Project: North Congress
N. Blandena and Congress
Portland, OR
Client: **Ben Waechter**

Date: 04/12/2016
Page: 1
By: BLS
Job #: 215345

STRUCTURAL CALCULATIONS

FOR N. CONGRESS AVE DUPLEX

DESIGN PARAMETERS

LIVE LOAD = 40 PSF
SNOW LOAD = 25 PSF
BASIC WIND SPEED = 120 MPH, EXP. CAT "B"
S_{DS} = 0.72, DESIGN CATEGORY "D"

16-187445 / 54-RS

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LATERAL DESIGN

- DETERMINE BUILDING MASS
- DETERMINE SEISMIC/WIND GOVERNANCE
- DESIGN WIND GOVERNED SHEAR WALLS
- CHECK DIAPHRAGMS AND PIER FOOTS FOR SEISMIC GOVERNED SHEAR WALLS
- DESIGN SEISMIC GOVERNED SHEAR WALLS

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MASS TAPPROPS

FLOOR WT →

TJI @ 16	=	2.0 PSF
3/4" PLYWOOD	=	2.5 PSF
5/8" GYP	=	2.75 PSF
INT. WALLS	=	8 PSF
MISC	=	4.75 PSF
		20 PSF

EXT. WALL WT →

2x6 STUDS @ 16" O.C.,
5/8" GYPSUM
INSULATION
3/8" CLADDING = 12 PSF

ROOF WT → TJI @ 24" O.C. = 1.5 PSF

5/8" PLYWOOD	=	2.1 PSF
2x6 OVERFRAME	=	1.7 PSF
TPO	=	1 PSF
INSULATION	=	1.5 PSF
MISC	=	6.9 PSF
		15 PSF

215249

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SEISMIC MASS (SEE TAMROPPS)

Dl (WALL) = 12 PSF
Dl (ROOF) = 15 PSF
Dl (GREEN ROOF) = 120 PSF (12" SOIL)
Dl (FLOOR) 20 PSF (INCLUDES INTERIOR WALL LOADS)

MAIN ROOF MASS

A = (28')(13') + (32')(20') + (13')(33') + (27')(20')
= 1973 SF

WT, ROOF = (1973 SF)(15 PSF) = 29.6 K

2ND - ROOF WALL MASS (TRIBUTARY FULL HT, ½ TO ROOF DIAPHRAGM, ½ TO SECOND FLOOR DIAPHRAGM)

HT = 12'
L = 32' + 45' + 20' + 32' + 8.5' + 13' + 40' + 19.5' + 27' + 13.5' + 13' + 33'
= 297'
WT WALLS = (297')(12')(12 PSF) = 42.8 K

2ND FLOOR MASS

A = 1973 SF
WT, 2ND FLOOR = (1973 SF)(12 PSF + 8 PSF) = 39.5 K

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WALL MASS, 1ST FLOOR TO 2ND FLOOR

Ht. = 10.5'

L = 20' + 13' + 4.5' + 6' + 3.5' + 27' + 20' + 32' + 27' + 13' + ...
... + 15' + 20' + 27' + 19.5' + 28' + 13' + 13'
= 302'

$W_{WALL} = (12.5\,psf + 8\,psf)(302')(10.5') = 63.4^{k}$

CALCULATE SEISMIC BASE SHEAR

$C_S = \frac{S_{DS}}{(R/I)} = \frac{0.72}{(6.5/1.00)} = 0.112$

$V_{BASE} = C_S W$

$= 0.112\left(29.6^{k} + 42.8^{k} + 39.5^{k} + \frac{63.4^{k}}{2}\right)$

$= 16.1^{k}$

DISTRIBUTE ACROSS FLOORS:

	h_x	w_x	$h_x w_x$	C_{vx}	V_x	
ROOF	22.5'	51^{k}	1148	0.54	8.7^{k}	(GOVERNS R-W WALLS)
2ND FLOOR	10.5'	99.6^{k}	971	0.46	7.4^{k}	(GOVERNS R-W WALLS)
			Σ = 2119			

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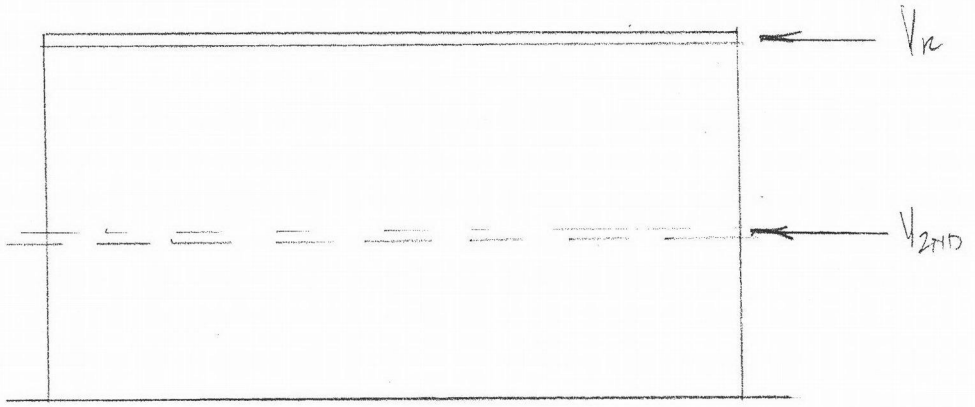
WIND LOADING:

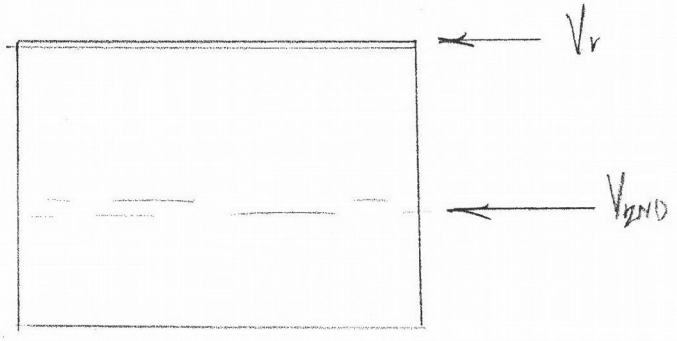


R-W ELEVATION

- ASSUME 11psf WALL PRESSURE
- ROOF CURB $h < 2'-6"$ ∴ $w_p = 16$ psf

$V_R = 16psf(2.5')(33') + 16psf(12'/2)(33') = \underline{4.5^k}$

$V_{2ND} = 16psf(12/2 + 10.5/2)(33') = \underline{5.9^k}$



H-S ELEVATION

$V_R = (11psf)(85')(25') + 11psf(85')(12'/2) = \underline{11.6^k}$ (GOVERNS)

$V_{2ND} = (11psf)(85')(12'/2 + 10.5/2) = \underline{15.3^k}$ (GOVERNS)

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Lateral Force Summaries

North - South Direction (long East-West walls) →

Seismic Governs: $V_R = 8.7^k$

$V_{2ND} = 7.4^k$

East - West Direction (short N-S walls) →

Wind Governs: $V_R = 11.6^k$

$V_{2ND} = 15.3^k$

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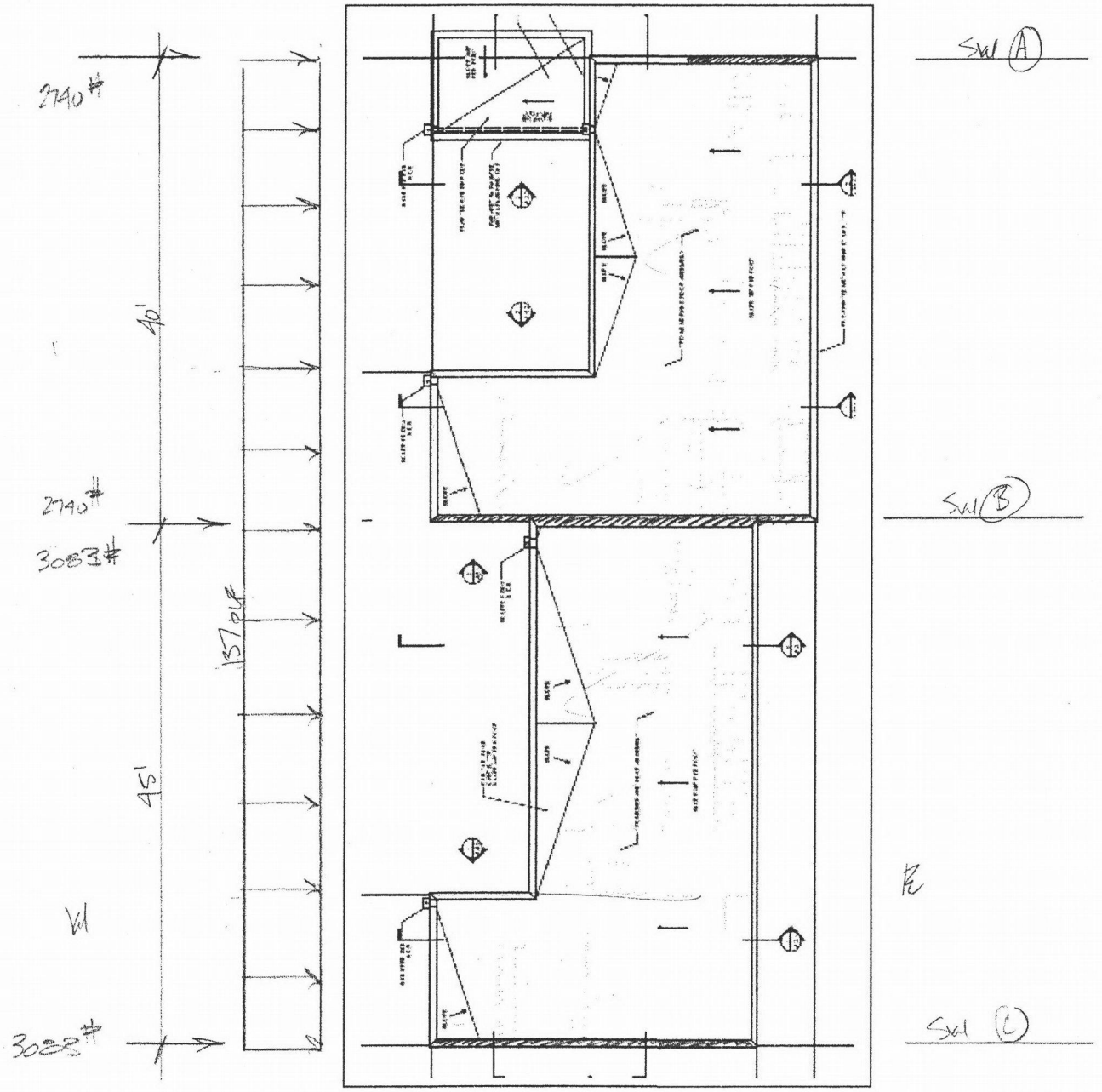
Shear into Roof Diaphragm

(R-W1)



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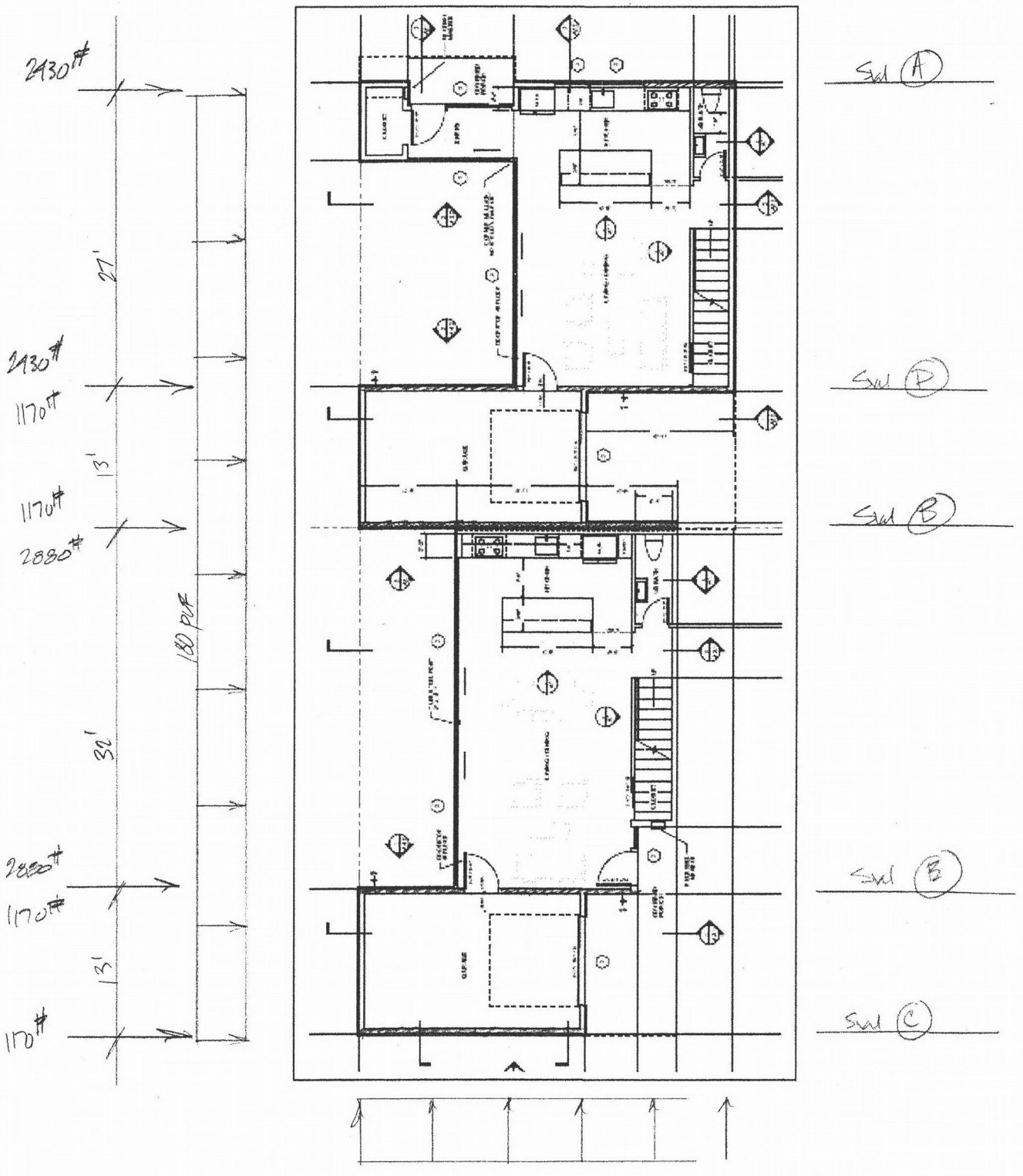
SHEAR INTO SECOND FLOOR DIAPHRAGM (E-W)



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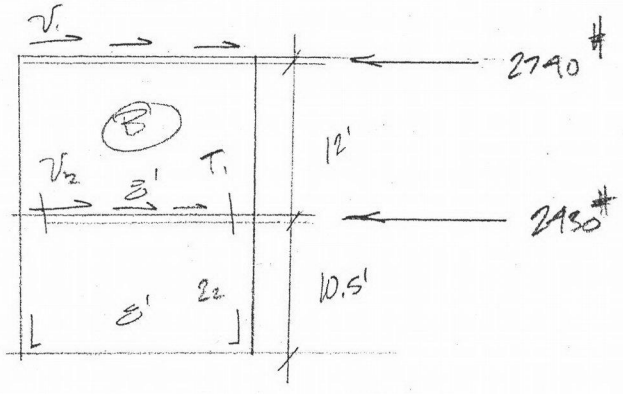
SHEARWALL DESIGNS

SW (A)



$V_1 = 2740^{\#} / 8' = 343$ plf

∴ USE Type (A)

$T_1 = (2740^{\#})(12') / 8' = 4110^{\#}$

∴ USE MST 48 STRAP

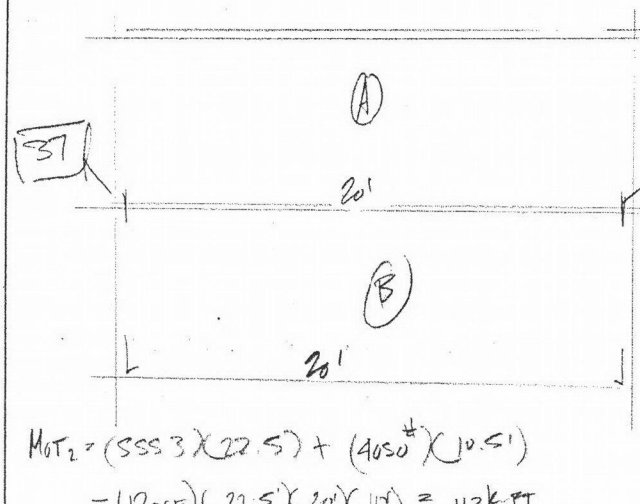
$V_2 = (2740^{\#} + 2430^{\#}) / 8' = 646$ plf ∴ USE Type (C)

$M_{OT_2} = (2740^{\#})(22.5) + (2430^{\#})(10.5') = 87.2$ k-ft

$M_k = (12\text{psf})(22.5')(8')(4') = 8.6$ k-ft

$T_2 = (87.2 - 8.6) / 8' = 9.8^k$ ∴ USE Type [11] HOLDOWN

SW (B)



$V_1 = 5553^{\#} / 20' = 278$ plf

∴ USE Type (A) WALL

$V_2 = (5553^{\#} + 4050^{\#}) / 20'$

$= 480$ plf ∴ USE Type (B) SW

$M_{OT} = (5553^{\#})(12') - (12psf)(12')(20')(10') = 37.8$

$T_1 = 37.8 / 20 = 1892^{\#}$ ∴ USE MST [37]

$M_{OT_2} = (5553)(22.5') + (4050^{\#})(10.5') - (12psf)(22.5')(20')(10') = 113^{k\text{-ft}}$

$T_2 = 5673^{\#}$ ∴ USE HDU-5

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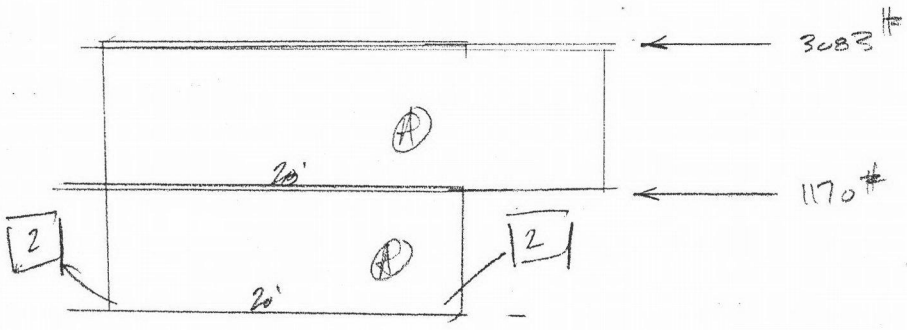
Swl C



$V_1 = 3083\#/28' = 110$ plf ∴ USE Swl (A)

$M_{OT} = (3.083\#)(12') - (12PSF)(28')(12.5)(28/2) \leq 0$ ∴ No Hold Downs Reqd

$V_2 = (3083\# + 1170\#)/12' = 213$ plf ∴ USE Type (A) Walls

$M_{OT2} = (3.83)(22.5') + (1170\#)(10.5') = 81.7$ k-ft

$M_R = (28')(12)(12')(6') + (12)(28)(10.5)(10') = 49.4$ k-ft

$T_2 = (81.7 - 49.4)/20' = 1615\#$ ∴ USE HDU-2

Swl (B)

$V = (2430\# + 1170\#) = 3600\#$

$\ell = 14'$

$V_1 = 3600\#/14' = 257$ plf ∴ USE Swl Type (A)

$T_1 = (3600\#)(10.5')/14' = 2700\#$ ∴ USE HDU-2

Swl (B) (Worst Case)

$V = 2880\# + 470\# = 4050\#$, $\ell = 9'$, $V_1 = 4050\#/9' = 450$ plf ∴ USE Type (B) Walls

$M_{OT} = (4050\#)(10.5') = 42.5$ #-ft $M_R = (12PSF)(10.5)(9)(4.5) + (12PSF)(13/2)(9)(4.5) = 8.3$

$T = (42.5 - 8.3)/9 = 3800\#$

∴ USE HDU-5 Holddown

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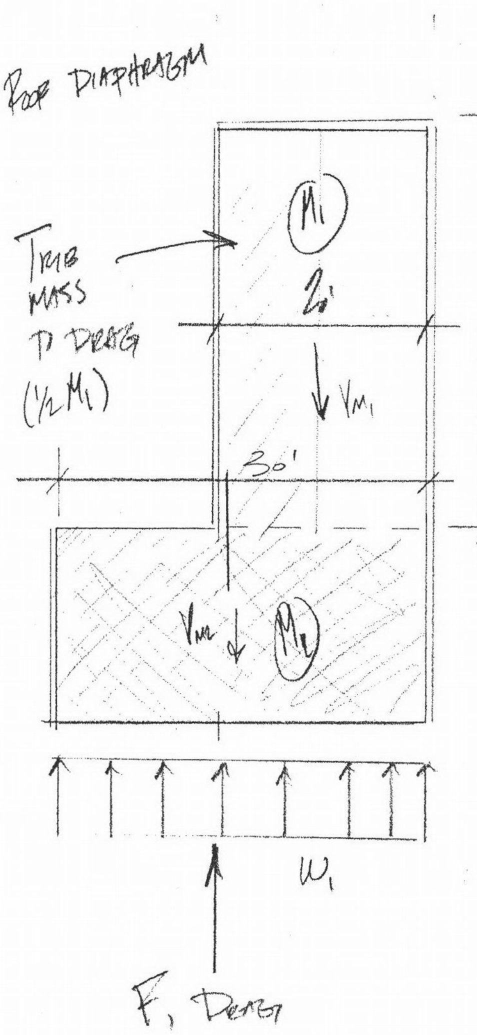
SEISMIC FORCE DIST ACROSS DIAPHRAGMS

ROOF DIAPHRAGM



$M_1 = (15psf)(20')(27') + (12psf)(6')(20' + 27' + 27')$ ≈ 5300#

$= 13.4^k$

$V_{M1} = 8.7^k \left(\frac{13.4^k}{51^k}\right) = 2.3^k$

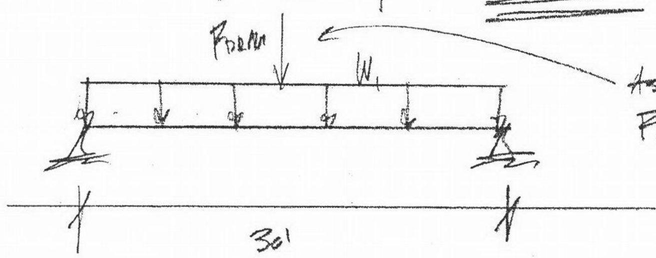
$F_{DRAG} = 2.3^k / 2 = \underline{1150^\#}$

$M_2 = (15psf)(30')(13') + (12psf)(6)(13' + 30 + 30' + 13')$

$= 12^k$

$V_{M2} = (12^k / 51^k)(8.7^k) = 2054^\#$

$W_1 = 2054^\# / 30' = \underline{68 plf}$



ASSUME F_{DRAG} @ MIDSPAN

DIAPHRAGM DESIGN

$M_{MAX} = \frac{wL^2}{8} + \frac{PL}{4}$

$= \frac{(68plf)(30')^2}{8} + \frac{(2054^\#)(30')}{4} = 23.1^{k-FT}$

$T_{CHORD} = 23.1^{k-FT} / 13' = \underline{1.8^k}$

← CHECK WOOD TENSION @ LSL RIM

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DIAPHRAGM DESIGN (CONTD)

$$V_{max} = \frac{P}{2} + \frac{wL}{2}$$

$$= \frac{1150\#}{2} + \frac{(68\,plf)(30')}{2} = 1595\#$$

v_s (@ diaphragm) = $1595\# / 13' =$ **123 plf**

v_s Allow = $\frac{360\,plf}{2} = 180\,plf > 123\,plf$ ∴ okay ✓

(NDS SDPWS, TABLE 4.2c)

USE ½" plywood DIAPHRAGM w/ 8d @ 6" o.c. AT PANEL EDGES AND 10" IN FIELD

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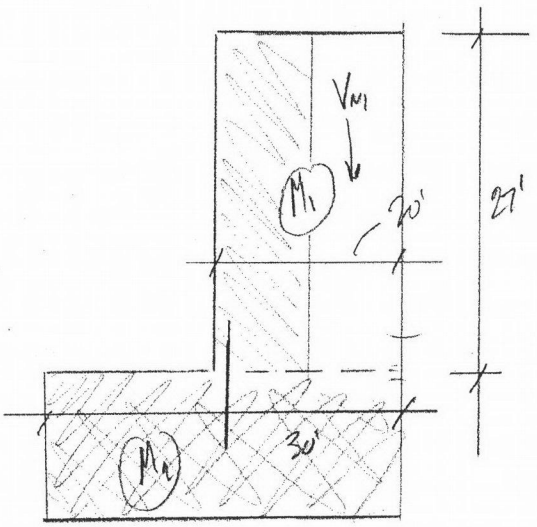
SEISMIC FORCE DIST ACROSS DIAPHRAGMS, SECOND FLOOR



$M_1 = (20psf)(20')(27') + \ldots$
$(12psf)(6+5.25')(20+27+27)$
$= 20.8^k$

$V_{M1} = (7.4^k)\left(\frac{20.8^k}{92.6^k}\right) = \underline{1.7^k}$

$F_{DIAPH} = 1.7^k/2 = 850\#$

$M_2 = (20psf)(30')(13') + (12psf)(11.25')(13+13+30+30)$
$= 19.4^k$

$V_{M2} = 7.4^k\left(\frac{19.4^k}{92.6^k}\right) = 1.6^k$

$W_1 = 1.6^k/30' = 54\,plf$

DIAPHRAGM DESIGN

$M_{MAX} = \frac{wL^2}{8} + \frac{PL}{4} = \frac{(54)(30^2)}{8} + \frac{(850\#)(30)}{4} = 12.5\,k\text{-ft}$

$T_{chord} = 12.5^{k\text{-ft}}/13' = \underline{958\#}$

$V_{MAX} = \frac{850}{2} + \frac{1.6^k}{2} = 1225\#$

$v_s = 1225\#/13' = 94\,plf$ $\therefore$ okay

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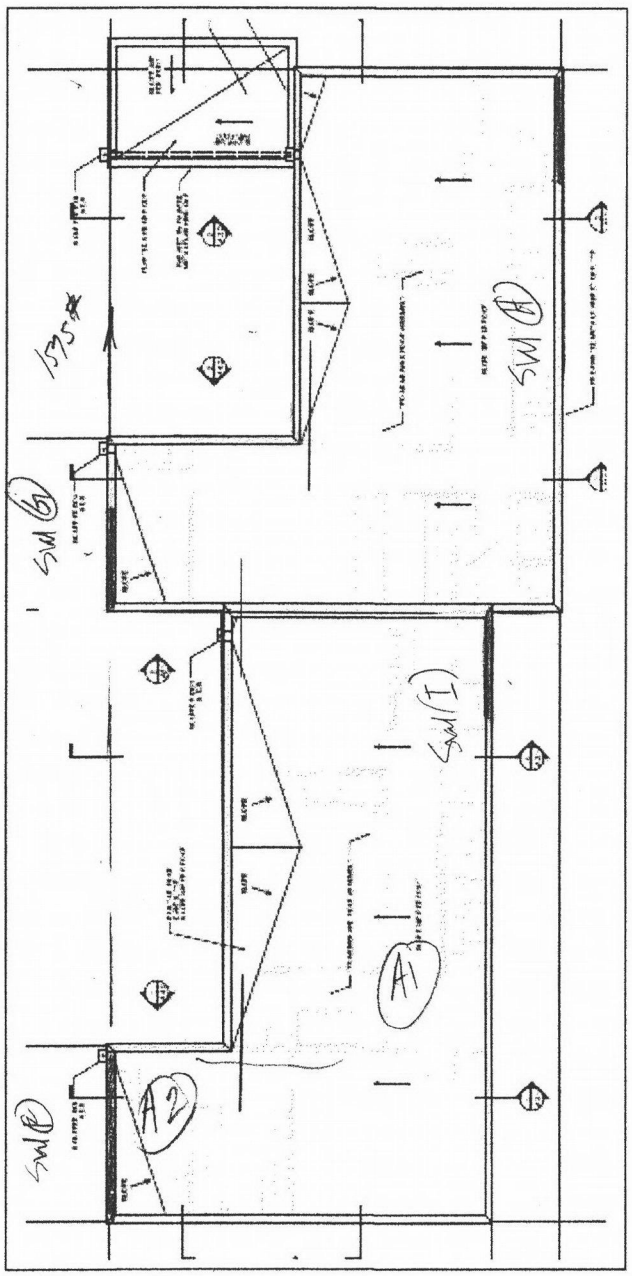
FORCES INTO ROOF DIAPHRAGM (M-S, SEISMIC)



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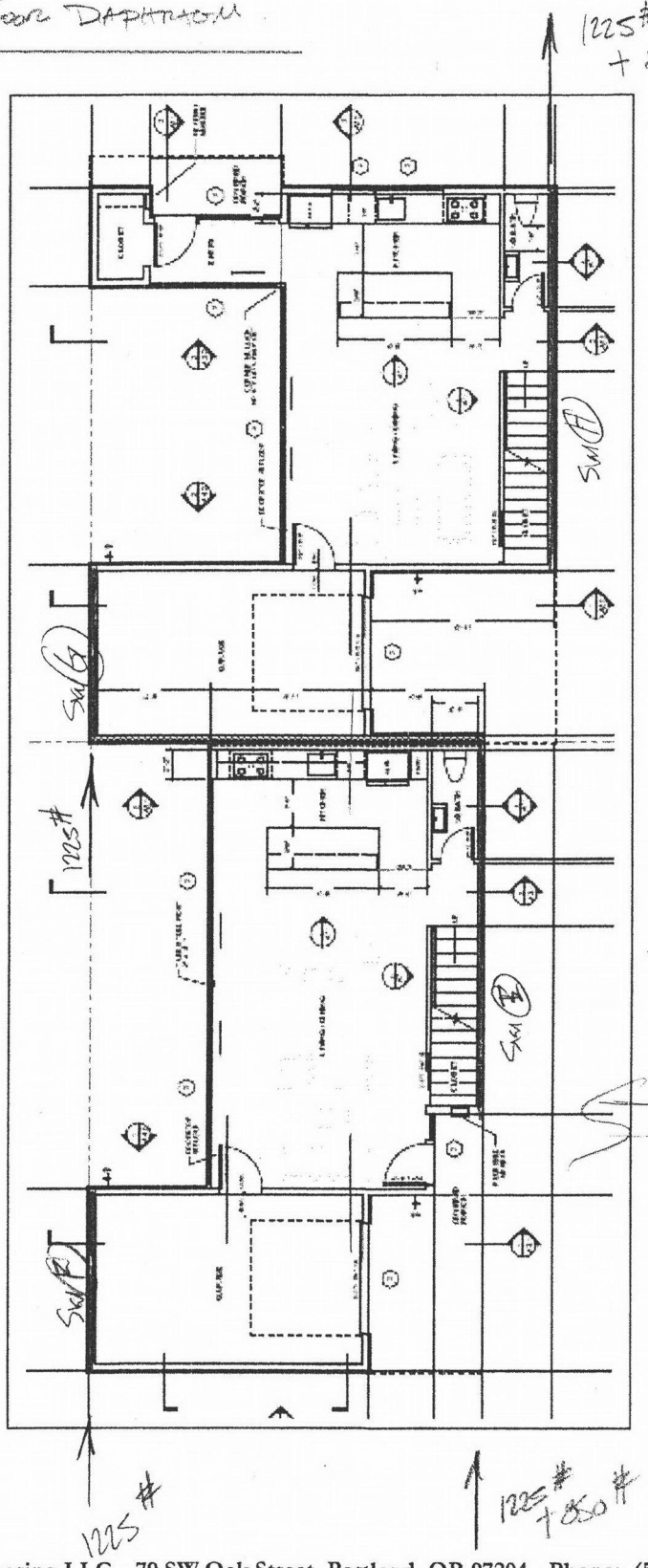
FORCES INTO 2ND FLOOR DIAPHRAGM



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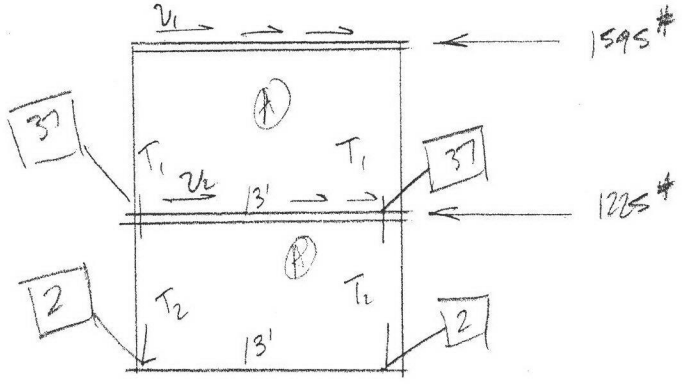
SHEAR WALL DESIGN

SHEARWALL (B)



$v_1 = 123$ plf ∴ USE Type (A) WALLS

$v_2 = (1595\# + 1225\#) / 13'$

$= 217$ plf

∴ USE Type (A) WALLS

$M_{ST_1} = (1595\#)(12') = 19.1$ k-ft

$M_{R_1} = (15psf)(4')(13')(13'/2) + (12psf)(13')(12')(13'/2) = 17.2$ k-ft

$T_1 = (19.1 - 17.2)/13' = 146\#$ ∴ USE 37 STRAP

$M_{ST_2} = (1595\#)(22.5') + (1225\#)(10.5') = 48.8$ k-ft

$M_{R_2} = (12psf)(22.5)(13')(13'/2) + 5.1$ k-ft $= 27.9$ k-ft

$T_2 = (48.8$ k-ft $- 27.9$ k-ft$)/13' = 1600\#$ ∴ USE HDU 2 HOLDOWN

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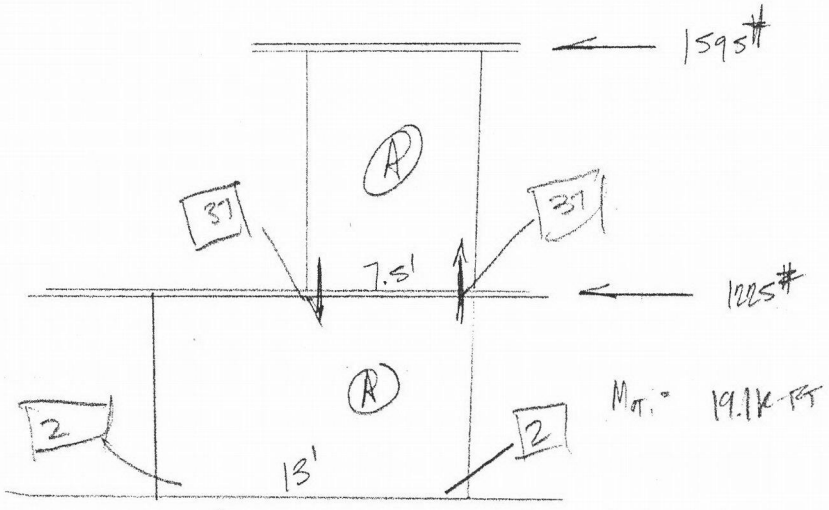
SWLG



$V_1 = 212\#/FT$ ∴ USE TYPE A

$V_2 = 47\#/FT$ ∴ USE TYPE A

$M_{T_1} = 19.1\text{k-FT}$

$M_{R_1} = (15\#/SF)(13'/2)(7')(7'/2) + (12\#/SF)(7.5')(12')(7.5'/2) = 6.5\text{k-FT}$

$T_1 = (19.1\text{k-FT} - 6.5\text{k-FT}) / 7.5' = 1680\#$ ∴ USE HST 5T STRAP

$M_{OT_2} = (1225\# + 1595\#)(10.5') + (1200\#)(13') = 51.5\#\text{-FT}$

$M_{RES_2} = (15\#/SF)(13'/2)(7')(13' - 3.5') + (12\#/SF)(7')(12')(13' - 3.5')$
$+ (12\#/SF)(13')(10.5')(13'/2) = 20.3\text{k-FT}$

$T_2 = (51.5\text{k-FT} - 20.3\text{k-FT}) / 13' = 2400\#$ ∴ USE HDU-2 HOLDDOWN

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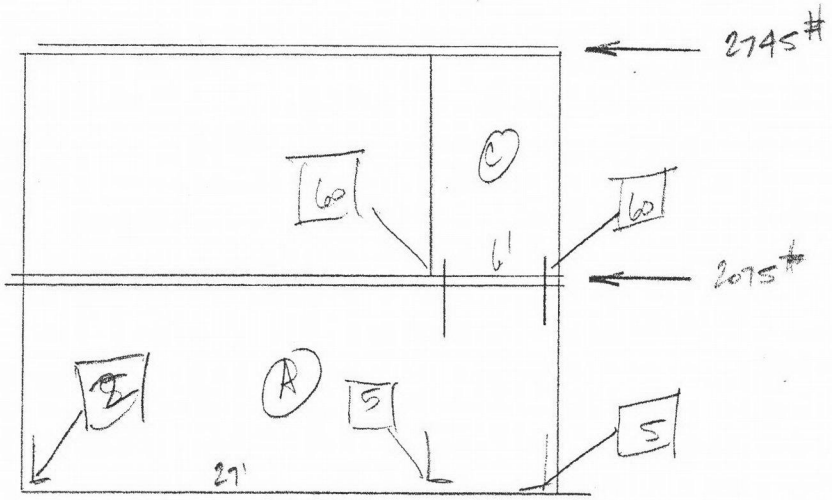
Skl (H) & (L)



V_1 = 2745#/6' = 413 PLF ∴ USE TYPE (C) WALLS

V_2 = (2745# + 2075#)/27' = 179 PLF ∴ USE TYPE (A) WALLS

M_{OT1} = (2745#)(12') = 32.9 K-FT

M_{R1} = (15PSF)(9.25')(6')(3') + (12PSF)(12')(6')(3') = 5.1 K-FT

T_1 = (32.9 K-FT − 5.1 K-FT)/6' = 4630# ∴ USE MST 60

M_{OT2} = (2745# + 2075#)(10.5') + (4630#)(27') = 175.6 K-FT

M_R = (12PSF)(27')(10.5')(27')/2) = 45.9 K-FT

T_2 = (175.6 K-FT − 45.9 K-FT)/27' = 4804# ∴ USE HDU-5

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GRAVITY DRAIN

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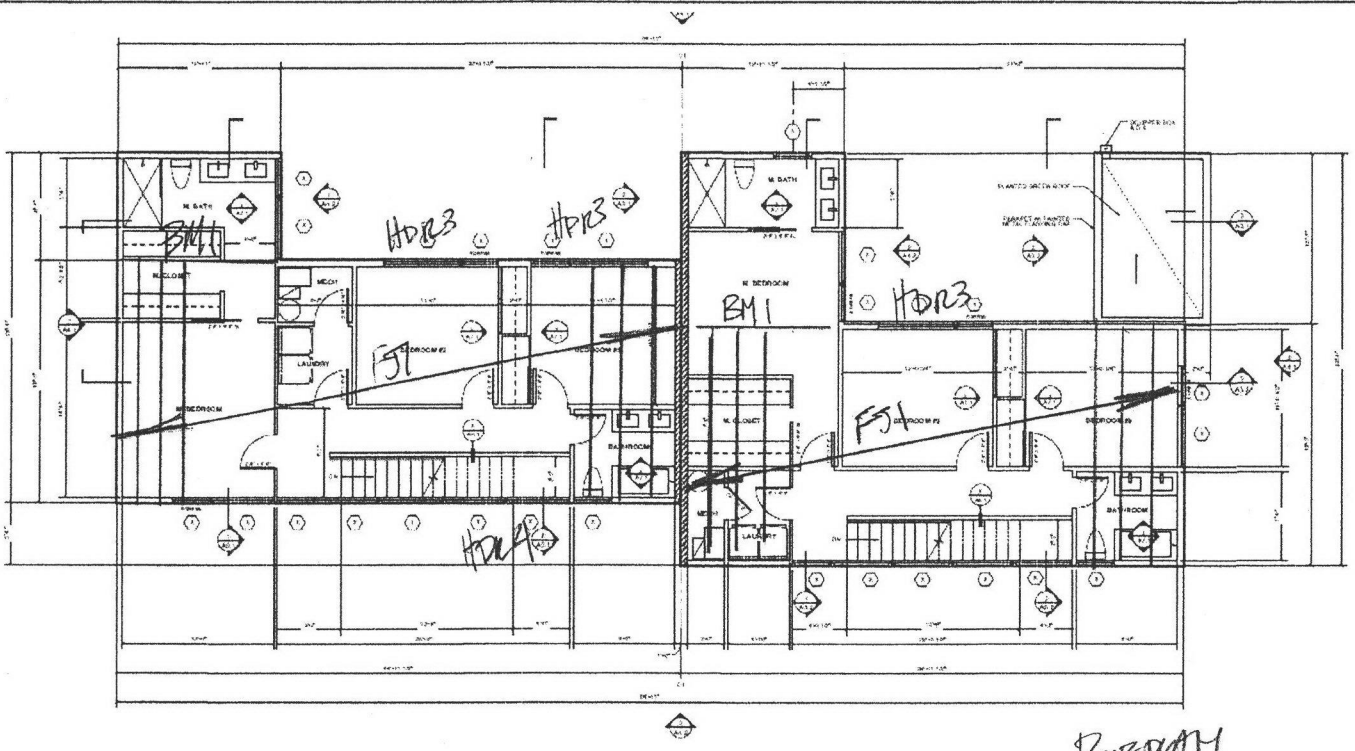


PROPOSED

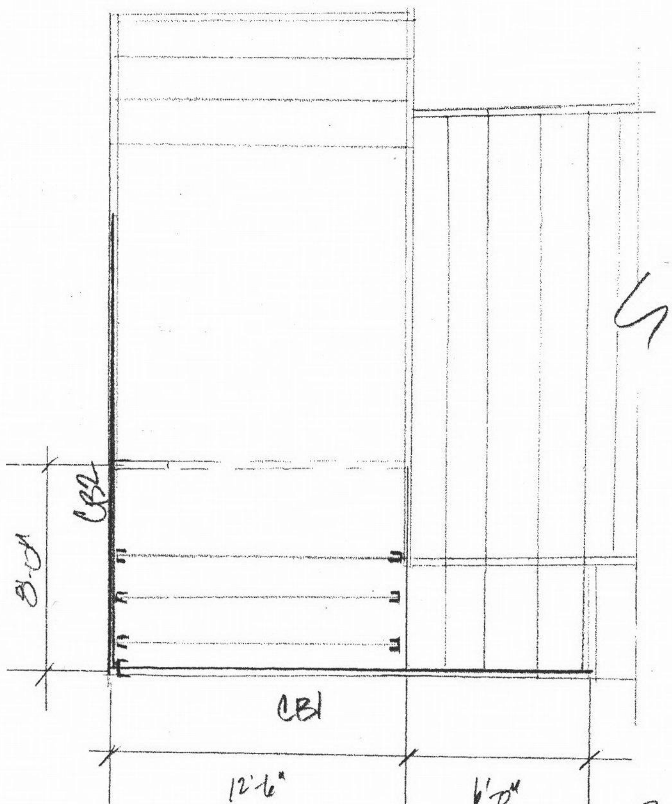
FJ1: USE 14" TJI 210S @ 24" O.C. (STEVE FORTTE)

BM1: D_L = 299# (12/16) = 224 PLF (FROM FJ1 FORTTE)
S_L = 498# (12/16) = 374 PLF
USE 3½" x 14" LVL

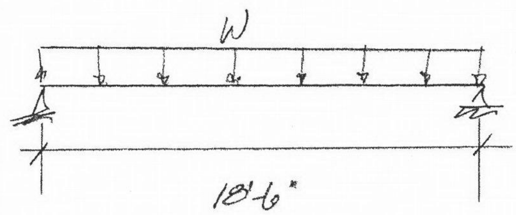
HDR3: 1¾" x 14" LVL (STEVE FORTTE)

HDR4: (3) 1¾" x 14" LVL (STEVE FORTTE)

DESIGN NW CANTILEVER CORNER



CB1:



W →

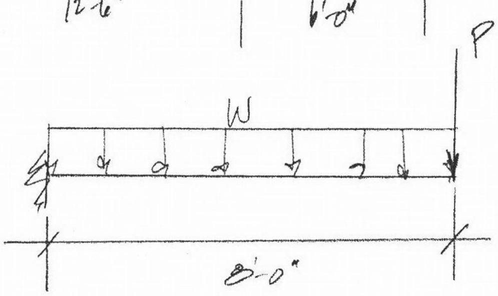
ROOF: $D_L = (19.5'/2)(15psf) = 147plf$

$S_L = (19.5'/2)(25psf) = 244plf$

WALL WT: $D_L = (12psf)(12') = 144plf$

USE 5 1/4" x 14" LVL (SEE FORTE)

CB2:



W →

WALL WT = 144plf

FLOOR: $D_L = (12.5'/2)(12psf) = 75plf$

$L = (12.5'/2)(40psf) = 250plf$

P → (FROM CB1 FORTE RESULTS)

$D_L = 2984^\#$ $S_L = 2354^\#$

GOVERNING LC = $D + 0.75(L+S)$

4795

AVOID BACKSPAN: $M_{RES} \geq M_{OT}$ $M_{RES} = \frac{wl^2}{8} = \frac{(144+75)l^2}{8} = 612^{k\text{-}in}$

DESIGN MW CANTILEVER (CONTD) 350

DESIGN BM —

$$\delta_{MAX} = \frac{wL^4}{8EI} + \frac{PL^3}{3EI}, \quad \delta_{MAX} = 24/240 = 0.8"$$

Try 5¼ x 22" LVL

$$I = \frac{bh^3}{12} = \frac{(5\frac{1}{4}")(22")^3}{12} = 4659\ IN^4$$

$$\delta_{TOT} = \frac{\left[75+144+(0.75)(250)\right]/12 \times 96"^3 \quad (1.02\times10^{-4})}{(8)(2\times10^6)(4659\ IN^4)} + \ldots$$

$$\ldots + \frac{\left[218\#+(0.75)(2354\#)\right](96)^3 \quad (0.150)}{(3)(2\times10^6 psi)(4659\ IN^4)} = 0.151\ IN < 0.8" \therefore \text{okay}$$

CHECK STRENGTH —

$$M_{MAX} = \frac{wL^2}{2} + PL$$

$$= \frac{\left(\frac{417\ plf}{12}\right)(96IN)^2}{2} + (4750\#)(96") = 612\ k\text{-}IN$$

$$S_{REQD} = \frac{612\ k\text{-}IN}{2900 psi} = 211\ IN^3$$

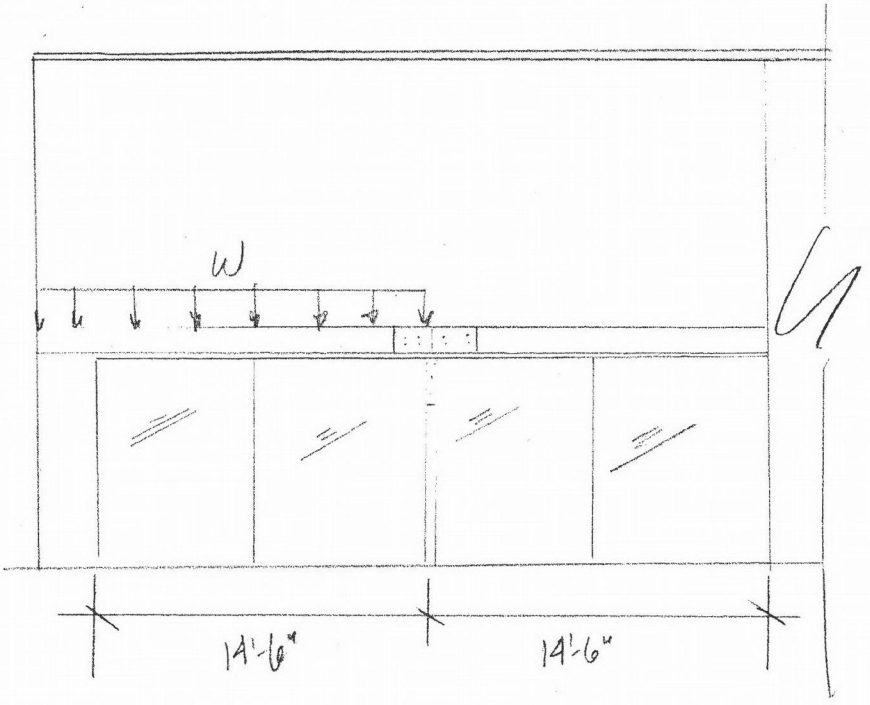
$\therefore$ USE 5¼" x 22" LVL

$$S_{PROV} = \frac{bh^2}{6} = \frac{(5\frac{1}{4})(22")^2}{6} = 424\ IN^4 > 211\ IN^4 \therefore \text{okay} \checkmark$$

Project: North Congress
N. Blandena and Congress
Portland, OR
Client: **Ben Waechter**

Date: 04/12/16
Page: 21
By: **BLS**
Job #: 215345

DESIGN FLUSH HEADERS OVER P2 WINDOWS (HDR1)



SPECIAL INSPECTION REQ'S FOR PREFAB WOOD WINDOW SYSTEM:

$\Delta \leq 0.25"$

W →

ROOF: $DL = (15psf)(19.5/2) = 147plf$

$SL = (25psf)(19.5/2) = 244plf$

2ND FLOOR: $DL = (12psf)(19.5/2) = 117plf$

$LL = (40psf)(19.5/2) = 390plf$

WALL WT = 44plf

USE 5 1/4" x 18" LVL HDRS w/ CC0Q'S - SDS 2.5

DESIGN HDRS OVER (E) WINDOWS

Check Columns:

P_L (2) 6727# = 13.5k

← From Footer output

$KL = (1.00)(10.5) = 10.5$ → USE 11'

P_n/Ω_c = 21.1k > 13.5k ∴ okay

USE 3x3x5/16" HSS post

Check 4x6 post under Column

P_L = 4672# + 1894# = 6566# (See Footer Exhibit @ HDR 3 + 9)

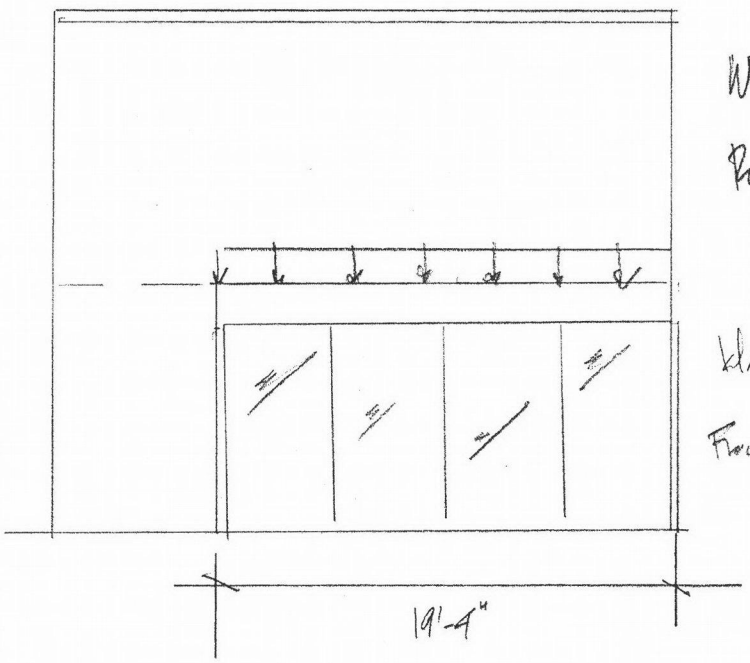
P_{all} = 7700# > 6566# ∴ okay

USE 4x6 post

Project: North Congress
N. Blandena and Congress
Portland, OR
Client: **Ben Waechter**

Date: 04/12/16
Page: 26
By: **BLS**
Job #: 215345

DESIGN EAST WALL, HDR 2



W →

ROOF: D_L = 47plf
S_L = 214plf

WALL WT = (12psf)(13') = 156plf

FLOOR: D_L = 117plf
L = 390plf

Δ_{TOTAL} = 0.32"

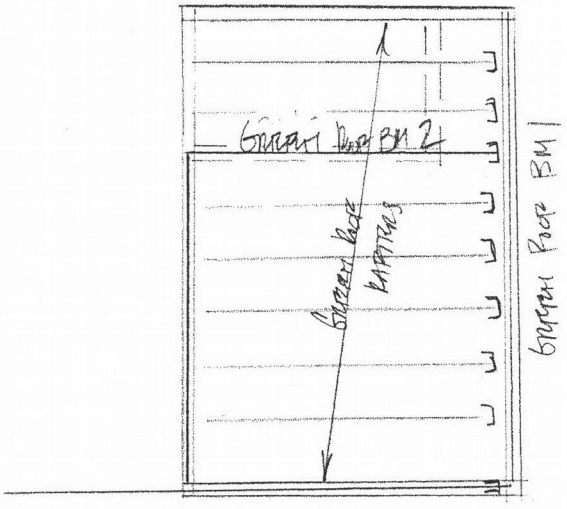
USE 5 1/2" x 24" GLB HDR (SEE FOOTER RESULTS)

CRIPPLE COLUMN: P = 10K, HSS 3x3x 3/16" OR (SEE FOOTER CALC)

Project: North Congress
N. Blandena and Congress
Portland, OR
Client: **Ben Waechter**

Date: 04/12/16
Page: 27
By: BLS
Job #: 215345

GARAGE ROOF AND SHED DESIGN



GARAGE ROOF RAFTERS: USE 14" TJI 110S @ 24" O.C.

GARAGE ROOF BM 1:

USE (2) 1 3/4" X 14 LVL's

GARAGE ROOF BM #2:

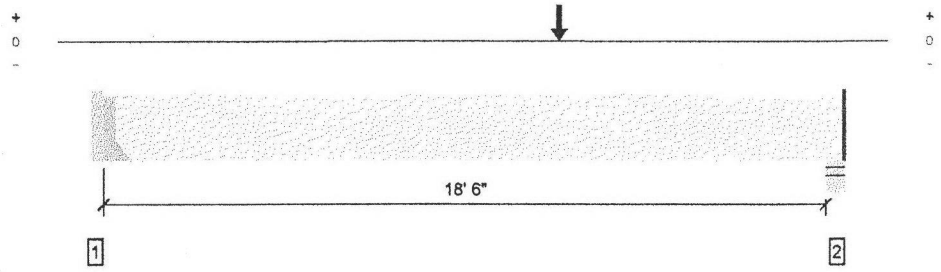
USE 1 3/4" X 14" LVL BY MANUFACTURER

FORTE MEMBER REPORT *Second Floor, CB1* **PASSED**

3 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

29

Overall Length: 19' 3"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4289 @ 18' 11"	9483 (4.25")	Passed (45%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4258 @ 17' 7 1/2"	16060	Passed (27%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	29150 @ 12'	41846	Passed (70%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.368 @ 10' 3 1/4"	0.466	Passed (L/607)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.640 @ 10' 2 15/16"	0.931	Passed (L/349)	--	1.0 D + 1.0 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 11' 8 1/2" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Hanger on 14" SPF beam	3.50"	Hanger[1]	1.50"	1160	1448	2608	See note [1]
2 - Stud wall - SPF	5.50"	4.25"	1.92"	1838	2452	4290	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Connector: Simpson Strong-Tie Connectors

Support	Model	Seat Length	Top Nails	Face Nails	Member Nails	Accessories
1 - Face Mount Hanger	MGU5.50 (H1=11)	4.50"	N/A	24-SDS self-drilling wood screw 0.242 dia. x 2 1/2"	16-SDS self-drilling wood screw 0.242 dia. x 2 1/2"	

Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
1 - Point (lb)	12'	N/A	730	1159	Linked from: HDR3, Support 1
2 - Point (lb)	12'	N/A	1885	2741	Linked from: HDR4, Support 1

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

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

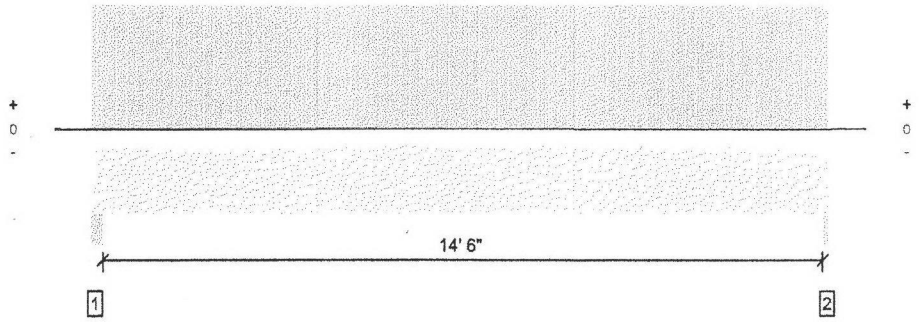
FORTE MEMBER REPORT *Second Floor, HDR1*

PASSED

29

3 piece(s) 1 3/4" x 18" 2.0E Microllam® LVL

Overall Length: 14' 11 1/4"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6727 @ 14' 11"	6661 (1.75")	Passed (101%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	4739 @ 1' 9 1/2"	17955	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	22412 @ 7' 6 1/2"	58130	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.115 @ 7' 6 1/2"	0.492	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.220 @ 7' 6 1/2"	0.738	Passed (L/805)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 14' 11 1/4" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Trimmer - SPF	3.50"	3.50"	1.80"	3274	2941	1840	8055	None
2 - Trimmer - SPF	1.75"	1.75"	1.77"	3211	2884	1805	7900	None

Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PLF)	0 to 14' 11 1/4"	N/A	147.0	-	244.0	Roof Loads
2 - Uniform (PLF)	0 to 14' 11 1/4"	N/A	144.0	-	-	Wall Weight
3 - Uniform (PLF)	0 to 14' 11 1/4"	N/A	117.0	390.0	-	

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SUSTAINABLE FORESTRY INITIATIVE

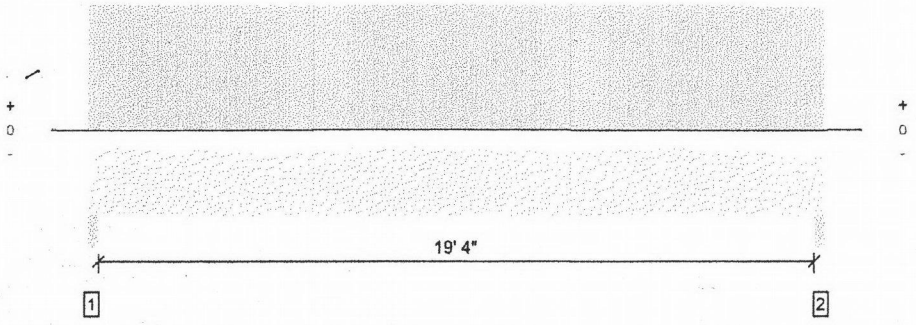
Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

FORTE MEMBER REPORT *Second Floor, HDR2* **PASSED**

3 piece(s) 1 3/4" x 18" 2.0E Microllam® LVL

3.0

Overall Length: 19' 10"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9139 @ 1 1/2"	11419 (3.00")	Passed (80%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	6828 @ 1' 9"	17955	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	40081 @ 9' 11"	58130	Passed (69%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.336 @ 9' 11"	0.653	Passed (L/699)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.652 @ 9' 11"	0.979	Passed (L/361)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 9' 5/16" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Trimmer - SPF	3.00"	3.00"	2.40"	4424	3868	2420	10712	None
2 - Trimmer - SPF	3.00"	3.00"	2.40"	4424	3868	2420	10712	None

Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PLF)	0 to 19' 10"	N/A	147.0	-	244.0	Roof Loads
2 - Uniform (PLF)	0 to 19' 10"	N/A	156.0	-	-	Wall Weight
3 - Uniform (PLF)	0 to 19' 10"	N/A	117.0	390.0	-	

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

SUSTAINABLE FORESTRY INITIATIVE

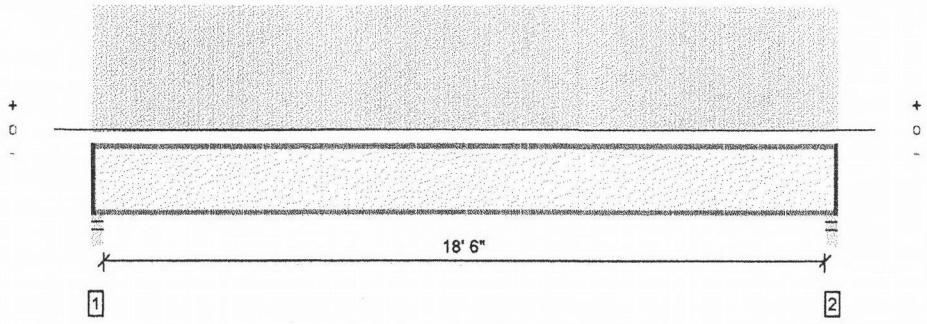
Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

FORTE MEMBER REPORT *Second Floor, FJ2f* **PASSED**

1 piece(s) 14" TJI® 110 @ 16" OC

31

Overall Length: 19' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	654 @ 2 1/2"	1041 (2.25")	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	641 @ 3 1/2"	1860	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3020 @ 9' 6 1/2"	3740	Passed (81%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.334 @ 9' 6 1/2"	0.467	Passed (L/670)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.434 @ 9' 6 1/2"	0.933	Passed (L/516)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	42	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 3' 1 1/4" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	3.50"	2.25"	1.75"	153	509	662	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.75"	153	509	662	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 19' 1"	16"	12.0	40.0	Residential - Living Areas

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

SUSTAINABLE FORESTRY INITIATIVE

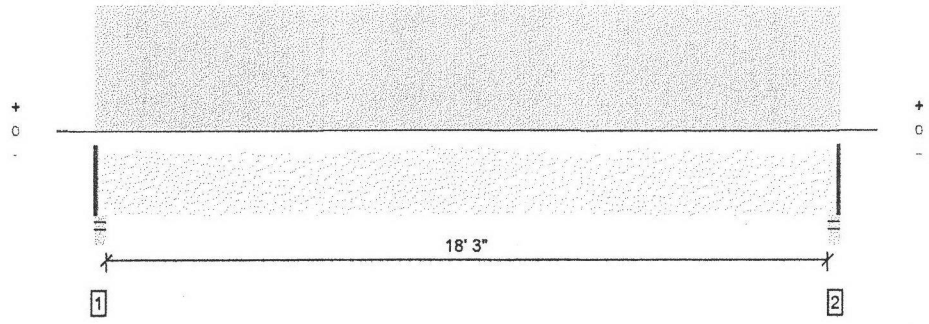
Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

FORTE MEMBER REPORT *Second Floor, Stair BM* **PASSED**

3 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

32

Overall Length: 18' 10"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3881 @ 2"	5020 (2.25")	Passed (77%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3317 @ 1' 5 1/2"	13965	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	17831 @ 9' 5"	36387	Passed (49%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.355 @ 9' 5"	0.463	Passed (L/625)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.485 @ 9' 5"	0.925	Passed (L/457)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 18' 7 1/2" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	3.50"	2.25"	1.74"	1051	2872	3923	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.74"	1051	2872	3923	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 18' 10"	7' 7 1/2"	12.0	40.0	Residential - Living Areas

Weyerhaeuser Notes

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

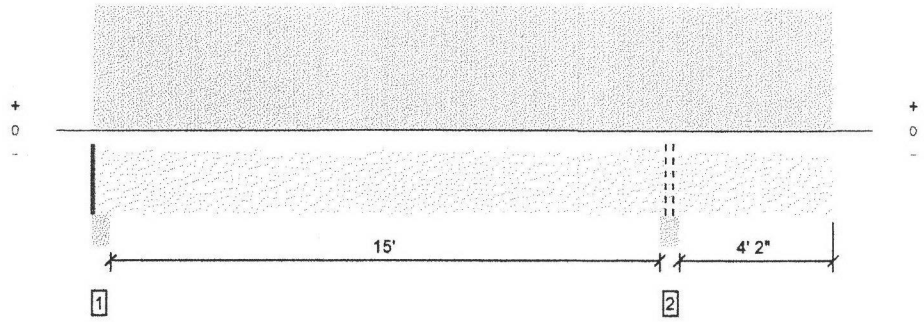
Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

FORTE® MEMBER REPORT *Second Floor, Green Roof BM* **PASSED**

2 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

93

Overall Length: 20' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5507 @ 15' 8 1/4"	8181 (5.50")	Passed (67%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2996 @ 14' 3 1/2"	9310	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	12233 @ 7' 10 1/8"	24258	Passed (50%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.272 @ 8' 1/8"	0.384	Passed (L/677)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.351 @ 7' 11 7/16"	0.768	Passed (L/524)	--	1.0 D + 1.0 L (Alt Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 14' 8 5/16" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - SPF	5.50"	4.25"	2.26"	837	2563/-168	3400/-168	1 1/4" Rim Board
2 - Beam - SPF	5.50"	5.50"	3.70"	1442	4065	5507	Blocking

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 20' 1"	4'	25.0	80.0	Residential - Living Areas

Weyerhaeuser Notes

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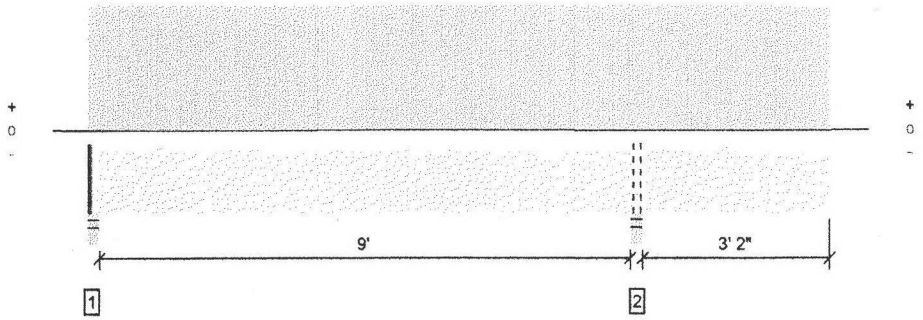
The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

FORTE MEMBER REPORT *Second Floor, Short Cantilever Beam* **PASSED**

2 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

Overall Length: 12' 9"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3169 @ 9' 5 1/4"	5206 (3.50")	Passed (61%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1452 @ 8' 1 1/2"	9310	Passed (16%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3687 @ 4' 7 1/2"	24258	Passed (15%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.034 @ 4' 9 5/8"	0.232	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.044 @ 4' 8 13/16"	0.464	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 12' 7 3/4" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	3.50"	2.25"	1.50"	466	1249/-127	1715/-127	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	3.50"	2.13"	948	2220	3168	Blocking

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 12' 9"	6' 6"	15.0	40.0	Residential - Living Areas

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SUSTAINABLE FORESTRY INITIATIVE

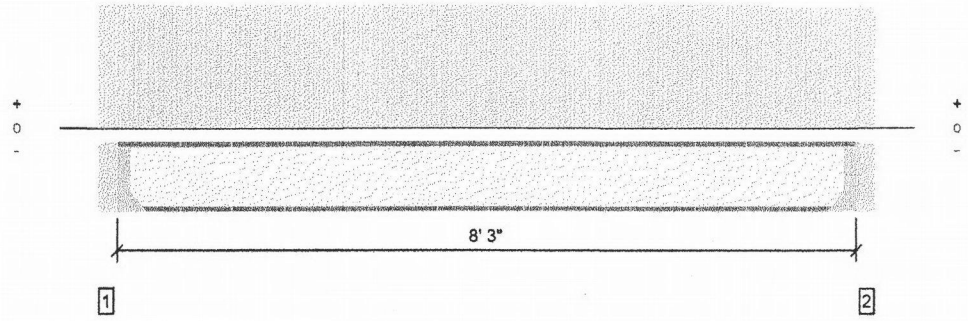
Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

FORTE MEMBER REPORT *Second Floor, Green Roof Rafters* **PASSED**

1 piece(s) 14" TJI® 210 @ 24" OC

35

Overall Length: 9' 2"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1485 @ 5 1/2"	1485 (0.00")	Passed (100%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1485 @ 5 1/2"	1945	Passed (76%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3063 @ 4' 7"	4490	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.037 @ 4' 7"	0.206	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.110 @ 4' 7"	0.412	Passed (L/899)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	62	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 3' 11 15/16" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 14" DF beam	5.50"	Hanger[1]	3.50" / - [2]	1100	550	1650	See note [1]
2 - Hanger on 14" DF beam	5.50"	Hanger[1]	3.50" / - [2]	1100	550	1650	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Connector: Simpson Strong-Tie Connectors

Support	Model	Seat Length	Top Nails	Face Nails	Member Nails	Accessories
1 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	
2 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

Loads	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 9' 2"	24"	120.0	60.0	Residential - Living Areas

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

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

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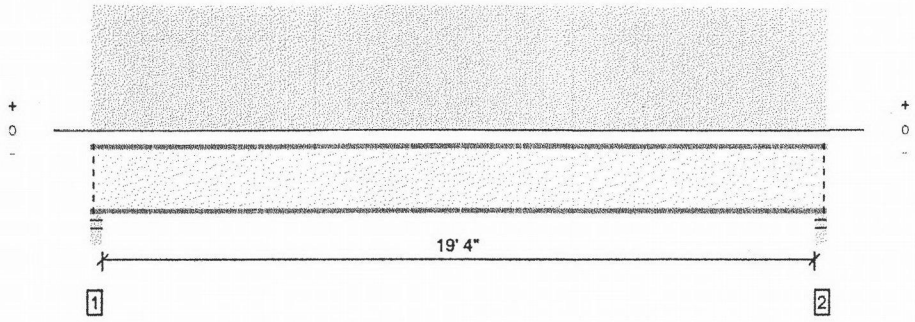
FORTE MEMBER REPORT *Roof, FJ1* **PASSED**

1 piece(s) 14" TJI® 210 @ 24" OC

36

Overall Length: 19' 11"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	797 @ 2 1/2"	1679 (3.50")	Passed (47%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	773 @ 3 1/2"	2237	Passed (35%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3802 @ 9' 11 1/2"	5164	Passed (74%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.388 @ 9' 11 1/2"	0.650	Passed (L/603)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.621 @ 9' 11 1/2"	0.975	Passed (L/377)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC
Design Methodology : ASD
Member Pitch: 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 3' 7" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - SPF	3.50"	3.50"	1.75"	299	498	797	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.75"	299	498	797	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 19' 11"	24"	15.0	25.0	Roof

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SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

FORTE

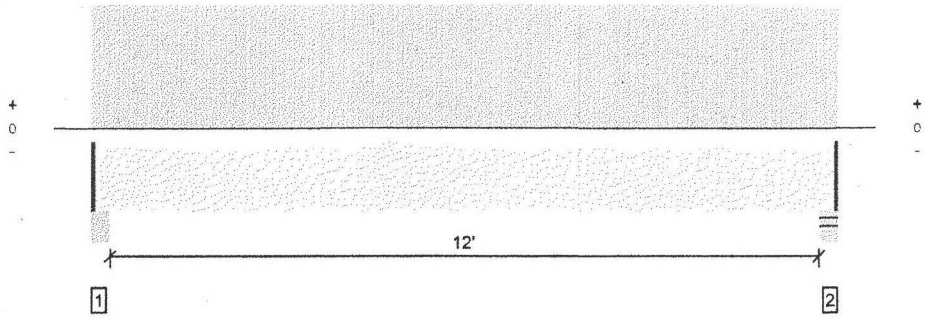
MEMBER REPORT *Roof, BM1*

PASSED

2 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

37

Overall Length: 12' 11"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4153 @ 4"	6322 (4.25")	Passed (66%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3159 @ 1' 7 1/2"	10707	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	12259 @ 6' 5 1/2"	27897	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.144 @ 6' 5 1/2"	0.408	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.236 @ 6' 5 1/2"	0.613	Passed (L/624)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC
Design Methodology : ASD
Member Pitch: 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 12' 8 1/2" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Beam - SPF	5.50"	4.25"	2.79"	1636	2583	4219	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	2.79"	1636	2583	4219	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 12' 11"	16'	15.0	25.0	Roof

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SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

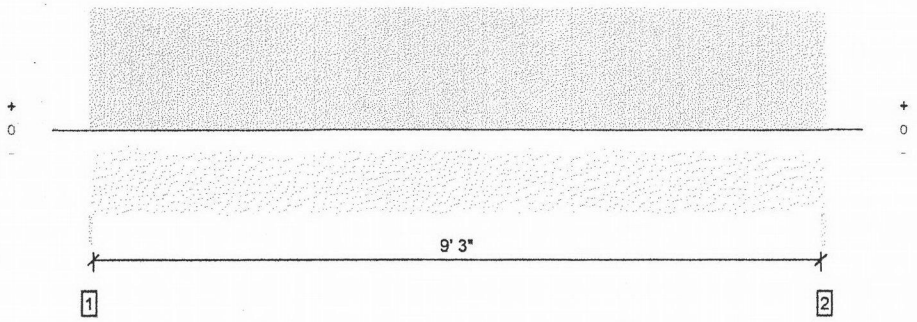
FORTE MEMBER REPORT *Roof, HDR3*

PASSED

38

1 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

Overall Length: 9' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1889 @ 0	1903 (1.50")	Passed (99%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1376 @ 1' 3 1/2"	5353	Passed (26%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4487 @ 4' 9"	13949	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.069 @ 4' 9"	0.317	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.112 @ 4' 9"	0.475	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 9' 6" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	1.50"	1.50"	1.50"	730	1159	1889	None
2 - Trimmer - SPF	1.50"	1.50"	1.50"	730	1159	1889	None

Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PLF)	0 to 9' 6"	N/A	147.0	244.0	Residential - Living Areas

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SUSTAINABLE FORESTRY INITIATIVE

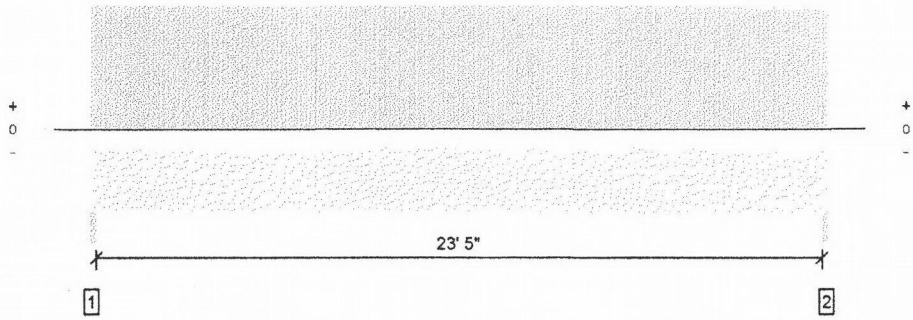
Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

FORTE MEMBER REPORT *Roof, HDR4* **PASSED**

39

3 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

Overall Length: 23' 8 1/2"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4627 @ 1/4"	6661 (1.75")	Passed (69%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4114 @ 1' 3 3/4"	16060	Passed (26%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	27326 @ 11' 10 1/4"	41846	Passed (65%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.705 @ 11' 10 1/4"	0.789	Passed (L/403)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	1.190 @ 11' 10 1/4"	1.183	Passed (L/239)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 12' 8 1/16" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	1.75"	1.75"	1.50"	1885	2741	4626	None
2 - Trimmer - SPF	1.75"	1.75"	1.50"	1885	2741	4626	None

Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 23' 8 1/2"	9' 3"	15.0	25.0	Residential - Living Areas

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SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

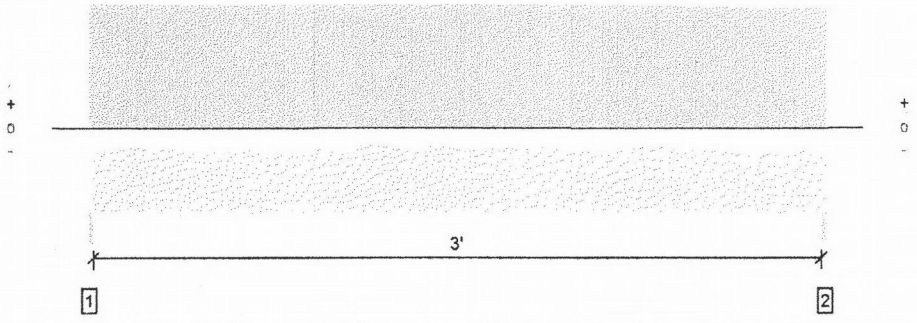
FORTE MEMBER REPORT *Roof, Wall: Header*

2 piece(s) 2 x 8 Douglas Fir-Larch No. 2

PASSED

40

Overall Length: 3' 3"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	643 @ 0	2813 (1.50")	Passed (23%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	354 @ 8 3/4"	3002	Passed (12%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	522 @ 1' 7 1/2"	2720	Passed (19%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.004 @ 1' 7 1/2"	0.108	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.007 @ 1' 7 1/2"	0.162	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 3' 3" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	1.50"	1.50"	1.50"	247	396	643	None
2 - Trimmer - SPF	1.50"	1.50"	1.50"	247	396	643	None

Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 3' 3"	9' 9"	15.0	25.0	Residential - Living Areas

Weyerhaeuser Notes

SUSTAINABLE FORESTRY INITIATIVE

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Refer to current Weyerhaeuser literature for installation details. (www.woodbywy.com) Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC ES under technical reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports refer to http://www.woodbywy.com/services/s_CodeReports.aspx.

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

Forte Software Operator	Job Notes
Brittany Stone Grummel Engineering (503) 244-7014 brittany@grummelengineering.com	

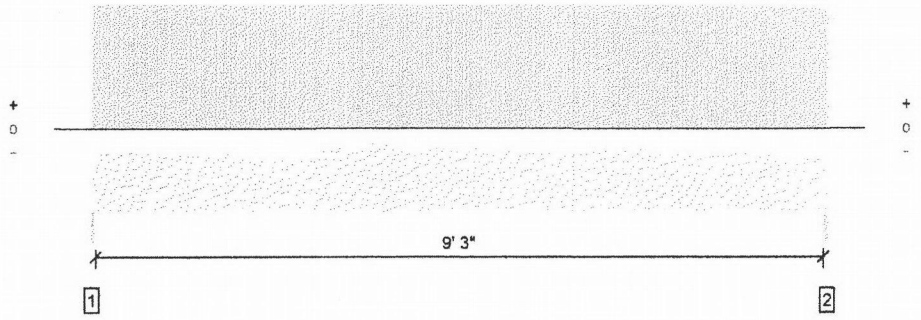
FORTE MEMBER REPORT *Roof, Other HDRs*

PASSED

4

1 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

Overall Length: 9' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1790 @ 0	1903 (1.50")	Passed (94%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1303 @ 1' 3 1/2"	5353	Passed (24%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4250 @ 4' 9"	13949	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.065 @ 4' 9"	0.317	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.106 @ 4' 9"	0.475	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 9' 6" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	1.50"	1.50"	1.50"	691	1098	1789	None
2 - Trimmer - SPF	1.50"	1.50"	1.50"	691	1098	1789	None

Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 9' 6"	9' 3"	15.0	25.0	Residential - Living Areas

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