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22-163680-RS - UNIT 1
22-163684-RS - UNIT 2
22-163687-RS - UNIT 3
22-163689-RS - UNIT 4
22-163692-RS

Structural Calculations

Project Name: Oregon Homeworks 4429 N Vancouver Ave 4-plex (Portland) 690722
Project Location: 4429 N Vancouver Ave
Portland, Oregon 97217
Project Number: 690722
Date: 12/1/2023

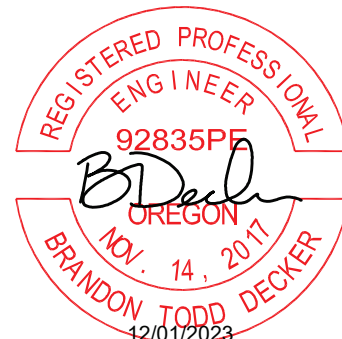
Issues / Revisions

Date	Number	Comment
12/1/2023	6921123	Roof and Plan Changes

RECEIVED 12.13.2023

SUBMITTED
12/07/2023

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EXP: 12/31/2025

Valid Wet Stamp In Red



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1. Design Criteria

Project information

Address / location * = 4429 N Vancouver Ave

Area / subdivision

Area / subdiv. No. 1 = Other

City, county = Portland (0 county)

State, Zip Code = Oregon 97217

* The structural calculations report and corresponding construction documents are valid for a single use at the project location and shall not be reused, copied, or reproduced without written consent.

Jurisdiction / occupancy information

Jurisdiction = Oregon

Building code = Oregon Code, ORS455

Model building code = 2018 IRC 2018 IBC 101.2 & IRC R301.1.3

Use and occupancy classification = Residential - townhouses (R)

Risk category = Not occupancy categories I, III, IV (II)

** Building code compliance of non-structural issues is not addressed. Refer to the architect or designer for compliance.

Deferred submittals

Prefabricated metal plate wood trusses - floor (truss manufacturer)



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Environmental load parameters

Earthquake

Latitude, longitude = 45.5556, -122.6681
Mapped short period $S_s = 0.872$ 2018 IBC Figure 1613.2.1(1)
Mapped 1-sec. period $S_1 = 0.39$ 2018 IBC Figure 1613.2.1(2)

Wind

Basic design wind speed $V = 98$ mph 2018 IBC Figure 1609.3(1), 1609.3(2), 1609.3(3)
Exposure category = B 2018 IBC 1609.4.3

Soil

Geotechnical design basis †

Area / subdiv. No. 1 = Presumptive values, 2018 IBC Table 1806.2
Minimum frost cover = 18 in. 2018 IBC 1809.5
Site class = D-Default
Special requirements = None

Lateral active press. = 40 psf/ft
Lateral at-rest press. = 60 psf/ft
Lateral passive press. = 150 psf/ft
Coeff. of friction = 0.25
Allow. vert. bearing $Q_a = 1500$ psf
Min. cont. footing = 18 in.
Min. spot footing = 20 in.

† It is recommended that a geotechnical investigation be conducted unless satisfactory data from adjacent areas is available that demonstrates an investigation is not necessary for any of the conditions in 2018 IBC 1803.5.1-12.
The structural calculations report and corresponding construction documents are only valid for the soil parameters listed herein. The design professional in responsible charge shall be notified if observations or field conditions differ.

Snow

Elevation (max) = 200 ft
Flat roof snow load $P_f = 25$ psf Jurisdiction

Rain

15-min. rainfall intensity = in/hr
60-min. rainfall intensity = in/hr



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2.1 Loads - Snow

Ground snow loads

(ASCE 7-16 Chap. 7.2)

Basis	=	Jurisdiction defined
Elevation	=	200 ft
Ground snow load	P _g =	30 psf

Flat roof snow loads

(ASCE 7-16 Chap. 7.3)

Basis	=	Jurisdiction	
Roof exposure definition	=	Not fully exposed or sheltered (ASCE 7-16 Table 7.3-1, Notes a and b).	
Roof exposure	=	Partial	ASCE 7-16 Table 7.3-1 (notes a,b)
Terrain category (wind)	=	B	
Exposure factor	C _e =	1	ASCE 7-16 Table 7.3-1
Roof thermal condition	=	Not unheated nor a continuously heated greenhouse (ASCE 7-16 Table 7.3-2).	
Thermal factor	C _t =	1	ASCE 7-16 Table 7.3-2
Risk category	=	II	
Snow importance factor	I _s =	1	ASCE 7-16 Table 1.5-2
Flat roof snow load	P _f =	25 psf	Jurisdiction

Sloped roof snow loads

(ASCE 7-16 Chap. 7.4)

Basis	=	Jurisdiction	
Roof surface	=	Non-slippery (asphalt shingles, wood shingles, or shakes).	
Roof slope	=	27 deg.	
Roof slope factor	C _s =	1	ASCE 7-16 Chap. C7.4
Eave snow load	P _{eave} =	50 psf	ASCE 7-16 Chap. 7.4.5
Balanced snow load	P _s =	25 psf	Jurisdiction

Unbalanced roof snow loads

(ASCE 7-16 Chap. 7.6)

Hip and gable roofs

Eave to ridge distance	W =	17.42 ft	
Roof system	=	Rafter	
Snow density	gamma =	18 pcf	ASCE 7-16 Equation 7.7-1
Height of balanced snow	H _b =	1 ft	ASCE 7-16 Chap. 7.7.1
Unbalanced snow load	P _s =	25 psf	ASCE 7-16 Chap. 7.6.1

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2.2 Loads - Dead / Live

Roof dead loads

(2018 IBC 1606, ASCE 7-16 Table C3.1-1a)

Asphalt shingles	= 2 psf	ASCE 7-16 Table C3.1-1a
Felt or ready roofing, roof sheathing	= 3 psf	ASCE 7-16 Table C3.1-1a
Wood trusses, misc	= 5 psf	Estimated
Insulation, gypsum sheathing	= 5 psf	ASCE 7-16 Table C3.1-1a
Miscellaneous	= 2 psf	Estimated
Roof DL No. 1	Total = 17 psf	

Floor dead loads

(2018 IBC 1606, ASCE 7-16 Table C3.1-1a)

Floor sheathing	= 2 psf	ASCE 7-16 Table C3.1-1a
Wood joists/trusses, MEP, misc	= 6 psf	ASCE 7-16 Table C3.1-1a
Gypsum sheathing	= 2 psf	ASCE 7-16 Table C3.1-1a
Interior Walls	= 2 psf	Estimated
Floor DL No. 1	Total = 12 psf	

6" composite suspended concrete slab	= 75 psf	Estimated
Floor DL No. 2	Total = 75 psf	

Wall dead loads

(2018 IBC 1606, ASCE 7-16 Table C3.1-1a)

Interior stud walls	= 10 psf	ASCE 7-16 12.14.8.1
Exterior 2x6@16"o.c., 5/8" gyp, insul., 7/16" sheath	= 12 psf	ASCE 7-16 Table C3.1-1a

Roof live loads

(2018 IBC 1607)

Occupancy or use	Unif. (psf)	Conc. (lb)	Ref.
Roofs (ordinary construction)	= 20	300	2018 IBC Table 1607.1 No. 26

Floor live loads

(2018 IBC 1607)

Occupancy or use	Unif. (psf)	Conc. (lb)	Ref.
Residential (1-2 unit dwelling)	= 40	0	2018 IBC Table 1607.1 No. 25
Stairs and exits (residential 1-2 unit dwelling)	= 40	300	2018 IBC Table 1607.1 No. 30

Load sets

Live load (occupancy or use)	(psf)	Dead load	(psf)	Abbrev.
Flat roof snow load	25	Roof DL No. 1	17	S 25 17
Residential (1-2 unit dwelling)	40	Floor DL No. 1	12	L 40 12
Stairs and exits (residential 1-2 unit dwelling)	40	Floor DL No. 1	12	Ex 40 12
Residential (1-2 unit dwelling)	40	Floor DL No. 2	75	C 40 75

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Deflection limits (L/limit)

(2018 IBC 1604.3.1)

Construction		L	S or W	D+L
Roof members (supporting plaster ceiling)	=	360	360	240
Floor members (joists)	=	480		240
Floor members (beams/headers)	=	360		240
Exterior walls and interior partitions (with other britt	=		240	

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2.3 Loads - Earthquake

Seismic Design Criteria

(2018 IBC 1613.2, ASCE 7-16 Chap. 11)

Mapped acceleration parameters

Latitude	= 45.556
Longitude	= -122.668
MCE short period	Ss = 0.872 g
MCE 1.0 sec. period	S1 = 0.39 g

Design acceleration parameters

Site class	= D-Default		
Site coefficient	Fa = 1.2		
Site coefficient	Fv = 1.91		
Adjusted short period	SMS = 1.05	Design short period	SDS = 0.7
Adjusted 1.0 sec. period	SM1 = 0.74	Design 1.0 sec. period	SD1 = 0.5
Risk category	= II		
IRC Seismic design category	= D1		

Dead loads

(2018 IBC 1606; ASCE 7-16 Chap. 12.7.2, Table C3.1-1a)

Effective seismic snow weight	= 0 psf	ASCE 7-16 Chap. 12.7.2
Roof DL No. 1	= 17 psf	
Floor DL No. 1	= 12 psf	
Interior stud walls	= 10 psf	
Exterior 2x6@16"o.c., 5/8" gyp, insul., 7/16" sheath	= 12 psf	

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Equivalent Lateral Force Procedure

(ASCE 7-16 Chap. 12.8)

	Primary LFRS
Basic structural system	= Bearing wall systems
Seismic force-resisting system	= Light-frame wood walls (wood sheathi

Structural design parameters

Response modification factor	R = 6.5	ASCE 7-16 Table 12.2-1 No. A15
System overstrength factor	Omega = 3	ASCE 7-16 Table 12.2-1 No. A15
Deflection amplification factor	Cd = 4	ASCE 7-16 Table 12.2-1 No. A15
Building height limit	= 65 ft	ASCE 7-16 Table 12.2-1 No. A15

Fundamental period

Structure type	= All other	
Approximate period parameter	Ct = 0.02	ASCE 7-16 Table 12.8-2
Approximate period parameter	x = 0.75	ASCE 7-16 Table 12.8-2
Height above base	= 18.5 ft	
Approximate fundamental period	Ta = 0.178 sec.	ASCE 7-16 Equation 12.8-7
Approximate fundamental freq.	n = 5.61 hz	
Long period transition period	TL = 8 sec.	ASCE 7-16 Figure 22-14

Seismic base shear

Seismic importance factor	Ie = 1.00	ASCE 7-16 Table 1.5-2
Seismic response coefficient	Csmin = 0.031	ASCE 7-16 Equations 12.8-5,6
Seismic response coefficient	Csmax = 0.428	ASCE 7-16 Equations 12.8-3,4
Seismic response coefficient	Cs = 0.11	ASCE 7-16 Equation 12.8-2
Seismic base shear (LRFD)	V = 12710 lb	ASCE 7-16 Equation 12.8-1

Weight Parameters

	Trib.	Exterior Wall		Roof		Floor + Int Wall		Total Weight (lb)
		Permtr 1 (ft)	Permtr 2 (ft)	Area (sf)	Weight (psf)	Area (sf)	Weight (psf)	
2	4	360	0	1,919	17	0	12	50,983
1	9	360	0	472	17	1,712	12	67,448
Total								118,431

Seismic Lateral Loads

(ASCE 7-16 Chap. 12.8.3)

Level	Height (ft)	Floor (in)	Hx (ft)	Cvx	Fx (lb)	Vx (Shear walls)	
						LRFD (lb)	ASD (lb)
2	8.0	12	18.50	0.6	7,411	7,411	5,188
1	9.0	0	10.00	0.4	5,300	12,710	8,897



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2.4 Loads - Wind

Design wind pressure

(2018 IBC 1609, ASCE 7-16 Chap. 26)

Terrain exposure

Surface roughness (upwind) = Open terrain with scattered obstructions having heights generally less than 30 ft.

Exposure category	= B	2018 IBC 1609.4.3
Terrain exp. constant	$\alpha = 7$	ASCE 7-16 Table 26.11-1
Terrain exp. constant	$Z_g = 1200$	ASCE 7-16 Table 26.11-1
Terrain exp. constant	$Z_{min} = 30$ ft	ASCE 7-16 Table 26.11-1
Topographic factor	$K_{zt} = 1$	ASCE 7-16 Chap. 26.8.2

Basic wind pressure

Basic design wind speed	$V = 98$ mph	2018 IBC Figure 1609.3(1), 1609.3(2),
Structure type	= Buildings - MWFRS	
Wind directionality factor	$K_d = 0.85$	ASCE 7-16 Table 26.6-1
Risk category	= II	2018 IBC Table 1604.5
Approx. fundamental freq.	= 5.61 hz	
Structure type	= Rigid	ASCE 7-16 Chap. 26.2
Gust effect factor	$G = 0.85$	ASCE 7-16 Chap. 26.11.1
Enclosure	= Enclosed (A building having less than 4 sq ft of openings in each wall)	
Roof pitch	= 6:12	
Internal pressure coeff.	$GC_{pi} = 0.18$	ASCE 7-16 Chap. 26.13, Table 26.13-
Basic velocity pressure	$q = 20.75$ psf	ASCE 7-16 Equation 26.10-1

Directional Procedure: Components and cladding

(ASCE 7-16 Chap. 30.3)

Roof mean height	$h = 23.1$ ft	ASCE 7-16 Chap. 26.2
Effective wind area (component)	$A_{eff} = 25$ sf	
Velocity press. exp. coeff.	$K_h = 0.65$	ASCE 7-16 Table 26.10-1 Note 1.
Velocity pressure	$q_h = 13.49$ psf	ASCE 7-16 Equation 26.10-1

Pressure coefficient

	End	Interior	
Positive	$GC_p = 0.93$	0.93	ASCE 7-16 Figure 30.3-1
Negative	$GC_p = -1.26$	-1.03	ASCE 7-16 Figure 30.3-1
Maximum pressure	$\max p = 19.42$	16.32	psf ASCE 7-16 Equation 30.3-1



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Elevation Geometry

Level	Trib. Height (ft)	Horiz. dim. (ft)		Max roof Elev. (ft)	Front Proj. A (sf)		Side Proj. A (sf)	
		Front	Side		Gable	Sloped	Gable	Sloped
2	4.3	59.17	34.17	28.17	303	261	160	161
1	9.0	59.2	34.2	10.84	8	0	8	0

Directional Procedure: MWFRS external pressure coefficients

(ASCE 7-16 Chap. 26.10, Figure 27.3-1 weighted Cp for sloped / gabled area)

Level	Front, Cp				Side, Cp			
Roof	Windward		Leeward		Windward		Leeward	
Level	Max Cp	Min Cp	Max Cp	Min Cp	Max Cp	Min Cp	Max Cp	Min Cp
2	0.48	0.25	-0.55	-0.55	0.50	0.27	-0.48	-0.48
1	0.80	0.80	-0.50	-0.50	0.80	0.80	-0.35	-0.35
	Windward	Leeward	Side		Windward	Leeward	Side	
Walls	0.80	-0.50	-0.70		0.80	-0.35	-0.70	

Directional Procedure: MWFRS wind pressures

(ASCE 7-16 Chap. 26.10.1, Table 26.10-1)

Level	Elev. (ft)	Kz	qz (psf)	Front pressure (psf)			Side pressure (psf)		
				+GCpi	-GCpi	Total	+GCpi	-GCpi	Total
Walls - Leeward									
Max h	18.50	0.61	12.66	-7.66	-3.10		-6.09	-1.53	
Walls - Windward									
2	18.50	0.61	12.66	6.33	10.89	13.99	6.33	10.89	12.42
1	10.00	0.57	11.92	5.83	10.39	13.49	5.83	10.39	11.92
Roofs - Leeward									
2	28.17	0.69	14.28	-9.20	-4.06		-8.36	-3.22	
1	10.84	0.57	11.92	-7.21	-2.92		-5.73	-1.44	
Roofs - Windward									
2	28.17	0.69	14.28	0.52	8.41	12.47	0.67	8.68	11.91
1	10.84	0.57	11.92	5.96	10.25	13.18	5.96	10.25	11.69

Directional Procedure: Wind Lateral Loads

(ASCE 7-16 Chap. 27.2-27.3)

Level	Front				Side			
	Walls (lb)	Roof (lb)	Fx (ASD) (lb)	Vx (ASD) (lb)	Walls (lb)	Roof (lb)	Fx (ASD) (lb)	Vx (ASD) (lb)
2	2,111	4,219	6,330	6,330	1,082	2,293	3,375	3,375
1	4,311	63	4,374	10,704	2,200	56	2,256	5,631



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3.1 LFRS - Wood Sheathing / Diaphragms

Sheathing analysis

APA Engineered Wood Construction Guide, Form No. E30W (2016 APA)

Location	Applied loads (OOP)		Sheathing		Support spacing (in.)	Allow LL (psf)	Result
	Label	LL (psf)	DL (psf)	Size			
Roof	S 25 17	25	17	7/16"	24	44	OK 43%
Upper Floor	L 40 12	40	12	3/4"	16	335	OK 88%

Diaphragm parameters

Level	Seismic Fpx	Transverse (front)		Longitudinal (side)		Minimum Sheathing Thickness	Diaphragm Nailing		
		Wind	Horz.	Wind	Horz.		Edge 1	Edge 2	Blocking
		MWFRS	dim. (ft)	MWFRS	dim. (ft)				
2	1,297	1,582	14.7925	3,375	34.17	7/16"	8d @ 6"	8d @ 6"	Unblocked
1	1,647	1,094	14.8	2,256	34.2	15/32"	8d @ 6"	8d @ 6"	Unblocked

Diaphragm analysis

Max		Reaction Load (lb)		Diaphragm	Wind		Seismic		
Level	Span (ft)	Wind	Seismic		Line L (ft)	Layout	v (plf)	Allow (plf)	v (plf)
Transverse (front) direction									
2	14.7925	791	648	34.17	Case 1	23	322.5	19	230
1	14.8	547	823	34.2	Case 1	16	335	24	240
Longitudinal (side) direction									
2	34.17	1,688	648	14.7925	Case 3	114	237.5	44	170
1	34.2	1,128	823	14.8	Case 3	76	252.5	56	180

Chord Analysis

Chord Analysis						
	Max		% Total	Chord		
Level	Span (ft)	Depth (ft)	Load	Force (lb)	Collector Type	Allow (lb)
Transverse (front) direction			on Diaph.			
2	14.7925	34	100%	86	TP Splice (12) 16d	2,700
1	14.8	34	100%	89	TP Splice (12) 16d	2,700
Longitudinal (side) direction						
2	34.17	15	100%	975	TP Splice (12) 16d	2,700
1	34.2	15	100%	652	TP Splice (12) 16d	2,700

Strut Analysis

	Line	Strut	% Total	Strut		
Level	Length (ft)	Length (ft)	Load	Force (lb)	Collector Type	Allow (lb)
Transverse (front) direction						
2	34.17	17	50%	396	TP Splice (12) 16d	2,700
1	34.2	17	50%	412	TP Splice (12) 16d	2,700
Longitudinal (side) direction			0			
2	14.7925	7	50%	844	TP Splice (12) 16d	2,700
1	14.8	7	50%	564	TP Splice (12) 16d	2,700



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3.2 LFRS - Wood Shear Walls

Level 1 - Transverse LFRS (2018 IBC 2305)

Wind lateral load (ASD)	=	10,704 lb
Seismic lateral load (ASD)	=	8,897 lb

Line	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W =	1,338	1,338													
E =	1,112	1,112													

Wall segment		Opening (ft)		LFRS						Anchorage		Hold-down	
Line	L (ft)	h (ft)	b total	h max	Type	Wind	Allow	Seismic	Allow	D (in.)	Type	T (lb)	Type
1	6.33	9	0	0	SW1	211	365	176	260	1.12	1/2" A.B. @ 32"	2,783	HDU4-SDS2.5
2 A	6	9	0	0	SW1	223	365	185	260	0.92	1/2" A.B. @ 32"	1,488	HDU2-SDS2.5
2 B	5.5	9	0	0	SW1	243	365	202	260	1.05	1/2" A.B. @ 32"	1,714	HDU2-SDS2.5

Level 1 - Longitudinal LFRS (2018 IBC 2305)

Wind lateral load (ASD)	=	5,631 lb
Seismic lateral load (ASD)	=	8,897 lb

Line	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
W =	704	704													
E =	1,112	1,112													

Wall segment		Opening (ft)		LFRS						Anchorage		Hold-down	
Line	L (ft)	h (ft)	b total	h max	Type	Wind	Allow	Seismic	Allow	D (in.)	Type	T (lb)	Type
A	7.5	9	0	0	SW1	94	365	148	260	0.65	1/2" A.B. @ 32"	708	HDU2-SDS2.5
B	12.17	9	2.5	4.5	SW1	73	233	115	166	0.48	1/2" A.B. @ 32"	210	HDU2-SDS2.5

Level 2 - Transverse LFRS (2018 IBC 2305)

Wind lateral load (ASD)	=	6,330 lb
Seismic lateral load (ASD)	=	5,188 lb

Line	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W =	791	791	791												
E =	648	648	648												

Wall segment		Opening (ft)		LFRS						Anchorage		Hold-down	
Line	L (ft)	h (ft)	b total	h max	Type	Wind	Allow	Seismic	Allow	D (in.)	Type	T (lb)	Type
1	6.33	12	0	0	SW1	125	365	102	260	1.02	10d @ 4"	1,162	CS16
2 A	13.33	8	6	4	SW1	108	273	88	194	0.35	10d @ 4"	0	
2 B	13.33	12	6	4	SW1	108	365	88	260	0.43	10d @ 4"	0	

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Level 2 - Longitudinal LFRS (2018 IBC 2305)

Wind lateral load (ASD) = 3,375 lb
Seismic lateral load (ASD) = 5,188 lb

Line	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
W =	422	422	422	422											
E =	648	648	648	648											

Wall segment			Opening (ft)		LFRS					Anchorage		Hold-down	
Line	L (ft)	h (ft)	b total	h max	Type	Wind	Allow	Seismic	Allow	D (in.)	Type	T (lb)	Type
A	6.583	8	0	0	SW1	64	365	98	260	0.43	10d @ 4"	323	CS16
B 1	19.75	8	8	2	SW1	36	365	55	260	0.17	10d @ 4"	0	
B 2	19.75	8	8	2	SW1	36	365	55	260	0.17	10d @ 4"	0	



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4.1 VFRS - Wood Bearing Walls

Wall

Wall 1 **2 X 6 DF Stud @ 16 in. o.c.**

Section	=	1
Level	=	Main
Height	=	8.71 ft
Label	=	2 X 6 DF Stud @ 16 in. o.c.
Result	=	OK Combo 5: D + (0.6W)

Vertical Load

Label	LL (psf)	DL (psf)	Trib (ft)	Line DL (plf)	Vertical Load (plf)	
					Total	Capacity
S 25 17	25	17	10.21	155	922	3,867
L 40 12	40	12	6.21			

Lateral out-of-plane (OOP) pressure

Seismic	=	3.3 psf			
H	=	8.71 ft	Stud Fac.	2015 SDPWS Table 3.1.1.1	= 1.35
s	=	16 in. o.c.	Wind zone		= End
Aeff	=	11.6 sf	Lateral out-of-plane (OOP) pressure		= 21 psf
Kz	=	0.70	Combined axial / bending stress factor (CSF)		= 0.24
qz	=	14.54 psf	Lateral out-of-plane deflection (L/Defl.)		= 2,709

Geometric Properties

Width	=	1.5 in.
Depth	=	5.5 in.
S	=	7.56 in.3
Area	=	8.25 in.2
I	=	20.8 in.4
Weight	=	20 lb
Slenderness Ratio Ratio		
x-x axis	=	19.0
y-y axis	=	0.0

Column Stability

CF (Fc)	=	1.00
Cd	=	1.15
Fc	=	850 psi
c	=	0.8
FcEx	=	1161 psi
FcEy	=	0 psi
Fc*	=	978 psi
Cp	=	0.74
F'c	=	730 psi
fc	=	129 psi

Combined Axial & Bending

Cd	=	1.60
CF (Fb)	=	1.00
Fc*	=	1360 psi
Cp	=	0.63
F'c	=	862 psi
fc	=	68 psi Combo 5
fc	=	129 psi Combo 6

Wind Forces Govern Design

Cr	=	1.35
M (ASD)	=	159 lb-ft
F'b	=	1512 psi
fb	=	252 psi
CSF	=	0.18 Combo 5
CSF	=	0.16 Combo 6
CSF	=	0.05 Combo 7

Wind Deflection

Deflection	=	0.04 in.
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Wall

Wall 2 2 X 6 DF Stud @ 16 in. o.c.

Section	=	2
Level	=	Main
Height	=	16.71 ft
Label	=	2 X 6 DF Stud @ 16 in. o.c.
Result	=	OK Combo 5: D + (0.6W)

Vertical Load

Label	LL (psf)	DL (psf)	Trib (ft)	Line DL (plf)	Vertical Load (plf)	
					Total	Capacity
S 25 17	25	17	10.2	155	612	1,771
L 40 12	40	12	0			

Lateral out-of-plane (OOP) pressure

Seismic	=	3.3 psf			
H	=	16.71 ft	Stud Fac.	2015 SDPWS Table 3.1.1.1	= 1.35
s	=	16 in. o.c.	Wind zone		= End
Aeff	=	22.3 sf	Lateral out-of-plane (OOP) pressure		= 21 psf
Kz	=	0.70	Combined axial / bending stress factor (CSF)		= 0.79
qz	=	14.54 psf	Lateral out-of-plane deflection (L/Defl.)		= 384

Geometric Properties

Width	=	1.5 in.
Depth	=	5.5 in.
S	=	7.56 in.3
Area	=	8.25 in.2
I	=	20.8 in.4
Weight	=	38.3 lb
Slenderness Ratio Ratio		
x-x axis	=	36.5
y-y axis	=	0.0

Column Stability

CF (Fc)	=	1.00
Cd	=	1.15
Fc	=	850 psi
c	=	0.8
FcEx	=	315 psi
FcEy	=	0 psi
Fc*	=	978 psi
Cp	=	0.29
F'c	=	291 psi
fc	=	99 psi

Combined Axial & Bending

Cd	=	1.60
CF (Fb)	=	1.00
Fc*	=	1360 psi
Cp	=	0.21
F'c	=	299 psi
fc	=	58 psi Combo 5
fc	=	89 psi Combo 6

Wind Forces Govern Design

Cr	=	1.35
M (ASD)	=	584 lb-ft
F'b	=	1512 psi
fb	=	927 psi
CSF	=	0.79 Combo 5
CSF	=	0.73 Combo 6
CSF	=	0.23 Combo 7

Wind Deflection

Deflection	=	0.52 in.
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Wall

Wall 3 2 X 4 DF Stud @ 16 in. o.c.

Section	=	3
Level	=	Main
Height	=	8.71 ft
Label	=	2 X 4 DF Stud @ 16 in. o.c.
Result	=	OK Combo 7: D + 0.75(0.7E) + 0.75L + 0.75S

Vertical Load

Label	LL (psf)	DL (psf)	Trib (ft)	Line DL (plf)	Vertical Load (plf)	
					Total	Capacity
S 25 17	25	17	0	55	475	1,580
L 40 12	40	12	7.9			

Lateral out-of-plane (OOP) pressure

Seismic	=	3.3 psf			
H	=	8.71 ft	Stud Fac.	2015 SDPWS Table 3.1.1.1	= 1.50
s	=	16 in. o.c.	Wind zone		= 0
Aeff	=	11.6 sf	Lateral out-of-plane (OOP) pressure		= 0 psf
Kz	=	0.70	Combined axial / bending stress factor (CSF)		= 0.30
qz	=	14.54 psf	Lateral out-of-plane deflection (L/Defl.)		= 1,967

Geometric Properties

Width	=	1.5 in.
Depth	=	3.5 in.
S	=	3.06 in.3
Area	=	5.25 in.2
I	=	5.36 in.4
Weight	=	12.7 lb
Slenderness Ratio Ratio		
x-x axis	=	29.9
y-y axis	=	0.0

Column Stability

CF (Fc)	=	1.05
Cd	=	1
Fc	=	850 psi
c	=	0.8
FcEx	=	470 psi
FcEy	=	0 psi
Fc*	=	893 psi
Cp	=	0.45
F'c	=	404 psi
fc	=	121 psi

Combined Axial & Bending

Cd	=	1.60
CF (Fb)	=	1.10
Fc*	=	1428 psi
Cp	=	0.30
F'c	=	433 psi
fc	=	40 psi Combo 5
fc	=	101 psi Combo 6

Seismic Forces Govern Design

Cr	=	1.15
M (ASD)	=	29 lb-ft
F'b	=	1417 psi
fb	=	114 psi
CSF	=	0.1 Combo 5
CSF	=	0.05 Combo 6
CSF	=	0.13 Combo 7

Seismic Deflection

Deflection	=	0.05 in.
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Wall

Section = 4
Level = Upper
Height = 7.71 ft
Label = 2 X 6 DF Stud @ 16 in. o.c.
Result = OK Combo 5: D + (0.6W)

Wall 4 2 X 6 DF Stud @ 16 in. o.c.

Vertical Load

Label	LL (psf)	DL (psf)	Trib (ft)	Line DL (plf)	Vertical Load (plf)	
					Total	Capacity
S 25 17	25	17	8.71	50	429	3,867
L 40 12	40	12	0			

Lateral out-of-plane (OOP) pressure

Seismic	=	3.3 psf				
H	=	7.71 ft	Stud Fac.	2015 SDPWS Table 3.1.1.1	=	1.35
s	=	16 in. o.c.	Wind zone		=	End
Aeff	=	10.3 sf	Lateral out-of-plane (OOP) pressure		=	21 psf
Kz	=	0.70	Combined axial / bending stress factor (CSF)		=	0.13
qz	=	14.54 psf	Lateral out-of-plane deflection (L/Defl.)		=	3,906

Geometric Properties

Width	=	1.5 in.
Depth	=	5.5 in.
S	=	7.56 in.3
Area	=	8.25 in.2
I	=	20.8 in.4
Weight	=	17.7 lb
Slenderness Ratio Ratio		
x-x axis	=	16.8
y-y axis	=	0.0

Column Stability

CF (Fc)	=	1.00
Cd	=	1.15
Fc	=	850 psi
c	=	0.8
FcEx	=	1482 psi
FcEy	=	0 psi
Fc*	=	978 psi
Cp	=	0.81
F'c	=	794 psi
fc	=	69 psi

Combined Axial & Bending

Cd	=	1.60
CF (Fb)	=	1.00
Fc*	=	1360 psi
Cp	=	0.71
F'c	=	979 psi
fc	=	34 psi Combo 5
fc	=	61 psi Combo 6

Wind Forces Govern Design

Cr	=	1.35
M (ASD)	=	124 lb-ft
F'b	=	1512 psi
fb	=	197 psi
CSF	=	0.13 Combo 5
CSF	=	0.11 Combo 6
CSF	=	0.03 Combo 7

Wind Deflection

Deflection	=	0.02 in.
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4.2 VFRS - Wood Joists

Summary

Mark	=	FJ 01
Center span	=	16 ft
Section	=	11-7/8" TJI 110 @ 16" O.C.
Result	=	Section adequate by 30%.

FJ 01**11-7/8" TJI 110 @ 16" O.C.****Uniform Load**

Label	Class	LL (psf)	DL (psf)	Partition DL (psf)	
				Center	Cantilever
L 40 12	Floor	40	12	0	0

Beam Adjustment Factors

Cd	=	1
CF / CV	=	1
Cr	=	1

Reference Allowable Loads

Moment	=	3160 lb-ft
Shear	=	1560 lb
R1	=	910 lb
R2	=	910 lb

Section and Material Properties

Flange		
d	=	1.375 in.
b	=	1.75 in.
Web		
h	=	9.125 in.
Panel		
t	=	0.75 in.
C. Factor	=	0.45

Joist Properties

Joist K	=	4.5
Joist EI	=	322688153 in.2-lb
Comp. EI	=	417910243 in.2-lb
Effec. EI	=	334909609 in.2-lb

Support

	Left	Right
Left (in.)	1.75	1.75
Web stiffener	No WS	No WS

Reactions

	Left	Right
Roof LL (lb)	0	0
Floor LL (lb)	427	427
DL (lb)	128	128
Total load (lb)	555	555

Uplift

	Left
Roof LL (lb)	0
Floor LL (lb)	0
DL (lb)	0
Total uplift (lb)	0

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Summary

Mark	=	FJ 02
Center span	=	3 ft
Section	=	9-1/2" TJI 110 @ 16" O.C.
Result	=	Section adequate by 89%.

FJ 02 9-1/2" TJI 110 @ 16" O.C.**Uniform Load**

Label	Class	LL (psf)	DL (psf)	Partition DL (psf)	
				Center	Cantilever
L 40 12	Floor	40	12	0	0

Beam Adjustment Factors

Cd	=	1
CF / CV	=	1
Cr	=	1

Reference Allowable Loads

Moment	=	2500 lb-ft
Shear	=	1220 lb
R1	=	910 lb
R2	=	910 lb

Section and Material Properties

Flange		
d	=	1.375 in.
b	=	1.75 in.
Web		
h	=	6.75 in.
Panel		
t	=	0.75 in.
C. Factor	=	0.45

Joist Properties

Joist K	=	4.5
Joist EI	=	193973500 in.2-lb
Comp. EI	=	255467659 in.2-lb
Effec. EI	=	201310447 in.2-lb

Support

	Left	Right
Left (in.)	1.75	1.75
Web stiffener	No WS	No WS

Reactions

	Left	Right
Roof LL (lb)	0	0
Floor LL (lb)	80	80
DL (lb)	24	24
Total load (lb)	104	104

Uplift

	Left
Roof LL (lb)	0
Floor LL (lb)	0
DL (lb)	0
Total uplift (lb)	0



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Summary

Mark	=	FJ 03
Center span	=	3.5 ft
Section	=	2 X 8 @ 16" O.C.
Result	=	Section adequate by 92%.

FJ 03 **2 X 8 @ 16" O.C.**

Uniform Load

Label	Class	LL (psf)	DL (psf)	Partition DL (psf)	
				Center	Cantilever
L 40 12	Floor	40	12	0	0

Beam Adjustment Factors

Cd	=	1
CF / CV	=	1.2
Cr	=	1

Reference Allowable Loads

Moment	=	1360 lb-ft
Shear	=	1305 lb
R1	=	1640.625 lb
R2	=	1640.625 lb

Section and Material Properties

Flange		
d	=	0 in.
b	=	0 in.
Web		
h	=	0 in.
Panel		
t	=	0.75 in.
C. Factor	=	0.45

Joist Properties

Joist K	=	738.46154
Joist EI	=	94519373 in.2-lb
Comp. EI	=	147722240 in.2-lb
Effec. EI	=	108393602 in.2-lb

Support

	Left	Right
Left (in.)	1.75	1.75
Web stiffener	No WS	No WS

Reactions

	Left	Right
Roof LL (lb)	0	0
Floor LL (lb)	93	93
DL (lb)	28	28
Total load (lb)	121	121

Uplift

	Left
Roof LL (lb)	0
Floor LL (lb)	0
DL (lb)	0
Total uplift (lb)	0



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Summary

Mark	=	RR 01
Center span	=	3 ft
Section	=	11-7/8" TJI 110 @ 24" O.C.
Result	=	Section adequate by 85%.

RR 01 **11-7/8" TJI 110 @ 24" O.C.**

Uniform Load

Label	Class	LL (psf)	DL (psf)	Partition DL (psf)	
				Center	Cantilever
S 25 17	Roof	25	17	0	0

Beam Adjustment Factors

Cd	=	1.15
CF / CV	=	1
Cr	=	1

Reference Allowable Loads

Moment	=	3160 lb-ft
Shear	=	1560 lb
R1	=	910 lb
R2	=	910 lb

Support

	Left	Right
Left (in.)	1.75	1.75
Web stiffener	No WS	No WS

Section and Material Properties

Flange		
d	=	0 in.
b	=	0 in.
Web		
h	=	0 in.
Panel		
t	=	0 in.
C. Factor	=	0

Reactions

	Left	Right
Roof LL (lb)	75	75
Floor LL (lb)	0	0
DL (lb)	57	57
Total load (lb)	132	132

Joist Properties

Joist K	=	4.5
Joist EI	=	0 in.2-lb
Comp. EI	=	0 in.2-lb
Effec. EI	=	267000000 in.2-lb

Uplift

	Left
Roof LL (lb)	0
Floor LL (lb)	0
DL (lb)	0
Total uplift (lb)	0

Ledger

2018 NDS Table 12

Mark	Members		Rows	Fastener		Spacing in.	Summary	
	Main	Side		Type			TL lbs/fast.	Z' lbs/fast.
FJ 03	2X BLCK	2 X 8	2	SDS 25312		16	OK75%	61
RR 01	2X BLCK	2 X 12	2	16d COMMON		16	OK73%	44
TRS 01	2X BLCK	1/4 X 11-7/8 S	2	SDS 25412		16	OK79%	44



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4.3 VFRS - Beams / Posts

Summary

Mark	=	RB 01
Section	=	4 X 6 DF #2 [DF #2]
Span	=	6.25 ft
Result	=	Section adequate by 52 % - Load Combo. No.3 DL + RLL - Flexure

RB 01

4 X 6 DF #2 [DF #2]

Distributed Loads

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	2.00	0.00	2.00	6.25

Dead Loads

Self Weight	BSW =	5 plf
Cont. Dead Load	W =	103 plf

Allowable Stress

Shear Stress	Fv =	180 psi
Bending Stress	Fb =	900 psi

Beam Adjustment Factors

Load Duration	Cd =	1.15
Form	CF =	1.30
Repetative	Cr / Cv =	1.00

Load Reduction Factors

Live Load	LLRF =	1.00
-----------	--------	------

Beam Section Properties

Width	b =	3.5 in.
Depth	d =	5.5 in.
Area	A =	19 in.2
Shear Area	As =	13 in.2
Moment of Inertia	I =	49 in.4
Section Modulus	S =	18 in.3

Beam Material Properties

Modulus of Elasticity	E =	1600000 psi
Flexure Stiffness	EI =	78000000 lb-in.2

Req'd bearing length = 0.28"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.06	0.02	89 %	0.09	72 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	521	2,657	80 %
Moment (lb-ft)	955	1,979	52 %

Support Reactions

	Left	Right
RLL (lb)	156	156
FLL (lb)	0	0
DL (lb)	455	455
Total (lb)	611	611
Post		Capacity

Left: 2 X 6 (1) K 5123 lb

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Summary

Mark	=	RB 02
Section	=	4 X 8 DF #2 [DF #2]
Span	=	6.25 ft
Result	=	Section adequate by 34 % - Load Combo. No.3 DL + RLL - Flexure

RB 02 4 X 8 DF #2 [DF #2]**Distributed Loads**

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	8.71	0.00	8.71	6.25

Dead Loads

Self Weight	BSW =	6 plf
Cont. Dead Load	W =	72 plf

Allowable Stress

Shear Stress	Fv =	180 psi
Bending Stress	Fb =	900 psi

Beam Adjustment Factors

Load Duration	Cd =	1.15
Form	CF =	1.30
Repetative	Cr / Cv =	1.00

Load Reduction Factors

Live Load	LLRF =	1.00
-----------	--------	------

Beam Section Properties

Width	b =	3.5 in.
Depth	d =	7.25 in.
Area	A =	25 in.2
Shear Area	As =	17 in.2
Moment of Inertia	I =	111 in.4
Section Modulus	S =	31 in.3

Beam Material Properties

Modulus of Elasticity	E =	1600000 psi
Flexure Stiffness	EI =	178000000 lb-in.2

Req'd bearing length = 0.66"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.06	0.04	80 %	0.09	72 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	1,163	3,502	67 %
Moment (lb-ft)	2,253	3,438	34 %

Support Reactions

	Left	Right
RLL (lb)	680	680
FLL (lb)	0	0
DL (lb)	761	761
Total (lb)	1,442	1,442
Post	Capacity	

Left: 2 X 6 (1) K 5123 lb

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Summary

Mark	=	RB 03
Section	=	4 X 6 DF #2 [DF #2]
Span	=	2.25 ft
Result	=	Section adequate by 87 % - Load Combo. No.3 DL + RLL - Flexure

RB 03 4 X 6 DF #2 [DF #2]**Distributed Loads**

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	8.71	0.00	8.71	2.25

Dead Loads

Self Weight	BSW =	5 plf
Cont. Dead Load	W =	25 plf

Allowable Stress

Shear Stress	Fv =	180 psi
Bending Stress	Fb =	900 psi

Beam Adjustment Factors

Load Duration	Cd =	1.15
Form	CF =	1.30
Repetative	Cr / Cv =	1.00

Load Reduction Factors

Live Load	LLRF =	1.00
-----------	--------	------

Beam Section Properties

Width	b =	3.5 in.
Depth	d =	5.5 in.
Area	A =	19 in.2
Shear Area	As =	13 in.2
Moment of Inertia	I =	49 in.4
Section Modulus	S =	18 in.3

Beam Material Properties

Modulus of Elasticity	E =	1600000 psi
Flexure Stiffness	EI =	78000000 lb-in.2

Req'd bearing length = 0.21"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.06	0.00	98 %	0.00	97 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	275	2,657	90 %
Moment (lb-ft)	261	1,979	87 %

Support Reactions

	Left	Right
RLL (lb)	245	245
FLL (lb)	0	0
DL (lb)	220	220
Total (lb)	464	464

Post	Capacity
Left: 2 X 6 (1) K	5123 lb

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Date:	12/1/2023	Prepared by:
Project:	Oregon Homeworks 4429 N Vancouver Ave 4-plex (Portland) 690722	HF

Summary

Mark	=	MB 01
Section	=	4 X 6 DF #2 [DF #2]
Span	=	3 ft
Result	=	Section adequate by 72 % - Load Combo. No.2 DL + FLL - Flexure

MB 01 4 X 6 DF #2 [DF #2]**Distributed Loads**

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Floor	40	12	1.00	0.00	1.00	3.00
Floor	40	12	7.00	0.00	7.00	3.00

Dead Loads

Self Weight BSW = 5 plf

Allowable Stress

Shear Stress $F_v = 180$ psi
Bending Stress $F_b = 900$ psi

Beam Adjustment Factors

Load Duration $C_d = 1.00$
Form $CF = 1.30$
Repetitive $Cr / C_v = 1.00$

Load Reduction Factors

Live Load LLRF = 1.00

Beam Section Properties

Width $b = 3.5$ in.
Depth $d = 5.5$ in.
Area $A = 19$ in.²
Shear Area $A_s = 13$ in.²
Moment of Inertia $I = 49$ in.⁴
Section Modulus $S = 18$ in.³

Beam Material Properties

Modulus of Elasticity $E = 1600000$ psi
Flexure Stiffness $EI = 78000000$ lb-in.²

Req'd bearing length = 0.29"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.01	92 %	0.01	93 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	438	2,310	81 %
Moment (lb-ft)	473	1,720	72 %

Support Reactions

	Left	Right
RLL (lb)	0	0
FLL (lb)	480	480
DL (lb)	151	151
Total (lb)	631	631
Post		Capacity

Left: 2 X 6 (1) K 5123 lb



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Summary

Mark	=	MB 02
Section	=	4 X 12 DF #2 [DF #2]
Span	=	9.5 ft
Result	=	Section adequate by 0 % - Load Combo. No.2 DL + FLL - Flexure

MB 02 4 X 12 DF #2 [DF #2]

Distributed Loads

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	2.00	0.00	2.00	3.00
Roof	25	17	1.50	0.00	1.50	9.50
Floor	40	12	6.50	0.00	6.50	9.50

Point Loads

Ref.	a (ft)	RLL (lb)	FLL (lb)	DL (lb)	Total (lb)
RB 01-L	3	156	0	455	611

Dead Loads

Self Weight	BSW =	9 plf
Cont. Dead Load	W =	95 plf

Allowable Stress

Shear Stress	Fv =	180 psi
Bending Stress	Fb =	900 psi

Beam Adjustment Factors

Load Duration	Cd =	1.00
Form	CF =	1.10
Repetative	Cr / Cv =	1.00

Load Reduction Factors

Live Load	LLRF =	1.00
-----------	--------	------

Beam Section Properties

Width	b =	3.5 in.
Depth	d =	11.25 in.
Area	A =	39 in.2
Shear Area	As =	26 in.2
Moment of Inertia	I =	415 in.4
Section Modulus	S =	74 in.3

Beam Material Properties

Modulus of Elasticity	E =	1600000 psi
Flexure Stiffness	EI =	664000000 lb-in.2

Req'd bearing length = 1.23" 1.08"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.07	77 %	0.15	69 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	2,182	4,725	54 %
Moment (lb-ft)	6,071	6,091	0 %

Support Reactions

	Left	Right
RLL (lb)	411	407
FLL (lb)	1,235	1,235
DL (lb)	1,448	1,583
Total (lb)	2,683	2,818

Post	Capacity
------	----------

Left: 6 X 6 16876 lb
Right: 2 X 6 (1) K 5125 lb

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Summary

Mark	=	MB 03
Section	=	4 X 6 DF #2 [DF #2]
Span	=	3.67 ft
Result	=	Section adequate by 21 % - Load Combo. No.2 DL + FLL - Flexure

MB 03 4 X 6 DF #2 [DF #2]**Distributed Loads**

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	10.20	0.00	10.20	3.67
Floor	40	12	8.00	0.00	8.00	3.67

Dead Loads

Self Weight	BSW =	5 plf
Cont. Dead Load	W =	197 plf

Allowable Stress

Shear Stress	Fv =	180 psi
Bending Stress	Fb =	900 psi

Beam Adjustment Factors

Load Duration	Cd =	1.00
Form	CF =	1.30
Repetative	Cr / Cv =	1.00

Load Reduction Factors

Live Load	LLRF =	1.00
-----------	--------	------

Beam Section Properties

Width	b =	3.5 in.
Depth	d =	5.5 in.
Area	A =	19 in.2
Shear Area	As =	13 in.2
Moment of Inertia	I =	49 in.4
Section Modulus	S =	18 in.3

Beam Material Properties

Modulus of Elasticity	E =	1600000 psi
Flexure Stiffness	EI =	78000000 lb-in.2

Req'd bearing length = 0.77"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.02	81 %	0.05	74 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	1,117	2,310	52 %
Moment (lb-ft)	1,366	1,720	21 %

Support Reactions

	Left	Right
RLL (lb)	468	468
FLL (lb)	587	587
DL (lb)	902	902
Total (lb)	1,693	1,693
Post		Capacity

Left: 2 X 6 (1) K 5123 lb

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Summary

Mark	=	MB 05
Section	=	3-1/2 X 9 GLB [24F-1.8E]
Span	=	9.5 ft
Result	=	Section adequate by 27 % - Load Combo. No.2 DL + FLL - Flexure

MB 05 3-1/2 X 9 GLB [24F-1.8E]**Distributed Loads**

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	8.71	0.00	8.71	3.00
Roof	25	17	1.50	0.00	1.50	9.50
Floor	40	12	6.50	0.00	6.50	9.50

Point Loads

Ref.	a (ft)	RLL (lb)	FLL (lb)	DL (lb)	Total (lb)
RB 02-L	3	680	0	761	1,442

Dead Loads

Self Weight	BSW =	7 plf
Cont. Dead Load	W =	95 plf

Allowable Stress

Shear Stress	Fv =	265 psi
Bending Stress	Fb =	2400 psi

Beam Adjustment Factors

Load Duration	Cd =	1.00
Form	CF =	1.00
Repetative	Cr / Cv =	1.00

Load Reduction Factors

Live Load	LLRF =	1.00
-----------	--------	------

Beam Section Properties

Width	b =	3.5 in.
Depth	d =	9 in.
Area	A =	32 in.2
Shear Area	As =	21 in.2
Moment of Inertia	I =	213 in.4
Section Modulus	S =	47 in.3

Beam Material Properties

Modulus of Elasticity	E =	1800000 psi
Flexure Stiffness	EI =	383000000 lb-in.2

Req'd bearing length = 1.67" 1.13"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.16	50 %	0.33	31 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	3,203	6,400	50 %
Moment (lb-ft)	6,885	9,450	27 %

Support Reactions

	Left	Right
RLL (lb)	1,194	496
FLL (lb)	1,235	1,235
DL (lb)	1,970	1,276
Total (lb)	3,792	2,575
Post		Capacity

Right: 2 X 6 (1) K 5124 lb



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Summary

Mark	=	MB 06
Section	=	1-3/4 X 11-7/8 LVL [LVL (2.0E)]
Left Cantilever	=	3 ft
Center Span	=	17 ft
Result	=	Section adequate by 54 % - Load Combo. No.3 DL + RLL - Live Load Deflection

MB 06

1-3/4 X 11-7/8 LVL [LVL (2.0E)]

Distributed Loads

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	2.00	0.00	2.00	3.00
Floor	40	12	1.00	3.00	1.00	20.00

Point Loads

Ref.	a (ft)	RLL (lb)	FLL (lb)	DL (lb)	Total (lb)
MB 08-L	0	362	0	260	623

Dead Loads

Self Weight	BSW =	6 plf
Cont. Dead Load	W =	3 plf

Allowable Stress

Shear Stress	Fv =	285 psi
Bending Stress	Fb =	2600 psi

Beam Adjustment Factors

Load Duration	Cd =	1.15
Form	CF =	1.00
Repetative	Cr / Cv =	1.00

Load Reduction Factors

Live Load	LLRF =	1.00
-----------	--------	------

Beam Section Properties

Width	b =	1.75 in.
Depth	d =	11.875 in.
Area	A =	21 in. ²
Shear Area	As =	14 in. ²
Moment of Inertia	I =	244 in. ⁴
Section Modulus	S =	41 in. ³

Beam Material Properties

Modulus of Elasticity	E =	2000000 psi
Flexure Stiffness	EI =	488000000 lb-in. ²

Req'd bearing length = 1" 0.36"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.15	73 %	0.17	80 %
Cantilever		0.09	54 %	0.12	61 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	812	4,541	82 %
Moment (lb-ft)	2,291	10,263	78 %

Support Reactions

	Left	Right
RLL (lb)	590	0
FLL (lb)	340	340
DL (lb)	611	138
Total (lb)	1,309	478
Post	Capacity	
Left: (2) 2 X 6		7512 lb
Right: (2) 2 X 6		6827 lb

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Summary**MB 07 (2) 1-3/4 X 11-7/8 LVL [LVL (2.0E)]**

Mark = MB 07
 Section = (2) 1-3/4 X 11-7/8 LVL [LVL (2.0E)]
 Center Span = 3.75 ft
 Right Cantilever = 3 ft
 Result = Section adequate by 89 % - Load Combo. No.3 DL + RLL - Flexure

Distributed Loads

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	2.00	3.50	2.00	6.75
Floor	40	12	6.30	0.00	6.30	3.50
Floor	40	12	1.50	0.00	1.50	3.50

Point Loads

Ref.	a (ft)	RLL (lb)	FLL (lb)	DL (lb)	Total (lb)
MB 08-L	6.75	362	0	260	623

Dead Loads

Self Weight BSW = 12 plf
 Cont. Dead Load W = 59 plf

Allowable Stress

Shear Stress Fv = 285 psi
 Bending Stress Fb = 2600 psi

Beam Adjustment Factors

Load Duration Cd = 1.15
 Form CF = 1.00
 Repetative Cr / Cv = 1.00

Load Reduction Factors

Live Load LLRF = 1.00

Beam Section Properties

Width b = 3.5 in.
 Depth d = 11.875 in.
 Area A = 42 in.²
 Shear Area As = 28 in.²
 Moment of Inertia I = 488 in.⁴
 Section Modulus S = 82 in.³

Beam Material Properties

Modulus of Elasticity E = 2000000 psi
 Flexure Stiffness EI = 977000000 lb-in.²

Req'd bearing length = 0.27" 0.81"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.00	98 %	0.00	99 %
Cantilever		0.02	92 %	0.02	92 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	923	9,081	90 %
Moment (lb-ft)	2,293	20,525	89 %

Support Reactions

	Left	Right
RLL (lb)	0	874
FLL (lb)	582	510
DL (lb)	116	1,077
Total (lb)	699	2,115

Post Capacity

Left: (2) 2 X 6 6827 lb
 Right: (2) 2 X 6 7512 lb



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Summary

Mark	=	MB 08
Section	=	1-3/4 X 11-7/8 LVL [LVL (2.0E)]
Center Span	=	19.33 ft
Right Cantilever	=	3 ft
Result	=	Section adequate by 39 % - Load Combo. No.3 DL + RLL - Live Load Deflection

MB 08 1-3/4 X 11-7/8 LVL [LVL (2.0E)]

Distributed Loads

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	1.50	0.00	1.50	22.33

Point Loads

Ref.	a (ft)	RLL (lb)	FLL (lb)	DL (lb)	Total (lb)
MB 09-L	22.33	461	0	425	886

Dead Loads

Self Weight BSW = 6 plf

Allowable Stress

Shear Stress Fv = 285 psi
Bending Stress Fb = 2600 psi

Beam Adjustment Factors

Load Duration Cd = 1.15
Form CF = 1.00
Repetative Cr / Cv = 1.00

Load Reduction Factors

Live Load LLRF = 1.00

Beam Section Properties

Width b = 1.75 in.
Depth d = 11.875 in.
Area A = 21 in.²
Shear Area As = 14 in.²
Moment of Inertia I = 244 in.⁴
Section Modulus S = 41 in.³

Beam Material Properties

Modulus of Elasticity E = 2000000 psi
Flexure Stiffness EI = 488000000 lb-in.²

Req'd bearing length = 0.47" 1.49"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.24	63 %	0.35	64 %
Cantilever		0.12	39 %	0.12	59 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	1,030	4,541	77 %
Moment (lb-ft)	2,920	10,263	72 %

Support Reactions

	Left	Right
RLL (lb)	362	1,016
FLL (lb)	0	0
DL (lb)	260	937
Total (lb)	623	1,953
Post	Capacity	

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Summary**MB 09 1-3/4 X 11-7/8 LVL [LVL (2.0E)]**

Mark = MB 09
 Section = 1-3/4 X 11-7/8 LVL [LVL (2.0E)]
 Left Cantilever = 3.83 ft
 Center Span = 16 ft
 Result = Section adequate by 62 % - Load Combo. No.3 DL + RLL - Total Load Deflection

Distributed Loads

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	1.50	0.00	1.50	19.83

Dead Loads

Self Weight BSW = 6 plf

Allowable Stress

Shear Stress $F_v = 285$ psi
 Bending Stress $F_b = 2600$ psi

Beam Adjustment Factors

Load Duration $C_d = 1.15$
 Form $CF = 1.00$
 Repetitive $Cr / C_v = 1.00$

Load Reduction Factors

Live Load LLRF = 1.00

Beam Section Properties

Width $b = 1.75$ in.
 Depth $d = 11.875$ in.
 Area $A = 21$ in.²
 Shear Area $A_s = 14$ in.²
 Moment of Inertia $I = 244$ in.⁴
 Section Modulus $S = 41$ in.³

Beam Material Properties

Modulus of Elasticity $E = 2000000$ psi
 Flexure Stiffness $EI = 488000000$ lb-in.²

Req'd bearing length = 0.67" 0.43"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.11	79 %	0.20	75 %
Cantilever		0.00	66 %	0.06	62 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	538	4,541	88 %
Moment (lb-ft)	2,181	10,263	79 %

Support Reactions

	Left	Right
RLL (lb)	461	300
FLL (lb)	0	0
DL (lb)	425	261
Total (lb)	886	561
Post	Capacity	

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Summary

Mark	=	MB 10
Section	=	4 X 10 DF #2 [DF #2]
Span	=	6.5 ft
Result	=	Section adequate by 26 % - Load Combo. No.2 DL + FLL - Flexure

MB 10 4 X 10 DF #2 [DF #2]**Distributed Loads**

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	2.00	0.00	2.00	3.00
Roof	25	17	1.50	0.00	1.50	6.50
Floor	40	12	6.50	0.00	6.50	6.50

Point Loads

Ref.	a (ft)	RLL (lb)	FLL (lb)	DL (lb)	Total (lb)
RB 01-L	3	156	0	455	611

Dead Loads

Self Weight	BSW =	8 plf
Cont. Dead Load	W =	101 plf

Allowable Stress

Shear Stress	Fv =	180 psi
Bending Stress	Fb =	900 psi

Beam Adjustment Factors

Load Duration	Cd =	1.00
Form	CF =	1.20
Repetative	Cr / Cv =	1.00

Load Reduction Factors

Live Load	LLRF =	1.00
-----------	--------	------

Beam Section Properties

Width	b =	3.5 in.
Depth	d =	9.25 in.
Area	A =	32 in. ²
Shear Area	As =	22 in. ²
Moment of Inertia	I =	231 in. ⁴
Section Modulus	S =	50 in. ³

Beam Material Properties

Modulus of Elasticity	E =	1600000 psi
Flexure Stiffness	EI =	369000000 lb-in. ²

Req'd bearing length = 0.88" 0.8"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.03	87 %	0.07	80 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	1,495	3,885	62 %
Moment (lb-ft)	3,317	4,492	26 %

Support Reactions

	Left	Right
RLL (lb)	1,515	229
FLL (lb)	2,080	845
DL (lb)	3,030	905
Total (lb)	5,727	1,750

Post	Capacity
------	----------

Left: 6 X 6 18847 lb
Right: 2 X 6 (1) K 5124 lb



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Summary

Mark = MB 11
 Section = 4 X 10 DF #2 [DF #2]
 Span = 6.5 ft
 Result = Section adequate by 13 % - Load Combo. No.3 DL + RLL - Flexure

MB 11 4 X 10 DF #2 [DF #2]

Distributed Loads

Class	LL (psf)	DL (psf)	Load Start		Load End	
			Trib (ft)	x1 (ft)	Trib (ft)	x2 (ft)
Roof	25	17	8.71	3.00	8.71	6.50
Roof	25	17	1.50	0.00	1.50	6.50
Floor	40	12	1.33	0.00	1.33	6.50

Point Loads

Ref.	a (ft)	RLL (lb)	FLL (lb)	DL (lb)	Total (lb)
RB 02-R	3	680	0	761	1,442

Dead Loads

Self Weight BSW = 8 plf
 Cont. Dead Load W = 120 plf

Allowable Stress

Shear Stress Fv = 180 psi
 Bending Stress Fb = 900 psi

Beam Adjustment Factors

Load Duration Cd = 1.15
 Form CF = 1.20
 Repetative Cr / Cv = 1.00

Load Reduction Factors

Live Load LLRF = 1.00

Beam Section Properties

Width b = 3.5 in.
 Depth d = 9.25 in.
 Area A = 32 in.²
 Shear Area As = 22 in.²
 Moment of Inertia I = 231 in.⁴
 Section Modulus S = 50 in.³

Beam Material Properties

Modulus of Elasticity E = 1600000 psi
 Flexure Stiffness EI = 369000000 lb-in.²

Req'd bearing length = 0.83" 1.06"

Deflection Criteria

Span	DLD (in.)	LLD (in.)	Result	TLD (in.)	Result
Center	0.00	0.04	84 %	0.08	74 %

Strength Criteria

Condition	Maximum	Allowable	Result
Shear (lb)	1,870	4,468	58 %
Moment (lb-ft)	4,501	5,166	13 %

Support Reactions

	Left	Right
RLL (lb)	693	1,404
FLL (lb)	173	1,408
DL (lb)	1,125	2,782
Total (lb)	1,819	4,891
Post	Capacity	

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Date:	12/1/2023	Prepared by:
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5.1 Foundation - Concrete Walls / Footings

Foundation Walls and Footings

ACI 318-14 Section 14

Foundation Wall				Line Loads			Point Loads			Continuous Footing			Spot Footing		
		Soil		RLL	FLL	DL	RLL	FLL	DL	Brg. Press.			Brg. Press.		
Section	Mark	(ft)	Result	(plf)	(plf)	(plf)	(plf)	(plf)	(plf)	Mark	(psf)	Result	Mark	(psf)	Result
1	FW4D	3.5	100%	255	128	722	126	0	98	FT15	962	36%			
2	FW4F	3.5	100%	413	207	1,451	0	0	0	FT18	1,277	15%			
3				0	316	205	0	0	0	FT15	417	72%			
4	FW4D	3.5	100%	0	0	300	455	624	909	FT15	240	84%	SF30	1,036	31%
5	FW4F	3.5	100%	250	340	1,380	0	0	0	FT15	1,458	3%			