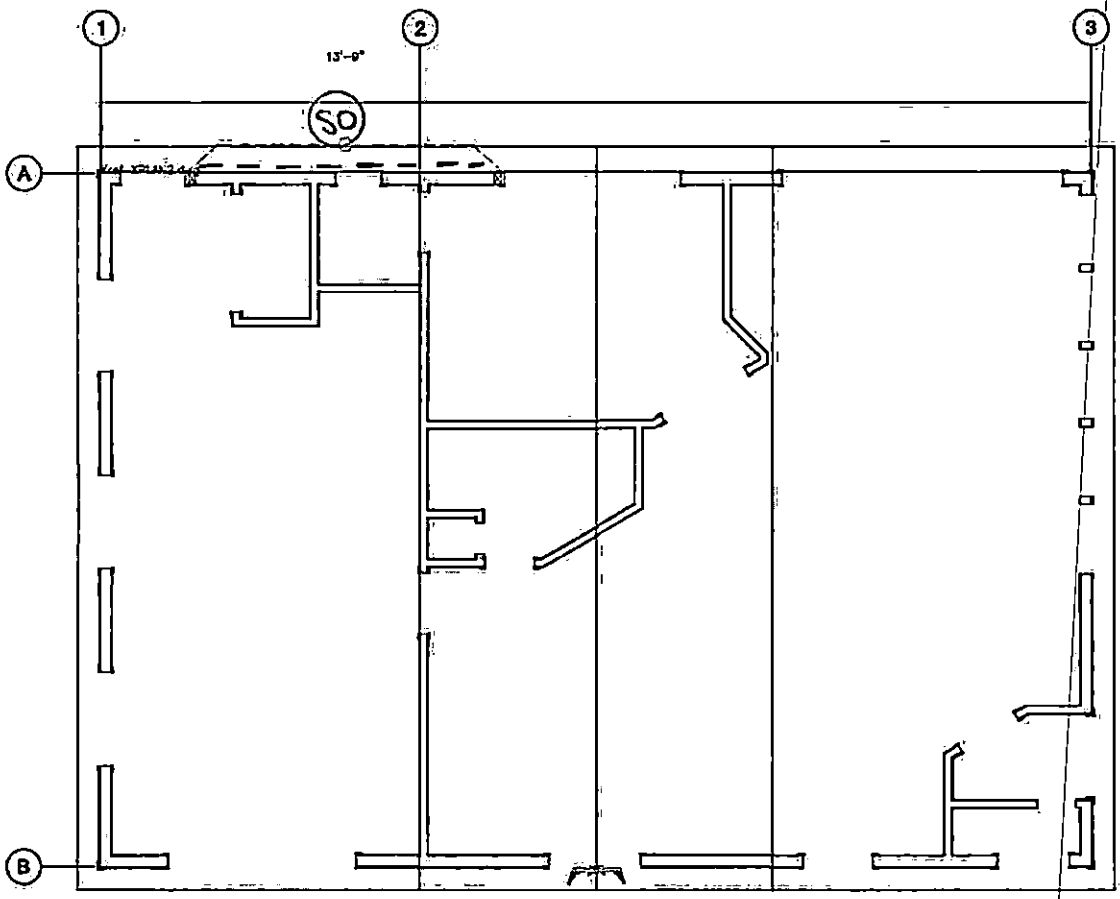
Job	190767
Date	1/30/2020
PE	ELD
	of

LATERAL PLAN KEY

(SW) = Designed sheathed wall
(SO) = Designed sheathed wall with opening

←— = Collector/drag

ZCALC



SCALE: 1/8" = 1'-0"

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5985 Lone Pine Rd.

Job	190767	
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Story Seismic Coefficient (ρ = 1.0)	0.108
Story Seismic Coefficient (ρ = 1.0 or 1.3)	0.108

Roof Lateral Design - Seismic #1

	Area 1			Area 2			Area 3			
	Uniform Weight (psf)	23.5		Uniform Weight (psf)	16.0		Uniform Weight (psf)	23.5		
	Tributary			Tributary			Tributary			
Gridline	Length (ft)	Width (ft)	Area (ft^2)	Length (ft)	Width (ft)	Area (ft^2)	Length (ft)	Width (ft)	Area (ft^2)	ASD Load (lbs)
A	45.0	16.0	720.0	43.0	3.0	129.0			0.0	2048
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	
			0.0			0.0			0.0	

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S.W.	Sheathing/Nailing	Wind 2:1	Wind 3.5:1	EQ 2:1	EQ 3.5:1
A6	3/8" or 15/32" / 8d at 6" o.c	365 plf	208 plf	260 plf	148 plf
A4	3/8" or 15/32" / 8d at 4" o.c.	532 plf	304 plf	350 plf (Note 1)	200 plf
A3	3/8" or 15/32" / 8d at 3" o.c.	685 plf	391 plf	490 plf	280 plf
A2	3/8" or 15/32" / 8d at 2" o.c.	895 plf	511 plf	640 plf	365 plf
B6	15/32" / 10d at 6" o.c.	435 plf	248 plf	310 plf	177 plf
B4	15/32" / 10d at 4" o.c.	645 plf	368 plf	460 plf	263 plf
B3	15/32" / 10d at 3" o.c.	840 plf	480 plf	600 plf	343 plf
B2	15/32" / 10d at 2" o.c.	1078 plf	616 plf	770 plf	440 plf
S2	Structural I 15/32" / 10d at 2" o.c.	1217 plf	695 plf	870 plf	497 plf
T6	303 siding / 8d at 6" o.c.	225 plf	128 plf	160 plf	91 plf
T4	303 siding / 8d at 4" o.c.	335 plf	191 plf	240 plf	137 plf
T3	303 siding / 8d at 3" o.c.	435 plf	248 plf	310 plf	177 plf
A3 / A3	3/8" or 15/32" each side / 8d at 3" o.c.	1372 plf	784 plf	980 plf	560 plf
A2 / A2	3/8" or 15/32" each side / 8d at 2" o.c.	1790 plf	1022 plf	1280 plf	730 plf
B3 / B3	15/32" each side/10d at 3"o.c.	1680 plf	960 plf	1200 plf	686 plf
B2 / B2	15/32" each side/10d at 2"o.c.	2156 plf	1232 plf	1540 plf	880 plf
S2 / S2	Structural I 15/32" each side / 10d at 2" o.c.	2434 plf	1390 plf	1740 plf	994 plf

Shear Wall Notes:

1) 380 plf max. allowable limited to 350 plf to avoid requirement of 3x edge members.
2) Loads are listed in allowable stress design as specified in table 4.3A of SDPWS-2015
3) 3/8" sheathing values assume studs are spaced no further than 16" on center

Anchor Bolt Design Values

Anchor Bolt	Sill Plate	Parallel Bolt Value/+60% (lbs)	Anchor Bolt Allowable Load for Listed Spacing (plf)					
			16"	24"	32"	4'-0"	5'-4"	6'-0"
1/2"	2x	650 / 1040	780	520	390	260	195	173
	3x	770 / 1232	924	616	462	308	231	205
	4x	770 / 1232	924	616	462	308	231	205
5/8"	2x	930 / 1488	1116	744	558	372	279	248
	3x	1180 / 1888	1416	944	708	472	354	315
	4x	1200 / 1920	1440	960	720	480	360	320

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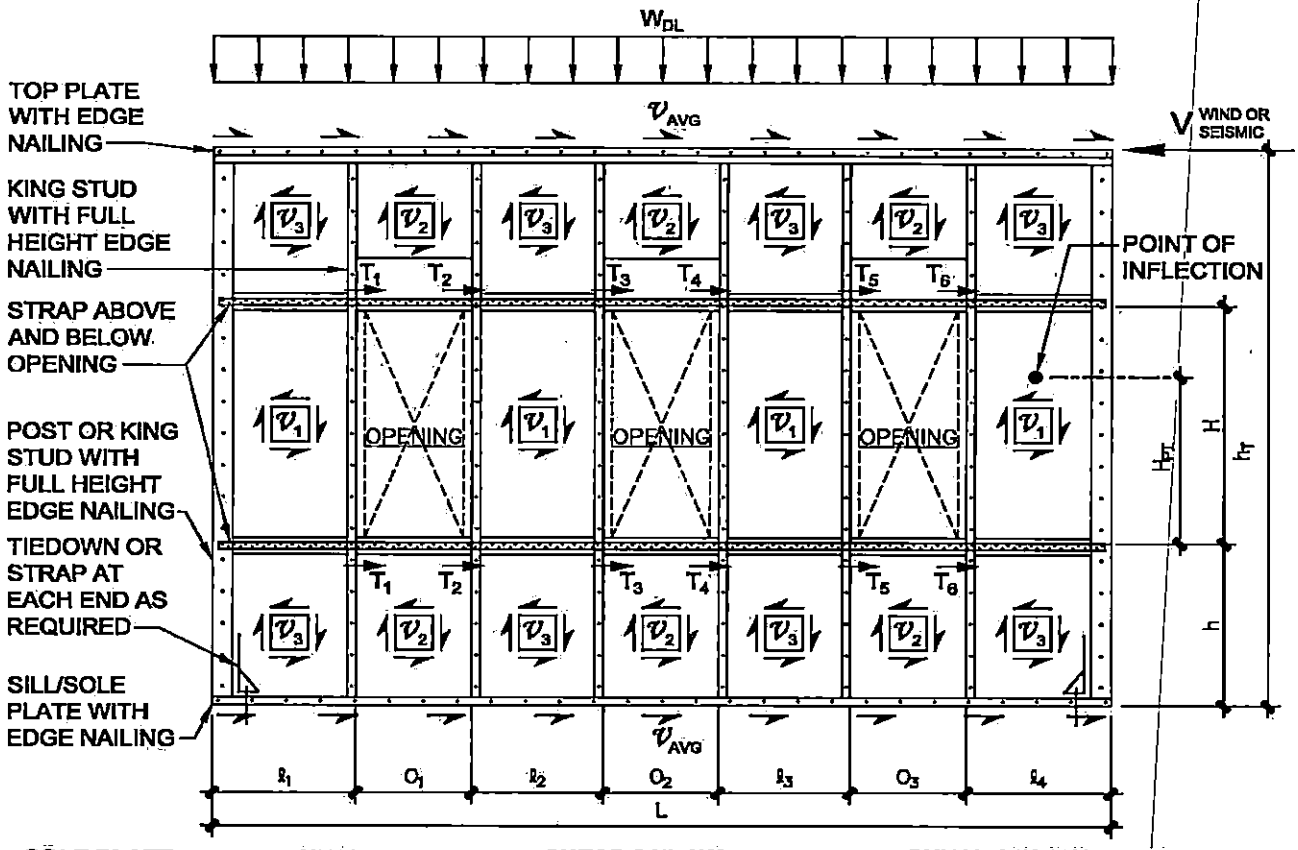
SHEAR WALL WITH OPENINGS - DESIGN PROCEDURE



SOLE PLATE SHEAR

$$v_{AVG} = \frac{V}{L}$$

SHEAR AT PIERS

$$v_1 = \frac{V}{\sum_{i=1}^{n} \ell_i}$$

SHEAR BELOW OPENINGS

$$v_2 = v_{AVG}\left(\frac{h_T}{h_T - H}\right)$$

SHEAR BELOW PIERS

$$v_3 = \left(v_1 - v_{AVG}\right)\left(\frac{H}{h_T - H}\right) - v_{AVG}$$

STRAP TENSION/COMPRESSION FORCE

$$\text{MAX OF } T = \begin{cases} T_1 = \left(v_1 + v_3\right)\ell_1 \\ T_2 = T_1 - v_2\, O_1 \\ T_3 = T_2 + \left(v_1 + v_3\right)\ell_2 \\ T_4 = T_3 - v_2\, O_2 \\ T_5 = \ldots \end{cases}$$

P_{UP} = UPLIFT FORCE AT ENDS

Wind Uplift = $[\, v_{AVG}\, h_T - 0.6W_{DL}\,(L/2)]$

Seismic Uplift = $[\, v_{AVG}\, h_T - (0.6 - 0.14S_{DS})W_{DL}(L/2)]$

LOCATION OF POINT OF INFLECTION

$$H_{PI} = H\left(\frac{h}{h_T - H}\right)$$

NOTES:
1. USE MAXIMUM "H" FOR ALL OPENINGS.
2. BOTTOM SECTION OF WALL IS ASSUMED TO BE A SIMPLY SUPPORTED BEAM WITH COUPLES APPLIED ALONG TOP FOR EACH PIER.
3. ASSUME SILL PLATE AT FOUNDATION CONDITION IS CONTINUOUS.
4. ANALYSIS IS THE SAME FOR ANY NUMBER OF OPENINGS.

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Shear Walls with Opening Roof #1

Grid	V (lbs)	l_1 (ft) / l_2 (ft) / l_3 (ft) / l_4 (ft)	l_5 (ft) / l_6 (ft) / l_7 (ft) / l_8 (ft)	L Total (ft)	H (ft) / h (ft)	Height (ft)	v_1 (plf) / v_2 (plf)	v_3 (plf) / v_{avg} (plf)	S.W. Type	W_{DL} (plf)	P_{up} (lbs)	Holdown / 5/8"AB Max Spacing (ft)	Sill Type / Opening Strap/ Comments
A	0	6.00		13.0	2.00	15	0	0	A4	0	0	HDU2	2x sill
0.6*W		5.00			5.00		0	0					CS16
A	2048			13.0	2.00	15	186	153	A4	0	2363	6.0	Strap Force lbs
0.7*E					5.00		182	158					198
0.6*W													
0.7*E													
0.6*W													
0.7*E													
0.6*W													
0.7*E													
0.6*W													
0.7*E													
0.6*W													
0.7*E													

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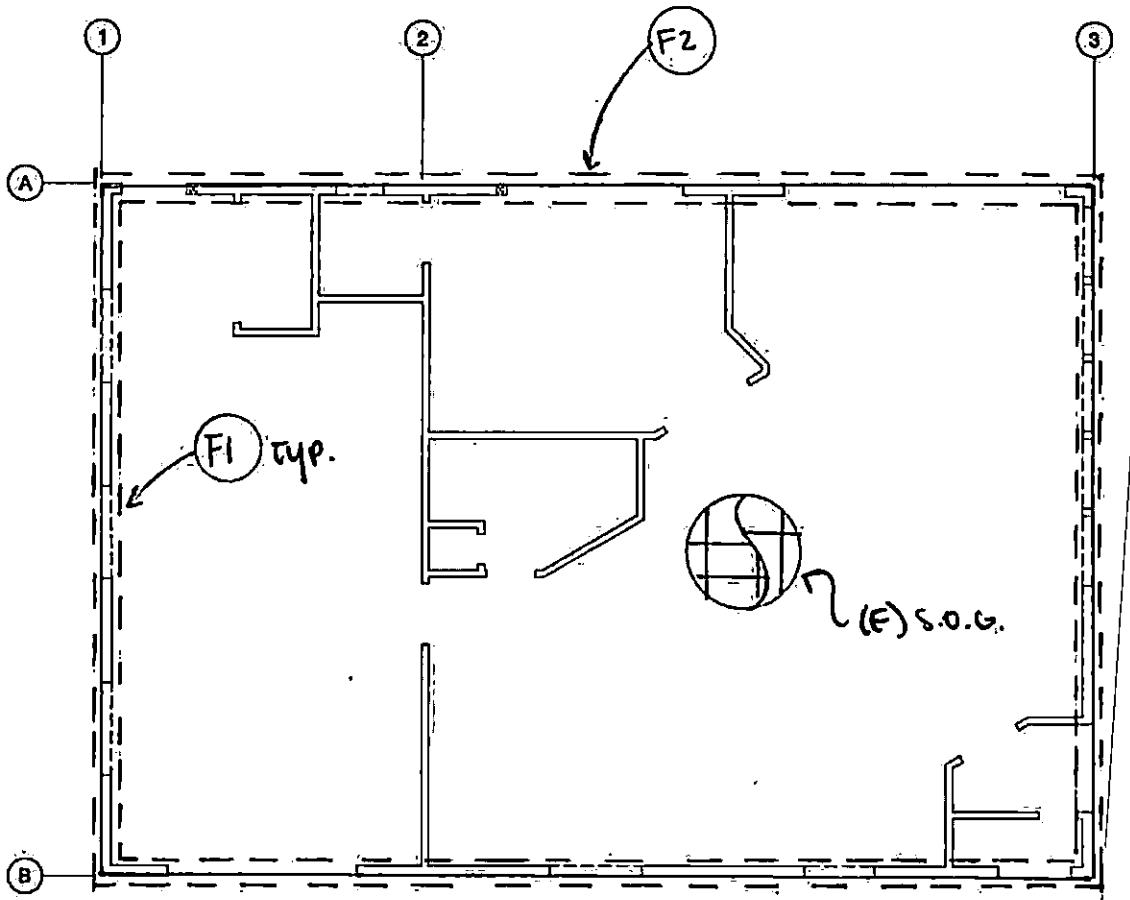
KEEGAN RESIDENCE REMODEL

VERTICAL SYSTEM: FOUNDATION KEY PLAN
5985 LONE PINE ROAD
SEBASTAPOL, CA 95472

Job	190767
Date	1/30/2020
PE FLD	of



SCALE: 1/8" = 1'-0"

MKM & Associates
structural engineering
5880 Commerce Blvd.
Rohnert Park, CA 94928
www.mkmassociates.com
Phone: (707) 578-8185

Project Title: Keegan Residence Remodel
Engineer: ELD
Project ID: 190767
Project Descr:

Beam on Elastic Foundation

Description : F1- Typ Footing

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-10
Load Combinations Used : ASCE 7-16

Material Properties

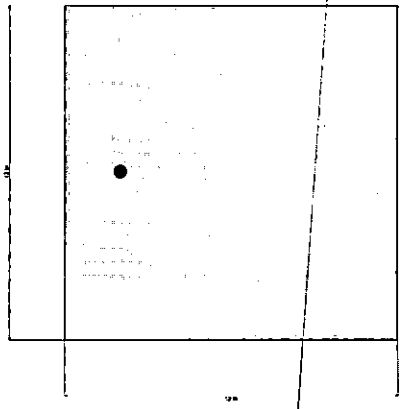
f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	=	375.0 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ Lt Wt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi			

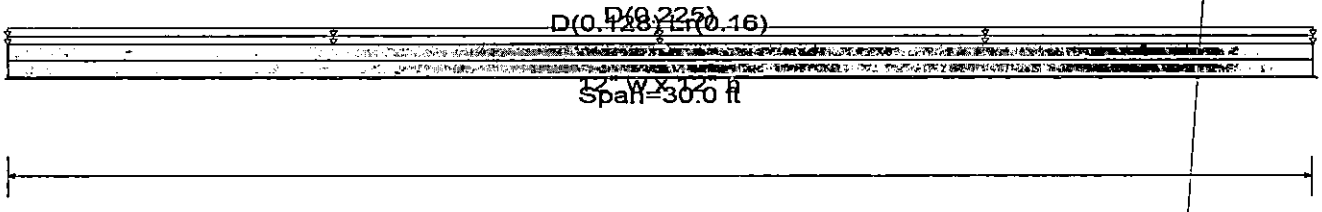
Soil Subgrade Modulus = 250.0 psi / (inch deflection)
Load Combination ASCE 7-16

fy - Main Rebar	=	60.0 ksi	Fy - Stirrups	=	40.0 ksi
E - Main Rebar	=	29,000.0 ksi	E - Stirrups	=	29,000.0 ksi
			Stirrup Bar Size #	=	# 3

Number of Resisting Legs Per Stirrup

Beam is supported on an elastic foundation.





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 12.0 in
Span #1 Reinforcing....
1-#4 at 6.0 in from Bottom, from 0.0 to 30.0 ft in this span

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0160, Lr = 0.020 ksf, Tributary Width = 8.0 ft, (Roof)
Uniform Load : D = 0.0150 ksf, Tributary Width = 15.0 ft, (Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.002**: 1	Maximum Deflection	
Section used for this span	**Typical Section**	Max Downward L+Lr+S Deflection	0.000 in
Mu : Applied	-0.009232 k-ft	Max Upward L+Lr+S Deflection	0.000 in
Mn * Phi : Allowable	5.188 k-ft	Max Downward Total Deflection	0.018 in
Load Combination	+1.20D+1.60Lr+L+1.60H	Max Upward Total Deflection	0.004 in
Location of maximum on span	14.824 ft		
Span # where maximum occurs	Span # 1		

Maximum Soil Pressure = **0.659** ksf at 7.00 ft LdComb: +D+Lr+H
Allowable Soil Pressure = **1.50** ksf **OK**

Cross Section Strength & Inertia

		Phi*Mn (k-ft)		Moment of Inertia (in^4)		
Cross Section	Bar Layout Description	Btm Tension	Top Tension	I gross	Icr - Btm Tension	Icr - Top Tension
Section 1	1-#4 @ d=6",	5.19	5.19	1,728.00	49.72	49.72

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
Span 1	1	0.0183	7.000		0.0000	0.000

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Rohnert Park, CA 94928
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Phone: (707) 578-8185

Project Title: Keegan Residence Remodel
Engineer: ELD
Project ID: 190767
Project Descr:

Beam on Elastic Foundation

Description : F2- Line A Footing

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-10
Load Combinations Used : ASCE 7-16

Material Properties

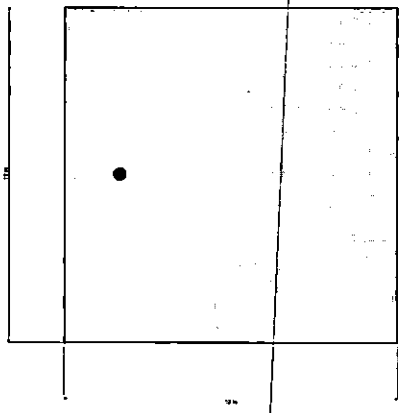
f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	=	375.0 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ Lt Wt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi			

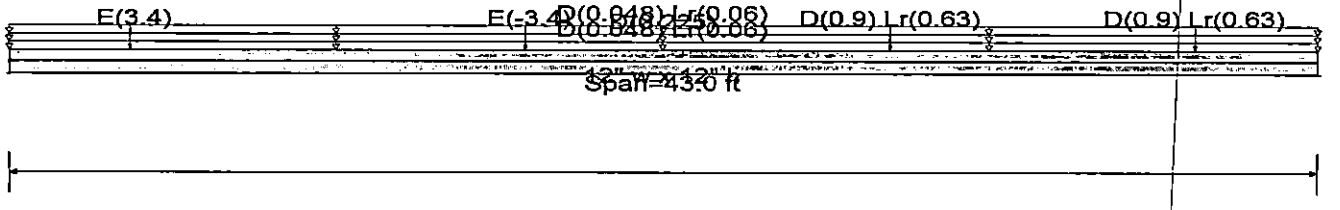
Soil Subgrade Modulus = 250.0 psi / (inch deflection)
Load Combination ASCE 7-16

fy - Main Rebar	=	60.0 ksi	Fy - Stirrups	=	40.0 ksi
E - Main Rebar	=	29,000.0 ksi	E - Stirrups	=	29,000.0 ksi
			Stirrup Bar Size #	=	# 3

Number of Resisting Legs Per Stirrup

Beam is supported on an elastic foundation.





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 12.0 in
Span #1 Reinforcing....
1-#4 at 6.0 in from Bottom, from 0.0 to 43.0 ft in this span

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0160, Lr = 0.020 ksf, Tributary Width = 3.0 ft, (Roof)
Uniform Load : D = 0.0150 ksf, Tributary Width = 15.0 ft, (Wall)
Uniform Load : D = 0.0160, Lr = 0.020 ksf, Tributary Width = 3.0 ft, (Awning)
Point Load : E = 3.40 k @ 4.0 ft
Point Load : E = -3.40 k @ 17.0 ft
Point Load : D = 0.90, Lr = 0.630 k @ 29.0 ft
Point Load : D = 0.90, Lr = 0.630 k @ 39.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.693**: 1	Maximum Deflection	
Section used for this span	**Typical Section**	Max Downward L+Lr+S Deflection	0.000 in
Mu : Applied	-3.596 k-ft	Max Upward L+Lr+S Deflection	0.000 in
Mn * Phi : Allowable	5.188 k-ft	Max Downward Total Deflection	0.022 in
Load Combination	+1.20D+L+0.20S+E+1.90H	Max Upward Total Deflection	-0.007 in
Location of maximum on span	17.200 ft		
Span # where maximum occurs	Span # 1		

Maximum Soil Pressure = **0.792** ksf at 3.34 ft LdComb: +D+0.70E+0.60H
Allowable Soil Pressure = **1.50** ksf OK

Cross Section Strength & Inertia

		Phi*Mn (k-ft)		Moment of Inertia (in^4)		
Cross Section	Bar Layout Description	Btm Tension	Top Tension	I gross	Icr - Btm Tension	Icr - Top Tension
Section 1	1-#4 @ d=6",	5.19	5.19	1,728.00	49.72	49.72