

Lateral Calculations

New Townhouse
7614 SE Washington Street
Portland, Oregon

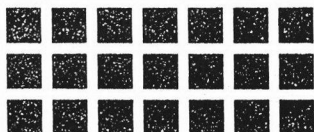


Engineer was retained in a limited capacity for this project. Design is based upon information provided by the client who is solely responsible for the accuracy of same. No responsibility and/or liability are assumed by, or are to be assigned to, the engineer for items beyond that shown on these sheets.

Job No. 18-05

Contact: Rich Silkett, PE
Thursday, January 25, 2018

Revised 03/04/18



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: _____

CLIENT: _____ JOB NO. _____

DATE: _____ BY: _____ SHEET NO. _____

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

17.180493/96/97/98/500-PS

SCAD

Lateral Analysis

7614 SE Washington St

18-05

Design Criteria:

Simplified Method

Seismic:

Site Class: D

R = 6

Ss = 0.995

S1 = 0.414

Sds = 0.731

Sd1 = 0.438

Ridge = 32

feet

Eave = 26

feet

h = 29

feet

F = 1.0

Wdl = 1.0

$$V = ((F \times Sds) \times Wdl) / R$$

$$V = 0.122 \quad Wdl$$

Design Dead Loads:

Roof = 17 psf

Wall = 12 psf

Floor = 15 psf

Seismic (Transverse) Front-Rear

Roof = 11968 lbs

Upper Floor = 7095 lbs

Main Floor = 7095 lbs

Wallperp = 10320 lbs

Base:

Vperp = 4444 lbs

Seismic (Longitudinal) Side-Side

Wallprl = 77400 lbs

Base:

Vprl = 11752 lbs

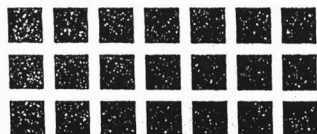
Note

This is a 3-story above grade wood-frame structure with a garage and living facility.

The Ground Level has full ht concrete foundation walls on all

exterior sides. The interior party wall and stairway walls are wood framed.

This calculation will be used for both 'A' & 'B' units.

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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 01/25/18 BY: Rich SHEET NO. 41

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wind: 3-Story Structure
Light-Frame Wood Construction
2014 OSSC
Exposure 'B'

$I = 1.0$
 $V_{3s} = 120$ mph

Edge Strip (Es)

Es = 3.0 ft < --- Use this
Es = 1.9 ft
Es = 10.4 ft

Ez = 6.0 ft
Roof Angle = 39.8 degrees

Horizontal Loads

Basic Pressures (psf): ASCE 7-10, Figure 28.6-1

Zone =	A	B	C	D	
Ps =	17.8	12.2	14.2	9.8	Case 1
	17.8	12.2	14.2	9.8	Case 2

Wind Pressure: (Transverse) Front-Rear

Roof = 11808 lbs
Main = 12527 lbs
Lower = 12565 lbs
Windperp = 36901 lbs
Wind Governs!
 $V_{perp}/1.4 = 2557$ lbs

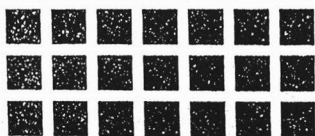
Wind Pressure: (Longitudinal) Side-Side

Roof = 2716 lbs
Main = 4028 lbs
Lower = 4028 lbs
Windprl = 10772 lbs
Wind Governs!
 $V_{prl}/1.4 = 8395$ lbs
Use Seismic force for
Interior Units (all levels)

Seismic Distribution Parallel to Ridge

$V_{prl} = 8.39$ kips

H	Wdl	HxWdl	%	Vstory	
29	11.64	337.56	54.07	4.54	kips
18	10.62	191.16	30.62	2.57	kips
9	10.62	95.58	15.31	1.29	kips
Total =		624.3			



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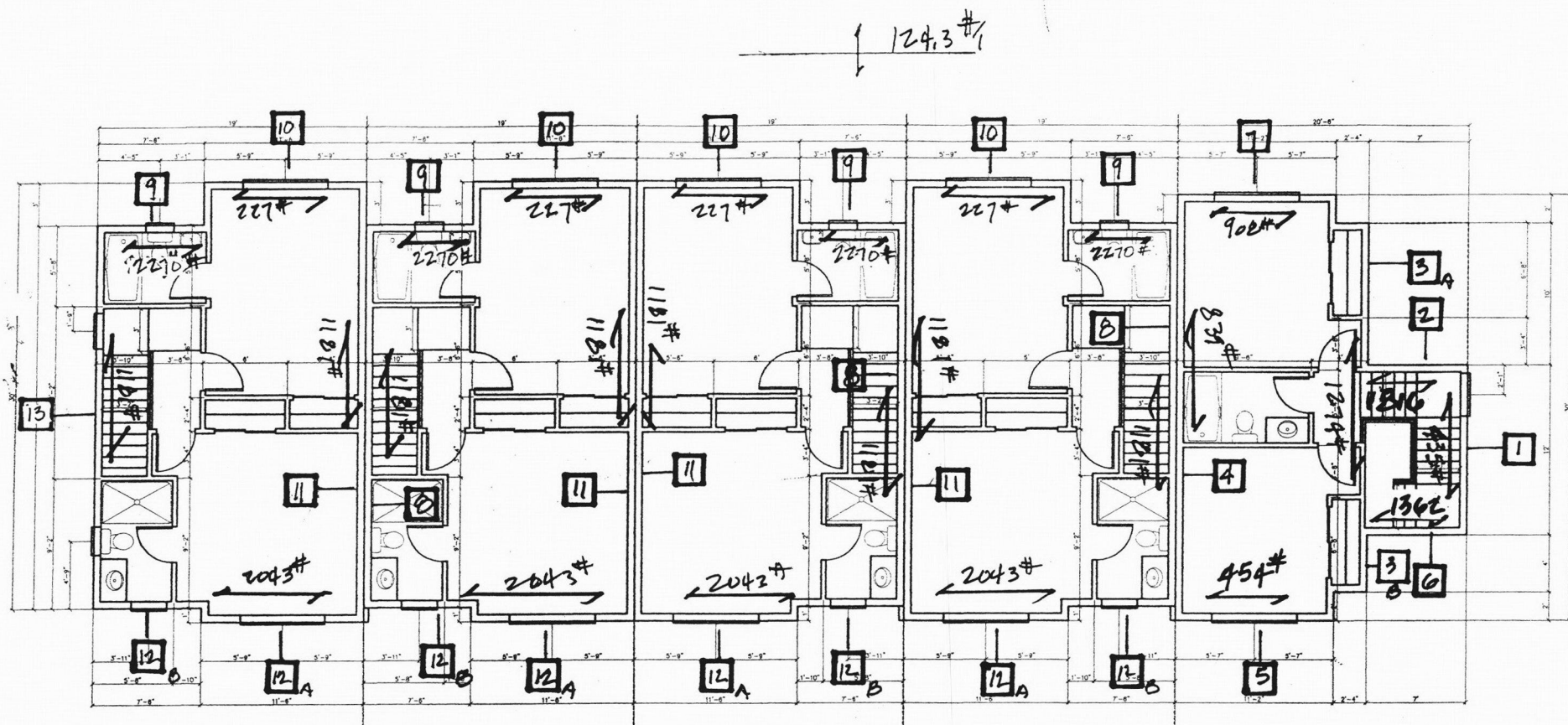
CIVIL - STRUCTURAL

JOB: 7614 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 01/25/18 BY: Rich SHEET NO. 62

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX



UPPER FLOOR SHEARWALLS

7614 SE Washington St.

Jesse Cereghino

01/25/18 Rich

18-05

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Roof Diaphragm:

Horizontal Forces and Shears - Wind (Transverse) Front-Rear

Shear = 210.9 plf

Horizontal Forces and Shears - Wind (Longitudinal) Side-Side

Shear = 14.3 plf

Roof Diaphragm

Use 1/2" CDX Plywood (Index 48/24)

W/8d @ 6" O.C. edges

8d @ 12" O.C. field

Upper Floor Shearwalls:

Wind Perpendicular to Ridge

Upper = 124.3 plf

Seismic Parallel to Ridge

Upper = 118.1 plf (Wind)

Upper = 151.3 plf (Seismic) < - Governs

Wall	Len	Force(lbs)	Shear(plf)	Type
1	8.5	435	51.2	A
2	7	1816	259.4	A
3	14	1274	91.0	A
4	30	839	28.0	A
5	5	454	90.8	A
6	7	1362	194.6	A
7	5	908	181.6	A
8	27	1181	43.7	A
9	5.5	2270	412.7	C
10	5.5	227	41.3	A
11	31	1181	38.1	A
12	10.5	2043	194.6	A
13	22.5	1181	52.5	A

Upper Floor Diaphragm:

Horizontal Forces and Shears - Wind (Transverse) Front-Rear

Shear = 160.4 plf

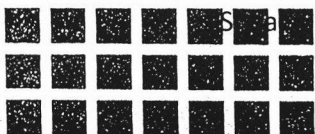
Upper Floor Diaphragm

Use 3/4" CDX Plywood (Index 32/16)

W/10d @ 6" O.C. edges

10d @ 12" O.C. field

Horizontal Forces and Shears - Wind (Longitudinal) Side-Side



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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St.

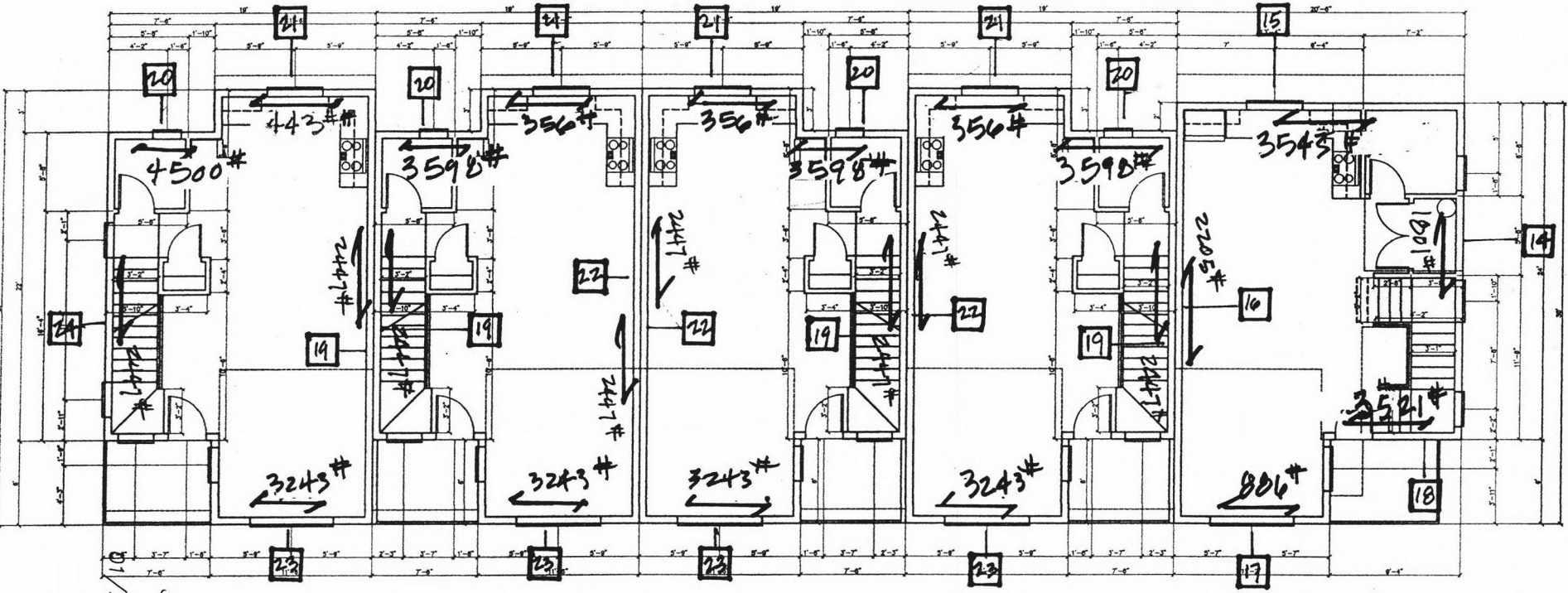
CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 01/25/18 BY: Rich SHEET NO. 4

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

133.3' +

143.4' +



MAIN FLOOR SHEARWALLS

7614 SE Washington St.
Jesse Cereghino
01/25/18 Rich

18-05
LS

Main Shearwalls:

Wind Perpendicular to Ridge

Main = 133.3 plf

Wind Parallel to Ridge

Main = 143.9 plf (Wind) < - - End Units

Main = 85.7 plf (Seismic) < - - Interior

Wall	Len	Force(lbs)	Shear(plf)	Type
14	15.5	1801	116.2	A
15	16.5	3543	214.7	A
16	30	2205	73.5	A
17	5	886	177.2	B
18	6.5	3521	541.7	C
19	22	2447	111.2	A
20	5.5	3598	654.2	C
21	7.5	356	47.5	A
22	31	2447	78.9	A
23	5.5	3243	589.6	C
24	15	2447	163.1	A

Main Floor Diaphragm:

Horizontal Forces and Shears - Wind (Transverse) Front-Rear

Shear = 131.8 plf

Horizontal Forces and Shears - Wind (Longitudinal) Side-Side

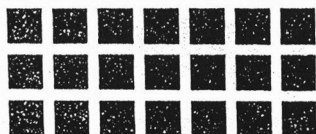
Shear = 56.7 plf

Main Floor Diaphragm

Use 3/4" CDX Plywood (Index:32/16)

W/10d @ 6" O.C. edges

10d @ 12" O.C. field

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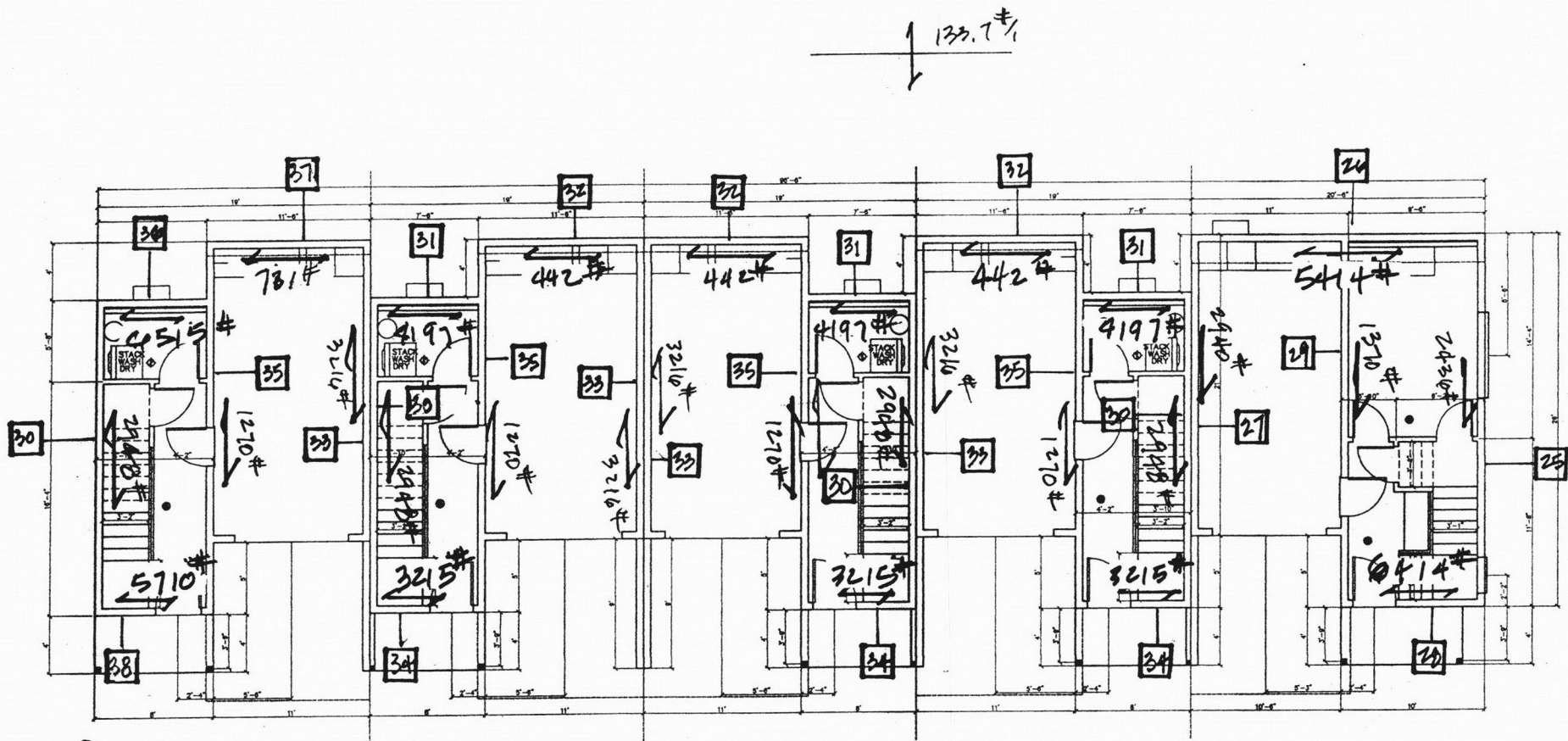
CIVIL - STRUCTURAL

JOB: 7614 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 01/25/18 BY: Rich SHEET NO. 16

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LOWER FLOOR SHEARWALLS

7614 SE Washington St.

Jesse Cereghino

01/25/18 Rich

18-05

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Lower Shearwalls:

Wind Perpendicular to Ridge

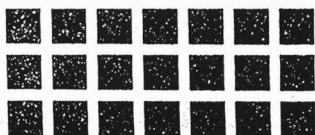
Lower = 133.7 plf

Wind Parallel to Ridge

Lower = 143.9 plf (Wind) < - - End Units

Lower = 42.8 plf (Seismic) < - - Interior

Wall	Len	Force(lbs)	Shear(plf)	Type
25	16.5	2436	147.6	A
26	20.5	5141	250.8	C
27	30	2940	98.0	A
28	6	6414	1069.0	C < - Ea. Face
29	23	1370	59.6	A
30	22	2948	134.0	A
31	7.5	4197	559.6	C
32	11.5	442	38.4	A
33	21	3216	153.1	A
34	4	3215	803.8	C
35	23	1270	55.2	A
36	8	6515	814.4	C
37	11.5	731	63.6	A
38	4	5710	1427.5	C < - Ea. Face

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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 01/25/18 BY: Rich SHEET NO. LB

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Component & Cladding - Roof

Roof Slope 4:12

L = 30 ft

h = 29 ft

$\lambda = 1.0$

Sp = 24 inches Truss Spacing

Wdl = 24 plf

Effective Area

be = 10.0 ft

Area = 300.0 sq.ft

Design Loads:

Wdl = 24 plf

Wll = 50 plf

Wtl = 74 plf

Zone 1

Negative Pressure

p = -15.2 psf

w = -30.4 plf

Zone 2

Negative Pressure

p = -23 psf

w = -46 plf

Zone 3

Negative Pressure

p = -35.5 psf

w = -71 plf

Zone 1

Positive Pressure

p = 8.1 psf

w = 16.2 plf

Zone 2

Positive Pressure

p = 8.1 psf

w = 16.2 plf

Zone 3

Positive Pressure

p = 8.1 psf

w = 16.2 plf

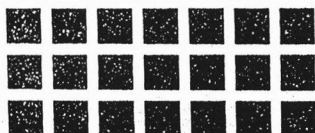
Number of nails per 4'x8' area = 48 Nails

Max Tension per Nail = -23.7 lbs per nail

Withdrawal capacity (8d) '05 NDS, Table 11.2C

Pn = 89.6 lbs per nail

Safety Factor = 3.8



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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 01/25/18 BY: Rich SHEET NO. 19

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Component & Cladding - Wall

L = 9 ft
Sp = 16 Stud Spacing

Effective Area

be = 3.0 ft
Area = 27.0 sq ft

Zone 4

Negative Pressure
p = -22.6 psf
w = -30.1 plf

Zone 5

Negative Pressure
p = -27.2 psf
w = -36.2 plf

Zone 4

Positive Pressure
p = 20.8 psf
w = 27.7 plf

Zone 5

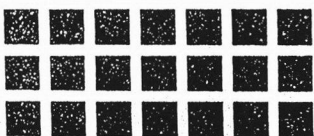
Positive Pressure
p = 20.8 psf
w = 27.7 plf

Number of nails per 4'x8' area = 48 Nails

Max Tension per Nail = 18.1 lbs per nail

Withdrawal capacity (8d) '05 NDS, Table 11.2C

Pn = 89.6 lbs per nail
Safety Factor = 4.9



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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 01/25/18 BY: Rich SHEET NO. L10

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 1

Len = 8.5 ft

Mot = 3480 ft-lbs

Resisting Moment (Mr)

Mr = -5925 ft-lbs

Uplift (T)

T = -9 lbs

Dead Loads:

Roof = 68 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -164 plf

No holdowns required

Wall 2

Len = 7 ft

Mot = 14528 ft-lbs

Resisting Moment (Mr)

Mr = -4851 ft-lbs

Uplift (T)

T = 1660 lbs

Dead Loads:

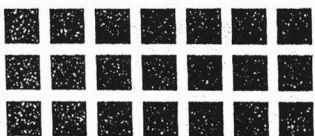
Roof = 102 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -198 plf

Use Simpson MST60 straps

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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 24

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 3a

Len = 10 ft

Mot = 7280 ft-lbs

Resisting Moment (Mr)

Mr = -9050 ft-lbs

Uplift (T)

T = 185 lbs

Dead Loads:

Roof = 85 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -181 plf

Use Simpson MST60 straps

Wall 3b

Len = 4 ft

Mot = 2912 ft-lbs

Resisting Moment (Mr)

Mr = -1448 ft-lbs

Uplift (T)

T = 511 lbs

Dead Loads:

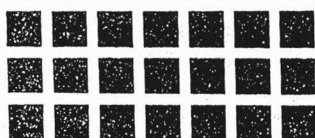
Roof = 85 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -181 plf

Use Simpson MST60 straps

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CIVIL - STRUCTURAL

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 12

Wall 4

Len = 30 ft

Mot = 6712 ft-lbs

Resisting Moment (Mr)

Mr = -73800 ft-lbs

Uplift (T) T = -1252 lbs

Dead Loads:

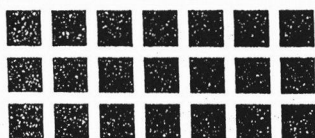
Roof = 68 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -164 plf

No holdowns required



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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L13

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 5**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.17 ft
Total Full Ht Segments (Sw) = 5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 44.8 percent

Opening Adjustment Factor (Co) = 0.65

Try 15/32 CDX Sheathing

8d @ 6" O.C. v = 393

Capacity of Perforated Wall

Va = 2555 lbs

OK Greater than 454

lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1118 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 139.7 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 3632 ft-lbs

Dead Loads:

Roof = 68 plf

Floor = 0 plf

Wall = 96 plf

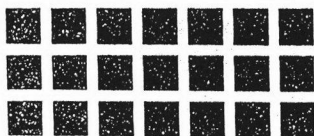
Resisting Moment (Mr)

Total DL = -164 plf

Mr = -10231 ft-lbs

Uplift (T) T = -224 lbs

No holdowns required

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CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 414

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 6

Len = 7 ft

Dead Loads:

Roof = 102 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -198 plf

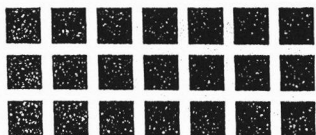
Mot = 10896 ft-lbs

Resisting Moment (Mr)

Mr = -4851 ft-lbs

Uplift (T) T = 1141 lbs

Use Simpson MST60 straps



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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 415

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 7**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.17 ft
Total Full Ht Segments (Sw) = 5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 44.8 percent

Opening Adjustment Factor (Co) = 0.65

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 2555 lbs

OK Greater than 908 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8)

T = 2235 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9)

v = 279.4 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 8172 ft-lbs

Dead Loads:

Roof = 238.0 plf

Floor = 0 plf

Wall = 108 plf

Resisting Moment (Mr)

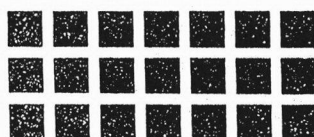
Total DL = -346.0 plf

Mr = -21585 ft-lbs

Uplift (T)

T = -428 lbs

No holdowns required



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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 616

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 8

Len = 27 ft

Mot = 9448 ft-lbs

Resisting Moment (Mr)

Mr = -72171 ft-lbs

Uplift (T) T = -1254 lbs

Dead Loads:

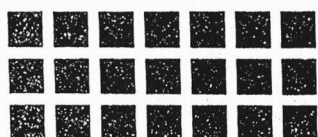
Roof = 102 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -198 plf

No holdowns required



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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 11

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 9**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 7.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 73.3 percent
Opening Adjustment Factor (Co) = 0.79
Try 15/32 CDX Sheathing
8d @ 3" O.C. v = 930

Capacity of Perforated Wall

Va = 8082 lbs OK Greater than 2270 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 4180 lbs Use (2)2x6 stud each end of perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 522.4 plf Use (2)SDS25312 @ 12" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 20430 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

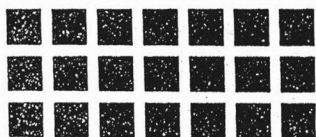
Wall = 108 plf

Total DL = -176.0 plf

Resisting Moment (Mr)

Mr = -4950 ft-lbs

Uplift (T) T = 2328 lbs Use Simpson MST60 straps



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CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L10

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 10**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 47.8 percent
Opening Adjustment Factor (Co) = 0.66
Try 15/32 CDX Sheathing
8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 2853 lbs OK Greater than 227 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 500 lbs Use (2) 2x6 stud each end of perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 62.5 plf Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 2043 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

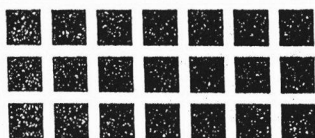
Wall = 108 plf

Resisting Moment (Mr)

Total DL = -176.0 plf

Mr = -11638 ft-lbs

Uplift (T) T = -430 lbs No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 619

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 11

Len = 31 ft

Mot = 9448 ft-lbs

Resisting Moment (Mr)

Mr = -78802 ft-lbs

Uplift (T) T = -1220 lbs

Dead Loads:

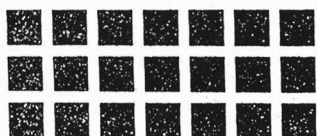
Roof = 68 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -164 plf

No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT# Jesse Cereghino JOB NO. 18-05

DATE# 03/06/18 BY# Rich SHEET NO. L20

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 12a**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 47.8 percent

Opening Adjustment Factor (Co) = 0.78

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Force in wall section 12a = 1070 lbs

Capacity of Perforated Wall

Va = 3372 lbs

OK Greater than 1070 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1995 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 249.4 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 8560 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

Wall = 96 plf

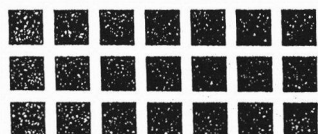
Resisting Moment (Mr)

Total DL = -164.0 plf

Mr = -10845 ft-lbs

Uplift (T) T = 179 lbs

Use Simpson MST60 straps



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT# Jesse Cereghino JOB NO. 18-05

DATE# 03/06/18 BY# Rich SHEET NO. 21

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 12b** 2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 7.5 ft
Total Full Ht Segments (Sw) = 5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 66.7 percent

Opening Adjustment Factor (Co) = 0.78

Try 15/32 CDX Sheathing

8d @ 6" O.C. v = 393

Force in wall section 12b = 973 lbs

Capacity of Perforated Wall

Va = 3065 lbs

OK Greater than: 973 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1996 lbs

Use (2)2x6 stud each end of
perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 249.5 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 7784 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

Wall = 96 plf

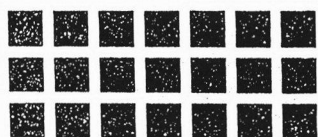
Total DL = -164.0 plf

Resisting Moment (Mr)

Mr = -4613 ft-lbs

Uplift (T) T = 669 lbs

Use Simpson MST60 straps



Benchmark
Engineering
CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 222

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 13**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 27 ft
Total Full Ht Segments (Sw) = 22.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 83.3 percent
Opening Adjustment Factor (Co) = 0.85
Try 15/32 CDX Sheathing
8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 15032 lbs OK Greater than 1181 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 494 lbs Use (2)2x6 stud each end of perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 61.8 plf Use (SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 10629 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

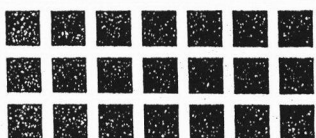
Wall = 108 plf

Total DL = -176.0 plf

Resisting Moment (Mr)

Mr = -64152 ft-lbs

Uplift (T) T = -1032 lbs No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L23

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 14**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 21 ft
Total Full Ht Segments (Sw) = 15.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 73.8 percent

Opening Adjustment Factor (Co) = 0.79

Try 15/32 CDX Sheathing.

8d @ 6" O, v = 393

Capacity of Perforated Wall

Va = 4812 lbs

OK Greater than 1801 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1177 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 147.1 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 19689 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 150 plf

Wall = 204 plf

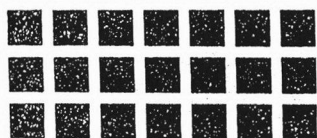
Resisting Moment (Mr)

Total DL = -422.0 plf

Mr = -93051 ft-lbs

Uplift (T) T = -1721 lbs

No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 124

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 15** 2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 20.5 ft
Total Full Ht Segments (Sw) = 16.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 80.5 percent
Opening Adjustment Factor (Co) = 0.84
Try 15/32 CDX Sheathing
8d @ 6" O.C. v = 393

Capacity of Perforated Wall

Va = 5447 lbs OK Greater than 3543 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 2045 lbs Use (2) 2x6 stud each end of perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 255.6 plf Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 39151 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

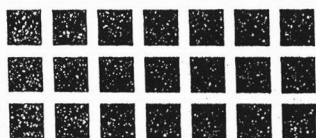
Wall = 204 plf

Total DL = -519.0 plf

Resisting Moment (Mr)

Mr = -109055 ft-lbs

Uplift (T) T = -1282 lbs No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L25

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 16

Len = 30 ft

Mot = 26557 ft-lbs

Resisting Moment (Mr)

Mr = -189900 ft-lbs

Uplift (T) T = -2913 lbs

Dead Loads:

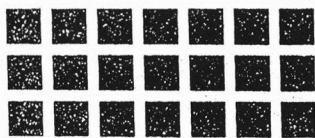
Roof = 68 plf

Floor = 150 plf

Wall = 204 plf

Total DL = -422 plf

No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L26

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 17**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.17 ft
Total Full Ht Segments (Sw) = 5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) 44.8 percent

Opening Adjustment Factor (Co) 0.55

Try 15/32 CDX Sheathing

8d @ 4" O. v = 710

Capacity of Perforated Wall

Va = 1953 lbs

OK Greater than 886 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 2577 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 322.2 plf

Use (2) SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 11606 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

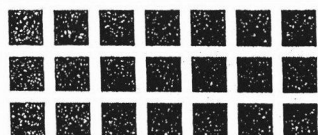
Wall = 204 plf

Resisting Moment (Mr)

Total DL = -519.0 plf

Mr = -32378 ft-lbs

Uplift (T) T = -700 lbs No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT# Jesse Cereghino JOB NO. 18-05

DATE# 03/06/18 BY# Rich SHEET NO. 627

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 18

Len = 6.5 ft

Mot = 42585 ft-lbs

Resisting Moment (Mr)

Mr = -7732 ft-lbs

Uplift (T)

T = 5838 lbs

Dead Loads:

Roof = 102 plf

Floor = 60 plf

Wall = 204 plf

Total DL = -366 plf

Use simpson MST60 straps

Wall 19

Len = 22 ft

Mot = 31471 ft-lbs

Resisting Moment (Mr)

Mr = -102124 ft-lbs

Uplift (T)

T = -1355 lbs

Dead Loads:

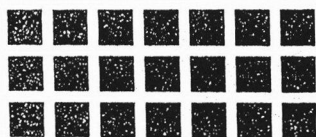
Roof = 68 plf

Floor = 150 plf

Wall = 204 plf

Total DL = -422 plf

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L28

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 20**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 7.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 73.3 percent

Opening Adjustment Factor (Co) = 0.79

Try 15/32 CDX Sheathing

8d @ 3" O. v = 930

Capacity of Perforated Wall

Va = 4041 lbs

OK Greater than 886 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8)

T = 1631 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9)

v = 203.9 plf

Use (2) SDS25312 @ 12" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 11606 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

Wall = 204 plf

Total DL = 519.0 plf

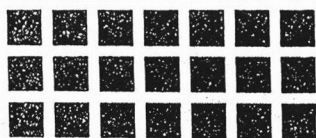
Resisting Moment (Mr)

Mr = -14597 ft-lbs

Uplift (T)

T = 380 lbs

Use Simpson MST60 straps

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L29

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 21** 2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.5 ft
Total Full Ht Segments (Sw) = 7.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 65.2 percent
Opening Adjustment Factor (Co) = 0.66
Try 15/32 CDX Sheathing
8d @ 6" O.C. v = 393

Capacity of Perforated Wall

Va = 1945 lbs OK Greater than 356 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 575 lbs Use (2)2x6 stud each end of perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 71.9 plf Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 5020 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

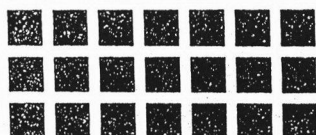
Wall = 204 plf

Total DL = -519.0 plf

Resisting Moment (Mr)

Mr = -34319 ft-lbs

Uplift (T) T = -1354 lbs No holdowns required



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 630

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 22

Len = 30 ft

Mot = 28735 ft-lbs

Resisting Moment (Mr)

Mr = -189900 ft-lbs

Dead Loads:

Roof = 68 plf

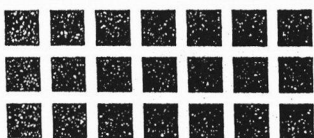
Floor = 150 plf

Wall = 204 plf

Total DL = -422 plf

Uplift (T) T = -2840 lbs

No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT# Jesse Cereghino JOB NO. 18-05

DATE# 03/06/18 BY# Rich SHEET NO. L31

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 23**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 47.8 percent
Opening Adjustment Factor (Co) = 0.56
Try 15/32 CDX Sheathing
8d @ 3" O. v = 930

Capacity of Perforated Wall

Va = 3581 lbs OK Greater than 3243 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 8423 lbs Use (2)2x6 stud each end of perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 1052.9 plf
Use (2)Simpson SDS25312 @ 12" O.C.

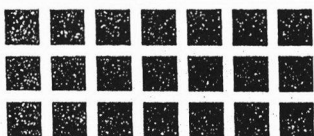
Wall Overturning (Sect 4.3.6.4.2.1)Dead Loads:

Mot = 45531 ft-lbs
Roof = 255.0 plf
Floor = 60 plf
Wall = 204 plf
Total DL = -519.0 plf

Resisting Moment (Mr)

Mr = -34319 ft-lbs

Uplift (T) T = 2169 lbs Use Simpson MST60 straps



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 132

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 24**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 17.5 ft
Total Full Ht Segments (Sw) = 15 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 85.7 percent
Opening Adjustment Factor (Co) = 0.83

Try 15/32 CDX Sheathing
8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 4893 lbs OK Greater than 2447 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1572 lbs Use (2) 2x6 stud each end of perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 196.5 plf Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 31471 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

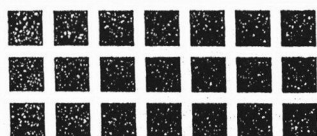
Wall = 204 plf

Resisting Moment (Mr)

Total DL = -519.0 plf

Mr = -79472 ft-lbs

Uplift (T) T = -926 lbs No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 233

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 25** 2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 22.5 ft
Total Full Ht Segments (Sw) = 16.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) 73.3 percent

Opening Adjustment Factor (Co) 0.71

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 9208 lbs OK Greater than 2436 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1664 lbs

Use (2)2x6 stud each end of
perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 207.9 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 39812 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 150 plf

Wall = 312 plf

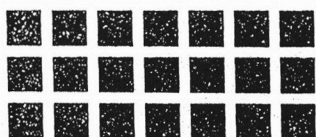
Resisting Moment (Mr)

Total DL = -530.0 plf

Mr = -134156 ft-lbs

Uplift (T) T = -1808 lbs

No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L34

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 26

Len = 20.5 ft

Mot = 84334 ft-lbs

Resisting Moment (Mr)

Mr = -131748 ft-lbs

Dead Loads:

Roof = 255 plf

Floor = 60 plf

Wall = 312 plf

Total DL = -627 plf

Uplift (T)

T = 258 lbs

Use Simpson HDU4 holdowns

Wall 27

Len = 30 ft

Mot = 50812 ft-lbs

Resisting Moment (Mr)

Mr = -238500 ft-lbs

Dead Loads:

Roof = 68 plf

Floor = 150 plf

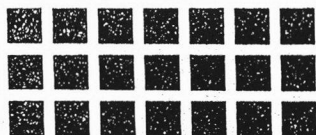
Wall = 312 plf

Total DL = -530 plf

Uplift (T)

T = -3076 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 635

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 28

Len = 6 ft

Mot = 96790 ft-lbs

Resisting Moment (Mr)

Mr = -8532 ft-lbs

Uplift (T) T = 15278 lbs

Dead Loads:

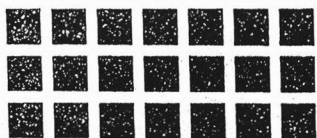
Roof = 102 plf

Floor = 60 plf

Wall = 312 plf

Total DL = -474 plf

Use (2) Simpson HDU8 holdowns
W/12" Vertical offset on 6x6 stud



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L30

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 29**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 26 ft
Total Full Ht Segments (Sw) = 23 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 88.5 percent

Opening Adjustment Factor (Co) = 0.88

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 15909 lbs

OK Greater than 1370 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8)

T = 542 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9)

v = 67.7 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 10960 ft-lbs

Dead Loads:

Roof = 0.0 plf

Floor = 150 plf

Wall = 96 plf

Resisting Moment (Mr)

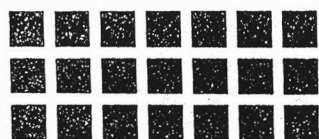
Total DL = -246.0 plf

Mr = -83148 ft-lbs

Uplift (T)

T = -1497 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 131

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 30

Len = 22 ft

Mot = 55556 ft-lbs

Resisting Moment (Mr)

Mr = -140844 ft-lbs

Dead Loads:

Roof = 102 plf

Floor = 180 plf

Wall = 300 plf

Total DL = -582 plf

Uplift (T) T = -1316 lbs

No holdowns required

Wall 31

Len = 7.5 ft

Mot = 84717 ft-lbs

Resisting Moment (Mr)

Mr = -18506 ft-lbs

Dead Loads:

Roof = 238 plf

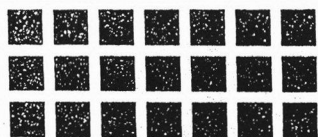
Floor = 120 plf

Wall = 300 plf

Total DL = -658 plf

Uplift (T) T = 9815 lbs

Use Simpson HDU11 holdowns

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L38

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 32

Len = 11.5 ft

Mot = 8642 ft-lbs

Resisting Moment (Mr)

Mr = -44634 ft-lbs

Dead Loads:

Roof = 255 plf

Floor = 120 plf

Wall = 300 plf

Total DL = -675 plf

Uplift (T)

T = -1577 lbs

No holdowns required

Wall 33

Len = 21 ft

Mot = 57968 ft-lbs

Resisting Moment (Mr)

Mr = -143987 ft-lbs

Dead Loads:

Roof = 68 plf

Floor = 285 plf

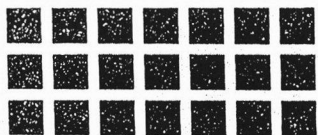
Wall = 300 plf

Total DL = -653 plf

Uplift (T)

T = -1354 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 639

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 34

Len = 4 ft

Mot = 28935 ft-lbs

Resisting Moment (Mr)

Mr = -3592 ft-lbs

Uplift (T)

T = 6695 lbs

Dead Loads:

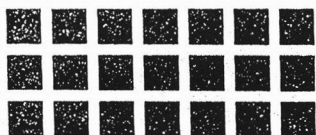
Roof = 221 plf

Floor = 120 plf

Wall = 108 plf

Total DL = 449 plf

Use Simpson HDU8 holdown



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L40

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 35**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 26 ft
Total Full Ht Segments (Sw) = 23 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 88.5 percent

Opening Adjustment Factor (Co) = 0.86

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 15547 lbs

OK Greater than 1270 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 514 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 64.2 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 19048 ft-lbs

Dead Loads:

Roof = 0.0 plf

Floor = 90 plf

Wall = 108 plf

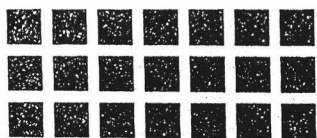
Total DL = -198.0 plf

Resisting Moment (Mr)

Mr = -66924 ft-lbs

Uplift (T) T = -812 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT# Jesse Cereghino JOB NO. 18-05

DATE# 03/06/18 BY# Rich SHEET NO. 41

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 36

Len = 8 ft

Mot = 58635 ft-lbs

Resisting Moment (Mr)

Mr = -12448 ft-lbs

Dead Loads:

Roof = 221 plf

Floor = 60 plf

Wall = 108 plf

Total DL = -389 plf

Uplift (T) T = 6396 lbs

Use Simpson HDU8 holdown

Wall 37

Len = 11.5 ft

Mot = 11939 ft-lbs

Resisting Moment (Mr)

Mr = -42386 ft-lbs

Dead Loads:

Roof = 221 plf

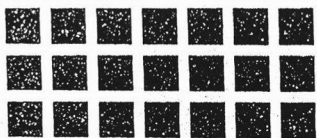
Floor = 120 plf

Wall = 300 plf

Total DL = -641 plf

Uplift (T) T = -1173 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. L42

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 38

Len = 4 ft

Mot = 51390 ft-lbs

Resisting Moment (Mr)

Mr = -3320 ft-lbs

Uplift (T) T = 12350 lbs

Dead Loads:

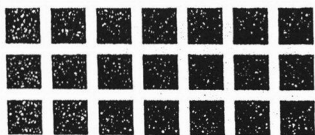
Roof = 187 plf

Floor = 120 plf

Wall = 108 plf

Total DL = 415 plf

Use (2) Simpson HDU8 holdowns
W/12" Vertical Offset on 6x6 stud



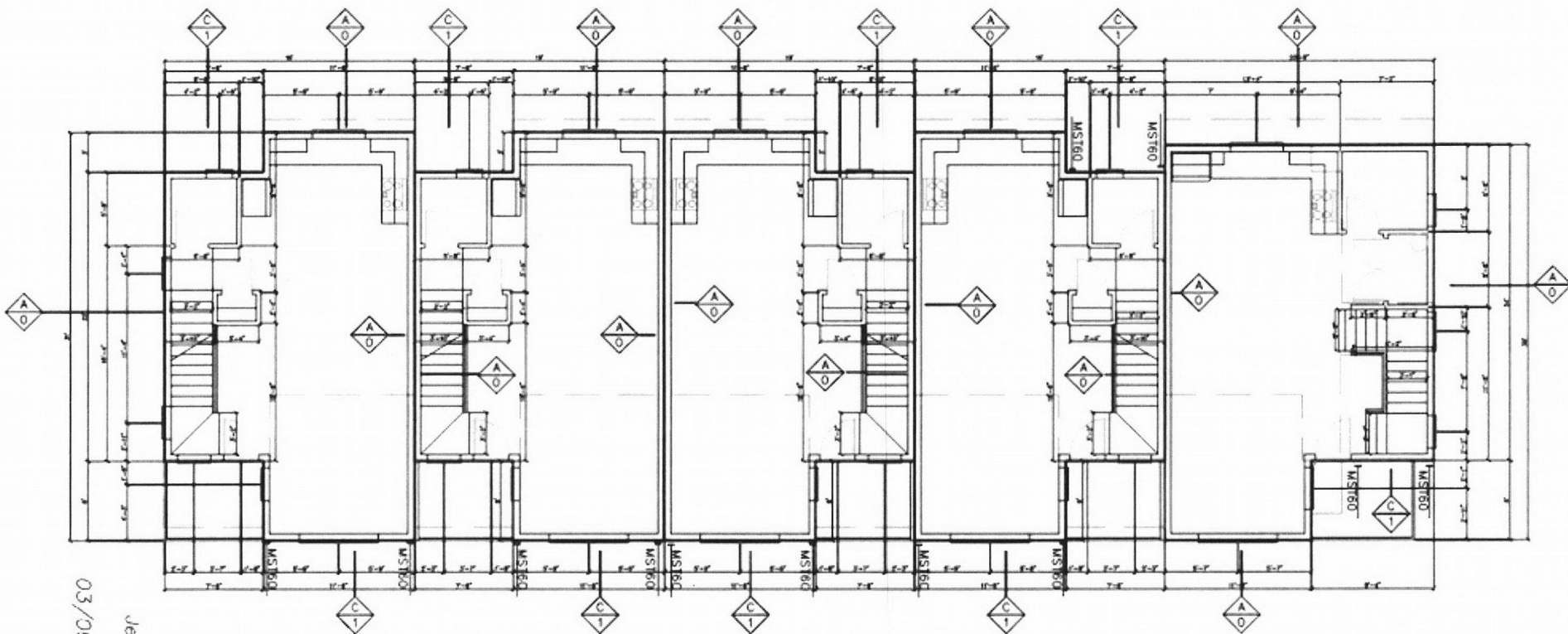
**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7614 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 18-05

DATE: 03/06/18 BY: Rich SHEET NO. 43



MAIN FLOOR SHEARWALLS

RECEIVED
APR 17 2018
SDS
DOCUMENT SERVICES

Revised 7/2/18

7614 SE Washington St

Jesse Cereghino

18-05

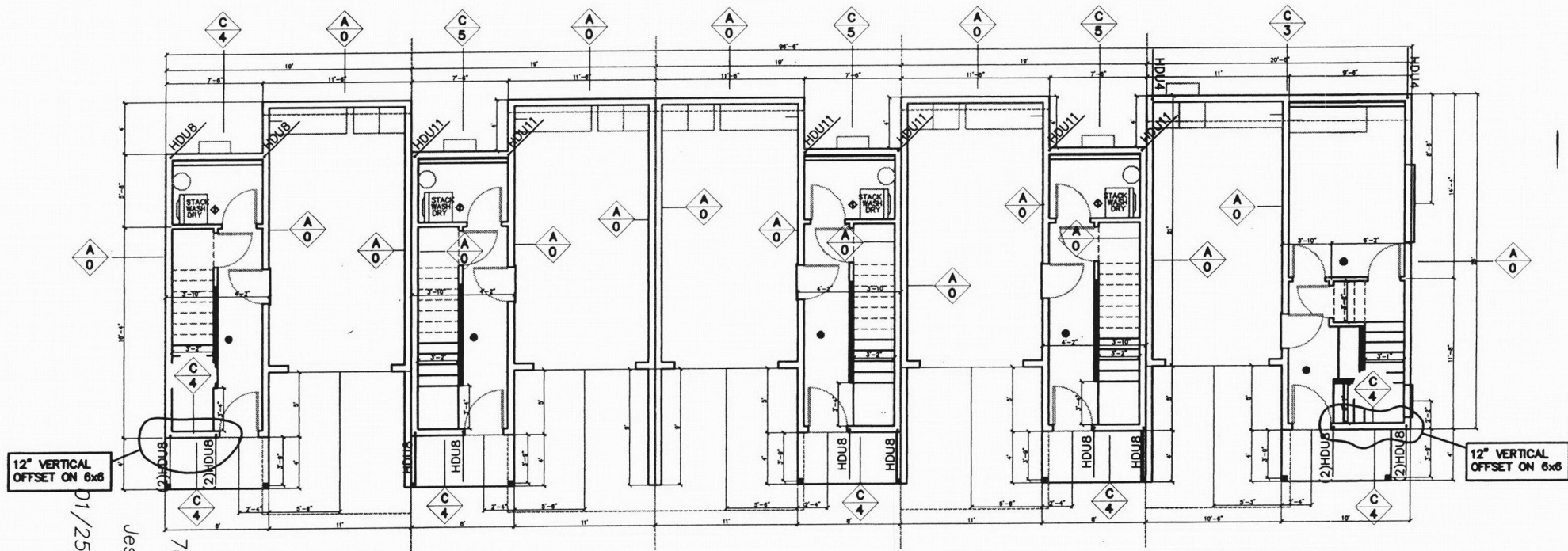
03/06/18

Rich

L46

Scanned

17-180493/96/97/98/500-R5

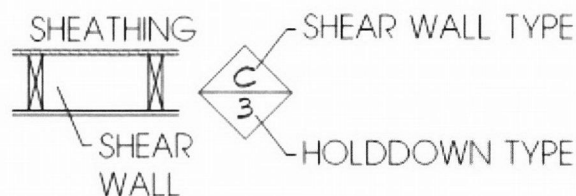


LOWER FLOOR SHEARWALLS

7614 SE Washington St.
Jesse Cereghino
01/25/18 Rich

18-05

L40



• HOLDDOWN/STRAP LOCATION

SHEARWALL SHEATHING SCHEDULE

TYPE	THICKNESS	EDGE NAILING	SILL TO FLOOR	SILL TO FOUNDATION
A	15/32"	8D @ 6" O.C.	SDS25312 @ 16" O.C.	5/8"~ A.B. @ 36" O.C.
B	15/32"	8D @ 4" O.C.	(2) SDS25312 @ 16" O.C.	5/8"~ A.B. @ 24" O.C.
C	15/32"	8D @ 3" O.C.	(2) SDS25312 @ 12" O.C.	5/8"~ A.B. @ 18" O.C.

SHEARWALL HOLDDOWN SCHEDULE

#	TYPE
0	NO HOLDDOWN REQ'D
1	SIMPSON MST60

MST60 – FILL 23 HOLES TOP AND 23 HOLES BOTTOM

#	TYPE	AB DIA	COL
2	SIMPSON HDU2	5/8"	2-2X
3	SIMPSON HDU4	5/8"	2-2X
4	SIMPSON HDU8	7/8"	2-2X
5	SIMPSON HDU11	1"	6X

ALL HDU FILL ALL HOLES

RECEIVED

APR 17 2018

BDS
DOCUMENT SERVICES

7614 SE Washington St

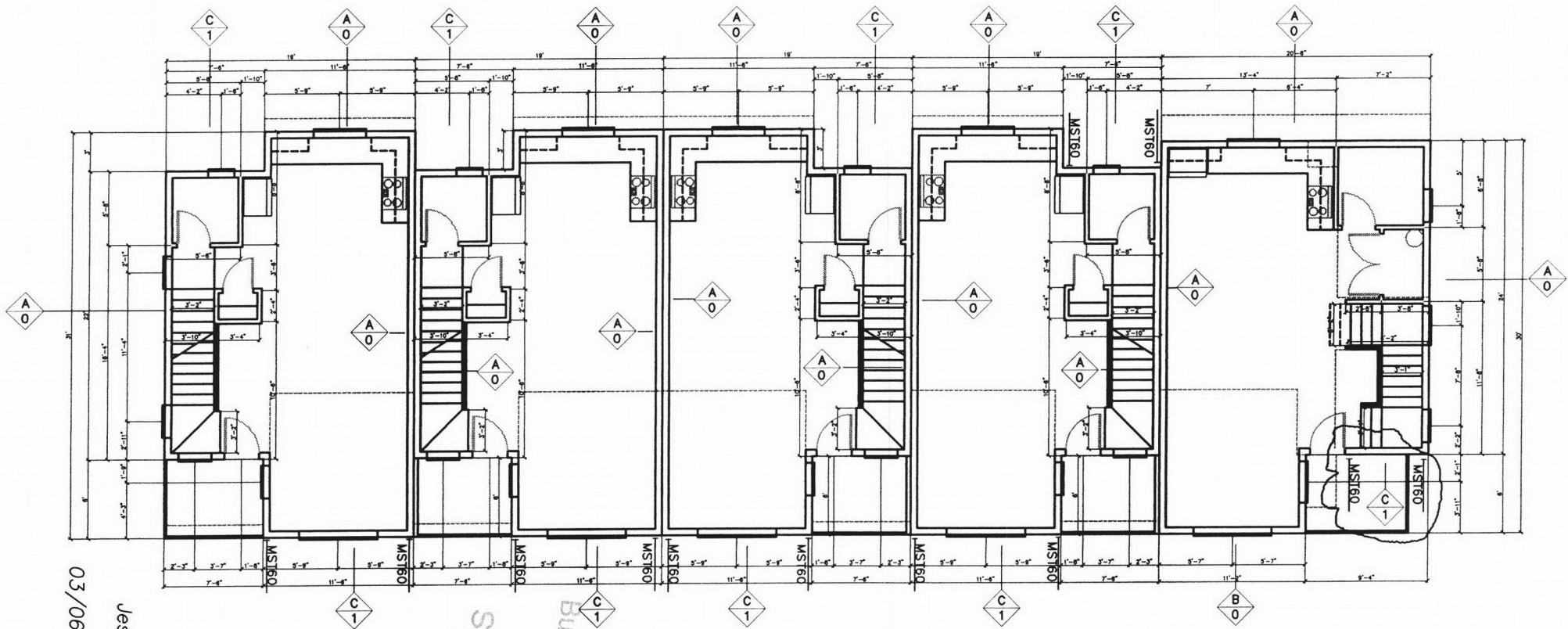
Jesse Cereghino

18-05

03/06/18

Rich

L47



MAIN FLOOR SHEARWALLS

City of Portland
Bureau of Development Services
VOID
Save for Reference Only

Revised 7/2/18

7614 SE Washington St

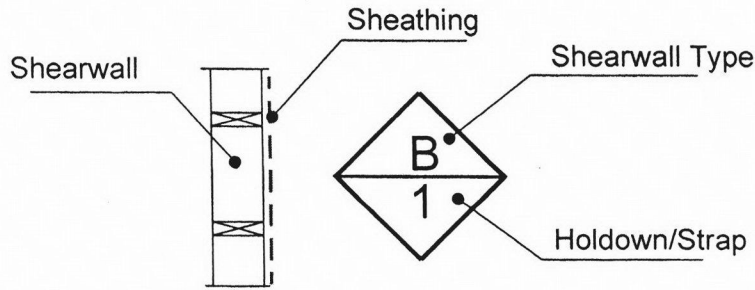
Jesse Cereghino

18-05

03/06/18

Rich

LA5



= HOLDOWN/STRAP LOCATION

SHEARWALL KEY

City of Portland
Bureau of Development Services

VOID:

Save for Reference Only

PLYWOOD or OSB 'RATED SHEATHING' or GYPSUM BOARD SHEATHING
SHEAR WALL PANEL DESCRIPTION

TYPE	SHEATHING THICKNESS	NAILING @ PANEL EDGES	SILL CONNECTOR & SPACING	
			SILL-TO-FLOOR	SILL-TO-FOUNDATION
[A]	15/32"	8d NAILS @ 6" O.C.	SDS25312 @ 16" O.C.	5/8"Ø Anchor Bolt @ 36" O.C.
[B]	15/32"	8d NAILS @ 4" O.C.	(2)SDS25312 @ 16" O.C.	5/8"Ø Anchor Bolt @ 24" O.C.
[C]	15/32"	8d NAILS @ 3" O.C.	(2) SDS25312 @ 12" O.C.	5/8"Ø Anchor Bolt @ 18" O.C.
[J]	1/2" GB	5d NAILS @ 7" O.C. UNBLKD	(1)16d NAILS @ 12" O.C.	1/2"Ø Anchor Bolt @ 48" O.C.
[K]	1/2" GB	5d NAILS @ 4" O.C. UNBLKD	(1)16d NAILS @ 12" O.C.	1/2"Ø Anchor Bolt @ 48" O.C.
[L]	5/8" GB	6d NAILS @ 8/12" O.C. BLKD	(1)16d NAILS @ 12" O.C.	1/2"Ø Anchor Bolt @ 48" O.C.

HOLDOWNS & STRAPS

HOLDOWN DESCRIPTION	
TYPE	
0	NO HOLDOWN REQUIRED
1	SIMPSON MST60
2	SIMPSON HDU2
3	SIMPSON HDU4
4	SIMPSON HDU8

7614 SE Washington St

Jesse Cereghino

18-05

03/06/18

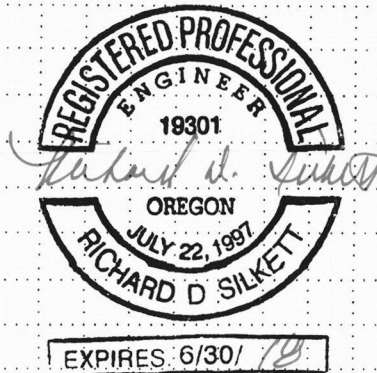
Rich

Revised 03/06/18

L47

Lateral Calculations

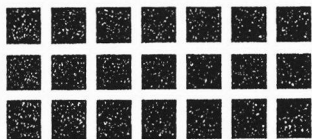
New Townhouse
7622 SE Washington Street
Portland, Oregon



Engineer was retained in a limited capacity for this project. Design is based upon information provided by the client who is solely responsible for the accuracy of same. No responsibility and/or liability are assumed by, or are to be assigned to, the engineer for items beyond that shown on these sheets.

Job No 17-83
Contact: Rich Silkett, PE
Thursday, January 25, 2018

Revised 03/06/18



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: _____
CLIENT: _____ JOB NO. _____
DATE: _____ BY: _____ SHEET NO. _____

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

17-258825/47/53/57/58/PS

Lateral Analysis7622 SE Washington St
17-83

Design Criteria:

Simplified Method

Seismic:

Site Class D

R = 6

Ss = 0.995

S1 = 0.414

Sds = 0.731

Sd1 = 0.438

Ridge = 32

feet

Eave = 26

feet

h = 29

feet

F = 1.0

Wdl = 1.0

$$V = ((F \times Sds) \times Wdl) / R$$

V = 0.122

Wdl

Design Dead Loads:

Roof = 17 psf

Wall = 12 psf

Floor = 15 psf

Seismic (Transverse) Front-Rear

Roof = 11968 lbs

Upper Floor = 7095 lbs

Main Floor = 7095 lbs

Wallperp = 10320 lbs

Base:

Vperp = 4444 lbs

Seismic (Longitudinal) Side-Side

Wallprl = 77400 lbs

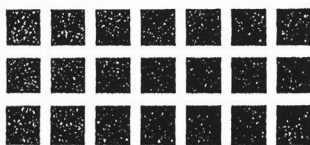
Base:

Vprl = 11752 lbs

Note

This is a 3-story above grade wood-frame structure with a garage and living facility. The Ground Level has full ht concrete foundation walls on all exterior sides. The interior party wall and stairway walls are wood framed.

This calculation will be used for both 'A' & 'B' units.

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St.
CLIENT: Jesse Cereghino JOB NO. 17-83
DATE: 01/25/18 BY: Rich SHEET NO. 41

Wind: 3-Story Structure
 Light-Frame Wood Construction
 2014 OSSC
 Exposure 'B'

I = 1.0
 V3s = 120 mph

Edge Strip (Es)

Es = 3.0 ft < --- Use this
 Es = 1.9 ft
 Es = 10.4 ft

Ez = 6.0 ft
 Roof Angle = 39.8 degrees

Horizontal Loads

Basic Pressures (psf): ASCE 7-10, Figure 28.6-1

Zone =	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	
Ps =	17.8	12.2	14.2	9.8	Case 1
	17.8	12.2	14.2	9.8	Case 2

Wind Pressure: (Transverse) Front-Rear

Wind Pressure: (Longintudinal) Side-Side

Roof = 11808 lbs
 Main = 12527 lbs
 Lower = 12565 lbs
 Windperp = 36901 lbs

Wind Governs!

Vperp/1.4 = 2557 lbs

Roof = 2716 lbs
 Main = 4028 lbs
 Lower = 4028 lbs
 Windprl = 10772 lbs

Wind Governs!

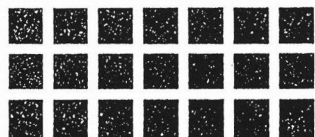
Vprl/1.4 = 8395 lbs

Use Seismic force for
 Interior Units (all levels)

Seismic Distribution Parallel to Ridge:

Vprl = 8.39 kips

H	Wdl	HxWdl	%	Vstory	
29	11.64	337.56	54.07	4.54	kips
18	10.62	191.16	30.62	2.57	kips
9	10.62	95.58	15.31	1.29	kips
Total =		624.3			



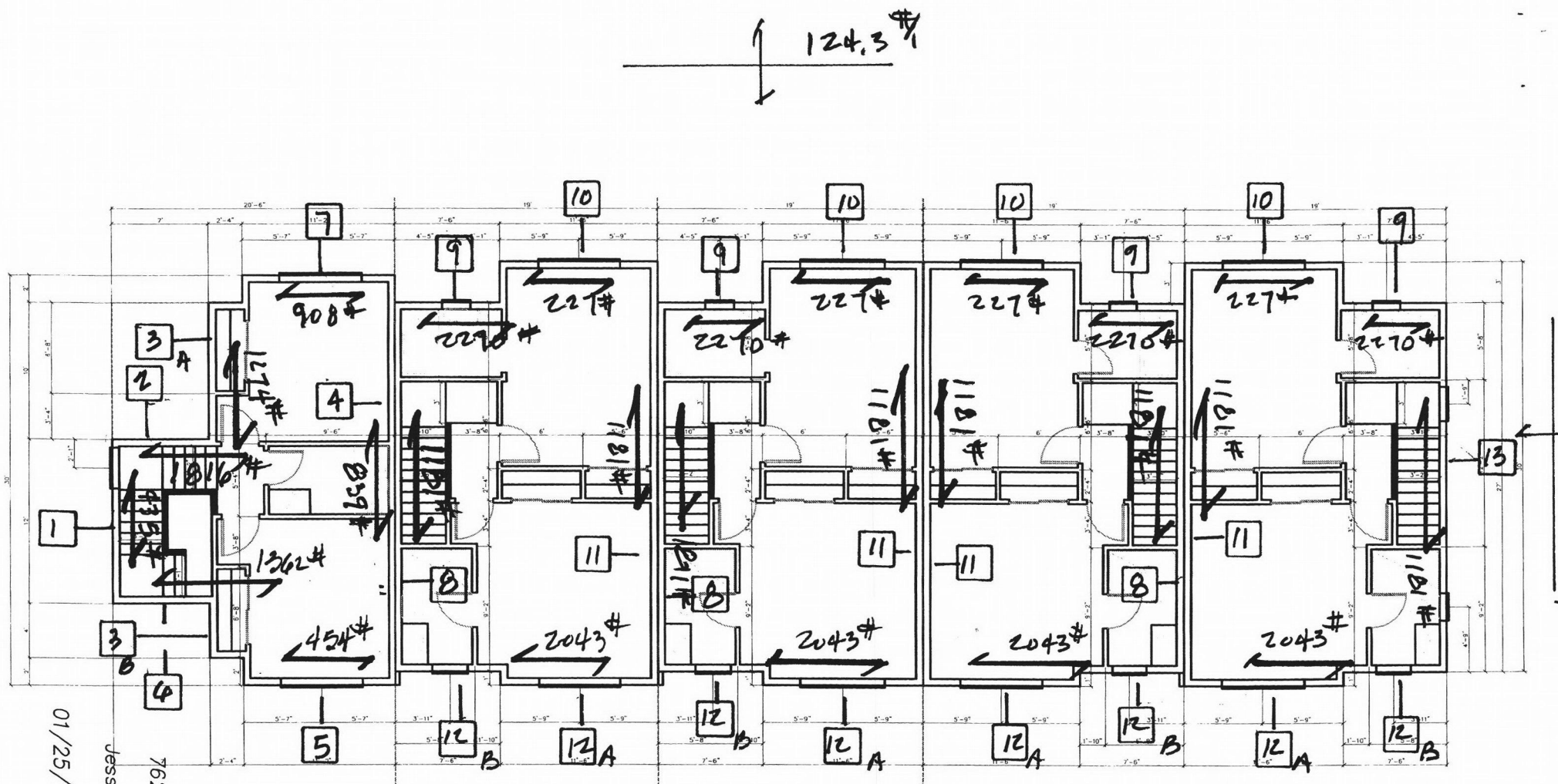
**Benchmark
 Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 01/25/18 BY: Rich SHEET NO. 12



Roof Diaphragm:

Horizontal Forces and Shears - Wind (Transverse) Front-Rear

Shear = 210.9 plf

Horizontal Forces and Shears - Wind (Longitudinal) Side-Side

Shear = 14.3 plf

Roof Diaphragm

Use 1/2" CDX Plywood (Index 48/24)

W/8d @ 6" O.C. edges

8d @ 12" O.C. field

Upper Floor Shearwalls:

Wind Perpendicular to Ridge

Upper = 124.3 plf

Seismic Parallel to Ridge

Upper = 118.1 plf (Wind)

Upper = 151.3 plf (Seismic) < - - Governs

Wall	Len	Force(lbs)	Shear(plf)	Type
1	8.5	435	51.2	A
2	7	1816	259.4	A
3	14	1274	91.0	A
4	30	839	28.0	A
5	5	454	90.8	A
6	7	1362	194.6	A
7	5	908	181.6	A
8	27	1181	43.7	A
9	5.5	2270	412.7	C
10	5.5	227	41.3	A
11	31	1181	38.1	A
12	10.5	2043	194.6	A
13	22.5	1181	52.5	A

Upper Floor Diaphragm:

Horizontal Forces and Shears - Wind (Transverse) Front-Rear

Shear = 160.4 plf

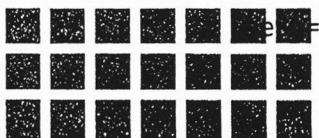
Upper Floor Diaphragm

Use 3/4" CDX Plywood (Index 32/16)

W/10d @ 6" O.C. edges

10d @ 12" O.C. field

Horizontal Forces and Shears - Wind (Longitudinal) Side-Side



Benchmark
Engineering

CIVIL - STRUCTURAL

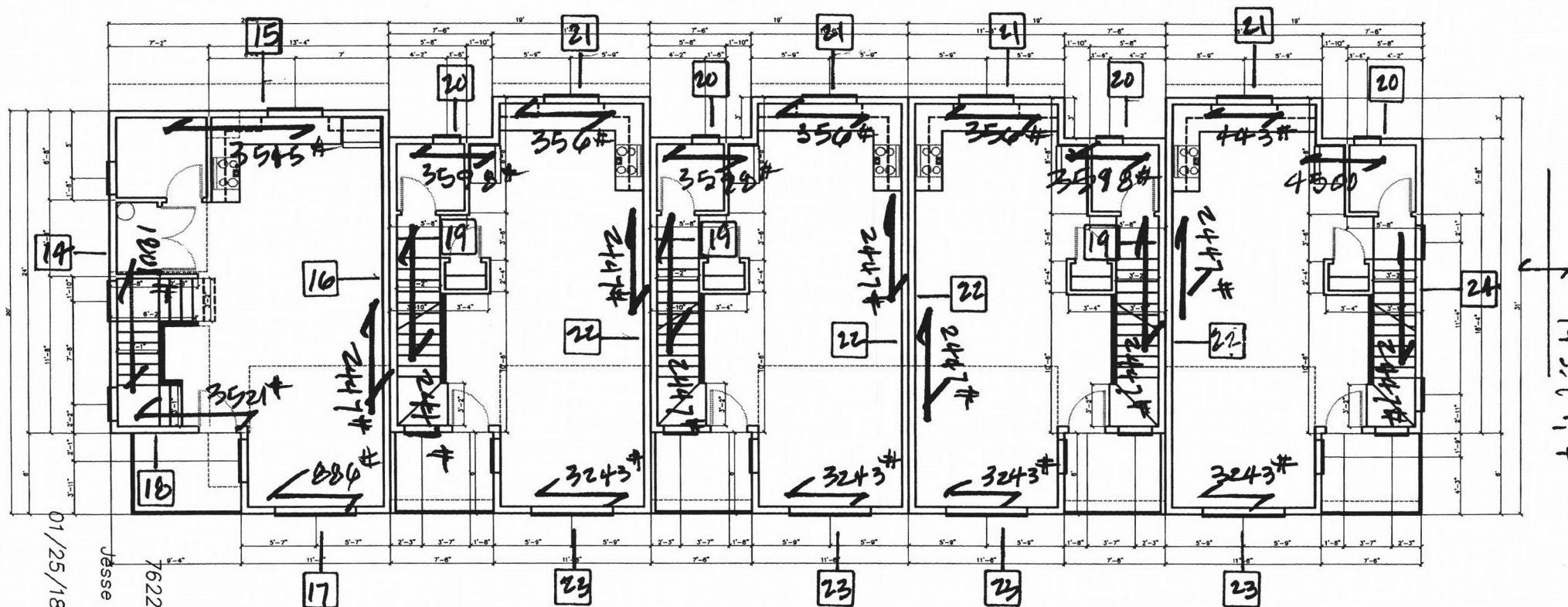
JOB: 7622 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 01/25/18 BY: Rich SHEET NO. 24

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

133.3# +



MAIN FLOOR SHEARWALLS

7622 SE Washington St.
Jesse Cereghino
01/25/18 Rich
17-83
LS

Main Shearwalls:

Wind Perpendicular to Ridge

Main = 133.3 plf

Wind Parallel to Ridge

Main = 143.9 plf (Wind) < - - End Units

Main = 85.7 plf (Seismic) < - - Interior

Wall	Len	Force(lbs)	Shear(plf)	Type
14	15.5	1801	116.2	A
15	16.5	3543	214.7	A
16	30	2205	73.5	A
17	5	886	177.2	B
18	6.5	3521	541.7	C
19	22	2447	111.2	A
20	5.5	3598	654.2	C
21	7.5	356	47.5	A
22	31	2447	78.9	A
23	5.5	3243	589.6	C
24	15	2447	163.1	A

Main Floor Diaphragm:

Horizontal Forces and Shears - Wind (Transverse) Front-Rear

Shear = 131.8 plf

Horizontal Forces and Shears - Wind (Longitudinal) Side-Side

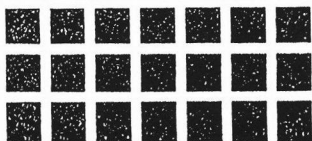
Shear = 56.7 plf

Main Floor Diaphragm

Use 3/4" CDX Plywood (Index 32/16)

W/10d @ 6" O.C. edges

10d @ 12" O.C. field

**Benchmark
Engineering**

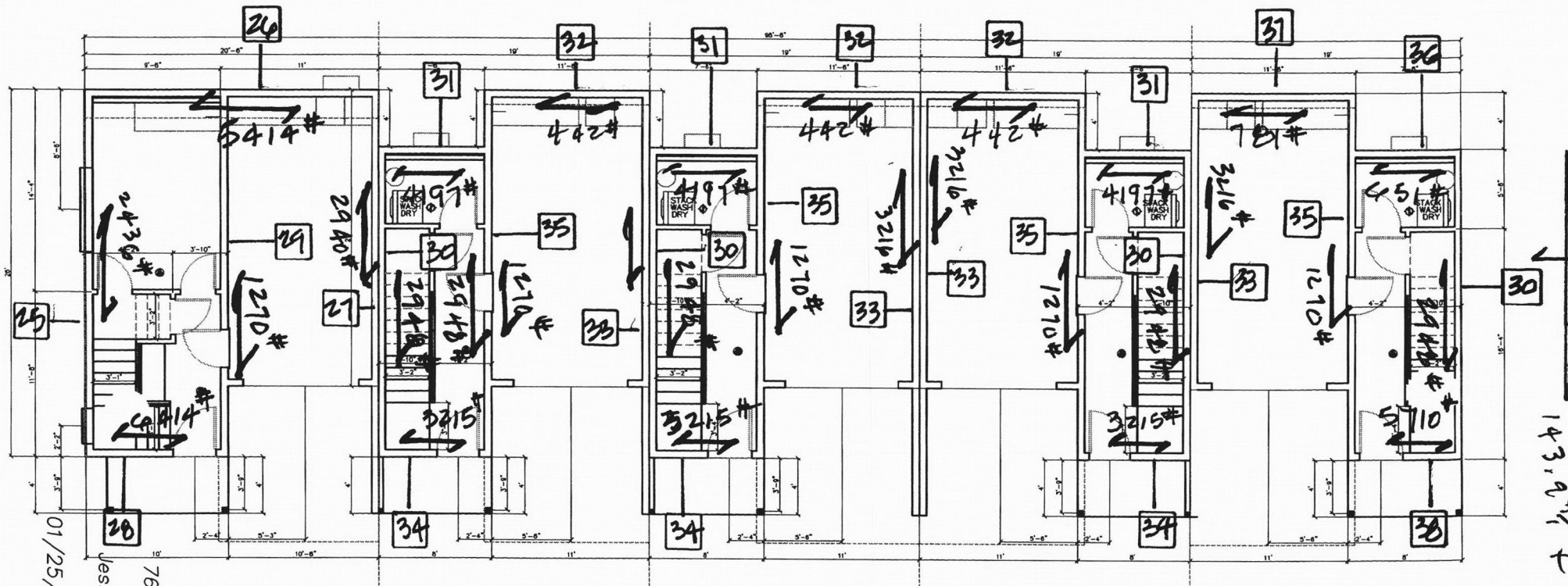
CIVIL - STRUCTURAL

JOB# 7622 SE Washington St.

CLIENT, Jesse Cereghino JOB NO. 17-83

DATE: 01/25/18 BY: Rich SHEET NO. 16

133.7 $\frac{\text{m}}{\text{s}}$



LOWER FLOOR SHEARWALLS

7622 SE Washington St.
Jesse Cereghino 17-83
01/25/18 Rich 67

Lower Shearwalls:

Wind Perpendicular to Ridge

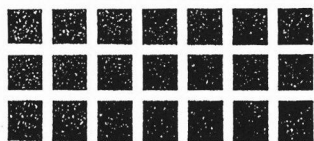
Lower = 133.7 plf

Wind Parallel to Ridge

Lower = 143.9 plf (Wind) < - End Units

Lower = 42.8 plf (Seismic) < - Interior

Wall	Len	Force(lbs)	Shear(plf)	Type
25	16.5	2436	147.6	A
26	20.5	5141	250.8	C
27	30	2940	98.0	A
28	6	6414	1069.0	C < - Ea. Face
29	23	1370	59.6	A
30	22	2948	134.0	A
31	7.5	4197	559.6	C
32	11.5	442	38.4	A
33	21	3216	153.1	A
34	4	3215	803.8	C
35	23	1270	55.2	A
36	8	6515	814.4	C
37	11.5	731	63.6	A
38	4	5710	1427.5	C < - Ea. Face

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 01/25/18 BY: Rich SHEET NO. 28

Component & Cladding - Roof

Roof Slope 4:12

L = 30 ft

h = 29 ft

$\lambda = 1.0$

Sp = 24 inches Truss Spacing

Wdl = 24 plf

Effective Area

be = 10.0 ft

Area = 300.0 sq ft

Design Loads:

Wdl = 24 plf

Wll = 50 plf

Wtl = 74 plf

Zone 1

Negative Pressure

p = -15.2 psf

w = -30.4 plf

Zone 2

Negative Pressure

p = -23 psf

w = -46 plf

Zone 3

Negative Pressure

p = -35.5 psf

w = -71 plf

Zone 1

Positive Pressure

p = 8.1 psf

w = 16.2 plf

Zone 2

Positive Pressure

p = 8.1 psf

w = 16.2 plf

Zone 3

Positive Pressure

p = 8.1 psf

w = 16.2 plf

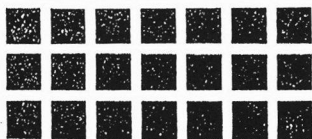
Number of nails per 4'x8' area = 48 Nails

Max Tension per Nail = -23.7 lbs per nail

Withdrawal capacity (8d) '05 NDS, Table 11.2C

Pn = 89.6 lbs per nail

Safety Factor = 3.8



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St.

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 01/25/18 BY: Rich SHEET NO. 49

Wall 1

Len = 8.5 ft

Mot = 3480 ft-lbs

Resisting Moment (Mr)

Mr = -5925 ft-lbs

Uplift (T)

T = -9 lbs

Dead Loads:

Roof = 68 plf

Floor = 0 plf

Wall = 96 plf

Total DL = 164 plf

No holdowns requiredWall 2

Len = 7 ft

Mot = 14528 ft-lbs

Resisting Moment (Mr)

Mr = -4851 ft-lbs

Uplift (T)

T = 1660 lbs

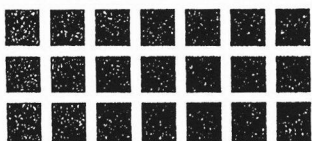
Dead Loads:

Roof = 102 plf

Floor = 0 plf

Wall = 96 plf

Total DL = 198 plf

Use Simpson MST60 straps**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 11

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 3a

Len = 10 ft

Mom = 7280 ft-lbs

Resisting Moment (Mr)

Mr = -9050 ft-lbs

Uplift (T)

T = 185 lbs

Dead Loads:

Roof = 85 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -181 plf

Use Simpson MST60 straps

Wall 3b

Len = 4 ft

Mom = 2912 ft-lbs

Resisting Moment (Mr)

Mr = -1448 ft-lbs

Uplift (T)

T = 511 lbs

Dead Loads:

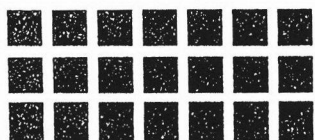
Roof = 85 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -181 plf

Use Simpson MST60 straps

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington StCLIENT# Jesse Cereghino JOB NO. 17-83DATE# 03/06/18 BY# Rich SHEET NO. L12

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 4

Len = 30 ft

Mot = 6712 ft-lbs

Resisting Moment (Mr)

Mr = -73800 ft-lbs

Uplift (T) T = -1252 lbs

Dead Loads:

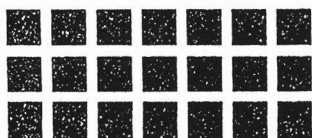
Roof = 68 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -164 plf

No holdowns required



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L13

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 5**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.17 ft
Total Full Ht Segments (Sw) = 5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) 44.8 percent

Opening Adjustment Factor (Co) 0.65
Try 15/32 CDX Sheathing
8d @ 6" O.C. v = 393

Capacity of Perforated Wall

Va = 2555 lbs OK Greater than 454 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1118 lbs Use (2)2x6 stud each end of
perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 139.7 plf Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 3632 ft-lbs

Dead Loads:

Roof = 68 plf

Floor = 0 plf

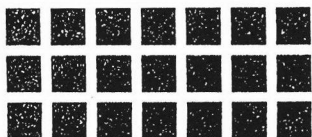
Wall = 96 plf

Resisting Moment (Mr)

Total DL = -164 plf

Mr = -10231 ft-lbs

Uplift (T) T = -224 lbs No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 414

Wall 6

Len = 7 ft

Mot = 10896 ft-lbs

Resisting Moment (Mr)

Mr = -4851 ft-lbs

Uplift (T) T = 1141 lbs

Dead Loads:

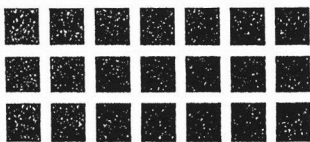
Roof = 102 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -198 plf

Use Simpson MST60 straps



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 619

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 7**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.17 ft
Total Full Ht Segments (Sw) = 5 ft
Maximum Opening Ht (Ho) = 2H/3 ft
Percent Full-ht/Sheathed (Sw/Lw) = 44.8 percent
Opening Adjustment Factor (Co) = 0.65
Try 15/32 CDX Sheathing
8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 2555 lbs OK Greater than 908 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 2235 lbs Use (2) 2x6 stud each end of perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 279.4 plf Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 8172 ft-lbs

Dead Loads:

Roof = 238.0 plf

Floor = 0 plf

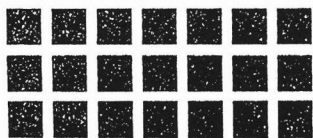
Wall = 108 plf

Total DL = -346.0 plf

Resisting Moment (Mr)

Mr = -21585 ft-lbs

Uplift (T) T = -428 lbs No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 110

Wall 8

Len = 27 ft

Mot = 9448 ft-lbs

Resisting Moment (Mr)

Mr = -72171 ft-lbs

Uplift (T) T = -1254 lbs

Dead Loads:

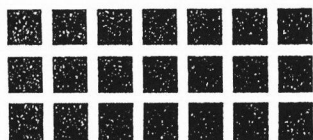
Roof = 102 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -198 plf

No holdowns required



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 217

PERFORATED WALL **Wall 9**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 7.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 73.3 percent

Opening Adjustment Factor (Co) = 0.79

Try 15/32 CDX Sheathing

8d @ 3" O. v = 930

Capacity of Perforated Wall

Va = 8082 lbs

OK Greater than 2270 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 4180 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 522.4 plf

Use (2) SDS25312 @ 12" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 20430 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

Wall = 108 plf

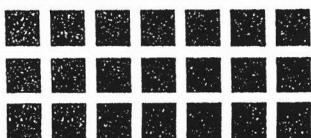
Resisting Moment (Mr)

Total DL = -176.0 plf

Mr = -4950 ft-lbs

Uplift (T) T = 2328 lbs

Use Simpson MST60 straps

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 118

PERFORATED WALL **Wall 10**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.5 ft

Total Full Ht Segments (Sw) = 5.5 ft

Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) 47.8 percent

Opening Adjustment Factor (Co) 0.66

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 2853 lbs

OK Greater than 227 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 500 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 62.5 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 2043 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

Wall = 108 plf

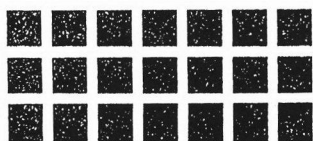
Resisting Moment (Mr)

Total DL = -176.0 plf

Mr = -11638 ft-lbs

Uplift (T) T = -430 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 219

Wall 11

Len = 31 ft

Mot = 9448 ft-lbs

Resisting Moment (Mr)

Mr = -78802 ft-lbs

Uplift (T)

T = -1220 lbs

Dead Loads:

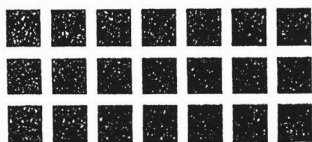
Roof = 68 plf

Floor = 0 plf

Wall = 96 plf

Total DL = -164 plf

No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT# Jesse Cereghino JOB NO. 17-83

DATE# 03/06/18 BY# Rich SHEET NO. L20

PERFORATED WALL **Wall 12a** 2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 47.8 percent

Opening Adjustment Factor (Co) = 0.78 Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Force in wall section 12a = 1070 lbs

Capacity of Perforated Wall

Va = 3372 lbs

OK Greater than 1070 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1995 lbs

Use (2) 2x6 stud each end of
perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 249.4 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 8560 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

Wall = 96 plf

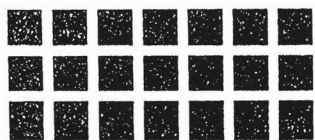
Resisting Moment (Mr)

Total DL = -164.0 plf

Mr = -10845 ft-lbs

Uplift (T) T = 179 lbs

Use Simpson MST60 straps



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 21

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL Wall 12b

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 7.5 ft
Total Full Ht Segments (Sw) = 5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 66.7 percent

Opening Adjustment Factor (Co) = 0.78

Try 15/32 CDX Sheathing
8d @ 6" O. v = 393

Force in wall section 12b = 973 lbs

Capacity of Perforated Wall

Va = 3065 lbs OK Greater than 973 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1996 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 249.5 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 7784 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

Wall = 96 plf

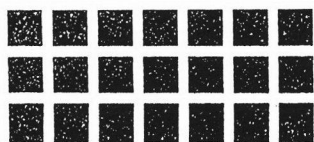
Total DL = 164.0 plf

Resisting Moment (Mr)

Mr = -4613 ft-lbs

Uplift (T) T = 669 lbs

Use Simpson MST60 straps

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 122

PERFORATED WALL **Wall 13**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 27 ft
Total Full Ht Segments (Sw) = 22.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 83.3 percent

Opening Adjustment Factor (Co) = 0.85

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 15032 lbs

OK Greater than 1181 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 494 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 61.8 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 10629 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 0 plf

Wall = 108 plf

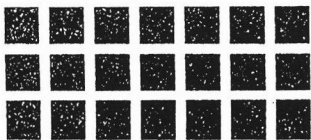
Total DL = 176.0 plf

Resisting Moment (Mr)

Mr = -64152 ft-lbs

Uplift (T) T = -1032 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 23

PERFORATED WALL Wall 14

2008 NDS, Section 4.3.3.4

Overall Length: (Lw) = 21 ft
Total Full Ht Segments (Sw) = 15.5 ft
Maximum Opening Ht (Ho) = 2H/3 ft

Percent Full-ht/Sheathed (Sw/Lw) = 73.8 percent

Opening Adjustment Factor (Co) = 0.79

Try 15/32 CDX Sheathing.

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 4812 lbs

OK Greater than 1801 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1177 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 147.1 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 19689 ft-lbs

Dead Loads:

Roof = 68.0 plf

Floor = 150 plf

Wall = 204 plf

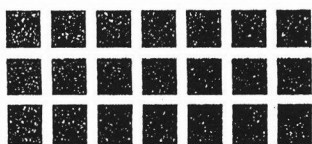
Resisting Moment (Mr)

Total DL = 422.0 plf

Mr = -93051 ft-lbs

Uplift (T) T = -1721 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L24

PERFORATED WALL Wall 15

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 20.5 ft
Total Full Ht Segments (Sw) = 16.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 80.5 percent

Opening Adjustment Factor (Co) = 0.84

Try 15/32 CDX Sheathing

8d @ 6" O.C. v = 393

Capacity of Perforated Wall

Va = 5447 lbs

OK Greater than 3543 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 2045 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 255.6 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 39151 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

Wall = 204 plf

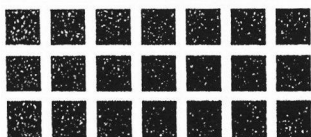
Total DL = 519.0 plf

Resisting Moment (Mr)

Mr = -109055 ft-lbs

Uplift (T) T = -1282 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 125

Wall 16

Len = 30 ft

Dead Loads:

Roof = 68 plf

Floor = 150 plf

Wall = 204 plf

Total DL = 422 plf

Mot = 26557 ft-lbs

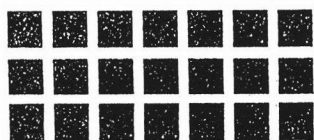
Resisting Moment (Mr)

Mr = -189900 ft-lbs

Uplift (T)

T = -2913 lbs

No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L 26

PERFORATED WALL **Wall 17**

2008 NDS, Section 4.3.3.4

Overall Length: (Lw) = 11.17 ft
Total Full Ht Segments (Sw) = 5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) 44.8 percent

Opening Adjustment Factor (Co) 0.55
Try 15/32 CDX Sheathing
8d @ 4" O. v = 710

Capacity of Perforated Wall

Va = 1953 lbs OK Greater than 886 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 2577 lbs Use (2)2x6 stud each end of
perforate wall

Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 322.2 plf Use (2)SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 11606 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

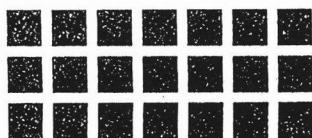
Wall = 204 plf

Total DL = 519.0 plf

Resisting Moment (Mr)

Mr = -32378 ft-lbs

Uplift (T) T = -700 lbs No holdowns required



Benchmark
Engineering

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L27

Wall 18

Len = 6.5 ft

Mot = 42585 ft-lbs

Resisting Moment (Mr)

Mr = -7732 ft-lbs

Uplift (T) T = 5838 lbs

Dead Loads:

Roof = 102 plf

Floor = 60 plf

Wall = 204 plf

Total DL = -366 plf

Use simpson MST60 straps

Wall 19

Len = 22 ft

Mot = 31471 ft-lbs

Resisting Moment (Mr)

Mr = -102124 ft-lbs

Uplift (T) T = -1355 lbs

Dead Loads:

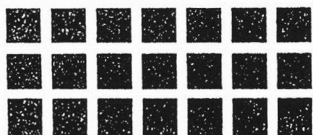
Roof = 68 plf

Floor = 150 plf

Wall = 204 plf

Total DL = -422 plf

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L28

PERFORATED WALL **Wall 20**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 7.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) 73.3 percent

Opening Adjustment Factor (Co) 0.79

Try 15/32 CDX Sheathing

8d @ 3" O. v = 930

Capacity of Perforated Wall

Va = 4041 lbs

OK Greater than 886 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1631 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 203.9 plf

Use (2) SDS25312 @ 12" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 11606 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

Wall = 204 plf

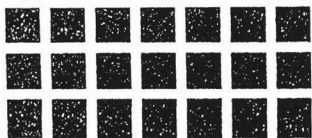
Resisting Moment (Mr)

Total DL = -519.0 plf

Mr = -14597 ft-lbs

Uplift (T) T = 380 lbs

Use Simpson MST60 straps

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 29

PERFORATED WALL **Wall 21**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.5 ft
Total Full Ht Segments (Sw) = 7.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 65.2 percent

Opening Adjustment Factor (Co) = 0.66

Try 15/32 CDX Sheathing.

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 1945 lbs

OK Greater than 356 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8)

T = 575 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9)

v = 71.9 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 5020 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

Wall = 204 plf

Resisting Moment (Mr)

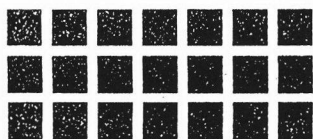
Total DL = 519.0 plf

Mr = -34319 ft-lbs

Uplift (T)

T = -1354 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 630

Wall 22:

Len = 30 ft

Mot = 28735 ft-lbs

Resisting Moment (Mr)

Mr = -189900 ft-lbs

Uplift (T) T = -2840 lbs

Dead Loads:

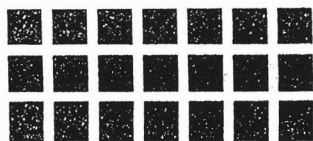
Roof = 68 plf

Floor = 150 plf

Wall = 204 plf

Total DL = 422 plf

No holdowns required



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 631

PERFORATED WALL **Wall 23**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 11.5 ft
Total Full Ht Segments (Sw) = 5.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 47.8 percent

Opening Adjustment Factor (Co) = 0.56

Try 15/32 CDX Sheathing

8d @ 3" O. v = 930

Capacity of Perforated Wall

Va = 3581 lbs

OK Greater than 3243 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8)

T = 8423 lbs

Use (2) 2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9)

v = 1052.9 plf

Use (2) Simpson SDS25312 @ 12" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)Dead Loads:

Mot = 45531 ft-lbs

Roof = 255.0 plf

Floor = 60 plf

Wall = 204 plf

Resisting Moment (Mr)

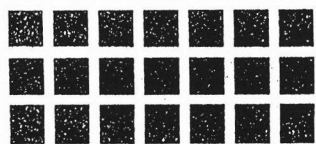
Total DL = 519.0 plf

Mr = -34319 ft-lbs

Uplift (T)

T = 2169 lbs

Use Simpson MST60 straps

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 132

PERFORATED WALL **Wall 24**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 17.5 ft
Total Full Ht Segments (Sw) = 15 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) = 85.7 percent

Opening Adjustment Factor (Co) = 0.83

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 4893 lbs

OK Greater than 2447 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1572 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 196.5 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 31471 ft-lbs

Dead Loads:

Roof = 255.0 plf

Floor = 60 plf

Wall = 204 plf

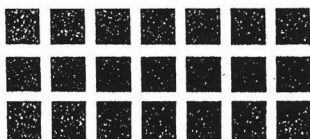
Resisting Moment (Mr)

Total DL = -519.0 plf

Mr = -79472 ft-lbs

Uplift (T) T = -926 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L33

PERFORATED WALL **Wall 25** 2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 22.5 ft
Total Full Ht Segments (Sw) = 16.5 ft
Maximum Opening Ht (Ho) = 5H/6 ft
Percent Full-ht/Sheathed (Sw/Lw) = 73.3 percent
Opening Adjustment Factor (Co) = 0.71
Try 15/32 CDX Sheathing
8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 9208 lbs OK Greater than 2436 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 1664 lbs Use (2)2x6 stud each end of perforate wall

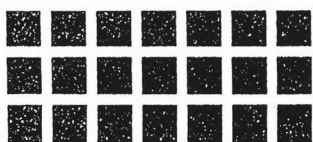
Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 207.9 plf Use (SDS25312 @ 16" O.C.)

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 39812 ft-lbs
Resisting Moment (Mr) Mr = -134156 ft-lbs
Dead Loads:
Roof = 68.0 plf
Floor = 150 plf
Wall = 312 plf
Total DL = -530.0 plf

Uplift (T) T = -1808 lbs No holdowns required



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L34

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 26

Len = 20.5 ft

Mot = 84334 ft-lbs

Resisting Moment (Mr)

Mr = -131748 ft-lbs

Uplift (T) T = 258 lbs

Dead Loads:

Roof = 255 plf

Floor = 60 plf

Wall = 312 plf

Total DL = -627 plf

Use Simpson HDU4 holdowns

Wall 27

Len = 30 ft

Mot = 50812 ft-lbs

Resisting Moment (Mr)

Mr = -238500 ft-lbs

Uplift (T) T = -3076 lbs

Dead Loads:

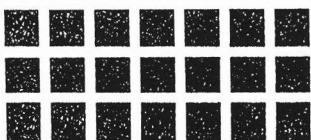
Roof = 68 plf

Floor = 150 plf

Wall = 312 plf

Total DL = -530 plf

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L35

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 28

Len = 6 ft

Mot = 96790 ft-lbs

Resisting Moment (Mr)

Mr = -8532 ft-lbs

Uplift (T) T = 15278 lbs

Dead Loads:

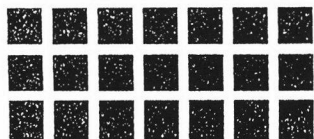
Roof = 102 plf

Floor = 60 plf

Wall = 312 plf

Total DL = 474 plf

Use (2) Simpson HDU8 holdowns
W/12" Vertical offset on 6x6 stud



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L30

PERFORATED WALL **Wall 29**

2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 26 ft
Total Full Ht Segments (Sw) = 23 ft
Maximum Opening Ht (Ho) = 5H/6 ft

Percent Full-ht/Sheathed (Sw/Lw) 88.5 percent

Opening Adjustment Factor (Co) 0.88

Try 15/32 CDX Sheathing

8d @ 6" O. v = 393

Capacity of Perforated Wall

Va = 15909 lbs

OK Greater than 1370 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 542 lbs

Use (2)2x6 stud each end of
perforate wallCheck Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 67.7 plf

Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 10960 ft-lbs

Dead Loads:

Roof = 0.0 plf

Floor = 150 plf

Wall = 96 plf

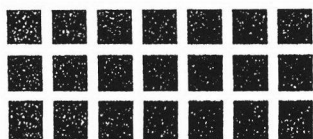
Resisting Moment (Mr)

Total DL = -246.0 plf

Mr = -83148 ft-lbs

Uplift (T) T = -1497 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 137

Wall 30

Len = 22 ft

Mot = 55556 ft-lbs

Resisting Moment (Mr)

Mr = -140844 ft-lbs

Uplift (T)

T = -1316 lbs

Dead Loads:

Roof = 102 plf

Floor = 180 plf

Wall = 300 plf

Total DL = -582 plf

No holdowns requiredWall 31

Len = 7.5 ft

Mot = 84717 ft-lbs

Resisting Moment (Mr)

Mr = -18506 ft-lbs

Uplift (T)

T = 9815 lbs

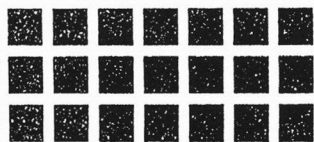
Dead Loads:

Roof = 238 plf

Floor = 120 plf

Wall = 300 plf

Total DL = -658 plf

Use Simpson HDU11 holdowns**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington StCLIENT# Jesse Cereghino JOB NO. 17-83DATE# 03/06/18 BY# Rich SHEET NO. L30

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 32

Len = 11.5 ft

Mot = 8642 ft-lbs

Resisting Moment (Mr)

Mr = -44634 ft-lbs

Uplift (T) T = -1577 lbs

Dead Loads:

Roof = 255 plf

Floor = 120 plf

Wall = 300 plf

Total DL = -675 plf

No holdowns required

Wall 33

Len = 21 ft

Mot = 57968 ft-lbs

Resisting Moment (Mr)

Mr = -143987 ft-lbs

Uplift (T) T = -1354 lbs

Dead Loads:

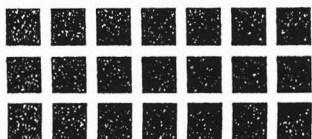
Roof = 68 plf

Floor = 285 plf

Wall = 300 plf

Total DL = -653 plf

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. L39

Wall 34

Len = 4 ft

Mot = 28935 ft-lbs

Resisting Moment (Mr)

Mr = -3592 ft-lbs

Uplift (T) T = 6695 lbs

Dead Loads:

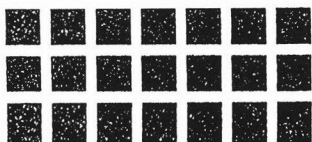
Roof = 221 plf

Floor = 120 plf

Wall = 108 plf

Total DL = 449 plf

Use Simpson HDU8 holdown



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 240

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

PERFORATED WALL **Wall 35** 2008 NDS, Section 4.3.3.4

Overall Length (Lw) = 26 ft
 Total Full Ht Segments (Sw) = 23 ft
 Maximum Opening Ht (Ho) = 5H/6 ft
 Percent Full-ht/Sheathed (Sw/Lw) = 88.5 percent
 Opening Adjustment Factor (Co) = 0.86
 Try 15/32 CDX Sheathing
 8d @ 6" O.C. v = 393

Capacity of Perforated Wall

Va = 15547 lbs OK Greater than 1270 lbs Shear Force

Tension & Compression chord at perforated wall ends (T), (Sect. 4.3.6.1.2)

(Equation 4.3-8) T = 514 lbs Use (2)2x6 stud each end of perforate wall

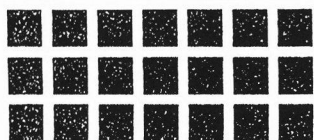
Check Top & Bottom chord shear (Sect 4.3.6.4.1)

(Equation 4.3-9) v = 64.2 plf Use SDS25312 @ 16" O.C.

Wall Overturning (Sect 4.3.6.4.2.1)

Mot = 19048 ft-lbs	<u>Dead Loads:</u>
	Roof = 0.0 plf
	Floor = 90 plf
	Wall = 108 plf
Resisting Moment (Mr)	Total DL = -198.0 plf
Mr = -66924 ft-lbs	

Uplift (T) T = -812 lbs No holdowns required



**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St
 CLIENT: Jesse Cereghino JOB NO. 17-83
 DATE: 03/06/18 BY: Rich SHEET NO. 241

Wall 36

Len = 8 ft

Dead Loads:

Roof = 221 plf

Mot = 58635 ft-lbs

Floor = 60 plf

Wall = 108 plf

Resisting Moment (Mr)

Total DL = -389 plf

Mr = -12448 ft-lbs

Uplift (T) T = 6396 lbs

Use Simpson HDU8 holdown

Wall 37

Len = 11.5 ft

Dead Loads:

Roof = 221 plf

Mot = 11939 ft-lbs

Floor = 120 plf

Wall = 300 plf

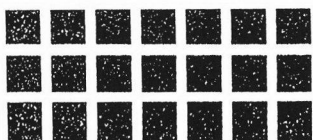
Resisting Moment (Mr)

Total DL = -641 plf

Mr = -42386 ft-lbs

Uplift (T) T = -1173 lbs

No holdowns required

**Benchmark
Engineering**

CIVIL - STRUCTURAL

JOB# 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 102

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

Wall 38

Len = 4 ft

Mot = 51390 ft-lbs

Resisting Moment (Mr)

Mr = -3320 ft-lbs

Uplift (T) T = 12350 lbs

Dead Loads:

Roof = 187 plf

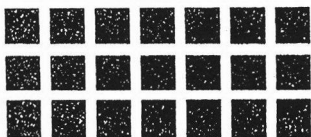
Floor = 120 plf

Wall = 108 plf

Total DL = -415 plf

Use (2) Simpson HDU8 holdowns

W/12" Vertical Offset on 6x6 stud



**Benchmark
Engineering**

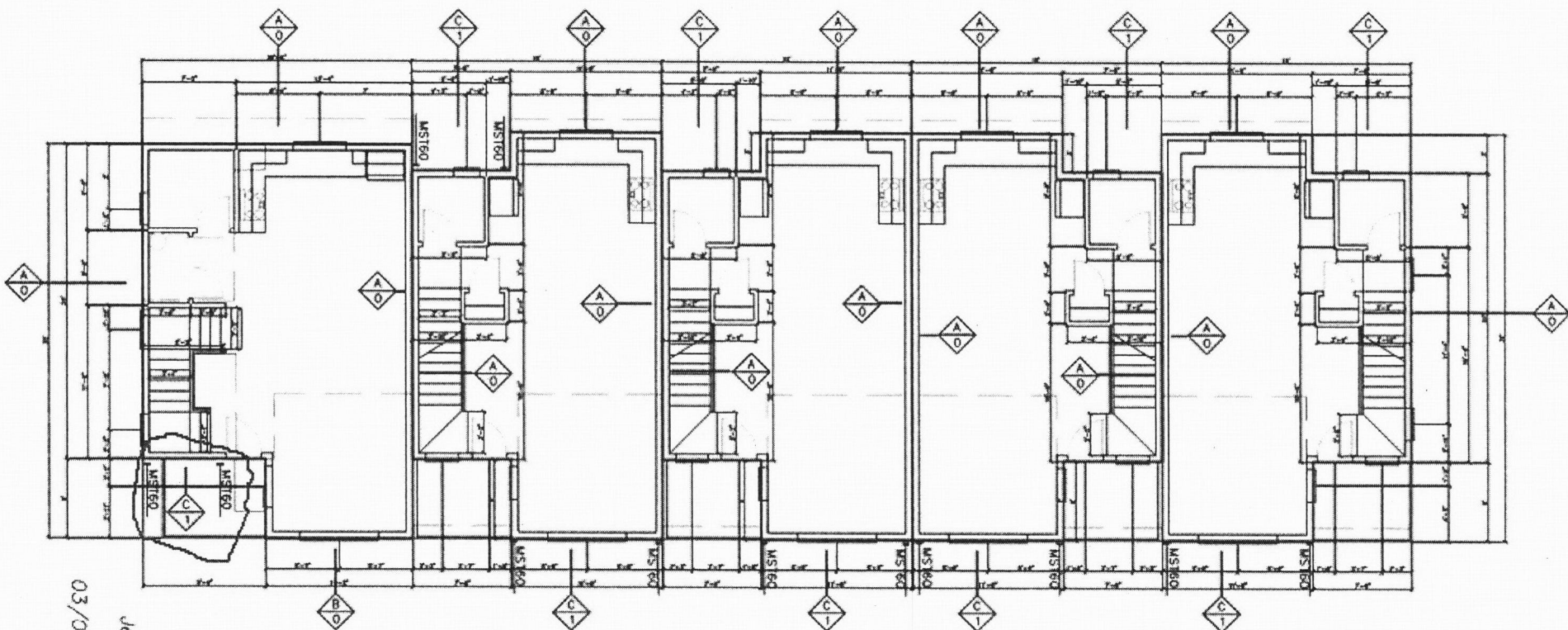
CIVIL - STRUCTURAL

JOB: 7622 SE Washington St

CLIENT: Jesse Cereghino JOB NO. 17-83

DATE: 03/06/18 BY: Rich SHEET NO. 243

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX



MAIN FLOOR SHEARWALLS

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DOCUMENT SERVICES
EDS

Revised 7/15/18

7622 SE Washington St

Jesse Cereghino

18-05

03/05/18

Rich

L45

SCM

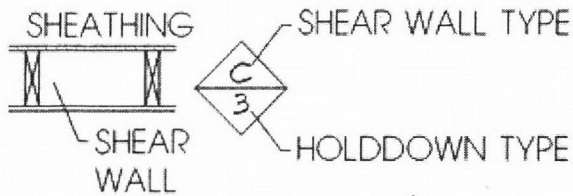
17-258825/47/53/57/58-R5



17-83

01/25/18 Rich

747



• HOLDDOWN/STRAP LOCATION

SHEARWALL SHEATHING SCHEDULE

TYPE	THICKNESS	EDGE NAILING	SILL TO FLOOR	SILL TO FOUNDATION
A	15/32"	8D @ 6" O.C.	SDS25312 @ 16" O.C.	5/8"~ A.B. @ 36" O.C.
B	15/32"	8D @ 4" O.C.	(2) SDS25312 @ 16" O.C.	5/8"~ A.B. @ 24" O.C.
C	15/32"	8D @ 3" O.C.	(2) SDS25312 @ 12" O.C.	5/8"~ A.B. @ 18" O.C.

SHEARWALL HOLDDOWN SCHEDULE

#	TYPE		
0	NO HOLDDOWN REQ'D		
1	SIMPSON MST60		
MST60 — FILL 23 HOLES TOP AND 23 HOLES BOTTOM			
#	TYPE	AB DIA	COL
2	SIMPSON HDU2	5/8"	2-2X
3	SIMPSON HDU4	5/8"	2-2X
4	SIMPSON HDU8	7/8"	2-2X
5	SIMPSON HDU11	1"	6X
ALL HDU FILL ALL HOLES			

RECEIVED
APR 17 2018

BDS
DOCUMENT SERVICES

7622 SE Washington St

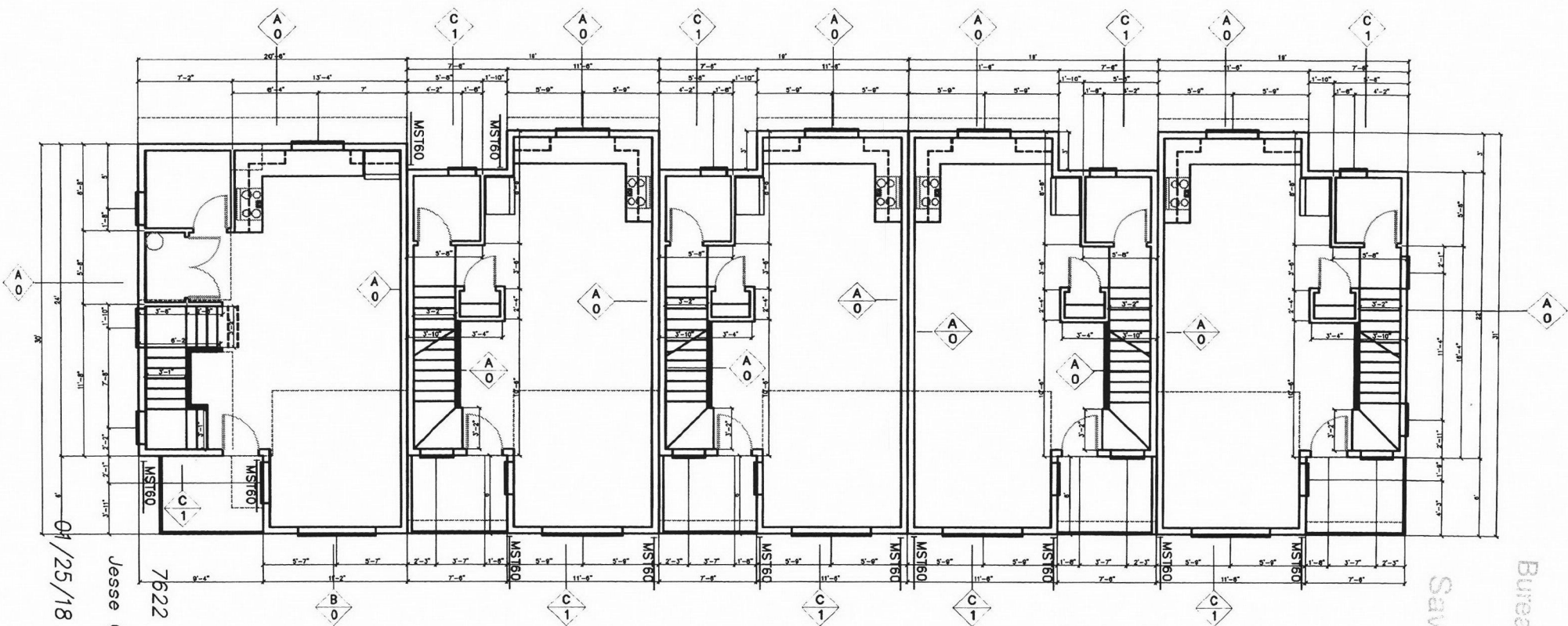
Jesse Cereghino

18-05

03/06/18

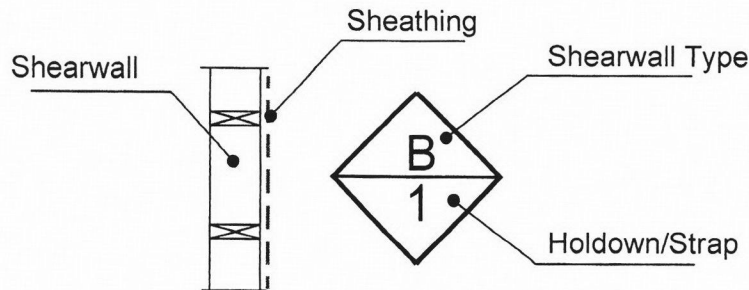
Rich

L47



MAIN FLOOR SHEARWALLS

7622 SE Washington St.
Jesse Cereghino
04/25/18 Rich
17-83
L45



= HOLDOWN/STRAP LOCATION

SHEARWALL KEY

PLYWOOD or OSB 'RATED SHEATHING' or GYPSUM BOARD SHEATHING SHEAR WALL PANEL DESCRIPTION

TYPE	SHEATHING THICKNESS	NAILING @ PANEL EDGES	SILL CONNECTOR & SPACING	
			SILL-TO-FLOOR	SILL-TO-FOUNDATION
A	15/32"	8d NAILS @ 6" O.C.	SDS25312 @ 16" O.C.	5/8"Ø Anchor Bolt @ 36" O.C.
B	15/32"	8d NAILS @ 4" O.C.	(2)SDS25312 @ 16" O.C.	5/8"Ø Anchor Bolt @ 24" O.C.
C	15/32"	8d NAILS @ 3" O.C.	(2) SDS25312 @ 12" O.C.	5/8"Ø Anchor Bolt @ 18" O.C.
J	1/2" GB	5d NAILS @ 7" O.C. UNBLKD	(1)16d NAILS @ 12" O.C.	1/2"Ø Anchor Bolt @ 48" O.C.
K	1/2" GB	5d NAILS @ 4" O.C. UNBLKD	(1)16d NAILS @ 12" O.C.	1/2"Ø Anchor Bolt @ 48" O.C.
L	5/8" GB	6d NAILS @ 8/12" O.C. BLKD	(1)16d NAILS @ 12" O.C.	1/2"Ø Anchor Bolt @ 48" O.C.

HOLDOWNS & STRAPS

HOLDOWN DESCRIPTION	
TYPE	
0	NO HOLDOWN REQUIRED
1	SIMPSON MST60
2	SIMPSON HDU2
3	SIMPSON HDU4
4	SIMPSON HDU8

Revised **LA7**

Project: Washington5

Location: Upper floor rear carrier joists
Floor Joist

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 8.5 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 69.3%

Controlling Factor: Shear

DEFLECTIONS

Center

Live Load 0.04 IN L/2797

Dead Load 0.02 in

Total Load 0.06 IN L/1774

Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360

REACTIONS

A

B

Live Load 289 lb 697 lb

Dead Load 140 lb 499 lb

Total Load 430 lb 1196 lb

Bearing Length 0.46 in 1.28 in

BEAM DATA

Center

Span Length 8.5 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 0 ft

Floor sheathing applied to top of joists-top of joists fully braced.

Floor Duration Factor 1.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 1035 psi

Cd=1.00 CF=1.00 Cr=1.15

Shear Stress: Fv = 180 psi Fv' = 180 psi

Cd=1.00

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment: 1258 ft-lb

5.86 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -1196 lb

8.0 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 14.59 in3 31.64 in3

Area (Shear): 9.97 in2 16.88 in2

Moment of Inertia (deflection): 36.11 in4 177.98 in4

Moment: 1258 ft-lb 2729 ft-lb

Shear: -1196 lb 2025 lb

NOTES



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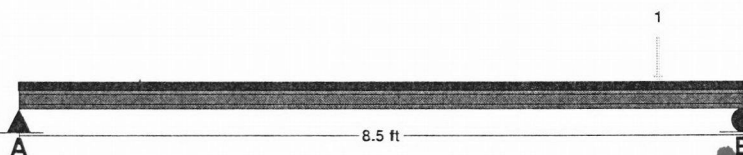
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LOADING DIAGRAM



JOIST LOADING

Uniform Floor Loading

Center

Live Load LL = 40 psf

Dead Load DL = 15 psf

Total Load TL = 55 psf

TL Adj. For Joist Spacing wT = 73.3 plf

Wall Loading

Wall One

Live Load ($\perp$ to Joists): L1 = 400 plf

Dead Load ($\perp$ to Joists): D1 = 352 plf

Load Location X1 = 7.5 ft

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BDS
DOCUMENT SERVICES

SCAN

17-180493/496/497/498/500-PS-005/856/256/356/456/556/656/756/856/956/1056/1156/1256/1356/1456/1556/1656/1756/1856/1956/2056/2156/2256/2356/2456/2556/2656/2756/2856/2956/3056/3156/3256/3356/3456/3556/3656/3756/3856/3956/4056/4156/4256/4356/4456/4556/4656/4756/4856/4956/5056/5156/5256/5356/5456/5556/5656/5756/5856/5956/6056/6156/6256/6356/6456/6556/6656/6756/6856/6956/7056/7156/7256/7356/7456/7556/7656/7756/7856/7956/8056/8156/8256/8356/8456/8556/8656/8756/8856/8956/9056/9156/9256/9356/9456/9556/9656/9756/9856/9956/10056/10156/10256/10356/10456/10556/10656/10756/10856/10956/11056/11156/11256/11356/11456/11556/11656/11756/11856/11956/12056/12156/12256/12356/12456/12556/12656/12756/12856/12956/13056/13156/13256/13356/13456/13556/13656/13756/13856/13956/14056/14156/14256/14356/14456/14556/14656/14756/14856/14956/15056/15156/15256/15356/15456/15556/15656/15756/15856/15956/16056/16156/16256/16356/16456/16556/16656/16756/16856/16956/17056/17156/17256/17356/17456/17556/17656/17756/17856/17956/18056/18156/18256/18356/18456/18556/18656/18756/18856/18956/19056/19156/19256/19356/19456/19556/19656/19756/19856/19956/20056/20156/20256/20356/20456/20556/20656/20756/20856/20956/21056/21156/21256/21356/21456/21556/21656/21756/21856/21956/22056/22156/22256/22356/22456/22556/22656/22756/22856/22956/23056/23156/23256/23356/23456/23556/23656/23756/23856/23956/24056/24156/24256/24356/24456/24556/24656/24756/24856/24956/25056/25156/25256/25356/25456/25556/25656/25756/25856/25956/26056/26156/26256/26356/26456/26556/26656/26756/26856/26956/27056/27156/27256/27356/27456/27556/27656/27756/27856/27956/28056/28156/28256/28356/28456/28556/28656/28756/28856/28956/29056/29156/29256/29356/29456/29556/29656/29756/29856/29956/30056/30156/30256/30356/30456/30556/30656/30756/30856/30956/31056/31156/31256/31356/31456/31556/31656/31756/31856/31956/32056/32156/32256/32356/32456/32556/32656/32756/32856/32956/33056/33156/33256/33356/33456/33556/33656/33756/33856/33956/34056/34156/34256/34356/34456/34556/34656/34756/34856/34956/35056/35156/35256/35356/35456/35556/35656/35756/35856/35956/36056/36156/36256/36356/36456/36556/36656/36756/36856/36956/37056/37156/37256/37356/37456/37556/37656/37756/37856/37956/38056/38156/38256/38356/38456/38556/38656/38756/38856/38956/39056/39156/39256/39356/39456/39556/39656/39756/39856/39956/40056/40156/40256/40356/40456/40556/40656/40756/40856/40956/41056/41156/41256/41356/41456/41556/41656/41756/41856/41956/42056/42156/42256/42356/42456/42556/42656/42756/42856/42956/43056/43156/43256/43356/43456/43556/43656/43756/43856/43956/44056/44156/44256/44356/44456/44556/44656/44756/44856/44956/45056/45156/45256/45356/45456/45556/45656/45756/45856/45956/46056/46156/46256/46356/46456/46556/46656/46756/46856/46956/47056/47156/47256/47356/47456/47556/47656/47756/47856/47956/48056/48156/48256/48356/48456/48556/48656/48756/48856/48956/49056/49156/49256/49356/49456/49556/49656/49756/49856/49956/50056/50156/50256/50356/50456/50556/50656/50756/50856/50956/51056/51156/51256/51356/51456/51556/51656/51756/51856/51956/52056/52156/52256/52356/52456/52556/52656/52756/52856/52956/53056/53156/53256/53356/53456/53556/53656/53756/53856/53956/54056/54156/54256/54356/54456/54556/54656/54756/54856/54956/55056/55156/55256/55356/55456/55556/55656/55756/55856/55956/56056/56156/56256/56356/56456/56556/56656/56756/56856/56956/57056/57156/57256/57356/57456/57556/57656/57756/57856/57956/58056/58156/58256/58356/58456/58556/58656/58756/58856/58956/59056/59156/59256/59356/59456/59556/59656/59756/59856/59956/60056/60156/60256/60356/60456/60556/60656/60756/60856/60956/61056/61156/61256/61356/61456/61556/61656/61756/61856/61956/62056/62156/62256/62356/62456/62556/62656/62756/62856/62956/63056/63156/63256/63356/63456/63556/63656/63756/63856/63956/64056/64156/64256/64356/64456/64556/64656/64756/64856/64956/65056/65156/65256/65356/65456/65556/65656/65756/65856/65956/66056/66156/66256/66356/66456/66556/66656/66756/66856/66956/67056/67156/67256/67356/67456/67556/67656/67756/67856/67956/68056/68156/68256/68356/68456/68556/68656/68756/68856/68956/69056/69156/69256/69356/69456/69556/69656/69756/69856/69956/70056/70156/70256/70356/70456/70556/70656/70756/70856/70956/71056/71156/71256/71356/71456/71556/71656/71756/71856/71956/72056/72156/72256/72356/72456/72556/72656/72756/72856/72956/73056/73156/73256/73356/73456/73556/73656/73756/73856/73956/74056/74156/74256/74356/74456/74556/74656/74756/74856/74956/75056/75156/75256/75356/75456/75556/75656/75756/75856/75956/76056/76156/76256/76356/76456/76556/76656/76756/76856/76956/77056/77156/77256/77356/77456/77556/77656/77756/77856/77956/78056/78156/78256/78356/78456/78556/78656/78756/78856/78956/79056/79156/79256/79356/79456/79556/79656/79756/79856/79956/80056/80156/80256/80356/80456/80556/80656/80756/80856/80956/81056/81156/81256/81356/81456/81556/81656/81756/81856/81956/82056/82156/82256/82356/82456/82556/82656/82756/82856/82956/83056/83156/83256/83356/83456/83556/83656/83756/83856/83956/84056/84156/84256/84356/84456/84556/84656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Project: Washington5

Location: Main floor front cantilever joists

Floor Joist

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 11.0 FT (9 + 2) @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 27.4%

Controlling Factor: Moment

DEFLECTIONS

	Center	Right
Live Load	-0.03 IN L/3398	0.04 IN 2L/1076
Dead Load	-0.03 in	0.04 in
Total Load	-0.06 IN L/1878	0.09 IN 2L/548
Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360		

REACTIONS

	A	B
Live Load	240 lb	909 lb
Dead Load	-36 lb	803 lb
Total Load	204 lb	1712 lb
Uplift (1.5 F.S)	-148 lb	0 lb
Bearing Length	0.22 in	1.83 in

BEAM DATA

	Center	Right
Span Length	9 ft	2 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	0 ft	0 ft
Floor sheathing applied to top of joists-top of joists fully braced.		
Sheathing/sheetrock applied to bottom of joists-bottom of joists fully braced.		
Floor Duration Factor	1.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 CF=1.00 Cr=1.15	Fb' = 1035 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment:

-2141 ft-lb

Over right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear:

1144 lb

At left support of span 3 (Right Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	24.83 in ³	31.64 in ³
Area (Shear):	9.53 in ²	16.88 in ²
Moment of Inertia (deflection):	116.96 in ⁴	177.98 in ⁴
Moment:	-2141 ft-lb	2729 ft-lb
Shear:	1144 lb	2025 lb

NOTES



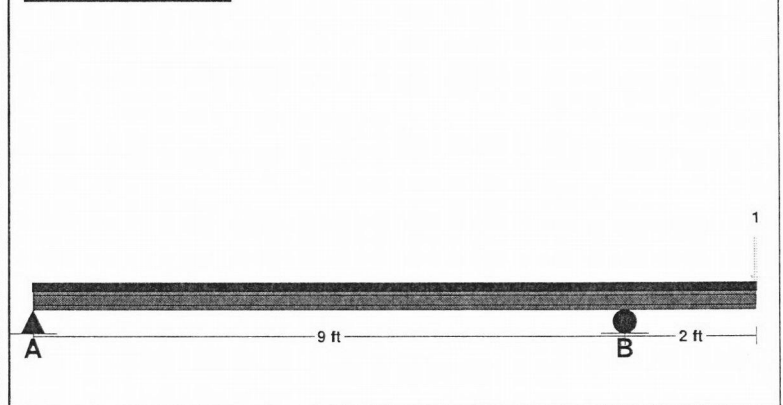
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LOADING DIAGRAM



JOIST LOADING

Uniform Floor Loading

	Center	Right
Live Load	LL = 40 psf	40 psf
Dead Load	DL = 15 psf	15 psf
Total Load	TL = 55 psf	55 psf
TL Adj. For Joist Spacing wT =	73.3 plf	73.3 plf

Wall Loading

Wall One

Live Load ($\perp$ to Joists): L1 =	0 plf	338 plf
Dead Load ($\perp$ to Joists) D1 =	0 plf	410 plf
Load Location X1 =	0 ft	2 ft

Project: Washington5

Location: Beam #1 upper floor

Roof Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 6.0 IN x 6.5 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 27.9%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.15 IN L/534

Dead Load 0.11 in

Total Load 0.25 IN L/309

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

REACTIONS

A

B

Live Load 1341 lb 1341 lb

Dead Load 976 lb 976 lb

Total Load 2316 lb 2316 lb

Bearing Length 1.02 in 1.02 in

BEAM DATA

Span Length 6.5 ft

Unbraced Length-Top 2 ft

Unbraced Length-Bottom 0 ft

Roof Pitch 4 :12

Roof Duration Factor 1.15

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:
Fb_cmpr = 1850 psi Fb' = 2751 psi
Cd=1.15 Cl=1.00

Shear Stress: Fv = 265 psi Fv' = 305 psi
Cd=1.15

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 650 psi Fc $\perp$ ' = 650 psi

Controlling Moment: 3764 ft-lb

3.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -2316 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 16.42 in³ 21 in³

Area (Shear): 11.4 in² 21 in²

Moment of Inertia (deflection): 48.93 in⁴ 63 in⁴

Moment: 3764 ft-lb 4815 ft-lb

Shear: -2316 lb 4267 lb

NOTES



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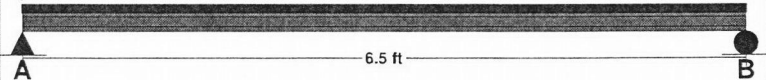
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LOADING DIAGRAM



ROOF LOADING

Side One:

Roof Live Load: LL = 25 psf

Roof Dead Load: DL = 17 psf

Tributary Width: TW = 15.5 ft

Side Two:

Roof Live Load: LL = 25 psf

Roof Dead Load: DL = 17 psf

Tributary Width: TW = 1 ft

Wall Load: WALL = 0 plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS

Adjusted Beam Length: Ladj = 6.5 ft

Beam Self Weight: BSW = 5 plf

Beam Uniform Live Load: wL = 413 plf

Beam Uniform Dead Load: wD_adj = 300 plf

Total Uniform Load: wT = 713 plf

Project: Washington5

Location: Beam #2 kitchen header

Uniformly Loaded Floor Beam

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 4.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 183.5%

Controlling Factor: Shear

DEFLECTIONS

Center

Live Load 0.01 IN L/9805

Dead Load 0.00 in

Total Load 0.01 IN L/5252

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

REACTIONS

A

B

Live Load 383 lb 383 lb

Dead Load 332 lb 332 lb

Total Load 714 lb 714 lb

Bearing Length 0.76 in 0.76 in

BEAM DATA

Center

Span Length 4.5 ft

Unbraced Length-Top 1.33 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi	Fb' = 888 psi
	Cd=1.00 Cl=0.99 CF=1.00	
Shear Stress:	Fv = 180 psi	Fv' = 180 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 803 ft-lb

2.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -714 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus:	10.85 in3	31.64 in3
Area (Shear):	5.95 in2	16.88 in2
Moment of Inertia (deflection):	8.13 in4	177.98 in4
Moment:	803 ft-lb	2342 ft-lb
Shear:	-714 lb	2025 lb

NOTES



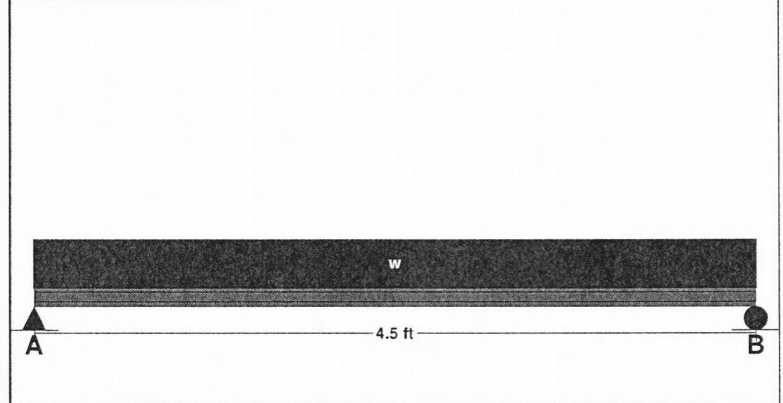
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	4.3 ft	0 ft
Wall Load	WALL =	80 plf	

BEAM LOADING

Beam Total Live Load:	wL =	170 plf
Beam Total Dead Load:	wD =	144 plf
Beam Self Weight:	BSW =	4 plf
Total Maximum Load:	wT =	317 plf

Project: Washington5

Location: Beam #3 over kitchen
Multi-Loaded Multi-Span Beam
[2009 International Building Code(2005 NDS)]
3.5 IN x 11.25 IN x 13.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 42.7%
Controlling Factor: Moment

DEFLECTIONS	Center	
Live Load	0.14	IN L/1152
Dead Load	0.06	in
Total Load	0.19	IN L/800
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	910 lb	910 lb
Dead Load	400 lb	400 lb
Total Load	1310 lb	1310 lb
Bearing Length	0.60 in	0.60 in

BEAM DATA	Center
Span Length	13 ft
Unbraced Length-Top	1.33 ft
Unbraced Length-Bottom	13 ft
Live Load Duration Factor	1.00
Notch Depth	0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Cl=1.00 CF=1.10	Fb' = 988 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 4257 ft-lb
6.5 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1310 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	51.72 in3	73.83 in3
Area (Shear):	10.92 in2	39.38 in2
Moment of Inertia (deflection):	129.74 in4	415.28 in4
Moment:	4257 ft-lb	6077 ft-lb
Shear:	1310 lb	4725 lb

NOTES



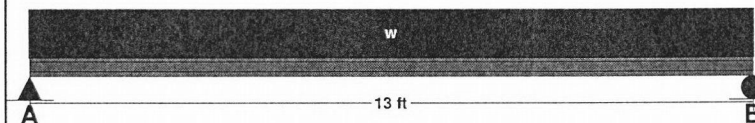
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LOADING DIAGRAM



UNIFORM LOADS	Center
Uniform Live Load	140 plf
Uniform Dead Load	53 plf
Beam Self Weight	9 plf
Total Uniform Load	202 plf

Project: Washington5

Location: Beam #4 under upper front cant
Combination Roof And Floor Beam
[2009 International Building Code(2005 NDS)]
3.5 IN x 11.25 IN x 7.5 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 8.2%
Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.05	IN L/1708
Dead Load	0.05	in
Total Load	0.10	IN L/915
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS		A	B
Live Load	1844	lb	1844 lb
Dead Load	1601	lb	1601 lb
Total Load	3445	lb	3445 lb
Bearing Length	1.57	in	1.57 in

BEAM DATA		Center
Span Length	7.5	ft
Unbraced Length-Top	1.33	ft
Roof Pitch	4	:12
Floor Duration Factor	1.00	
Roof Duration Factor	1.15	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi <i>Cd=1.15 Cl=1.00 CF=1.10</i>	Fb' = 1136 psi
Shear Stress:	Fv = 180 psi <i>Cd=1.15</i>	Fv' = 207 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 6459 ft-lb
3.75 ft from left support
Created by combining all dead and live loads.

Controlling Shear: 3445 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	68.25 in ³	73.83 in ³
Area (Shear):	24.96 in ²	39.38 in ²
Moment of Inertia (deflection):	108.97 in ⁴	415.28 in ⁴
Moment:	6459 ft-lb	6986 ft-lb
Shear:	3445 lb	5434 lb

NOTES



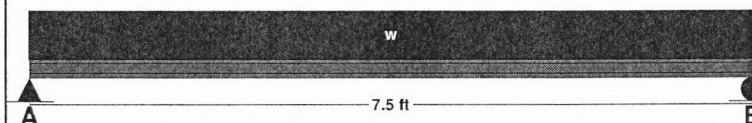
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LOADING DIAGRAM



ROOF LOADING

		Side 1	Side 2
Roof Live Load	RLL =	25 psf	25 psf
Roof Dead Load	RDL =	17 psf	17 psf
Roof Tributary Width	RTW =	13.7 ft	2 ft

FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	2.5 ft	0 ft
Wall Load	WALL =	100 plf	

BEAM LOADING

Roof Uniform Live Load:	wL-roof =	392 plf
Roof Uniform Dead Load:	wD-roof =	281 plf
Floor Uniform Live Load:	wL-floor =	100 plf
Floor Uniform Dead Load:	wD-floor =	38 plf
Beam Self Weight:	BSW =	9 plf
Combined Uniform Live Load:	wL =	492 plf
Combined Uniform Dead Load:	wD =	427 plf
Combined Uniform Total Load:	wT =	919 plf
Controlling Total Design Load:	wT-cont =	919 plf

Project: Washington5

Location: Beam #5 carrier for #4

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 16.5 IN x 13.0 FT (8 + 5)

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 15.4%

Controlling Factor: Moment

DEFLECTIONS	Center		Right	
Live Load	0.00	IN L/Infinity	0.00	IN 2L/Infinity
Dead Load	-0.05	in	0.28	in
Total Load	-0.05	IN L/1867	0.28	IN 2L/424
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240				

REACTIONS	A	B
Live Load	0 lb	0 lb
Dead Load	-1863 lb	6721 lb
Total Load	-1863 lb	6721 lb
Uplift (1.5 F.S)	-1863 lb	0 lb
Bearing Length	0.00 in	2.95 in

BEAM DATA	Center	Right
Span Length	8 ft	5 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	8 ft	5 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values		Adjusted	
Bending Stress:	Fb =	2400 psi	Controlled by:	
	Fb_cmpr =	1850 psi	Fb_cmpr' =	1614 psi
	Cd=0.90 CI=0.97			
Shear Stress:	Fv =	265 psi	Fv' =	239 psi
	Cd=0.90			
Modulus of Elasticity:	E =	1800 ksi	E' =	1800 ksi
Min. Mod. of Elasticity:	E_min =	930 ksi	E_min' =	930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ =	650 psi	Fc $\perp$ ' =	650 psi

Controlling Moment: -18506 ft-lb
Over right support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 3958 lb
At left support of span 3 (Right Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	137.56 in3	158.81 in3
Area (Shear):	24.89 in2	57.75 in2
Moment of Inertia (deflection):	741.68 in4	1310.2 in4
Moment:	-18506 ft-lb	21366 ft-lb
Shear:	3958 lb	9182 lb

NOTES



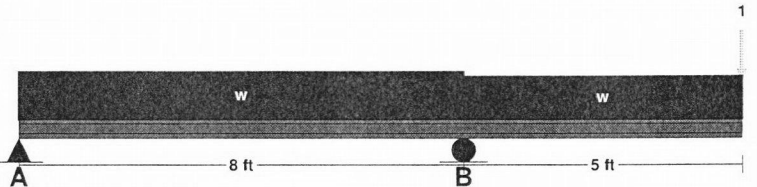
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LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	0 ft
Wall Load	WALL = 100 plf	90 plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	0 lb
Dead Load	3445 lb
Location	5 ft

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	0 plf	0 plf
Total Dead Load	100 plf	90 plf
Beam Self Weight	13 plf	13 plf
Total Load	113 plf	103 plf

Project: Washington5

Location: Beam #6 end unit

Combination Roof And Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 10.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 52.8%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.16 IN L/739

Dead Load 0.12 in

Total Load 0.29 IN L/420

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

REACTIONS

A

B

Live Load 2194 lb 2194 lb

Dead Load 1663 lb 1663 lb

Total Load 3857 lb 3857 lb

Bearing Length 1.70 in 1.70 in

BEAM DATA

Center

Span Length 10 ft

Unbraced Length-Top 1.33 ft

Roof Pitch 9 :12

Floor Duration Factor 1.00

Roof Duration Factor 1.15

Camber Adj. Factor 1

Camber Required 0.12

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi Fb_cmp = 1850 psi Cd=1.15 Cl=1.00	Controlled by: Fb' = 2750 psi
Shear Stress:	Fv = 265 psi Cd=1.15	Fv' = 305 psi
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ ' = 650 psi

Controlling Moment: 9643 ft-lb

5.0 ft from left support

Created by combining all dead and live loads.

Controlling Shear: 3857 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	42.08 in3	64.31 in3
Area (Shear):	18.98 in2	36.75 in2
Moment of Inertia (deflection):	192.82 in4	337.64 in4
Moment:	9643 ft-lb	14737 ft-lb
Shear:	3857 lb	7466 lb

NOTES



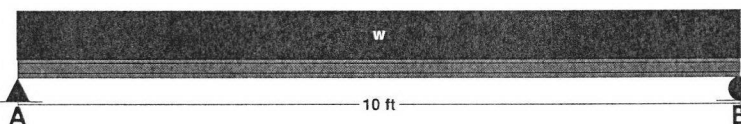
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LOADING DIAGRAM



ROOF LOADING

	Side 1	Side 2
Roof Live Load	RLL = 25 psf	25 psf
Roof Dead Load	RDL = 17 psf	17 psf
Roof Tributary Width	RTW = 6.8 ft	0 ft

FLOOR LOADING

	Side 1	Side 2
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width	FTW = 6.8 ft	0 ft
Wall Load	WALL = 80 plf	

BEAM LOADING

Roof Uniform Live Load:	wL-roof = 169 plf
Roof Uniform Dead Load:	wD-roof = 143 plf
Floor Uniform Live Load:	wL-floor = 270 plf
Floor Uniform Dead Load:	wD-floor = 101 plf
Beam Self Weight:	BSW = 8 plf
Combined Uniform Live Load:	wL = 439 plf
Combined Uniform Dead Load:	wD = 333 plf
Combined Uniform Total Load:	wT = 771 plf
Controlling Total Design Load:	wT-cont = 771 plf

Project: Washington5

Location: Beam #7 end unit

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 12.0 FT (8 + 4)

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 59.4%

Controlling Factor: Moment

DEFLECTIONS	Center		Right	
Live Load	0.07	IN L/1442	0.15	IN 2L/656
Dead Load	0.02	in	0.03	in
Total Load	0.09	IN L/1110	0.18	IN 2L/546
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240				

REACTIONS	A	B
Live Load	1756 lb	3951 lb
Dead Load	975 lb	2925 lb
Total Load	2731 lb	6876 lb
Bearing Length	1.20 in	3.02 in

BEAM DATA	Center	Right
Span Length	8 ft	4 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	8 ft	4 ft
Live Load Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values		Adjusted	
Bending Stress:	Fb =	2400 psi	Controlled by:	
	Fb_cmpr =	1850 psi	Fb_cmpr' =	1818 psi
	Cd=1.00 Cl=0.98			
Shear Stress:	Fv =	265 psi	Fv' =	265 psi
	Cd=1.00			
Modulus of Elasticity:	E =	1800 ksi	E' =	1800 ksi
Min. Mod. of Elasticity:	E_min =	930 ksi	E_min' =	930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ =	650 psi	Fc $\perp$ ' =	650 psi

Controlling Moment: -6112 ft-lb

Over right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 3

Controlling Shear: -3820 lb

At right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Req'd	Provided
Section Modulus:	40.35 in3	64.31 in3
Area (Shear):	21.62 in2	36.75 in2
Moment of Inertia (deflection):	185.43 in4	337.64 in4
Moment:	-6112 ft-lb	9742 ft-lb
Shear:	-3820 lb	6493 lb

NOTES



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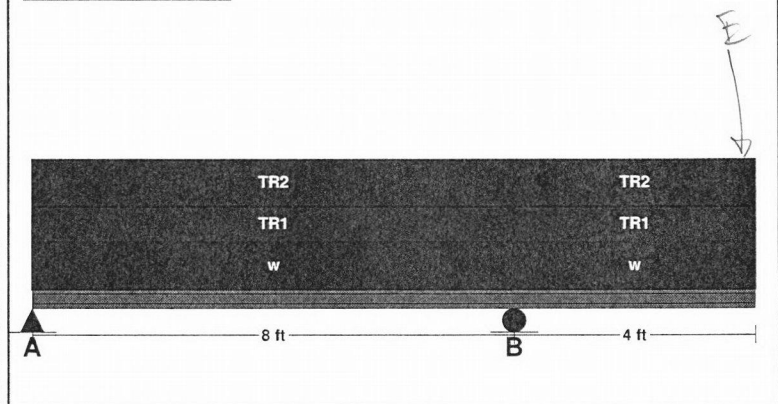
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LOADING DIAGRAM



UNIFORM LOADS	Center	Right
Uniform Live Load	0 plf	0 plf
Uniform Dead Load	100 plf	100 plf
Beam Self Weight	8 plf	8 plf
Total Uniform Load	108 plf	108 plf

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two
Left Live Load	169 plf	270 plf
Left Dead Load	115 plf	102 plf
Right Live Load	169 plf	270 plf
Right Dead Load	115 plf	102 plf
Load Start	0 ft	0 ft
Load End	8 ft	8 ft
Load Length	8 ft	8 ft

RIGHT SPAN

Load Number	One	Two
Left Live Load	169 plf	270 plf
Left Dead Load	115 plf	102 plf
Right Live Load	169 plf	270 plf
Right Dead Load	115 plf	102 plf
Load Start	0 ft	0 ft
Load End	4 ft	4 ft
Load Length	4 ft	4 ft

Project: Washington5

Location: Beam #8 end unit carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 14.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 47.3%

Controlling Factor: Shear

DEFLECTIONS		Center
Live Load	0.11	IN L/1477
Dead Load	0.19	in
Total Load	0.30	IN L/555
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS		A	B
Live Load	560 lb	560 lb	
Dead Load	541 lb	3847 lb	
Total Load	1101 lb	4407 lb	
Bearing Length	0.48 in	1.94 in	

BEAM DATA		Center
Span Length	14	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	14	ft
Floor Duration Factor	1.00	
Camber Adj. Factor	1	
Camber Required	0.19	
Notch Depth	0.00	

MATERIAL PROPERTIES		Base Values	Adjusted
Bending Stress:	Fb =	2400 psi	Controlled by:
	Fb_cmp =	1850 psi	Fb' = 2400 psi
	Cd=	1.00	
Shear Stress:	Fv =	265 psi	Fv' = 265 psi
	Cd=	1.00	
Modulus of Elasticity:	E =	1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min =	930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ =	650 psi	Fc - $\perp$ ' = 650 psi

Controlling Moment: 5140 ft-lb
9.38 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -4407 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	25.7 in3	64.31 in3
Area (Shear):	24.95 in2	36.75 in2
Moment of Inertia (deflection):	145.94 in4	337.64 in4
Moment:	5140 ft-lb	12863 ft-lb
Shear:	-4407 lb	6493 lb

NOTES



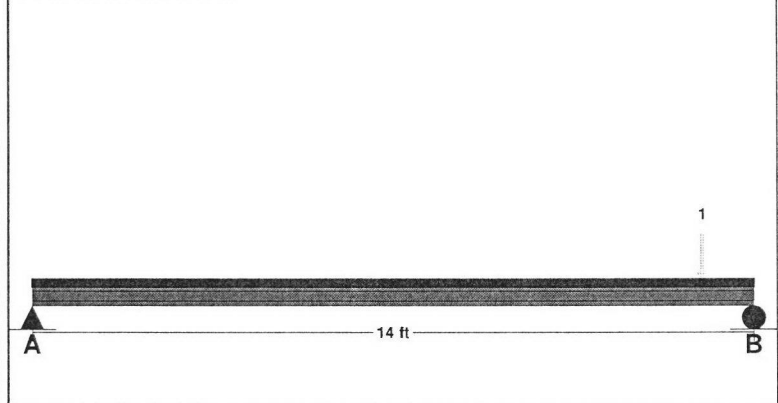
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LOADING DIAGRAM



FLOOR LOADING

		Center
Floor Live Load	FLL =	40 psf
Floor Dead Load	FDL =	15 psf
Floor Tributary Width Side One	TW1 =	1 ft
Floor Tributary Width Side Two	TW2 =	1 ft
Wall Load	WALL =	0 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	3857 lb
Location	13 ft

BEAM LOADING

		Center
Reduced Floor Live Load	40	psf
Total Live Load	80	plf
Total Dead Load	30	plf
Beam Self Weight	8	plf
Total Load	118	plf

Project: Washington5

Location: Beam #9 end unit deck door

Multi-Span Roof Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 9.0 IN x 3.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 5.6%

Controlling Factor: Shear

DEFLECTIONS		Center
Live Load	0.00	IN L/Infinity
Dead Load	0.02	in
Total Load	0.02	IN L/2319
Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180		

REACTIONS		A	B
Live Load	0 lb	0 lb	
Dead Load	4744 lb	2452 lb	
Total Load	4744 lb	2452 lb	
Bearing Length	2.09 in	1.08 in	

BEAM DATA		Center
Span Length	3 ft	
Unbraced Length-Top	2 ft	
Unbraced Length-Bottom	3 ft	
Roof Pitch	9 :12	
Roof Duration Factor	1.15	
Camber Adj. Factor	1	
Camber Required	0.02	
Notch Depth	0.00	

MATERIAL PROPERTIES		Base Values	Adjusted
24F-V4 - Visually Graded Western Species			
Bending Stress:	Fb =	2400 psi	Controlled by:
	Fb_cmpr =	1850 psi	Fb' = 2152 psi
	Cd=0.90	Cl=1.00	
Shear Stress:	Fv =	265 psi	Fv' = 239 psi
	Cd=0.90		
Modulus of Elasticity:	E =	1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min =	930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ =	650 psi	Fc - $\perp$ ' = 650 psi

Controlling Moment: 4646 ft-lb
1.02 Ft from left support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 4744 lb
At left support of span 2 (Center Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	25.91 in3	47.25 in3
Area (Shear):	29.84 in2	31.5 in2
Moment of Inertia (deflection):	16.5 in4	212.63 in4
Moment:	4646 ft-lb	8473 ft-lb
Shear:	4744 lb	5009 lb

NOTES



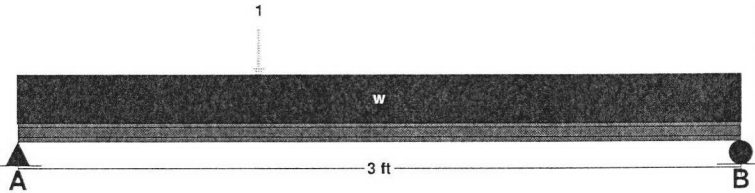
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LOADING DIAGRAM



ROOF LOADING		Center
Roof Live Load	RLL =	25 psf
Roof Dead Load	RDL =	17 psf
Roof Tributary Width Side One	TW1 =	0 ft
Roof Tributary Width Side Two	TW2 =	0 ft
Wall Load	WALL =	100 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	6876 lb
Location	1 ft

BEAM LOADING		Center
Total Live Load		0 plf
Total Dead Load (Adjusted for Roof Pitch)		100 plf
Beam Self Weight		7 plf
Total Load		107 plf

Project: Washington5

Location: Beam #10 garage header

Uniformly Loaded Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 8.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 162.8%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.03 IN L/3206

Dead Load 0.01 in

Total Load 0.05 IN L/2254

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

REACTIONS

A

B

Live Load 765 lb 765 lb

Dead Load 323 lb 323 lb

Total Load 1088 lb 1088 lb

Bearing Length 0.50 in 0.50 in

BEAM DATA

Center

Span Length 8.5 ft

Unbraced Length-Top 1.33 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 988 psi

Cd=1.00 Cl=1.00 CF=1.10

Shear Stress: Fv = 180 psi Fv' = 180 psi

Cd=1.00

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment:

2312 ft-lb

4.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear:

-1088 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 28.09 in³ 73.83 in³

Area (Shear): 9.07 in² 39.38 in²

Moment of Inertia (deflection): 46.63 in⁴ 415.28 in⁴

Moment: 2312 ft-lb 6077 ft-lb

Shear: -1088 lb 4725 lb

NOTES



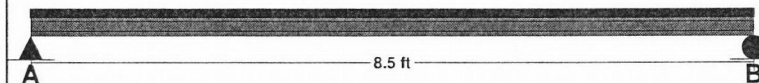
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	4.5 ft	0 ft
Wall Load	WALL =	0 plf	

BEAM LOADING

Beam Total Live Load:	wL =	180 plf
Beam Total Dead Load:	wD =	68 plf
Beam Self Weight:	BSW =	9 plf
Total Maximum Load:	wT =	256 plf

Project: Washington5

Location: Beam #11 in front of garage

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 12.0 IN x 11.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 7.6%

Controlling Factor: Moment

DEFLECTIONS	Center	
Live Load	0.14	IN L/976
Dead Load	0.26	in
Total Load	0.40	IN L/331
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	2461 lb	2461 lb
Dead Load	4321 lb	4321 lb
Total Load	6782 lb	6782 lb
Bearing Length	2.98 in	2.98 in

BEAM DATA	Center
Span Length	11 ft
Unbraced Length-Top	1.33 ft
Unbraced Length-Bottom	11 ft
Live Load Duration Factor	1.00
Camber Adj. Factor	1
Camber Required	0.26
Notch Depth	0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi	Controlled by: Fb' = 2391 psi
	Fb_cmpr = 1850 psi	
	Cd=1.00 Ci=1.00	
Shear Stress:	Fv = 265 psi	Fv' = 265 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ ' = 650 psi

Controlling Moment: 15556 ft-lb
5.5 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -6782 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	78.07 in3	84 in3
Area (Shear):	38.39 in2	42 in2
Moment of Inertia (deflection):	365.75 in4	504 in4
Moment:	15556 ft-lb	16738 ft-lb
Shear:	-6782 lb	7420 lb

NOTES



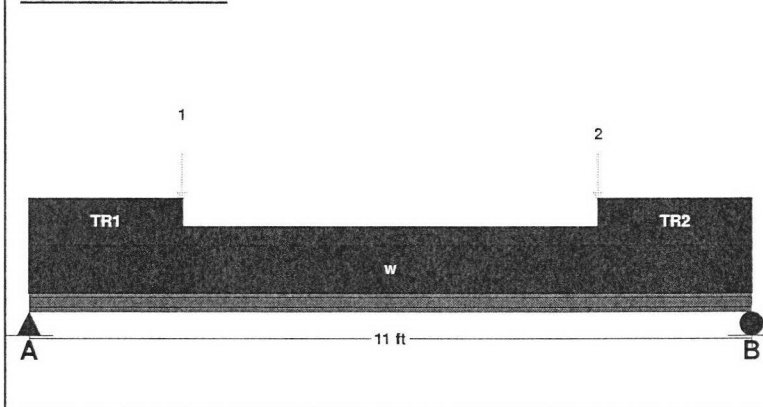
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LOADING DIAGRAM



UNIFORM LOADS

	Center
Uniform Live Load	260 plf
Uniform Dead Load	98 plf
Beam Self Weight	9 plf
Total Uniform Load	367 plf

POINT LOADS - CENTER SPAN

Load Number	One	Two
Live Load	0 lb	0 lb
Dead Load	2816 lb	2816 lb
Location	2.33 ft	8.67 ft

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two	Three
Left Live Load	388 plf	388 plf	40 plf
Left Dead Load	264 plf	264 plf	95 plf
Right Live Load	388 plf	388 plf	40 plf
Right Dead Load	264 plf	264 plf	95 plf
Load Start	0 ft	8.67 ft	2.33 ft
Load End	2.33 ft	11 ft	8.67 ft
Load Length	2.33 ft	2.33 ft	6.34 ft

Project: Washington5

Location: Beam #12 at lower stairs

Uniformly Loaded Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 8.83 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 2.0%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.08 IN L/1355

Dead Load 0.05 in

Total Load 0.13 IN L/843

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

REACTIONS

A

B

Live Load 1678 lb 1678 lb

Dead Load 1020 lb 1020 lb

Total Load 2698 lb 2698 lb

Bearing Length 1.23 in 1.23 in

BEAM DATA

Center

Span Length 8.83 ft

Unbraced Length-Top 1.33 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 988 psi

Cd=1.00 Cl=1.00 CF=1.10

Shear Stress: Fv = 180 psi Fv' = 180 psi

Cd=1.00

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment: 5955 ft-lb

4.415 ft from left support

Created by combining all dead and live loads.

Controlling Shear: 2698 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 72.35 in³ 73.83 in³

Area (Shear): 22.48 in² 39.38 in²

Moment of Inertia (deflection): 118.3 in⁴ 415.28 in⁴

Moment: 5955 ft-lb 6077 ft-lb

Shear: 2698 lb 4725 lb

NOTES



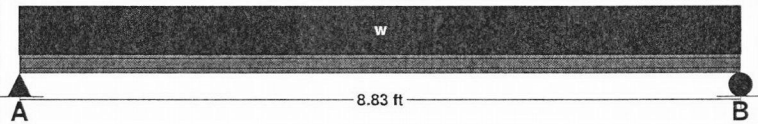
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	0 ft	9.5 ft
Wall Load	WALL =	80 plf	

BEAM LOADING

Beam Total Live Load:	wL =	380 plf
Beam Total Dead Load:	wD =	223 plf
Beam Self Weight:	BSW =	9 plf
Total Maximum Load:	wT =	611 plf

Project: Washington5

Location: Beam #13 lower stairs carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 12.0 IN x 7.33 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 25.3%

Controlling Factor: Moment



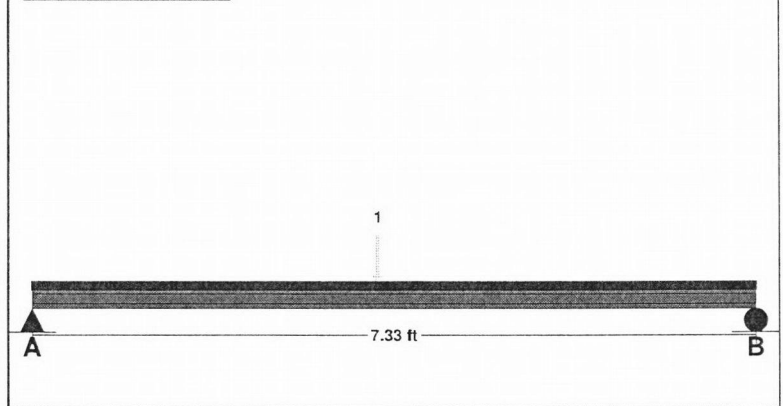
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LOADING DIAGRAM



DEFLECTIONS

Center

Live Load 0.01 IN L/7680

Dead Load 0.10 in

Total Load 0.12 IN L/762

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

REACTIONS

A

B

Live Load 586 lb 586 lb

Dead Load 3574 lb 3288 lb

Total Load 4161 lb 3875 lb

Bearing Length 1.83 in 1.70 in

BEAM DATA

Center

Span Length 7.33 ft

Unbraced Length-Top 1.33 ft

Unbraced Length-Bottom 7.33 ft

Floor Duration Factor 1.00

Camber Adj. Factor 0

Camber Required 0

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:
Fb_cmpr = 1850 psi Fb' = 2153 psi
Cd=0.90 Cl=1.00

Shear Stress: Fv = 265 psi Fv' = 265 psi
Cd=1.00

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 650 psi Fc $\perp$ ' = 650 psi

Controlling Moment: 12031 ft-lb

3.52 Ft from left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Controlling Shear: 4161 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 67.06 in³ 84 in³

Area (Shear): 23.55 in² 42 in²

Moment of Inertia (deflection): 158.74 in⁴ 504 in⁴

Moment: 12031 ft-lb 15070 ft-lb

Shear: 4161 lb 7420 lb

FLOOR LOADING

Center

Floor Live Load FLL = 40 psf

Floor Dead Load FDL = 15 psf

Floor Tributary Width Side One TW1 = 4 ft

Floor Tributary Width Side Two TW2 = 0 ft

Wall Load WALL = 0 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 0 lb

Dead Load 6356 lb

Location 3.5 ft

BEAM LOADING

Center

Reduced Floor Live Load 40 psf

Total Live Load 160 plf

Total Dead Load 60 plf

Beam Self Weight 9 plf

Total Load 229 plf

NOTES

Project: Washington5

Location: Beam #14 front edge carrier end unit
Multi-Span Floor Beam
[2009 International Building Code(2005 NDS)]
1.5 IN x 11.25 IN x 9.33 FT (7.3 + 2)
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 40.8%
Controlling Factor: Moment

DEFLECTIONS	Center	Right
Live Load	-0.01 IN L/5882	0.03 IN 2L/1880
Dead Load	0.01 in	0.00 in
Total Load	0.01 IN L/7065	0.02 IN 2L/1930
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	0 lb	813 lb
Dead Load	304 lb	1016 lb
Total Load	304 lb	1828 lb
Bearing Length	0.32 in	1.95 in

BEAM DATA	Center	Right
Span Length	7.33 ft	2 ft
Unbraced Length-Top	1.33 ft	1.33 ft
Unbraced Length-Bottom	7.33 ft	2 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Cl=0.76 CF=1.00	Fb' = 680 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: -1274 ft-lb
Over right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear: 1274 lb
At left support of span 3 (Right Span)
Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Req'd	Provided
Section Modulus:	22.47 in3	31.64 in3
Area (Shear):	10.62 in2	16.88 in2
Moment of Inertia (deflection):	34.09 in4	177.98 in4
Moment:	-1274 ft-lb	1794 ft-lb
Shear:	1274 lb	2025 lb

NOTES



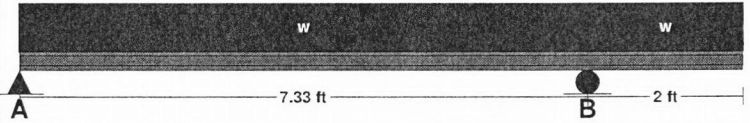
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LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	65 psf
Floor Dead Load	FDL = 15 psf	32 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	5.5 ft
Wall Load	WALL = 100 plf	100 plf

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	65 psf
Total Live Load	0 plf	358 plf
Total Dead Load	100 plf	276 plf
Beam Self Weight	4 plf	4 plf
Total Load	104 plf	637 plf

Project: Washington5

Location: Beam #15 front edge carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 9.67 FT (7.7 + 2)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 10.7%

Controlling Factor: Shear

DEFLECTIONS

	Center	Right
Live Load	0.00 IN L/MAX	0.01 IN 2L/6862
Dead Load	-0.03 in	0.05 in
Total Load	-0.03 IN L/3100	0.06 IN 2L/862

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

REACTIONS

	A	B
Live Load	0 lb	497 lb
Dead Load	-83 lb	4742 lb
Total Load	-83 lb	5240 lb
Uplift (1.5 F.S)	-140 lb	0 lb
Bearing Length	0.00 in	2.40 in

BEAM DATA

	Center	Right
Span Length	7.67 ft	2 ft
Unbraced Length-Top	1.33 ft	1.33 ft
Unbraced Length-Bottom	7.67 ft	2 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Cl=0.98 CF=1.10	Fb' = 975 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment:

-4267 ft-lb

Over right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear:

4267 lb

At left support of span 3 (Right Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	52.52 in3	73.83 in3
Area (Shear):	35.56 in2	39.38 in2
Moment of Inertia (deflection):	115.72 in4	415.28 in4
Moment:	-4267 ft-lb	5998 ft-lb
Shear:	4267 lb	4725 lb

NOTES



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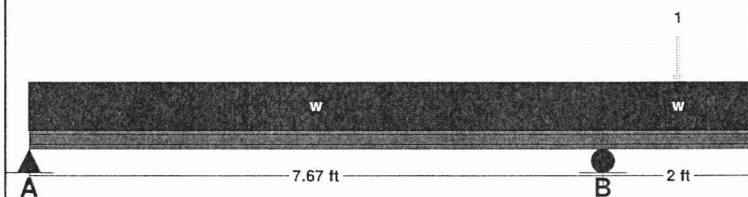
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LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	5.5 ft
Wall Load	WALL = 100 plf	100 plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	0 lb
Dead Load	3445 lb
Location	1 ft

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	0 plf	220 plf
Total Dead Load	100 plf	183 plf
Beam Self Weight	9 plf	9 plf
Total Load	109 plf	411 plf

Project: Washington5

Location: Beam #16 main floor stair beam

Uniformly Loaded Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 9.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 13.6%

Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.07	IN L/1519
Dead Load	0.05	in
Total Load	0.12	IN L/920
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS		A	B
Live Load	1440 lb	1440 lb	
Dead Load	938 lb	938 lb	
Total Load	2378 lb	2378 lb	
Bearing Length	1.09 in	1.09 in	

BEAM DATA		Center
Span Length	9	ft
Unbraced Length-Top	1.33	ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values		Adjusted	
Bending Stress:	Fb =	900 psi	Fb' =	988 psi
	Cd=1.00 Cl=1.00 CF=1.10			
Shear Stress:	Fv =	180 psi	Fv' =	180 psi
	Cd=1.00			
Modulus of Elasticity:	E =	1600 ksi	E' =	1600 ksi
Min. Mod. of Elasticity:	E_min =	580 ksi	E_min' =	580 ksi
Comp. ⊥ to Grain:	Fc ⊥ =	625 psi	Fc ⊥' =	625 psi

Controlling Moment: 5351 ft-lb

4.5 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -2378 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	65.01 in3	73.83 in3
Area (Shear):	19.82 in2	39.38 in2
Moment of Inertia (deflection):	108.35 in4	415.28 in4
Moment:	5351 ft-lb	6077 ft-lb
Shear:	-2378 lb	4725 lb

NOTES



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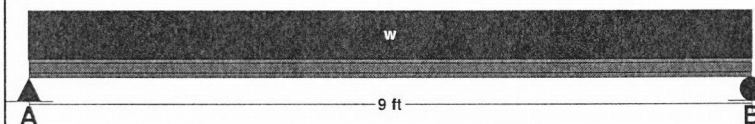
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	8 ft	0 ft
Wall Load	WALL =	80 plf	

BEAM LOADING

Beam Total Live Load:	wL =	320 plf
Beam Total Dead Load:	wD =	200 plf
Beam Self Weight:	BSW =	9 plf
Total Maximum Load:	wT =	529 plf

Project: Washington5

Location: Beam #17 over great room
Multi-Loaded Multi-Span Beam
[2009 International Building Code(2005 NDS)]
(2) 1.5 IN x 11.25 IN x 14.83 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 56.5%
Controlling Factor: Moment



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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

Center

Live Load 0.05 IN L/3320
Dead Load 0.11 in
Total Load 0.17 IN L/1065
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A B

Live Load 600 lb 89 lb
Dead Load 680 lb 227 lb
Total Load 1280 lb 316 lb
Bearing Length 0.68 in 0.17 in

BEAM DATA

Center

Span Length 14.83 ft
Unbraced Length-Top 1.33 ft
Unbraced Length-Bottom 14.83 ft
Live Load Duration Factor 1.00
Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

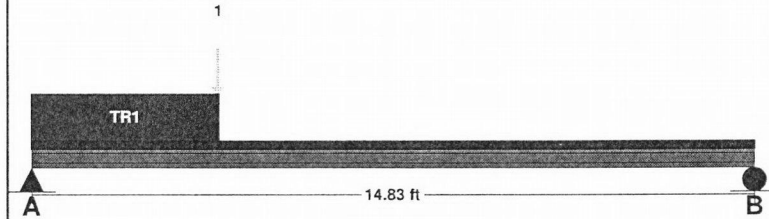
	Base Values	Adjusted
Bending Stress:	Fb = 900 psi	Fb' = 897 psi
	Cd=1.00 Cl=1.00 CF=1.00	
Shear Stress:	Fv = 180 psi	Fv' = 180 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. ⊥ to Grain:	Fc ⊥ = 625 psi	Fc ⊥' = 625 psi

Controlling Moment: 3024 ft-lb
3.86 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1280 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	40.43 in3	63.28 in3
Area (Shear):	10.67 in2	33.75 in2
Moment of Inertia (deflection):	80.21 in4	355.96 in4
Moment:	3024 ft-lb	4733 ft-lb
Shear:	1280 lb	4050 lb

LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 0 plf
Uniform Dead Load 0 plf
Beam Self Weight 7 plf
Total Uniform Load 7 plf

POINT LOADS - CENTER SPAN

Load Number One
Live Load 0 lb
Dead Load 538 lb
Location 3.83 ft

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number One
Left Live Load 180 plf
Left Dead Load 68 plf
Right Live Load 180 plf
Right Dead Load 68 plf
Load Start 0 ft
Load End 3.83 ft
Load Length 3.83 ft

NOTES

Project: Washington5

Location: Beam #18 over end unit lower floor

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 9.5 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 58.4%

Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.02	IN L/7134
Dead Load	0.15	in
Total Load	0.17	IN L/684
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS		A	B
Live Load	252 lb	252 lb	
Dead Load	1148 lb	2975 lb	
Total Load	1400 lb	3227 lb	
Bearing Length	0.62 in	1.42 in	

BEAM DATA		Center
Span Length	9.5	ft
Unbraced Length-Top	1.33	ft
Unbraced Length-Bottom	9.5	ft
Live Load Duration Factor	1.00	
Camber Adj. Factor	1	
Camber Required	0.15	
Notch Depth	0.00	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi	Controlled by:
	Fb_cmpr = 1850 psi	Fb' = 2154 psi
	Cd=0.90 Cl=1.00	
Shear Stress:	Fv = 265 psi	Fv' = 239 psi
	Cd=0.90	
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ ' = 650 psi

Controlling Moment: 7288 ft-lb
6.93 Ft from left support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: -2975 lb
At right support of span 2 (Center Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	40.6 in3	64.31 in3
Area (Shear):	18.71 in2	36.75 in2
Moment of Inertia (deflection):	118.41 in4	337.64 in4
Moment:	7288 ft-lb	11543 ft-lb
Shear:	-2975 lb	5843 lb

NOTES



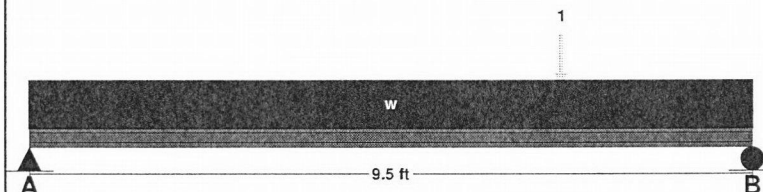
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LOADING DIAGRAM



UNIFORM LOADS

	Center
Uniform Live Load	53 plf
Uniform Dead Load	20 plf
Beam Self Weight	8 plf
Total Uniform Load	81 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	3857 lb
Location	7 ft

Project: Washington5

Location: Beam #19 over lower floor garage

Combination Roof And Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 10.5 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 77.1%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.12 IN L/1077

Dead Load 0.12 in

Total Load 0.24 IN L/533

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

REACTIONS

A

B

Live Load 1365 lb 1365 lb

Dead Load 1394 lb 1394 lb

Total Load 2759 lb 2759 lb

Bearing Length 1.21 in 1.21 in

BEAM DATA

Center

Span Length 10.5 ft

Unbraced Length-Top 1.33 ft

Roof Pitch 10 :12

Floor Duration Factor 1.00

Roof Duration Factor 1.15

Camber Adj. Factor 1

Camber Required 0.12

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:

Fb_cmpr = 1850 psi Fb' = 2392 psi

Cd=1.00 Cl=1.00

Shear Stress: Fv = 265 psi Fv' = 265 psi

Cd=1.00

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 650 psi Fc $\perp$ ' = 650 psi

Controlling Moment: 7242 ft-lb

5.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -2759 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 36.32 in3 64.31 in3

Area (Shear): 15.62 in2 36.75 in2

Moment of Inertia (deflection): 152.05 in4 337.64 in4

Moment: 7242 ft-lb 12821 ft-lb

Shear: -2759 lb 6493 lb

NOTES



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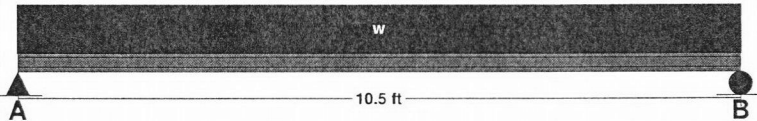
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LOADING DIAGRAM



ROOF LOADING

		Side 1	Side 2
Roof Live Load	RLL =	25 psf	25 psf
Roof Dead Load	RDL =	17 psf	17 psf
Roof Tributary Width	RTW =	0 ft	1.5 ft

FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	3 ft	3.5 ft
Wall Load	WALL =	160 plf	

BEAM LOADING

Roof Uniform Live Load:	wL-roof =	38 plf
Roof Uniform Dead Load:	wD-roof =	33 plf
Floor Uniform Live Load:	wL-floor =	260 plf
Floor Uniform Dead Load:	wD-floor =	98 plf
Beam Self Weight:	BSW =	8 plf
Combined Uniform Live Load:	wL =	298 plf
Combined Uniform Dead Load:	wD =	299 plf
Combined Uniform Total Load:	wT =	596 plf
Controlling Total Design Load:	wT-cont =	525 plf

Project: Washington5

Location: Beam #20 front carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 11.0 FT (9 + 2)

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 115.5%

Controlling Factor: Moment

DEFLECTIONS

	Center	Right
Live Load	0.00 IN L/Infinity	0.00 IN 2L/Infinity
Dead Load	-0.06 in	0.08 in
Total Load	-0.06 IN L/1854	0.08 IN 2L/582

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

REACTIONS

	A	B
Live Load	0 lb	0 lb
Dead Load	-416 lb	2820 lb
Total Load	-416 lb	2820 lb
Uplift (1.5 F.S)	-416 lb	0 lb
Bearing Length	0.00 in	1.24 in

BEAM DATA

	Center	Right
Span Length	9 ft	2 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	9 ft	2 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi	Controlled by: Fb_cmpr = 1850 psi Fb_cmpr' = 1636 psi Cd=0.90 Cl=0.98
Shear Stress:	Fv = 265 psi	Fv' = 239 psi Cd=0.90
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ ' = 650 psi

Controlling Moment: -4069 ft-lb
Over right support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 2332 lb
At left support of span 3 (Right Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	29.84 in3	64.31 in3
Area (Shear):	14.67 in2	36.75 in2
Moment of Inertia (deflection):	139.05 in4	337.64 in4
Moment:	-4069 ft-lb	8769 ft-lb
Shear:	2332 lb	5843 lb

NOTES



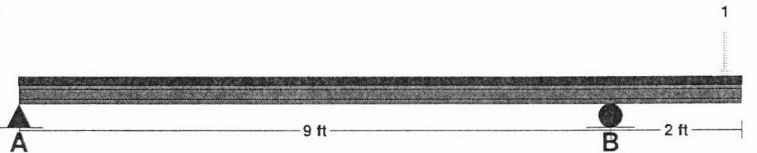
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LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	0 ft
Wall Load	WALL = 0 plf	0 plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	0 lb
Dead Load	2316 lb
Location	1.75 ft

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	0 plf	0 plf
Total Dead Load	0 plf	0 plf
Beam Self Weight	8 plf	8 plf
Total Load	8 plf	8 plf

Project: Washington5

Location: Beam #21 over rear of garage

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 12.0 IN x 11.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 39.4%

Controlling Factor: Shear

DEFLECTIONS

Center

Live Load 0.03 IN L/4214

Dead Load 0.27 in

Total Load 0.30 IN L/444

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

REACTIONS

A

B

Live Load 962 lb 962 lb

Dead Load 4361 lb 4361 lb

Total Load 5323 lb 5323 lb

Bearing Length 2.34 in 2.34 in

BEAM DATA

Center

Span Length 11 ft

Unbraced Length-Top 1.33 ft

Unbraced Length-Bottom 11 ft

Live Load Duration Factor 1.00

Camber Adj. Factor 1

Camber Required 0.27

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:
Fb_cmpr = 1850 psi Fb' = 2391 psi
Cd=1.00 Cl=1.00

Shear Stress: Fv = 265 psi Fv' = 265 psi
Cd=1.00

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 650 psi Fc $\perp$ ' = 650 psi

Controlling Moment: 11219 ft-lb

5.5 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 5323 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 56.3 in3 84 in3

Area (Shear): 30.13 in2 42 in2

Moment of Inertia (deflection): 272.37 in4 504 in4

Moment: 11219 ft-lb 16738 ft-lb

Shear: 5323 lb 7420 lb

NOTES



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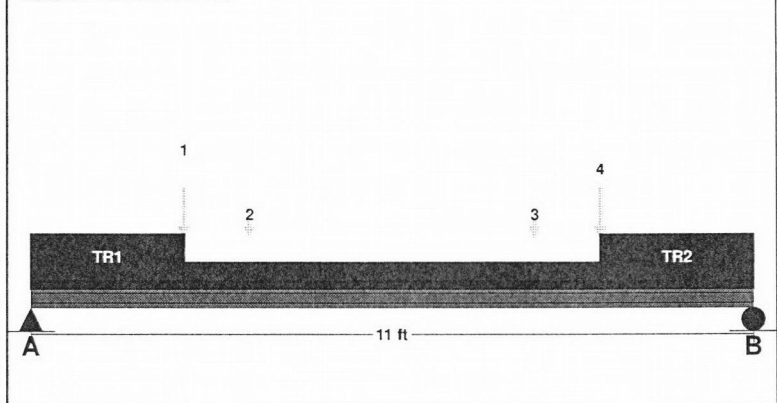
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LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 0 plf

Uniform Dead Load 0 plf

Beam Self Weight 9 plf

Total Uniform Load 9 plf

POINT LOADS - CENTER SPAN

Load Number	One	Two	Three	Four
Live Load	0 lb	0 lb	0 lb	0 lb
Dead Load	2316 lb	714 lb	714 lb	2316 lb
Location	2.33 ft	3.33 ft	7.67 ft	8.67 ft

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two	Three
Left Live Load	413 plf	413 plf	0 plf
Left Dead Load	441 plf	441 plf	80 plf
Right Live Load	413 plf	413 plf	0 plf
Right Dead Load	441 plf	441 plf	80 plf
Load Start	0 ft	8.67 ft	2.33 ft
Load End	2.33 ft	11 ft	8.67 ft
Load Length	2.33 ft	2.33 ft	6.34 ft

Project: Washington5

Location: Beam #22 over main floor stairs

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 14.0 FT (2 + 12)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 55.0%

Controlling Factor: Moment

DEFLECTIONS	Left	Center
Live Load	-0.06 IN 2L/806	0.12 IN L/1244
Dead Load	-0.01 in	0.03 in
Total Load	-0.07 IN 2L/668	0.14 IN L/1019
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	482 lb	521 lb
Dead Load	131 lb	238 lb
Total Load	613 lb	759 lb
Bearing Length	0.65 in	0.81 in

BEAM DATA	Left	Center
Span Length	2 ft	12 ft
Unbraced Length-Top	0 ft	1.33 ft
Unbraced Length-Bottom	2 ft	12 ft
Live Load Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Cl=0.99 CF=1.00	Fb' = 888 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 1511 ft-lb
8.04 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -759 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	20.41 in ³	31.64 in ³
Area (Shear):	6.33 in ²	16.88 in ²
Moment of Inertia (deflection):	79.43 in ⁴	177.98 in ⁴
Moment:	1511 ft-lb	2342 ft-lb
Shear:	-759 lb	2025 lb

NOTES



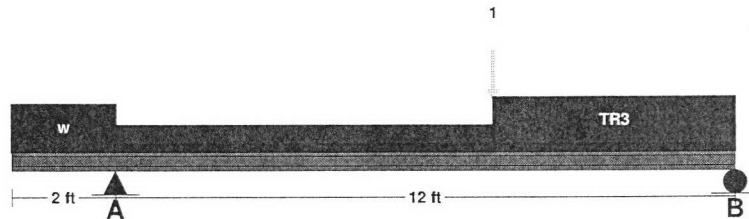
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LOADING DIAGRAM



UNIFORM LOADS	Left	Center
Uniform Live Load	53 plf	0 plf
Uniform Dead Load	13 plf	0 plf
Beam Self Weight	4 plf	4 plf
Total Uniform Load	70 plf	4 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	-200 lb
Location	7.33 ft

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two	Three
Left Live Load	53 plf	53 plf	107 plf
Left Dead Load	13 plf	20 plf	80 plf
Right Live Load	53 plf	53 plf	107 plf
Right Dead Load	13 plf	20 plf	80 plf
Load Start	0 ft	4 ft	7.33 ft
Load End	4 ft	7.33 ft	12 ft
Load Length	4 ft	3.33 ft	4.67 ft

Project: Washington5

Location: Deck Guardrail

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

1.5 IN x 5.5 IN x 8.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 48.7%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.00 IN L/Infinity

Dead Load 0.12 in

Total Load 0.12 IN L/830

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

REACTIONS

A

B

Live Load 0 lb 0 lb

Dead Load 107 lb 107 lb

Total Load 107 lb 107 lb

Bearing Length 0.11 in 0.11 in

BEAM DATA

Center

Span Length 8 ft

Unbraced Length-Top 8 ft

Unbraced Length-Bottom 8 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 978 psi

Cd=0.90 Cl=0.93 CF=1.30

Shear Stress: Fv = 180 psi Fv' = 162 psi

Cd=0.90

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment: 414 ft-lb

4.0 Ft from left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Controlling Shear: 107 lb

At left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Comparisons with required sections:

Req'd

Provided

Section Modulus: 5.09 in³ 7.56 in³

Area (Shear): 0.99 in² 8.25 in²

Moment of Inertia (deflection): 6.02 in⁴ 20.8 in⁴

Moment: 414 ft-lb 616 ft-lb

Shear: 107 lb 891 lb



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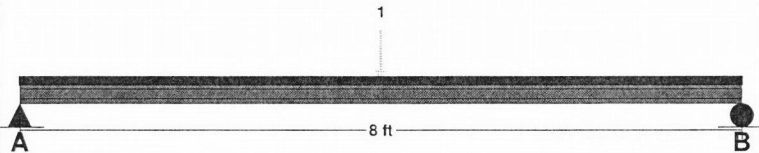
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LOADING DIAGRAM



FLOOR LOADING

Center

Floor Live Load FLL = 0 psf

Floor Dead Load FDL = 0 psf

Floor Tributary Width Side One TW1 = 0 ft

Floor Tributary Width Side Two TW2 = 0 ft

Wall Load WALL = 0 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 0 lb

Dead Load 200 lb

Location 4 ft

BEAM LOADING

Center

Reduced Floor Live Load 0 psf

Total Live Load 0 plf

Total Dead Load 0 plf

Beam Self Weight 2 plf

Total Load 2 plf

NOTES

Project: Washington5

Location: Footing A

Footing

[2009 International Building Code(2005 NDS)]

Footing Size: 3.0 FT x 3.0 FT x 12.00 IN

Reinforcement: #4 Bars @ 7.00 IN. O.C. E/W / (5) min.

Section Footing Design Adequate



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FOOTING PROPERTIES

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

FOOTING SIZE

Width: $W = 3$ ft
Length: $L = 3$ ft
Depth: $\text{Depth} = 12$ in
Effective Depth to Top Layer of Steel: $d = 8.25$ in

COLUMN AND BASEPLATE SIZE

Column Type: Wood
Column Width: $m = 3.5$ in
Column Depth: $n = 5.5$ in

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure: $Q_u = 1253$ psf
Effective Allowable Soil Bearing Pressure: $Q_e = 1350$ psf
Required Footing Area: $A_{req} = 8.35$ sf
Area Provided: $A = 9.00$ sf

Baseplate Bearing:

Bearing Required: $\text{Bear} = 15788$ lb
Allowable Bearing: $\text{Bear-A} = 53178$ lb

Beam Shear Calculations (One Way Shear):

Beam Shear: $V_{u1} = 4276$ lb
Allowable Beam Shear: $V_{c1} = 22275$ lb

Punching Shear Calculations (Two Way Shear):

Critical Perimeter: $B_o = 51$ in
Punching Shear: $V_{u2} = 13820$ lb
Allowable Punching Shear (ACI 11-35): $vc2-a = 71719$ lb
Allowable Punching Shear (ACI 11-36): $vc2-b = 133650$ lb
Allowable Punching Shear (ACI 11-37): $vc2-c = 63113$ lb
Controlling Allowable Punching Shear: $vc2 = 63113$ lb

Bending Calculations:

Factored Moment: $M_u = 71045$ in-lb
Nominal Moment Strength: $M_n = 282369$ in-lb

Reinforcement Calculations:

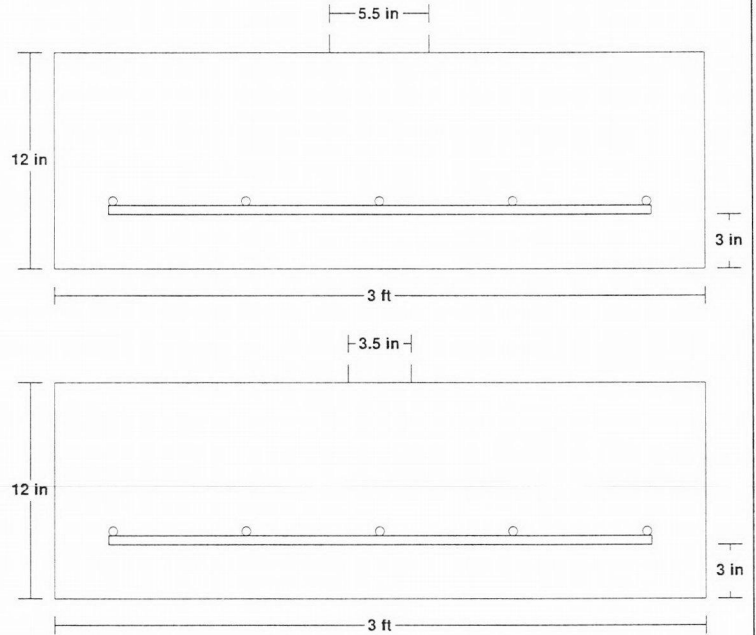
Concrete Compressive Block Depth: $a = 0.51$ in
Steel Required Based on Moment: $A_s(1) = 0.24$ in²
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4): $A_s(2) = 0.86$ in²
Controlling Reinforcing Steel: $A_{s-reqd} = 0.86$ in²
Selected Reinforcement: #4's @ 7.0 in. o.c. e/w (5) Min.
Reinforcement Area Provided: $A_s = 0.98$ in²

Development Length Calculations:

Development Length Required: $L_d = 15$ in
Development Length Supplied: $L_{d-sup} = 15$ in

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

LOADING DIAGRAM



FOOTING LOADING

Live Load: $PL = 0$ lb
Dead Load: $PD = 11277$ lb
Total Load: $PT = 11277$ lb
Ultimate Factored Load: $P_u = 15788$ lb
Weight to resist uplift w/ 1.5 F.S.: $U.R. = 870$ lb

NOTES

Project: Washington5

Location: Footing B

Footing

[2009 International Building Code(2005 NDS)]

Footing Size: 3.17 FT x 3.17 FT x 12.00 IN

Reinforcement: #4 Bars @ 7.00 IN. O.C. E/W / (5) min.

Section Footing Design Adequate



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FOOTING PROPERTIES

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

FOOTING SIZE

Width: $W = 3.17$ ft
Length: $L = 3.17$ ft
Depth: $\text{Depth} = 12$ in
Effective Depth to Top Layer of Steel: $d = 8.25$ in

COLUMN AND BASEPLATE SIZE

Column Type: Wood
Column Width: $m = 3.5$ in
Column Depth: $n = 5.5$ in

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure: $Q_u = 1350$ psf
Effective Allowable Soil Bearing Pressure: $Q_e = 1350$ psf
Required Footing Area: $A_{req} = 10.05$ sf
Area Provided: $A = 10.05$ sf

Baseplate Bearing:

Bearing Required: $\text{Bear} = 18990$ lb
Allowable Bearing: $\text{Bear-A} = 53178$ lb

Beam Shear Calculations (One Way Shear):

Beam Shear: $V_{u1} = 5376$ lb
Allowable Beam Shear: $V_{c1} = 23537$ lb

Punching Shear Calculations (Two Way Shear):

Critical Perimeter: $B_o = 51$ in
Punching Shear: $V_{u2} = 16869$ lb
Allowable Punching Shear (ACI 11-35): $vc2-a = 71719$ lb
Allowable Punching Shear (ACI 11-36): $vc2-b = 133650$ lb
Allowable Punching Shear (ACI 11-37): $vc2-c = 63113$ lb
Controlling Allowable Punching Shear: $vc2 = 63113$ lb

Bending Calculations:

Factored Moment: $M_u = 90296$ in-lb
Nominal Moment Strength: $M_n = 282855$ in-lb

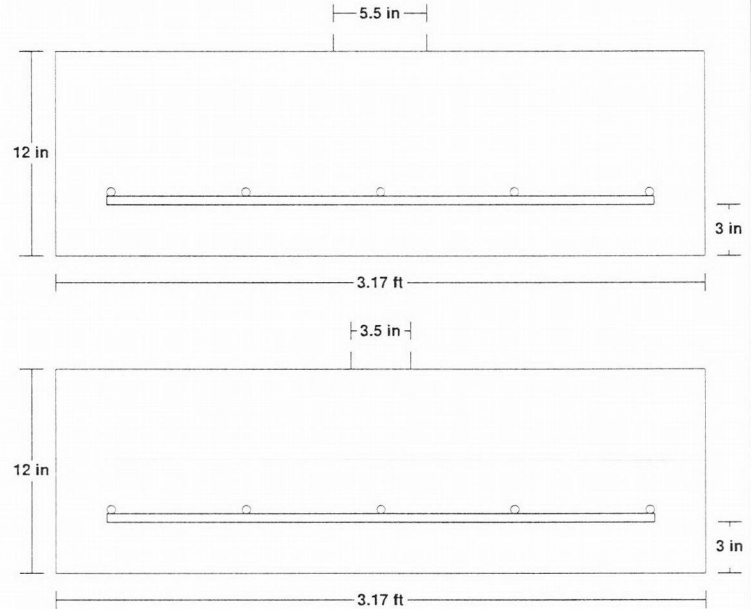
Reinforcement Calculations:

Concrete Compressive Block Depth: $a = 0.49$ in
Steel Required Based on Moment: $A_s(1) = 0.31$ in²
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4): $A_s(2) = 0.91$ in²
Controlling Reinforcing Steel: $A_{s-reqd} = 0.91$ in²
Selected Reinforcement: #4's @ 7.0 in. o.c. e/w (5) Min.
Reinforcement Area Provided: $A_s = 0.98$ in²

Development Length Calculations:

Development Length Required: $L_d = 15$ in
Development Length Supplied: $L_{d-sup} = 16.02$ in

LOADING DIAGRAM



FOOTING LOADING

Live Load: $PL = 0$ lb
Dead Load: $PD = 13564$ lb
Total Load: $PT = 13564$ lb
Ultimate Factored Load: $P_u = 18990$ lb
Weight to resist uplift w/ 1.5 F.S.: $U.R. = 971$ lb

NOTES

Project: Washington5

Location: Strip footings

Footing

[2009 International Building Code(2005 NDS)]

Footing Size: 15.0 IN Wide x 7.0 IN Deep Continuous Footing With 6.0 IN Thick x 12.0 IN Tall Stemwall

Section Footing Design Adequate



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CAUTIONS

* Footing has been designed without reinforcement

FOOTING PROPERTIES

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

FOOTING SIZE

Width: $W = 15$ in
Depth: $\text{Depth} = 7$ in
Effective Depth to Top Layer of Steel: $d = 5$ in

STEMWALL SIZE

Stemwall Width: 6 in
Stemwall Height: 12 in
Stemwall Weight: 150 pcf

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure: $Q_u = 1389$ psf
Effective Allowable Soil Bearing Pressure: $Q_e = 1413$ psf
Width Required: $W_{req} = 1.23$ in2

Beam Shear Calculations (One Way Shear):

Beam Shear: $V_{u1} = 0$ lb
Allowable Beam Shear: $V_{c1} = 2200$ lb

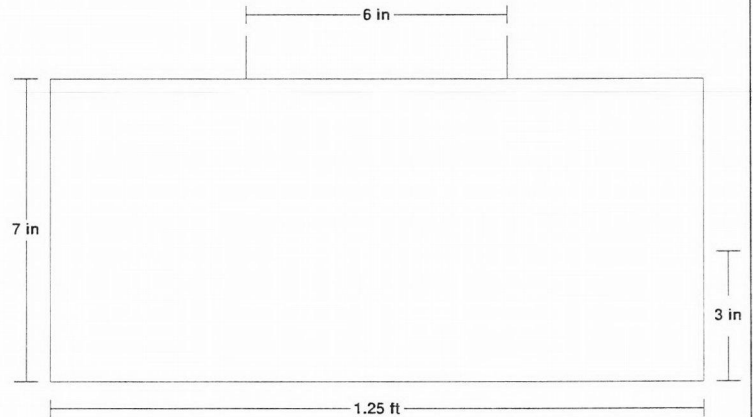
Transverse Direction:

Bending Calculations:

Factored Moment: $M_u = 1673$ in-lb
Nominal Moment Strength: $M_n = 6875$ in-lb

NOTES

LOADING DIAGRAM



FOOTING LOADING

Live Load: $PL = 989$ lb
Dead Load: $PD = 672$ lb
Total Load: $PT = 1736$ lb
Ultimate Factored Load: $P_u = 2479$ lb

LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Roof:	$LL = 25$ psf	$DL = 17$ psf	$TA = 6.8$ ft2
Second Floor:	$LL = 40$ psf	$DL = 15$ psf	$TA = 10.3$ ft2
First Floor:	$LL = 40$ psf	$DL = 15$ psf	$TA = 10.3$ ft2

9.75



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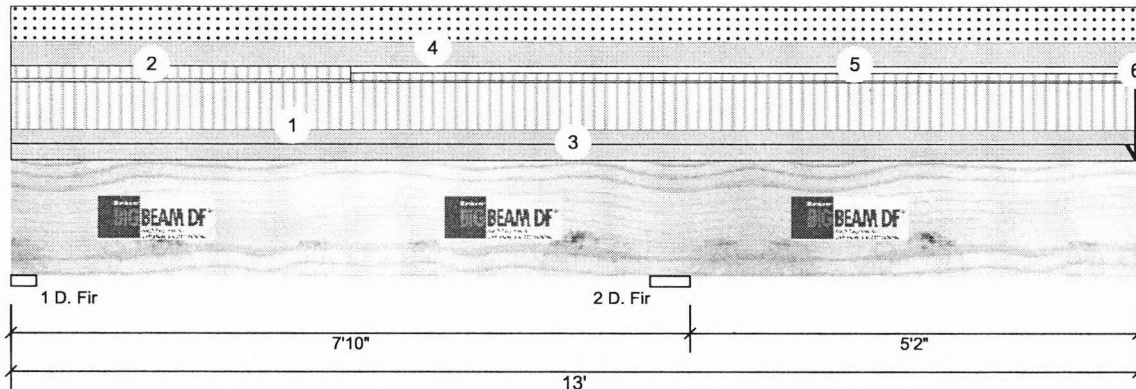
Client: Kevin Brayson - Precision Truss & Lumber
 Project: CANTILEVER X-BEAM
 Address:

Date: 2/16/2018
 Designer: EVAN KELLY
 Job Name: STOCKHOUSE PLAN
 Project #:

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B2 Rosboro Big Beam DF 5.500" X 16.000" - PASSED

Level: Level

**Member Information**

Type:	Girder	Application:	Floor
Moisture Condition:	Dry	Design Method:	ASD
Deflection LL:	480	Building Code:	IBC/IRC 2015
Deflection TL:	360	Load Sharing:	No
Importance:	Normal	Wet Use:	No
Temperature:	Temp <= 100°F	Deck:	Not Checked
General Load			
Floor Live:	40 PSF		
Dead:	12 PSF		

Reactions UNPATTERNED lb (Uplift)

Brg	Live	Dead	Snow	Wind	Const
1	708	(-239)	0 (-1279)	0	0
2	3267	5978	6209	0	0

Bearings

Bearing	Length	Cap. React D/L lb	Total	Ld. Case	Ld. Comb.
1 - D. Fir 3.500"	8%	-239 / 1246	1007 (-1875)	L_	D+L
2 - D. Fir 5.500"	69%	5978 / 7107	13085	LL	D+0.75(L+S)

Analysis Results

Analysis	Actual	Location	Allowed	Capacity	Comb.	Case
Neg Moment	26607 ft-lb	7'7 1/4"	67467 ft-lb	0.394 (39%)	D+S	_L
Unbraced	26607 ft-lb	7'7 1/4"	66383 ft-lb	0.401 (40%)	D+S	_L
Pos Moment	557 ft-lb	1'6 1/8"	58667 ft-lb	0.009 (1%)	D+L	L_
Unbraced	557 ft-lb	1'6 1/8"	58427 ft-lb	0.010 (1%)	D+L	L_
Shear	5875 lb	9'2"	17879 lb	0.329 (33%)	D+0.75(L+S)	LL
LL Defl inch	0.021 (L/4127)	4'6 3/8"	0.185 (L/480)	0.120 (12%)	S	_L
TL Defl inch	0.034 (L/2630)	4'7 7/16"	0.246 (L/360)	0.140 (14%)	D+S	_L
LL Cant	0.136 (2L/910)	Rt Cant	0.258 (2L/480)	0.530 (53%)	S	_L
TL Cant	0.229 (2L/542)	Rt Cant	0.344 (2L/360)	0.660 (66%)	D+S	_L

Design Notes

- Warning Note: right cant exceeds 1/3 of back span, wind uplift may need to be checked.
- Girders are designed to be supported on the bottom edge only.
- Tie-down connection required at bearing 1 for uplift 1875 lb (Combination D+S, Load Case _L).
- Top braced at bearings.
- Bottom braced at bearings.

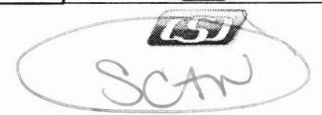
ID	Load Type	Location	Trib Width	Side	Dead 0.9	Live 1	Snow 1.15	Wind 1.6	Const. 1.25	Comments
1	Tie-In	0-0-0 to 13-0-0	(Span) 12-10-8	Top	12 PSF	40 PSF	0 PSF	0 PSF	0 PSF	LSC
2	Tie-In	0-0-0 to 3-11-0	(Span) 3-4-8	Top	12 PSF	40 PSF	0 PSF	0 PSF	0 PSF	RSC1

Continued on page 2...

Manufacturer Info

Rosboro
 Springfield, OR 97477
 (877) 457-4139
 www.rosboro.com
 APA: PR-L251

INTERNATIONAL WOOD
 PRODUCTS
 14421 SE 98th CT, OR
 97015



17-258 825/47/53/57/58-25



isDesign™

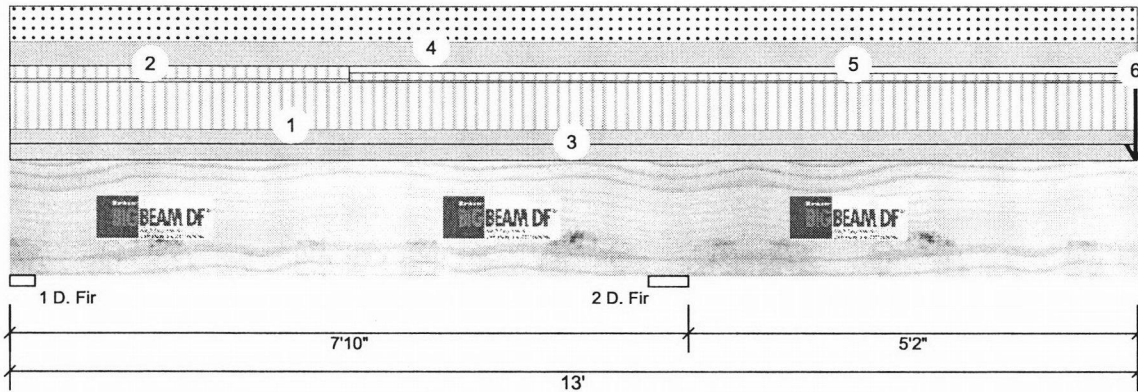
Client: Kevin Brayson - Precision Truss & Lumber
Project: CANTILEVER X-BEAM
Address:

Date: 2/16/2018
Designer: EVAN KELLY
Job Name: STOCKHOUSE PLAN
Project #:

Page 4 of 4

B2 Rosboro Big Beam DF 5.500" X 16.000" - PASSED

Level: Level



...Continued from page 1

ID	Load Type	Location	Trib Width	Side	Dead 0.9	Live 1	Snow 1.15	Wind 1.6	Const. 1.25	Comments
3	Uniform			Top	90 PLF	0 PLF	0 PLF	0 PLF	0 PLF	WALL
4	Tie-In	0-0-0 to 13-0-0	(Span)15-6-0	Top	17 PSF	0 PSF	25 PSF	0 PSF	0 PSF	ROOF
5	Tie-In	3-11-0 to 13-0-0	(Span)2-0-0	Top	12 PSF	40 PSF	0 PSF	0 PSF	0 PSF	RSC2
6	Point	12-11-12		Top	1378 lb	0 lb	2411 lb	0 lb	0 lb	PL
	Self Weight				22 PLF					

Manufacturer Info

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Springfield, OR 97477
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APA: PR-L251

INTERNATIONAL WOOD
PRODUCTS
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503-659-9371

Title :
Dsgnr:
Description :
Date:
Job #
Scope :

Rev: 580004
User: KVV-0507115, Ver: 5.8.0, 1-Dec-2003
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General Timber Beam

Page 1

Description 7614 SE Washington St Beam Supporting Shearwall 3a **BEAM #7**
7622 SE Washington St

General Information

Code Ref: 1997/2001 NDS, 2000/2003 IBC, 2003 NFPA 5000. Base allowables are user defined

Section Name	4x12	Center Span	8.33 ft	Lu	0.00 ft
Beam Width	3.500 in	Left Cantilever	ft	Lu	0.00 ft
Beam Depth	11.250 in	Right Cantilever	4.00 ft	Lu	0.00 ft
Member Type	Sawn	Douglas Fir - Larch, No.2			
Bm Wt. Added to Loads		Fb Base Allow	875.0 psi		
Load Dur. Factor	1.330	Fv Allow	170.0 psi		
Beam End Fixity	Pin-Pin	Fc Allow	625.0 psi		
Wood Density	30.000 pcf	E	1,300.0 ksi		

Trapezoidal Loads

#1 DL @ Left	224.00 #/ft	LL @ Left	#/ft	Start Loc	0.000 ft
DL @ Right	224.00 #/ft	LL @ Right	#/ft	End Loc	8.330 ft
#2 DL @ Left	181.00 #/ft	LL @ Left	#/ft	Start Loc	8.330 ft
DL @ Right	181.00 #/ft	LL @ Right	#/ft	End Loc	12.330 ft

Moment Loads

Dead Load	in-#	in-#	in-#	in-#	in-#	in-#	in-#
Live Load	2,912.00 in-#	in-#	in-#	in-#	in-#	in-#	in-#
...distance	10.330 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft

Summary

Beam Design OK

Span= 8.33ft, Right Cant= 4.00ft, Beam Width = 3.500in x Depth = 11.25in. Ends are Pin-Pin

Max Stress Ratio 0.192 : 1

Maximum Moment Allowable

-1.5 k-ft
7.9 k-ft

Maximum Shear * 1.5 Allowable

1.4 k
8.9 k

Max. Positive Moment 1.33 k-ft at 3.401 ft

Max. Negative Moment -1.51 k-ft at 8.330 ft

Max @ Left Support

0.00 k-ft

Max @ Right Support

-1.27 k-ft

Max. M allow

7.88

Shear:

@ Left 0.81 k

@ Right 1.15 k

Camber:

@ Left 0.000 in

@ Center 0.039 in

@ Right 0.002 in

Fb 246.02 psi

Fv 35.48 psi

Reactions...

Left DL 0.79 k

Max 0.81 k

Fb 1,280.13 psi

Fv 226.10 psi

Right DL 1.91 k

Max 1.88 k

Deflections

Center Span...	Dead Load	Total Load	Left Cantilever...	Dead Load	Total Load
Deflection	-0.026 in	-0.026 in	Deflection	0.000 in	0.000 in
...Location	3.746 ft	3.746 ft	...Length/Defl	0.0	0.0
...Length/Defl	3,855.4	3,855.43	Right Cantilever...		
Camber (using 1.5 * D.L. Defl) ...			Deflection	-0.001 in	0.012 in
@ Center	0.039 in		...Length/Defl	75,849.3	8,180.5
@ Left	0.000 in				
@ Right	0.002 in				

2/8

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503-659-9371

Title :
Dsgnr:
Description :

Job #
Date:

Scope :

Rev: 580004
User: KWA-0607115 Ver 5.8.0, 1-Dec-2003
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General Timber Beam

Page 2

Description 7614 SE Washington St Beam Supporting Shearwall 3a
7622 SE Washington St

Stress Calcs

Bending Analysis

Ck	27.106	La	0.000 ft	Sxx	73.828 in3	Area	39.375 in2
Cf	1.100	Rb	0.000	Cf	0.000		

Max Moment

Sxx Req'd

Allowable fb

@ Center	1.51 k-ft	14.19 in3	1,280.13 psi
@ Left Support	0.00 k-ft	0.00 in3	1,280.13 psi
@ Right Support	1.27 k-ft	11.91 in3	1,280.13 psi

Shear Analysis

@ Left Support

@ Right Support

Design Shear	0.90 k	1.40 k
Area Required	3.961 in2	6.179 in2
Fv: Allowable	226.10 psi	226.10 psi

Bearing @ Supports

Max. Left Reaction	0.81 k	Bearing Length Req'd	0.372 in
Max. Right Reaction	1.88 k	Bearing Length Req'd	0.658 in

Query Values

M, V, & D @ Specified Locations

Moment

Shear

Deflection

@ Center Span Location =	0.00 ft	0.00 k-ft	0.81 k	0.0000 in
@ Right Cant. Location =	0.00 ft	0.00 k-ft	0.81 k	0.0000 in
@ Left Cant. Location =	0.00 ft	0.00 k-ft	0.00 k	0.0000 in

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503-659-9371

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Scope :

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General Timber Beam

Page 1

Description 7614 SE Washington St Beam Supporting Shearwall 3a

General Information

Code Ref: 1997/2001 NDS, 2000/2003 IBC, 2003 NFPA 5000. Base allowables are user defined

Section Name	4x12	Center Span	8.33 ft	Lu	0.00 ft
Beam Width	3.500 in	Left Cantilever	ft	Lu	0.00 ft
Beam Depth	11.250 in	Right Cantilever	4.00 ft	Lu	0.00 ft
Member Type	Sawn	Douglas Fir - Larch, No.2			
Bm Wt. Added to Loads		Fb Base Allow	875.0 psi		
Load Dur. Factor	1.330	Fv Allow	170.0 psi		
Beam End Fixity	Pin-Pin	Fc Allow	625.0 psi		
Wood Density	30.000 pcf	E	1,300.0 ksi		

Trapezoidal Loads

#1 DL @ Left	224.00 #/ft	LL @ Left	#/ft	Start Loc	0.000 ft
DL @ Right	224.00 #/ft	LL @ Right	#/ft	End Loc	8.330 ft
#2 DL @ Left	181.00 #/ft	LL @ Left	#/ft	Start Loc	8.330 ft
DL @ Right	181.00 #/ft	LL @ Right	#/ft	End Loc	12.330 ft

Moment Loads

Dead Load	in-#	in-#	in-#	in-#	in-#	in-#	in-#
Live Load	-2,912.00 in-#	in-#	in-#	in-#	in-#	in-#	in-#
...distance	10.330 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft

Summary

Beam Design OK

Span= 8.33ft, Right Cant= 4.00ft, Beam Width = 3.500in x Depth = 11.25in, Ends are Pin-Pin

Max Stress Ratio 0.223 ; 1

Maximum Moment Allowable

-1.8 k-ft
7.9 k-ft

Maximum Shear * 1.5 Allowable

1.4 k
8.9 k

Max. Positive Moment 1.33 k-ft at 3.401 ft
Max. Negative Moment -1.51 k-ft at 8.330 ft

Max @ Left Support 0.00 k-ft
Max @ Right Support -1.76 k-ft

Max. M allow 7.88

fb 285.47 psi

Fb 1,280.13 psi

fv 36.59 psi

Fv 226.10 psi

Reactions...

Left DL 0.79 k

Right DL 1.91 k

Shear: @ Left 0.79 k
@ Right 1.18 k

Camber: @ Left 0.000 in
@ Center 0.039 in
@ Right 0.002 in

Max 0.79 k

Max 1.93 k

Deflections

Center Span...	Dead Load	Total Load	Left Cantilever...	Dead Load	Total Load
Deflection	-0.026 in	-0.026 in	Deflection	0.000 in	0.000 in
...Location	3.746 ft	3.746 ft	...Length/Defl	0.0	0.0
...Length/Defl	3,855.4	3,855.43	Right Cantilever...		
Camber (using 1.5 * D.L. Defl) ...			Deflection	-0.001 in	-0.015 in
@ Center	0.039 in		...Length/Defl	75,849.3	6,607.8
@ Left	0.000 in				
@ Right	0.002 in				

4/8

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General Timber Beam

Page 2

Description 7614 SE Washington St Beam Supporting Shearwall 3a
7622 SE Washington St

Stress Calcs

Bending Analysis

Ck	27.106	Le	0.000 ft	Sxx	73.828 in ³	Area	39.375 in ²
Cf	1.100	Rb	0.000	CI	0.000		

Max Moment

Sxx Req'd

Allowable fb

@ Center	1.51 k-ft	14.19 in ³	1,280.13 psi
@ Left Support	0.00 k-ft	0.00 in ³	1,280.13 psi
@ Right Support	1.76 k-ft	16.46 in ³	1,280.13 psi

Shear Analysis

@ Left Support

@ Right Support

Design Shear	0.85 k	1.44 k
Area Required	3.768 in ²	6.372 in ²
Fv Allowable	226.10 psi	226.10 psi

Bearing @ Supports

Max. Left Reaction	0.79 k	Bearing Length Req'd	0.359 in
Max. Right Reaction	1.93 k	Bearing Length Req'd	0.884 in

Query Values

M, V, & D @ Specified Locations

Moment

Shear

Deflection

@ Center Span Location =	0.00 ft	0.00 k-ft	0.76 k	0.0000 in
@ Right Cant. Location =	0.00 ft	0.00 k-ft	0.76 k	0.0000 in
@ Left Cant. Location =	0.00 ft	0.00 k-ft	0.00 k	0.0000 in

5/8

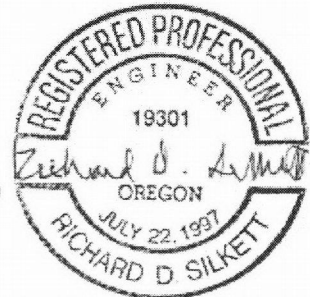
7614 SE Washington St
18-05
1422 SE Washington

Anchor Bolt Pullout: Edge Bolts

(ACI 318-05, Appendix D) Normal Strength Concrete:

$\phi := 0.70$ for Tension design $f_c := 2500$ psi

Category 1, Condition A



EXPIRES 6/30/18

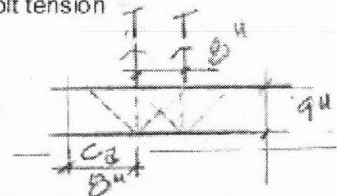
Anchor Bolt Strength: (2) 7/8" Anchor Bolt with 12" Embed, Edge distance = 2" min

Section D.5.1:

Single Anchor bolt (n) $n := 2$
Cross sectional area of bolt (Ase) $Ase := 0.60$
Allowable tension stress of bolt (Futa) $Futa := 1.9 \cdot 36$ $Futa = 68.4 < 125$ OK
Nominal tension strength of bolt (Nsa) $Nsa := n \cdot Ase \cdot Futa$
 $Nsa = 82.08$ kips

Allowable tension strength (ϕNsa) $\phi \cdot Nsa = 57.46$ kips Allowable Bolt tension

Concrete Strength: 7/8" Anchor Bolt with 9" Embed, Edge distance = 8" min



Section D.5.2.3 $Ca := 8$
 $hef := \frac{8}{1.5}$ $hef = 5.333$ inches (use for design)
Section D.5.2.1 $(c_2 + 5 + 1.5 \cdot hef) \cdot (2 \cdot 1.5 \cdot hef)$
Projected concrete failure area (Anc) $Anc := (8 + 8 + 1.5 \cdot 5.33) \cdot (2 \cdot 1.5 \cdot 5.33)$ $Anc = 384$ inches²
Projected concrete failure area at edge (Anco) $Anco := 9 \cdot 5.33^2$ $Anco = 256$ inches²

Modification factor for edge anchors (ψ_{ed}) $\psi_{ed} := 0.7 + 0.3 \cdot \left(\frac{2}{1.5 \cdot 5.33} \right)$ $\psi_{ed} = 0.775$

Max Allowed (Nb) (D-8) $Nb := \frac{16 \cdot \sqrt{f_c} \cdot 5.33^{1.5}}{1000}$ $Nb = 9.844$ kips N.A.
 $hef < 11$

Single Anchor breakout strength (Nb) $Nb := \frac{24 \cdot \sqrt{f_c} \cdot 5.33^{1.5}}{1000}$
 $Nb = 14.77$ kips < -- Use This!!

7614 SE Washington

Osterman Designs

18-05

04/06/18

Rich

4/8

7614 SE Washington St
18-05

7614 SE Washington

Single Anchor Allowable
breakout strength (Ncb)

$$N_{cb} := \phi \cdot \frac{A_{nc}}{A_{nco}} \cdot \psi_{ed} \cdot N_b$$

Ncb = 12.02 kips Allowable in Concrete
W/9" embedment (Single Anchor)

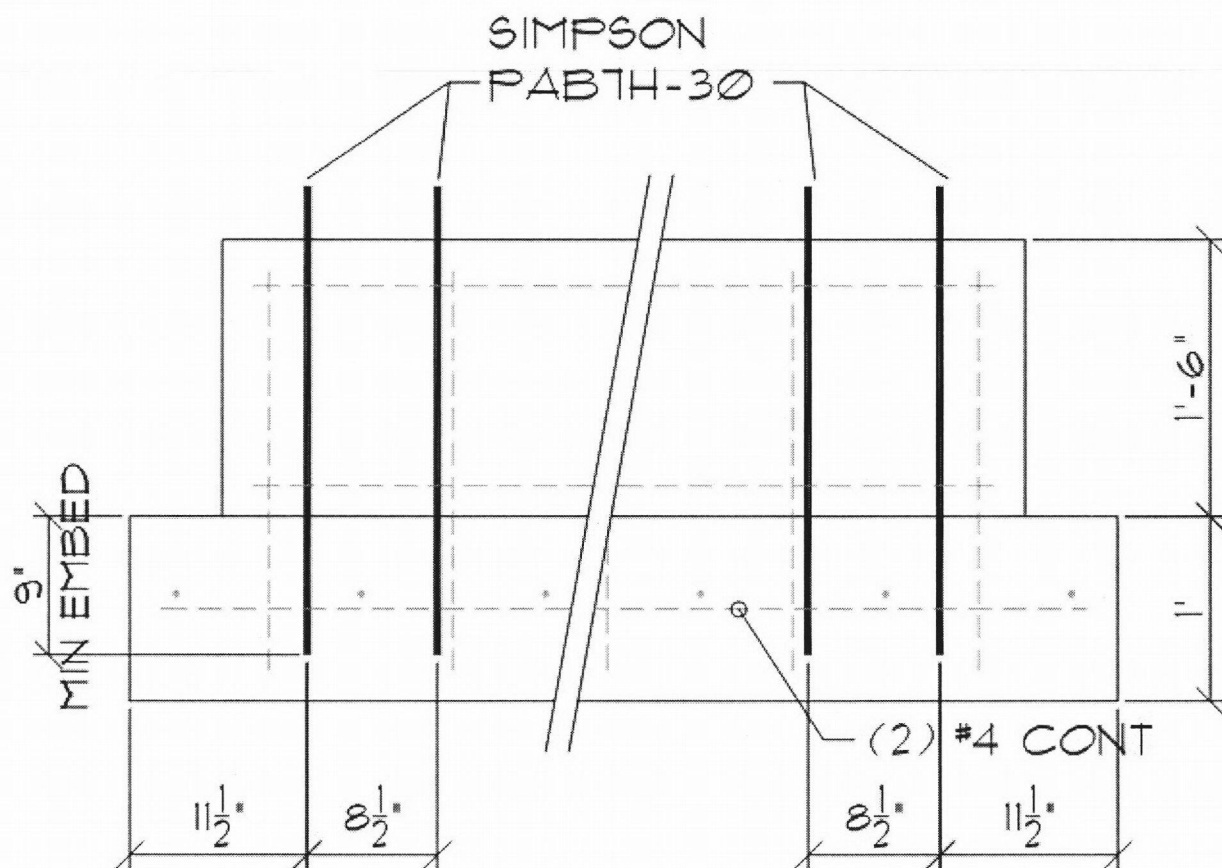
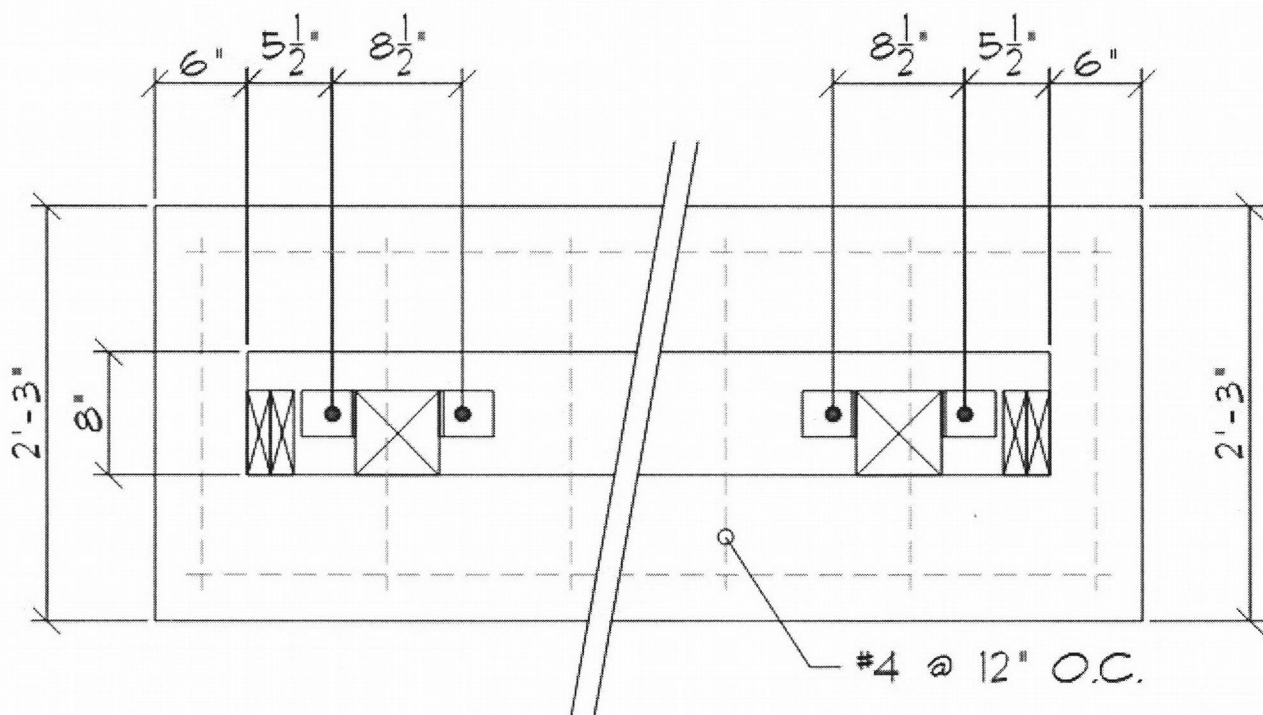
$$T_u = N_{cb} \cdot 2$$

T = 24.04 kips Capacity OK

04/06/18

Rich

7/0

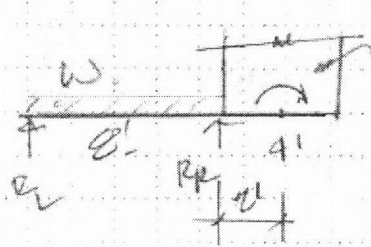


04/06/18

Rich

6/2

✓ REIN SUPPORT HG WALL 3A - BEAM #17



SHEAR FORCE
3A

LEFT

$$W_{DL} = 15(8)^{1/2} + 12(8) + 17(8)^{1/2} = 224\#$$

$$W_{LL} = 40(8)^{1/2} + 25(8)^{1/2} = 200\#$$

RIGHT

$$W_{LL} = 10(8)^{1/2} \text{ (LAT LIT)}$$

$$H_{DT} = 2912 \text{ ft-kips} @ 2'$$

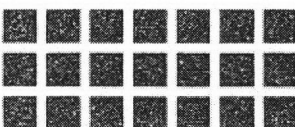
$$M_{OT} = -2912 \text{ ft-kips} @ 2'$$

CASE I

CASE II

USE 4x12 DF#2

17-258825/47/53/57/58-RS



**Benchmark
Engineering**

CIVIL - STRUCTURAL

2905 SE OAK GROVE BLVD, SUITE #8, MILWAUKIE, OREGON 97267 503-659-9371/659-9796 FAX

JOB: 7614 SE Washington
CLIENT: JOB NO. 18-05
DATE: 04/06/18 BY: Rich SHEET NO. 1/8

SCAN

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Milwaukie, Oregon 97267
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Title :
Dsgnr:
Description :
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Job #
Scope :

Rev: 580004
User: KVV-0507115, Ver: 5.8.0, 1-Dec-2003
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General Timber Beam

Page 1

Description 7614 SE Washington St Beam Supporting Shearwall 3a - BEAM #7
7622 SE Washington St

General Information

Code Ref: 1997/2001 NDS, 2000/2003 IBC, 2003 NFPA 5000. Base allowables are user defined

Section Name	4x12	Center Span	8.33 ft	Lu	0.00 ft
Beam Width	3.500 in	Left Cantilever	ft	Lu	0.00 ft
Beam Depth	11.250 in	Right Cantilever	4.00 ft	Lu	0.00 ft
Member Type	Sawn	Douglas Fir - Larch, No.2			
Bm Wt. Added to Loads		Fb Base Allow	875.0 psi		
Load Dur. Factor	1.330	Fv Allow	170.0 psi		
Beam End Fixity	Pin-Pin	Fc Allow	625.0 psi		
Wood Density	30.000 pcf	E	1,300.0 ksi		

Trapezoidal Loads

#1 DL @ Left	224.00 #/ft	LL @ Left	#/ft	Start Loc	0.000 ft
DL @ Right	224.00 #/ft	LL @ Right	#/ft	End Loc	8.330 ft
#2 DL @ Left	181.00 #/ft	LL @ Left	#/ft	Start Loc	8.330 ft
DL @ Right	181.00 #/ft	LL @ Right	#/ft	End Loc	12.330 ft

Moment Loads

Dead Load	in-#	in-#	in-#	in-#	in-#	in-#	in-#
Live Load	2,912.00 in-#	in-#	in-#	in-#	in-#	in-#	in-#
...distance	10.330 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft

Summary

Beam Design OK

Span= 8.33ft, Right Cant= 4.00ft, Beam Width = 3.500in x Depth = 11.25in, Ends are Pin-Pin

Max Stress Ratio 0.192 : 1

Maximum Moment Allowable

-1.5 k-ft
7.9 k-ft

Maximum Shear * 1.5 Allowable

1.4 k
8.9 k

Max. Positive Moment 1.33 k-ft at 3.401 ft
Max. Negative Moment -1.51 k-ft at 8.330 ft

Max @ Left Support 0.00 k-ft
Max @ Right Support -1.27 k-ft

Max. M allow 7.88

Shear: @ Left 0.81 k
@ Right 1.15 k
Camber: @ Left 0.000 in
@ Center 0.039 in
@ Right 0.002 in

fb 246.02 psi fv 35.48 psi
Fb 1,280.13 psi Fv 226.10 psi

Reactions...

Left DL 0.79 k Max 0.81 k
Right DL 1.91 k Max 1.88 k

Deflections

Center Span...	Dead Load	Total Load	Left Cantilever...	Dead Load	Total Load
Deflection	-0.026 in	-0.026 in	Deflection	0.000 in	0.000 in
...Location	3.746 ft	3.746 ft	...Length/Defl	0.0	0.0
...Length/Defl	3,855.4	3,855.43	Right Cantilever...		
Camber (using 1.5 * D.L. Defl) ...			Deflection	-0.001 in	0.012 in
@ Center	0.039 in		...Length/Defl	75,849.3	8,180.5
@ Left	0.000 in				
@ Right	0.002 in				

2/8

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General Timber Beam

Page 2

Description 7614 SE Washington St Beam Supporting Shearwall 3a
7622 SE Washington St

Stress Calcs

Bending Analysis

Ck	27.106	Le	0.000 ft	Sxx	73.828 in ³	Area	39.375 in ²
Cf	1.100	Rb	0.000	Cf	0.000		

Max Moment

Sxx Req'd

Allowable fb

@ Center	1.51 k-ft	14.19 in ³	1,280.13 psi
@ Left Support	0.00 k-ft	0.00 in ³	1,280.13 psi
@ Right Support	1.27 k-ft	11.91 in ³	1,280.13 psi

Shear Analysis

@ Left Support

@ Right Support

Design Shear	0.90 k	1.40 k
Area Required	3.961 in ²	6.179 in ²
Fv Allowable	226.10 psi	226.10 psi

Bearing @ Supports

Max. Left Reaction	0.81 k	Bearing Length Req'd	0.372 in
Max. Right Reaction	1.88 k	Bearing Length Req'd	0.858 in

Query Values

M, V, & D @ Specified Locations

Moment

Shear

Deflection

@ Center Span Location =	0.00 ft	0.00 k-ft	0.81 k	0.0000 in
@ Right Cant. Location =	0.00 ft	0.00 k-ft	0.81 k	0.0000 in
@ Left Cant. Location =	0.00 ft	0.00 k-ft	0.00 k	0.0000 in

3/8

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General Timber Beam

Page 1

Description 7614 SE Washington St Beam Supporting Shearwall 3a - BEAM #7

General Information

Code Ref: 1997/2001 NDS, 2000/2003 IBC, 2003 NFPA 5000. Base allowables are user defined

Section Name	4x12	Center Span	8.33 ft	Lu	0.00 ft
Beam Width	3.500 in	Left Cantilever	ft	Lu	0.00 ft
Beam Depth	11.250 in	Right Cantilever	4.00 ft	Lu	0.00 ft
Member Type	Sawn	Douglas Fir - Larch, No.2			
Bm Wt. Added to Loads		Fb Base Allow	875.0 psi		
Load Dur. Factor	1.330	Fv Allow	170.0 psi		
Beam End Fixity	Pin-Pin	Fc Allow	625.0 psi		
Wood Density	30.000 pcf	E	1,300.0 ksi		

Trapezoidal Loads

#1 DL @ Left	224.00 #/ft	LL @ Left	#/ft	Start Loc	0.000 ft
DL @ Right	224.00 #/ft	LL @ Right	#/ft	End Loc	8.330 ft
#2 DL @ Left	181.00 #/ft	LL @ Left	#/ft	Start Loc	8.330 ft
DL @ Right	181.00 #/ft	LL @ Right	#/ft	End Loc	12.330 ft

Moment Loads

Dead Load	in-#	in-#	in-#	in-#	in-#	in-#	in-#
Live Load	-2,912.00 in-#	in-#	in-#	in-#	in-#	in-#	in-#
...distance	10.330 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft	0.000 ft

Summary

Beam Design OK

Span= 8.33ft, Right Cant= 4.00ft, Beam Width = 3.500in x Depth = 11.25in, Ends are Pin-Pin

Max Stress Ratio	0.223 ; 1	Maximum Shear * 1.5	1.4 k
Maximum Moment Allowable	-1.8 k-ft 7.9 k-ft	Allowable	8.9 k
Max. Positive Moment	1.33 k-ft at 3.401 ft	Shear:	@ Left 0.79 k
Max. Negative Moment	-1.51 k-ft at 8.330 ft		@ Right 1.18 k
Max @ Left Support	0.00 k-ft	Camber:	@ Left 0.000 in
Max @ Right Support	-1.76 k-ft		@ Center 0.039 in
Max. M allow	7.88		@ Right 0.002 in
fb 285.47 psi	fV 36.59 psi	Reactions...	
Fb 1,280.13 psi	Fv 226.10 psi	Left DL 0.79 k	Max 0.79 k
		Right DL 1.91 k	Max 1.93 k

Deflections

Center Span...	Dead Load	Total Load	Left Cantilever...	Dead Load	Total Load
Deflection	-0.026 in	-0.026 in	Deflection	0.000 in	0.000 in
...Location	3.746 ft	3.746 ft	...Length/Defl	0.0	0.0
...Length/Defl	3,855.4	3,855.43	Right Cantilever...		
Camber (using 1.5 * D.L. Defl) ...			Deflection	-0.001 in	-0.015 in
@ Center	0.039 in		...Length/Defl	75,849.3	6,607.8
@ Left	0.000 in				
@ Right	0.002 in				

4/8

Benchmark Engineering LLC
2905 SE Oak Grove Blvd, Ste 8
Milwaukie, Oregon 97267
503-659-9371

Title :
Dsgnr:
Description :

Job #
Date:

Scope :

Rev: 080004
User: KVV-0507115, Ver 5 B.C, 1-Dec-2003
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General Timber Beam

Page 2

Description 7614 SE Washington St Beam Supporting Shearwall 3a
7622 SE Washington St

Stress Calcs

Bending Analysis

Ck	27.106	Le	0.000 ft	Sxx	73.828 in3	Area	39.375 in2
Cf	1.100	Rb	0.000	CI	0.000		

Max Moment

Sxx Req'd

Allowable fb

@ Center	1.51 k-ft	14.19 in3	1,280.13 psi
@ Left Support	0.00 k-ft	0.00 in3	1,280.13 psi
@ Right Support	1.76 k-ft	16.46 in3	1,280.13 psi

Shear Analysis

@ Left Support

@ Right Support

Design Shear	0.85 k	1.44 k
Area Required	3.768 in2	6.372 in2
Fv Allowable	226.10 psi	226.10 psi

Bearing @ Supports

Max. Left Reaction	0.79 k	Bearing Length Req'd	0.359 in
Max. Right Reaction	1.93 k	Bearing Length Req'd	0.884 in

Query Values

M, V, & D @ Specified Locations

Moment

Shear

Deflection

@ Center Span Location =	0.00 ft	0.00 k-ft	0.76 k	0.0000 in
@ Right Cant. Location =	0.00 ft	0.00 k-ft	0.76 k	0.0000 in
@ Left Cant. Location =	0.00 ft	0.00 k-ft	0.00 k	0.0000 in

5/8

Anchor Bolt Pullout: Edge Bolts

(ACI 318-05, Appendix D)

Normal Strength Concrete:

$\phi := 0.70$ for Tension design $f'_c := 2500$ psi

Category 1, Condition A



Anchor Bolt Strength: (2) 7/8" Anchor Bolt with 12" Embed, Edge distance = 2" min

Section D.5.1:

Single Anchor bolt (n)

$$n := 2$$

Cross sectional area of bolt (Ase)

$$Ase := 0.60$$

Allowable tension stress
of bolt (Futa)

$$Futa := 1.9 \cdot 36 \quad Futa = 68.4 < 125 \quad \text{OK}$$

Nominal tension strength
of bolt (Nsa)

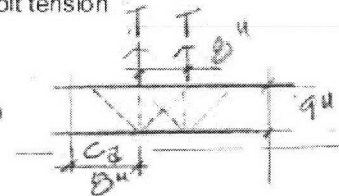
$$Nsa := n \cdot Ase \cdot Futa$$

$$Nsa = 82.08 \quad \text{kips}$$

Allowable tension strength (ϕNsa)

$$\phi \cdot Nsa = 57.46 \quad \text{kips}$$

Allowable Bolt tension



Concrete Strength: 7/8" Anchor Bolt with 9" Embed, Edge distance = 8" min

$$Ca := 8$$

Section D.5.2.3

$$hef := \frac{8}{1.5}$$

$$hef = 5.333 \quad \text{inches (use for design)}$$

Section D.5.2.1

Projected concrete failure area (Anc)

$$Anc := (Ca + 8 + 1.5 \cdot hef) \cdot (2 \cdot 1.5 \cdot hef) \quad Anc = 384 \quad \text{inches}^2$$

Projected concrete failure area
at edge (Anco)

$$Anco := 9 \cdot 5.33^2 \quad Anco = 256 \quad \text{inches}^2$$

Modification factor for
edge anchors (ψ_{ed})

$$\psi_{ed} := 0.7 + 0.3 \cdot \left(\frac{2}{1.5 \cdot 5.33} \right) \quad \psi_{ed} = 0.775$$

Max Allowed (Nb) (D-8)

$$Nb := \frac{16 \cdot \sqrt{f'_c} \cdot 5.33^{1.5}}{1000} \quad Nb = 9.844 \quad \text{kips N.A.}$$

$hef < 11$

Single Anchor breakout
strength (Nb)

$$Nb := \frac{24 \cdot \sqrt{f'_c} \cdot 5.33^{1.5}}{1000}$$

$$Nb = 14.77 \quad \text{kips} \quad < \text{--- Use This!!}$$

7614 SE Washington

Osterman Designs

18-05

04/06/18

Rich

4/8

7614 SE Washington St
18-05

7614 SE Washington

Single Anchor Allowable
breakout strength (Ncb)

$$N_{cb} := \phi \cdot \frac{A_{nc}}{A_{nco}} \cdot \psi_{ed} \cdot N_b$$

Ncb = 12.02 kips Allowable in Concrete
W/9" embedment (Single Anchor)

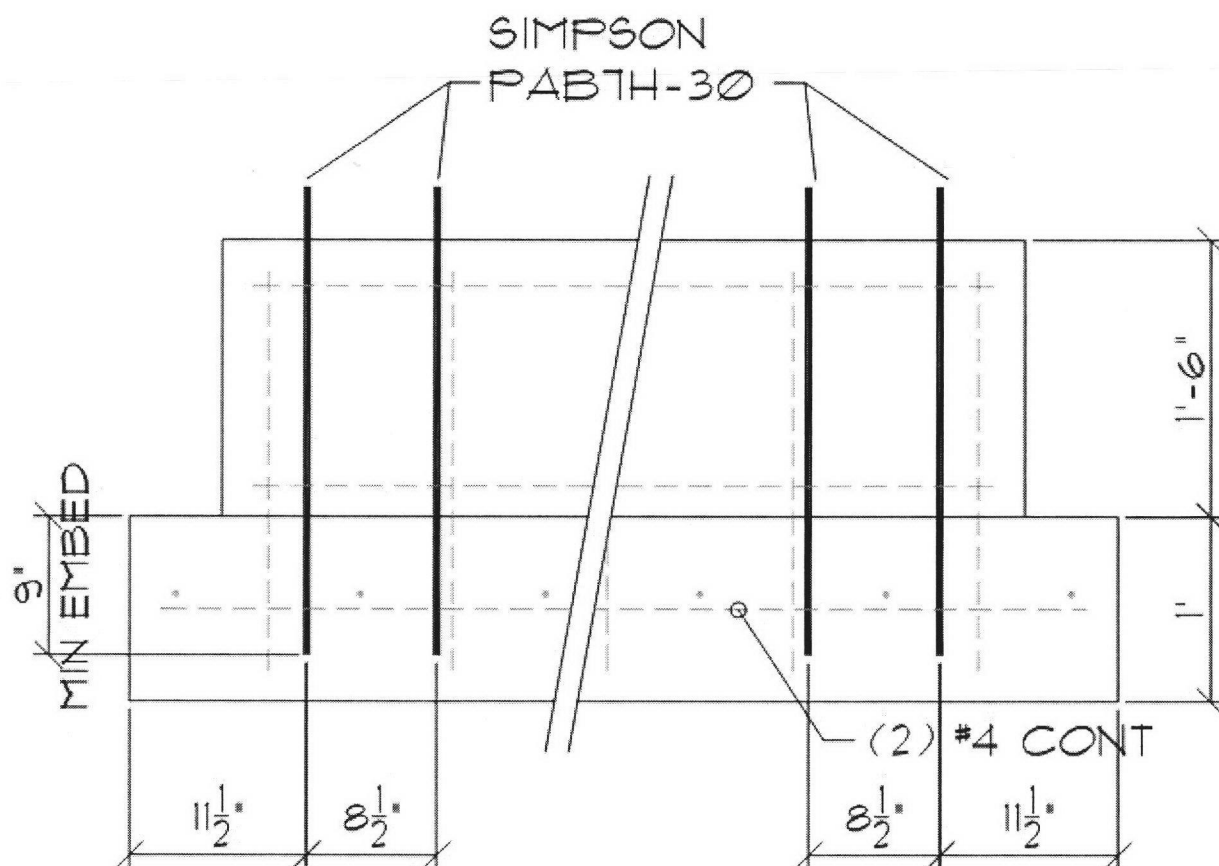
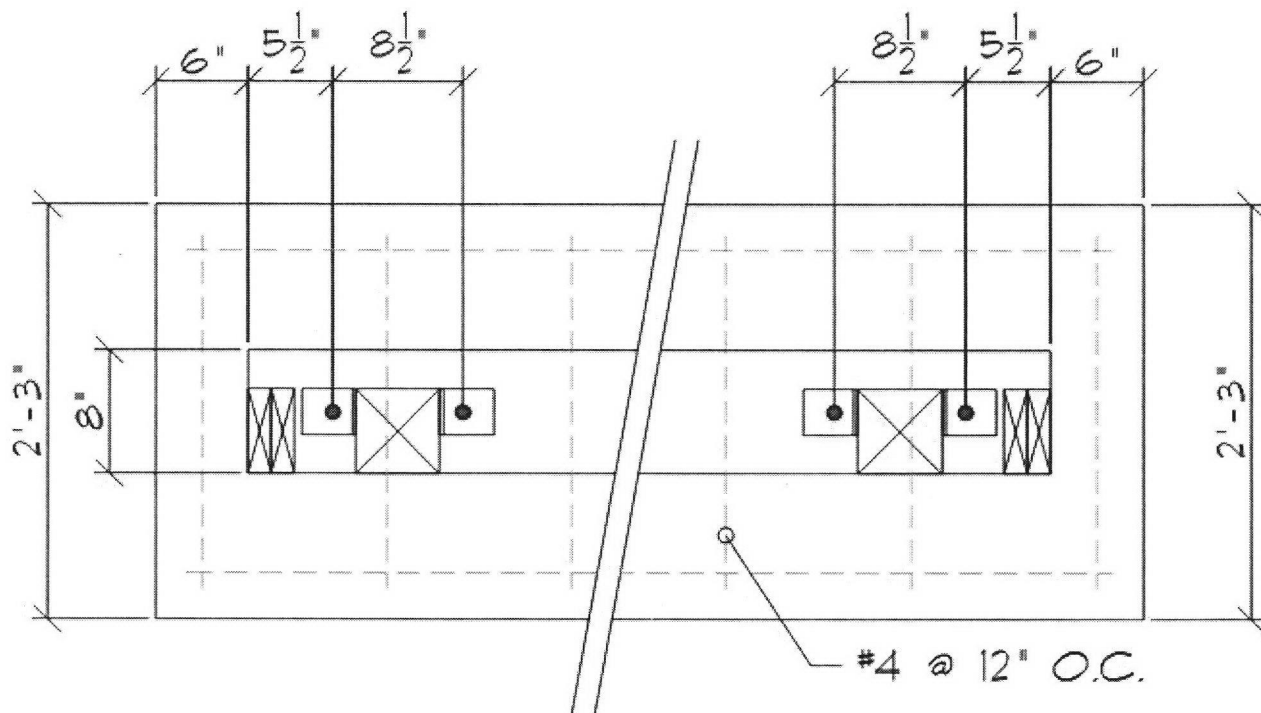
$$T_u := N_{cb} \cdot 2$$

T = 24.04 kips Capacity OK

04/06/18

Rich

7/0



Project: Washington5

Location: Beam #7 end unit

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 12.0 FT (8 + 4)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 17.5%

Controlling Factor: Moment

DEFLECTIONS	Center	Right
Live Load	0.06 IN L/1577	-0.10 IN 2L/986
Dead Load	0.03 in	0.00 in
Total Load	0.09 IN L/1117	-0.10 IN 2L/1004
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	1756 lb	2851 lb
Dead Load	1060 lb	2515 lb
Total Load	2816 lb	5366 lb
Bearing Length	1.29 in	2.45 in

BEAM DATA	Center	Right
Span Length	8 ft	4 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	8 ft	4 ft
Live Load Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 CF=1.10	Fb' = 990 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 5185 ft-lb

3.68 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -3520 lb

At right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Req'd	Provided
Section Modulus:	62.84 in3	73.83 in3
Area (Shear):	29.33 in2	39.38 in2
Moment of Inertia (deflection):	151.7 in4	415.28 in4
Moment:	5185 ft-lb	6091 ft-lb
Shear:	-3520 lb	4725 lb

NOTES



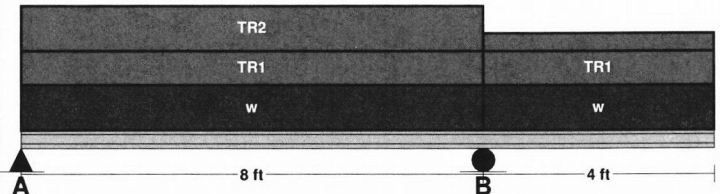
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LOADING DIAGRAM



UNIFORM LOADS	Center	Right
Uniform Live Load	0 plf	0 plf
Uniform Dead Load	100 plf	100 plf
Beam Self Weight	9 plf	9 plf
Total Uniform Load	109 plf	109 plf

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two
Left Live Load	169 plf	270 plf
Left Dead Load	115 plf	102 plf
Right Live Load	169 plf	270 plf
Right Dead Load	115 plf	102 plf
Load Start	0 ft	0 ft
Load End	8 ft	8 ft
Load Length	8 ft	8 ft

RIGHT SPAN

Load Number	One	Two
Left Live Load	169 plf	50 plf
Left Dead Load	115 plf	19 plf
Right Live Load	169 plf	50 plf
Right Dead Load	115 plf	19 plf
Load Start	0 ft	0 ft
Load End	4 ft	4 ft
Load Length	4 ft	4 ft

SCAN

17-180493/96/97/98/500-75

Project: Washington5

Location: Beam #9 end unit deck door

Multi-Span Roof Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 3.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 13.7%

Controlling Factor: Shear



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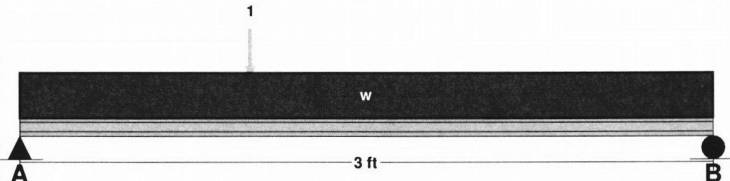
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LOADING DIAGRAM



ROOF LOADING

	Center
Roof Live Load	RLL = 25 psf
Roof Dead Load	RDL = 17 psf
Roof Tributary Width Side One	TW1 = 0 ft
Roof Tributary Width Side Two	TW2 = 0 ft
Wall Load	WALL = 100 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	5366 lb
Location	1 ft

BEAM LOADING

	Center
Total Live Load	0 plf
Total Dead Load (Adjusted for Roof Pitch)	100 plf
Beam Self Weight	9 plf
Total Load	109 plf

DEFLECTIONS

	Center
Live Load	0.00 IN L/Infinity
Dead Load	0.01 in
Total Load	0.01 IN L/5110

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS

	A	B
Live Load	0 lb	0 lb
Dead Load	3740 lb	1951 lb
Total Load	3740 lb	1951 lb
Bearing Length	1.71 in	0.89 in

BEAM DATA

	Center
Span Length	3 ft
Unbraced Length-Top	2 ft
Unbraced Length-Bottom	3 ft
Roof Pitch	9 :12
Roof Duration Factor	1.15
Notch Depth	0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=0.90 Cl=1.00 CF=1.10	Fb' = 888 psi
Shear Stress:	Fv = 180 psi Cd=0.90	Fv' = 162 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 3651 ft-lb

1.02 Ft from left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Controlling Shear: 3740 lb

At left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	49.33 in3	73.83 in3
Area (Shear):	34.63 in2	39.38 in2
Moment of Inertia (deflection):	14.63 in4	415.28 in4
Moment:	3651 ft-lb	5465 ft-lb
Shear:	3740 lb	4253 lb

NOTES

Project: Washington5

Location: Beam #10 garage header

Uniformly Loaded Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 9.25 IN x 8.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 95.0%

Controlling Factor: Moment



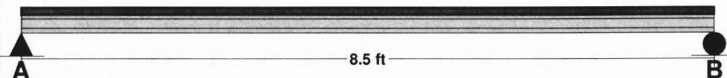
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	4.5 ft	0 ft
Wall Load	WALL =	0 plf	

BEAM LOADING

Beam Total Live Load:	wL =	180 plf
Beam Total Dead Load:	wD =	68 plf
Beam Self Weight:	BSW =	7 plf
Total Maximum Load:	wT =	255 plf

DEFLECTIONS

Center

Live Load 0.06 IN L/1782

Dead Load 0.02 in

Total Load 0.08 IN L/1260

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

REACTIONS

A B

Live Load 765 lb 765 lb

Dead Load 317 lb 317 lb

Total Load 1082 lb 1082 lb

Bearing Length 0.49 in 0.49 in

BEAM DATA

Center

Span Length 8.5 ft

Unbraced Length-Top 1.33 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Cl=1.00 CF=1.20	Fb' = 1078 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 2299 ft-lb

4.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -1082 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	25.59 in3	49.91 in3
Area (Shear):	9.01 in2	32.38 in2
Moment of Inertia (deflection):	46.63 in4	230.84 in4
Moment:	2299 ft-lb	4483 ft-lb
Shear:	-1082 lb	3885 lb

NOTES

Project: Washington5

Location: Beam #20 front carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

(2) 1.5 IN x 11.25 IN x 11.0 FT (9 + 2)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 2.8%

Controlling Factor: Moment



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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

	Center	Right
Live Load	0.00 IN L/Infinity	0.00 IN 2L/Infinity
Dead Load	-0.06 in	0.09 in
Total Load	-0.06 IN L/1734	0.09 IN 2L/546

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

REACTIONS

	A	B
Live Load	0 lb	0 lb
Dead Load	-419 lb	2816 lb
Total Load	-419 lb	2816 lb
Uplift (1.5 F.S)	-419 lb	0 lb
Bearing Length	0.00 in	1.50 in

BEAM DATA

	Center	Right
Span Length	9 ft	2 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	9 ft	2 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

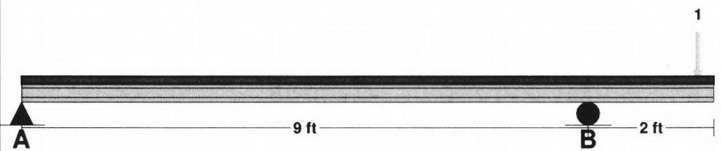
	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=0.90 Cl=0.98 CF=1.00	Fb' = 793 psi
Shear Stress:	Fv = 180 psi Cd=0.90	Fv' = 162 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: -4068 ft-lb
Over right support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 2331 lb
At left support of span 3 (Right Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	61.55 in ³	63.28 in ³
Area (Shear):	21.58 in ²	33.75 in ²
Moment of Inertia (deflection):	156.6 in ⁴	355.96 in ⁴
Moment:	-4068 ft-lb	4182 ft-lb
Shear:	2331 lb	3645 lb

LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	0 ft
Wall Load	WALL = 0 plf	0 plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	0 lb
Dead Load	2316 lb
Location	1.75 ft

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	0 plf	0 plf
Total Dead Load	0 plf	0 plf
Beam Self Weight	7 plf	7 plf
Total Load	7 plf	7 plf

NOTES

Project: Washington5

Location: Beam #23 over front porch

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 8.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 132.7%

Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.02	IN L/4327
Dead Load	0.02	in
Total Load	0.04	IN L/2137
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS		A	B
Live Load	640 lb	640 lb	
Dead Load	709 lb	453 lb	
Total Load	1349 lb	1093 lb	
Bearing Length	0.62 in	0.50 in	

BEAM DATA		Center
Span Length	8 ft	
Unbraced Length-Top	1.33 ft	
Unbraced Length-Bottom	8 ft	
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Cl=1.00 CF=1.10	Fb' = 988 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ = 625 psi

Controlling Moment: 2612 ft-lb
3.2 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1349 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	31.73 in3	73.83 in3
Area (Shear):	11.24 in2	39.38 in2
Moment of Inertia (deflection):	46.63 in4	415.28 in4
Moment:	2612 ft-lb	6077 ft-lb
Shear:	1349 lb	4725 lb



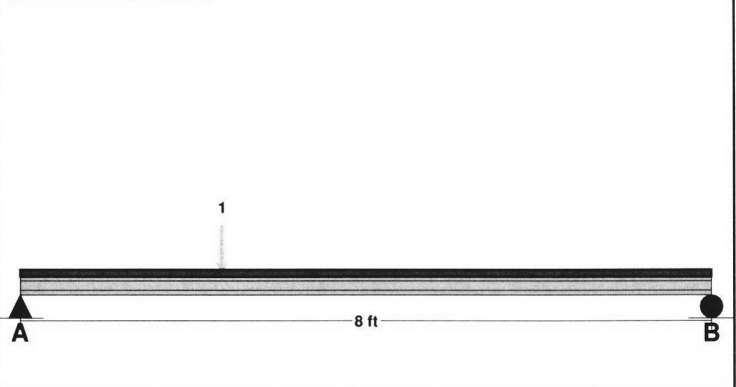
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LOADING DIAGRAM



FLOOR LOADING		Center
Floor Live Load	FLL =	40 psf
Floor Dead Load	FDL =	15 psf
Floor Tributary Width Side One	TW1 =	2 ft
Floor Tributary Width Side Two	TW2 =	2 ft
Wall Load	WALL =	0 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	613 lb
Location	2.33 ft

BEAM LOADING		Center
Reduced Floor Live Load	40	psf
Total Live Load	160	plf
Total Dead Load	60	plf
Beam Self Weight	9	plf
Total Load	229	plf

NOTES

Project: Washington5

Location: Roof Rafter 1

Roof Rafter

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 11.2 FT (11 + 0.2) @ 24 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 124.4%

Controlling Factor: Moment

<u>DEFLECTIONS</u>	<u>Center</u>	<u>Right</u>
Live Load	0.09 IN L/1826	0.00 IN 2L/MAX
Dead Load	0.08 in	0.00 in
Total Load	0.17 IN L/987	0.00 IN 2L/Infinity
Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180		

<u>RAFTER REACTIONS</u>	<u>LOADS</u>	<u>REACTIONS</u>
Upper Live Load @ A	138 plf	275 lb
Upper Dead Load @ A	117 plf	234 lb
Upper Total Load @ A	254 plf	509 lb
Lower Live Load @ B	143 plf	285 lb
Lower Dead Load @ B	121 plf	242 lb
Lower Total Load @ B	264 plf	527 lb

<u>RAFTER SUPPORT DATA</u>	<u>A</u>	<u>B</u>
Bearing Length	0.54 in	0.56 in

<u>RAFTER DATA</u>	<u>Interior</u>	<u>Eave</u>
Span Length	11 ft	0.2 ft
Rafter Pitch	9	:12
Roof sheathing applied to top of joists-top of rafters fully braced.		
Roof Duration Factor	1.15	
Peak Notch Depth	0.00	
Base Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	<u>Base Values</u>	<u>Adjusted</u>
Bending Stress:	Fb = 900 psi Cd=1.15 CF=1.00 Cr=1.15	Fb' = 1190 psi
Shear Stress:	Fv = 180 psi Cd=1.15	Fv' = 207 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ = 625 psi

Controlling Moment: 1399 ft-lb
5.504 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -407 lb
11.2 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2, 3

<u>Comparisons with required sections:</u>	<u>Req'd</u>	<u>Provided</u>
Section Modulus:	14.1 in3	31.64 in3
Area (Shear):	2.95 in2	16.88 in2
Moment of Inertia (deflection):	32.45 in4	177.98 in4
Moment:	1399 ft-lb	3138 ft-lb
Shear:	-407 lb	2329 lb

NOTES



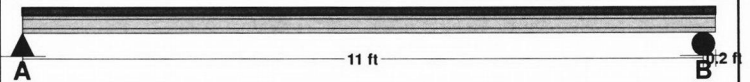
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LOADING DIAGRAM



RAFTER LOADING

Uniform Roof Loading

Roof Live Load:	LL =	25 psf
Roof Dead Load:	DL =	17 psf

Slope Adjusted Spans And Loads

Interior Span:	L-adj =	13.75 ft
Eave Span:	L-Eave-adj =	0.25 ft
Rafter Live Load:	wL-adj =	32 plf
Eave Live Load:	wL-Eave-adj =	32 plf
Rafter Dead Load:	wD-adj =	27 plf
Rafter Total Load:	wT-adj =	59 plf
Eave Total Load:	wT-Eave-adj =	59 plf

Project: Washington5

Location: Front porch column

Column

[2009 International Building Code(2005 NDS)]

3.5 IN x 5.5 IN x 8.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 9.4%



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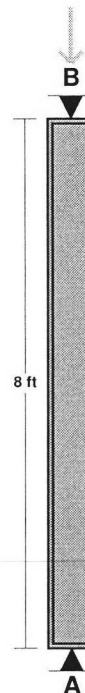
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LOADING DIAGRAM



AXIAL LOADING

Live Load: PL = 0 lb
Dead Load: PD = 13500 lb
Column Self Weight: CSW = 33 lb
Total Load: PT = 13533 lb

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 0 lb
Dead Load: Vert-DL-Rxn = 13533 lb
Total Load: Vert-TL-Rxn = 13533 lb

COLUMN DATA

Total Column Length: 8 ft
Unbraced Length (X-Axis) Lx: 8 ft
Unbraced Length (Y-Axis) Ly: 8 ft
Column End Condition-K (e): 0.8
Axial Load Duration Factor: 1.00

COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi Cd=0.90 Cf=1.10 Cp=0.58	Fc' = 776 psi
Bending Stress (X-X Axis):	Fbx = 900 psi Cd=0.90 CF=1.30	Fbx' = 1053 psi
Bending Stress (Y-Y Axis):	Fby = 900 psi Cd=0.90 CF=1.30	Fby' = 1053 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi

Column Section (X-X Axis):	dx = 5.5 in
Column Section (Y-Y Axis):	dy = 3.5 in
Area:	A = 19.25 in ²
Section Modulus (X-X Axis):	Sx = 17.65 in ³
Section Modulus (Y-Y Axis):	Sy = 11.23 in ³
Slenderness Ratio:	L _{ex} /dx = 13.96 L _{ey} /dy = 21.94

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load Only (D)

Actual Compressive Stress:	Fc = 703 psi
Allowable Compressive Stress:	Fc' = 776 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1053 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1053 psi
Combined Stress Factor:	CSF = 0.91

NOTES

Project: Washington5

Location: Footing C

Footing

[2009 International Building Code(2005 NDS)]

Footing Size: 2.67 FT x 2.67 FT x 12.00 IN

Reinforcement: #4 Bars @ 8.00 IN. O.C. E/W / (4) min.

Section Footing Design Adequate



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FOOTING PROPERTIES

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

FOOTING SIZE

Width: $W = 2.67$ ft
Length: $L = 2.67$ ft
Depth: $\text{Depth} = 12$ in
Effective Depth to Top Layer of Steel: $d = 8.25$ in

COLUMN AND BASEPLATE SIZE

Column Type: Wood
Column Width: $m = 3.5$ in
Column Depth: $n = 5.5$ in

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure: $Q_u = 1331$ psf
Effective Allowable Soil Bearing Pressure: $Q_e = 1350$ psf
Required Footing Area: $A_{req} = 7.03$ sf
Area Provided: $A = 7.13$ sf

Baseplate Bearing:

Bearing Required: $Bear = 13286$ lb
Allowable Bearing: $Bear-A = 53178$ lb

Beam Shear Calculations (One Way Shear):

Beam Shear: $V_{u1} = 3222$ lb
Allowable Beam Shear: $V_{c1} = 19825$ lb

Punching Shear Calculations (Two Way Shear):

Critical Perimeter: $B_o = 51$ in
Punching Shear: $V_{u2} = 11195$ lb
Allowable Punching Shear (ACI 11-35): $vc2-a = 71719$ lb
Allowable Punching Shear (ACI 11-36): $vc2-b = 133650$ lb
Allowable Punching Shear (ACI 11-37): $vc2-c = 63113$ lb
Controlling Allowable Punching Shear: $vc2 = 63113$ lb

Bending Calculations:

Factored Moment: $M_u = 53210$ in-lb
Nominal Moment Strength: $M_n = 226628$ in-lb

Reinforcement Calculations:

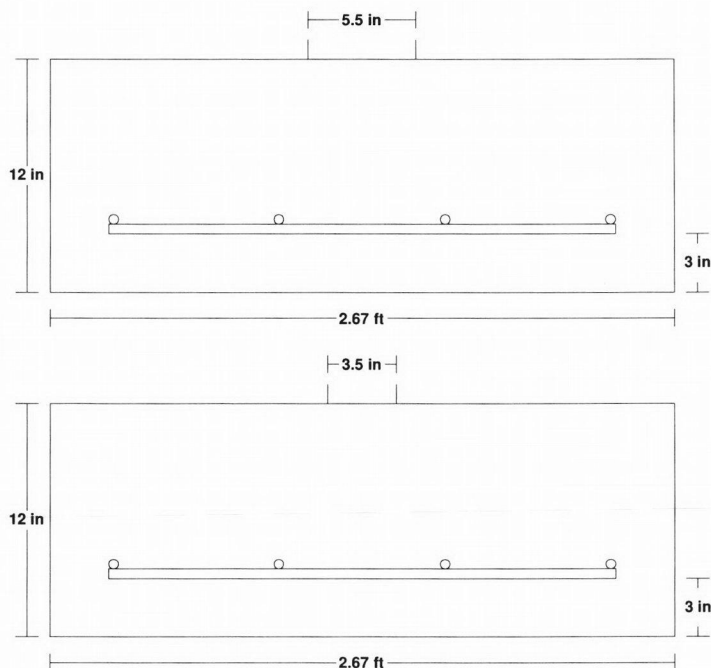
Concrete Compressive Block Depth: $a = 0.46$ in
Steel Required Based on Moment: $A_s(1) = 0.18$ in²
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4): $A_s(2) = 0.77$ in²
Controlling Reinforcing Steel: $A_{s-reqd} = 0.77$ in²
Selected Reinforcement: #4's @ 8.0 in. o.c. e/w (4) Min.
Reinforcement Area Provided: $A_s = 0.79$ in²

Development Length Calculations:

Development Length Required: $L_d = 15$ in
Development Length Supplied: $L_{d-sup} = 13.02$ in

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

LOADING DIAGRAM



FOOTING LOADING

Live Load: $PL = 0$ lb
Dead Load: $PD = 9490$ lb
Total Load: $PT = 9490$ lb
Ultimate Factored Load: $P_u = 13286$ lb
Weight to resist uplift w/ 1.5 F.S.: $U.R. = 689$ lb

NOTES

Project: Washington5

Location: Front porch column

Column

[2009 International Building Code(2005 NDS)]

3.5 IN x 3.5 IN x 7.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 7.3%



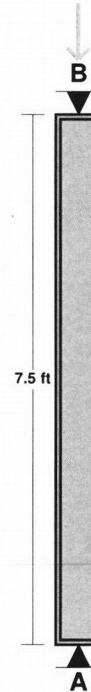
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LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	0 lb
Dead Load:	PD =	9703 lb
Column Self Weight:	CSW =	20 lb
Total Load:	PT =	9723 lb

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	0 lb
Dead Load:	Vert-DL-Rxn =	9723 lb
Total Load:	Vert-TL-Rxn =	9723 lb

COLUMN DATA

Total Column Length:	7.5 ft
Unbraced Length (X-Axis) Lx:	7.5 ft
Unbraced Length (Y-Axis) Ly:	7.5 ft
Column End Condition-K (e):	0.8
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi Cd=0.90 Cf=1.15 Cp=0.61	Fc' = 856 psi
Bending Stress (X-X Axis):	Fbx = 900 psi Cd=0.90 CF=1.50	Fbx' = 1215 psi
Bending Stress (Y-Y Axis):	Fby = 900 psi Cd=0.90 CF=1.50	Fby' = 1215 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi

Column Section (X-X Axis):	dx =	3.5 in
Column Section (Y-Y Axis):	dy =	3.5 in
Area:	A =	12.25 in ²
Section Modulus (X-X Axis):	Sx =	7.15 in ³
Section Modulus (Y-Y Axis):	Sy =	7.15 in ³
Slenderness Ratio:	L _{ex} /dx =	20.57
	L _{ey} /dy =	20.57

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load Only (D)

Actual Compressive Stress:	Fc =	794 psi
Allowable Compressive Stress:	Fc' =	856 psi
Eccentricity Moment (X-X Axis):	M _{x-ex} =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	M _{y-ey} =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	M _x =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	M _y =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1215 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1215 psi
Combined Stress Factor:	CSF =	0.93

NOTES

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Bureau of Development Services
VOID:
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Project: Washington5

Location: Beam #7 end unit

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 12.0 FT (8 + 4)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 17.5%

Controlling Factor: Moment



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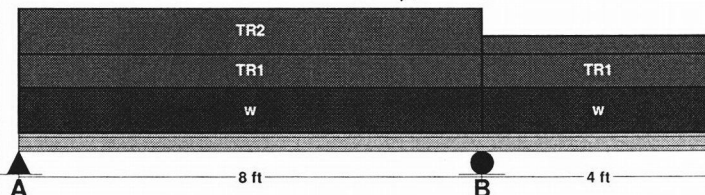
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LOADING DIAGRAM



UNIFORM LOADS

	Center	Right
Uniform Live Load	0 plf	0 plf
Uniform Dead Load	100 plf	100 plf
Beam Self Weight	9 plf	9 plf
Total Uniform Load	109 plf	109 plf

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two
Left Live Load	169 plf	270 plf
Left Dead Load	115 plf	102 plf
Right Live Load	169 plf	270 plf
Right Dead Load	115 plf	102 plf
Load Start	0 ft	0 ft
Load End	8 ft	8 ft
Load Length	8 ft	8 ft

RIGHT SPAN

Load Number	One	Two
Left Live Load	169 plf	50 plf
Left Dead Load	115 plf	19 plf
Right Live Load	169 plf	50 plf
Right Dead Load	115 plf	19 plf
Load Start	0 ft	0 ft
Load End	4 ft	4 ft
Load Length	4 ft	4 ft

DEFLECTIONS

	Center	Right
Live Load	0.06 IN L/1577	-0.10 IN 2L/986
Dead Load	0.03 in	0.00 in
Total Load	0.09 IN L/1117	-0.10 IN 2L/1004
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS

	A	B
Live Load	1756 lb	2851 lb
Dead Load	1060 lb	2515 lb
Total Load	2816 lb	5366 lb
Bearing Length	1.29 in	2.45 in

BEAM DATA

	Center	Right
Span Length	8 ft	4 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	8 ft	4 ft
Live Load Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 CF=1.10	Fb' = 990 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment:

5185 ft-lb

3.68 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear:

-3520 lb

At right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	62.84 in ³	73.83 in ³
Area (Shear):	29.33 in ²	39.38 in ²
Moment of Inertia (deflection):	151.7 in ⁴	415.28 in ⁴
Moment:	5185 ft-lb	6091 ft-lb
Shear:	-3520 lb	4725 lb

NOTES

17-258825/47/53/57/58-R5

SCAN

Project: Washington5

Location: Beam #9 end unit deck door

Multi-Span Roof Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 3.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 13.7%

Controlling Factor: Shear



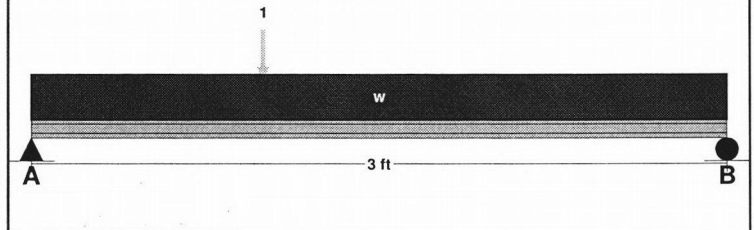
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LOADING DIAGRAM



ROOF LOADING

	Center
Roof Live Load	RLL = 25 psf
Roof Dead Load	RDL = 17 psf
Roof Tributary Width Side One	TW1 = 0 ft
Roof Tributary Width Side Two	TW2 = 0 ft
Wall Load	WALL = 100 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	5366 lb
Location	1 ft

BEAM LOADING

	Center
Total Live Load	0 plf
Total Dead Load (Adjusted for Roof Pitch)	100 plf
Beam Self Weight	9 plf
Total Load	109 plf

DEFLECTIONS

	Center
Live Load	0.00 IN L/Infinity
Dead Load	0.01 in
Total Load	0.01 IN L/5110

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS

	A	B
Live Load	0 lb	0 lb
Dead Load	3740 lb	1951 lb
Total Load	3740 lb	1951 lb
Bearing Length	1.71 in	0.89 in

BEAM DATA

	Center
Span Length	3 ft
Unbraced Length-Top	2 ft
Unbraced Length-Bottom	3 ft
Roof Pitch	9 :12
Roof Duration Factor	1.15
Notch Depth	0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=0.90 Cl=1.00 CF=1.10	Fb' = 888 psi
Shear Stress:	Fv = 180 psi Cd=0.90	Fv' = 162 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. ⊥ to Grain:	Fc ⊥ = 625 psi	Fc ⊥' = 625 psi

Controlling Moment: 3651 ft-lb
1.02 Ft from left support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 3740 lb
At left support of span 2 (Center Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	49.33 in3	73.83 in3
Area (Shear):	34.63 in2	39.38 in2
Moment of Inertia (deflection):	14.63 in4	415.28 in4
Moment:	3651 ft-lb	5465 ft-lb
Shear:	3740 lb	4253 lb

NOTES

Project: Washington5

Location: Beam #10 garage header

Uniformly Loaded Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 9.25 IN x 8.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 95.0%

Controlling Factor: Moment



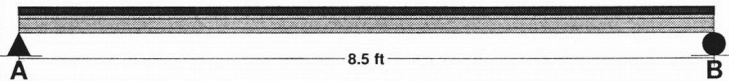
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	4.5 ft	0 ft
Wall Load	WALL =	0 plf	

BEAM LOADING

Beam Total Live Load:	wL =	180 plf
Beam Total Dead Load:	wD =	68 plf
Beam Self Weight:	BSW =	7 plf
Total Maximum Load:	wT =	255 plf

DEFLECTIONS

Center

Live Load 0.06 IN L/1782

Dead Load 0.02 in

Total Load 0.08 IN L/1260

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

REACTIONS

A

B

Live Load 765 lb 765 lb

Dead Load 317 lb 317 lb

Total Load 1082 lb 1082 lb

Bearing Length 0.49 in 0.49 in

BEAM DATA

Center

Span Length 8.5 ft

Unbraced Length-Top 1.33 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 1078 psi

Cd=1.00 Cl=1.00 CF=1.20

Shear Stress: Fv = 180 psi Fv' = 180 psi

Cd=1.00

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment: 2299 ft-lb

4.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -1082 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 25.59 in3 49.91 in3

Area (Shear): 9.01 in2 32.38 in2

Moment of Inertia (deflection): 46.63 in4 230.84 in4

Moment: 2299 ft-lb 4483 ft-lb

Shear: -1082 lb 3885 lb

NOTES

Project: Washington5

Location: Beam #20 front carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

(2) 1.5 IN x 11.25 IN x 11.0 FT (9 + 2)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 2.8%

Controlling Factor: Moment



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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

	Center	Right
Live Load	0.00 IN L/Infinity	0.00 IN 2L/Infinity
Dead Load	-0.06 in	0.09 in
Total Load	-0.06 IN L/1734	0.09 IN 2L/546
Live Load Deflection Criteria:	L/360	Total Load Deflection Criteria: L/240

REACTIONS

	A	B
Live Load	0 lb	0 lb
Dead Load	-419 lb	2816 lb
Total Load	-419 lb	2816 lb
Uplift (1.5 F.S)	-419 lb	0 lb
Bearing Length	0.00 in	1.50 in

BEAM DATA

	Center	Right
Span Length	9 ft	2 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	9 ft	2 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

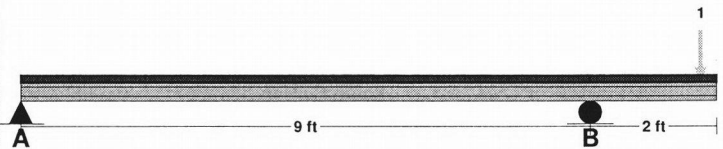
	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=0.90 Cl=0.98 CF=1.00	Fb' = 793 psi
Shear Stress:	Fv = 180 psi Cd=0.90	Fv' = 162 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: -4068 ft-lb
Over right support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 2331 lb
At left support of span 3 (Right Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	61.55 in3	63.28 in3
Area (Shear):	21.58 in2	33.75 in2
Moment of Inertia (deflection):	156.6 in4	355.96 in4
Moment:	-4068 ft-lb	4182 ft-lb
Shear:	2331 lb	3645 lb

LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	0 ft
Wall Load	WALL = 0 plf	0 plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	0 lb
Dead Load	2316 lb
Location	1.75 ft

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	0 plf	0 plf
Total Dead Load	0 plf	0 plf
Beam Self Weight	7 plf	7 plf
Total Load	7 plf	7 plf

NOTES

Project: Washington5

Location: Beam #23 over front porch

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 8.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 132.7%

Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.02	IN L/4327
Dead Load	0.02	in
Total Load	0.04	IN L/2137
Live Load Deflection Criteria: L/360		Total Load Deflection Criteria: L/240

REACTIONS	A	B
Live Load	640 lb	640 lb
Dead Load	709 lb	453 lb
Total Load	1349 lb	1093 lb
Bearing Length	0.62 in	0.50 in

BEAM DATA	Center
Span Length	8 ft
Unbraced Length-Top	1.33 ft
Unbraced Length-Bottom	8 ft
Floor Duration Factor	1.00
Notch Depth	0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Ci=1.00 CF=1.10	Fb' = 988 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 2612 ft-lb
3.2 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1349 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	31.73 in ³	73.83 in ³
Area (Shear):	11.24 in ²	39.38 in ²
Moment of Inertia (deflection):	46.63 in ⁴	415.28 in ⁴
Moment:	2612 ft-lb	6077 ft-lb
Shear:	1349 lb	4725 lb

NOTES



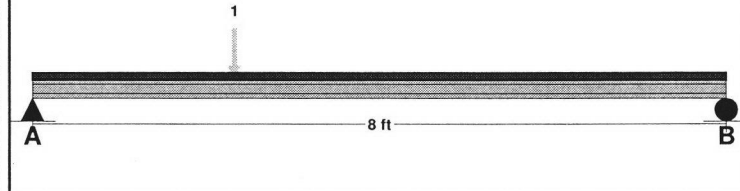
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LOADING DIAGRAM



FLOOR LOADING

	Center
Floor Live Load	FLL = 40 psf
Floor Dead Load	FDL = 15 psf
Floor Tributary Width Side One	TW1 = 2 ft
Floor Tributary Width Side Two	TW2 = 2 ft
Wall Load	WALL = 0 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	613 lb
Location	2.33 ft

BEAM LOADING

	Center
Reduced Floor Live Load	40 psf
Total Live Load	160 plf
Total Dead Load	60 plf
Beam Self Weight	9 plf
Total Load	229 plf

Project: Washington5

Location: Roof Rafter 1

Roof Rafter

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 11.2 FT (11 + 0.2) @ 24 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 124.4%

Controlling Factor: Moment



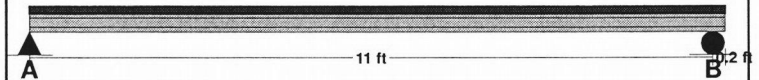
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LOADING DIAGRAM



RAFTER LOADING

Uniform Roof Loading

Roof Live Load: LL = 25 psf
Roof Dead Load: DL = 17 psf

Slope Adjusted Spans And Loads

Interior Span: L-adj = 13.75 ft
Eave Span: L-Eave-adj = 0.25 ft
Rafter Live Load: wL-adj = 32 plf
Eave Live Load: wL-Eave-adj = 32 plf
Rafter Dead Load: wD-adj = 27 plf
Rafter Total Load: wT-adj = 59 plf
Eave Total Load: wT-Eave-adj = 59 plf

DEFLECTIONS

	Center	Right
Live Load	0.09 IN L/1826	0.00 IN 2L/MAX
Dead Load	0.08 in	0.00 in
Total Load	0.17 IN L/987	0.00 IN 2L/Infinity

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

RAFTER REACTIONS

	LOADS	REACTIONS
Upper Live Load @ A	138 plf	275 lb
Upper Dead Load @ A	117 plf	234 lb
Upper Total Load @ A	254 plf	509 lb
Lower Live Load @ B	143 plf	285 lb
Lower Dead Load @ B	121 plf	242 lb
Lower Total Load @ B	264 plf	527 lb

RAFTER SUPPORT DATA

	A	B
Bearing Length	0.54 in	0.56 in

RAFTER DATA

	Interior	Eave
Span Length	11 ft	0.2 ft
Rafter Pitch	9	:12
Roof sheathing applied to top of joists-top of rafters fully braced.		
Roof Duration Factor	1.15	
Peak Notch Depth	0.00	
Base Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.15 CF=1.00 Cr=1.15	Fb' = 1190 psi
Shear Stress:	Fv = 180 psi Cd=1.15	Fv' = 207 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. ⊥ to Grain:	Fc ⊥ = 625 psi	Fc ⊥' = 625 psi

Controlling Moment: 1399 ft-lb

5.504 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -407 lb

11.2 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	14.1 in ³	31.64 in ³
Area (Shear):	2.95 in ²	16.88 in ²
Moment of Inertia (deflection):	32.45 in ⁴	177.98 in ⁴
Moment:	1399 ft-lb	3138 ft-lb
Shear:	-407 lb	2329 lb

NOTES

Project: Washington5

Location: Front porch column

Column

[2009 International Building Code(2005 NDS)]

3.5 IN x 5.5 IN x 8.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 9.4%



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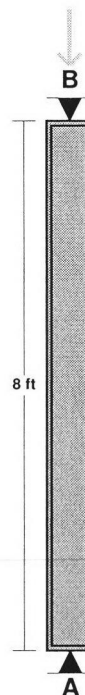
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LOADING DIAGRAM



AXIAL LOADING

Live Load: PL = 0 lb
Dead Load: PD = 13500 lb
Column Self Weight: CSW = 33 lb
Total Load: PT = 13533 lb

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 0 lb
Dead Load: Vert-DL-Rxn = 13533 lb
Total Load: Vert-TL-Rxn = 13533 lb

COLUMN DATA

Total Column Length: 8 ft
Unbraced Length (X-Axis) Lx: 8 ft
Unbraced Length (Y-Axis) Ly: 8 ft
Column End Condition-K (e): 0.8
Axial Load Duration Factor: 1.00

COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi Cd=0.90 Cf=1.10 Cp=0.58	Fc' = 776 psi
Bending Stress (X-X Axis):	Fbx = 900 psi Cd=0.90 CF=1.30	Fbx' = 1053 psi
Bending Stress (Y-Y Axis):	Fby = 900 psi Cd=0.90 CF=1.30	Fby' = 1053 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Column Section (X-X Axis):	dx = 5.5 in	
Column Section (Y-Y Axis):	dy = 3.5 in	
Area:	A = 19.25 in ²	
Section Modulus (X-X Axis):	Sx = 17.65 in ³	
Section Modulus (Y-Y Axis):	Sy = 11.23 in ³	
Slenderness Ratio:	Lex/dx = 13.96 Ley/dy = 21.94	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load Only (D)

Actual Compressive Stress:	Fc = 703 psi
Allowable Compressive Stress:	Fc' = 776 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1053 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1053 psi
Combined Stress Factor:	CSF = 0.91

NOTES

Project: Washington5

Location: Footing C

Footing

[2009 International Building Code(2005 NDS)]

Footing Size: 2.67 FT x 2.67 FT x 12.00 IN

Reinforcement: #4 Bars @ 8.00 IN. O.C. E/W / (4) min.

Section Footing Design Adequate



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FOOTING PROPERTIES

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

FOOTING SIZE

Width: $W = 2.67$ ft
Length: $L = 2.67$ ft
Depth: $\text{Depth} = 12$ in
Effective Depth to Top Layer of Steel: $d = 8.25$ in

COLUMN AND BASEPLATE SIZE

Column Type: Wood
Column Width: $m = 3.5$ in
Column Depth: $n = 5.5$ in

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure: $Q_u = 1331$ psf
Effective Allowable Soil Bearing Pressure: $Q_e = 1350$ psf
Required Footing Area: $A_{req} = 7.03$ sf
Area Provided: $A = 7.13$ sf

Baseplate Bearing:

Bearing Required: $\text{Bear} = 13286$ lb
Allowable Bearing: $\text{Bear-A} = 53178$ lb

Beam Shear Calculations (One Way Shear):

Beam Shear: $V_{u1} = 3222$ lb
Allowable Beam Shear: $V_{c1} = 19825$ lb

Punching Shear Calculations (Two Way Shear):

Critical Perimeter: $B_o = 51$ in
Punching Shear: $V_{u2} = 11195$ lb
Allowable Punching Shear (ACI 11-35): $vc2-a = 71719$ lb
Allowable Punching Shear (ACI 11-36): $vc2-b = 133650$ lb
Allowable Punching Shear (ACI 11-37): $vc2-c = 63113$ lb
Controlling Allowable Punching Shear: $vc2 = 63113$ lb

Bending Calculations:

Factored Moment: $M_u = 53210$ in-lb
Nominal Moment Strength: $M_n = 226628$ in-lb

Reinforcement Calculations:

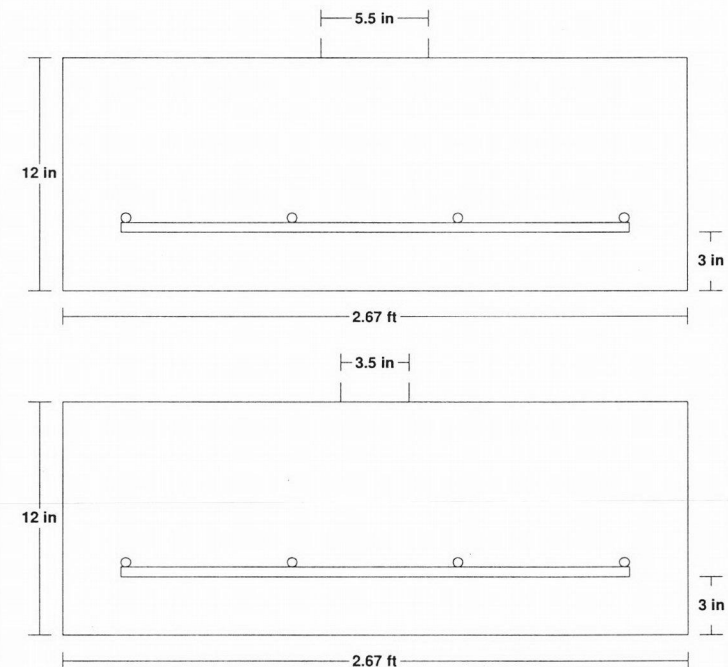
Concrete Compressive Block Depth: $a = 0.46$ in
Steel Required Based on Moment: $A_s(1) = 0.18$ in²
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4): $A_s(2) = 0.77$ in²
Controlling Reinforcing Steel: $A_{s-reqd} = 0.77$ in²
Selected Reinforcement: #4's @ 8.0 in. o.c. e/w (4) Min.
Reinforcement Area Provided: $A_s = 0.79$ in²

Development Length Calculations:

Development Length Required: $L_d = 15$ in
Development Length Supplied: $L_{d-sup} = 13.02$ in

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

LOADING DIAGRAM



FOOTING LOADING

Live Load: $PL = 0$ lb
Dead Load: $PD = 9490$ lb
Total Load: $PT = 9490$ lb
Ultimate Factored Load: $P_u = 13286$ lb
Weight to resist uplift w/ 1.5 F.S.: $U.R. = 689$ lb

NOTES

Project: Washington5

Location: Front porch column

Column

[2009 International Building Code(2005 NDS)]

3.5 IN x 3.5 IN x 7.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 7.3%



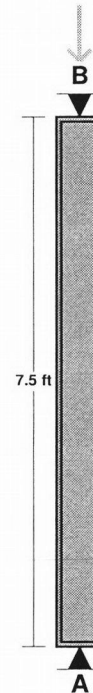
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LOADING DIAGRAM



AXIAL LOADING

Live Load: PL = 0 lb
Dead Load: PD = 9703 lb
Column Self Weight: CSW = 20 lb
Total Load: PT = 9723 lb

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 0 lb
Dead Load: Vert-DL-Rxn = 9723 lb
Total Load: Vert-TL-Rxn = 9723 lb

COLUMN DATA

Total Column Length: 7.5 ft
Unbraced Length (X-Axis) Lx: 7.5 ft
Unbraced Length (Y-Axis) Ly: 7.5 ft
Column End Condition-K (e): 0.8
Axial Load Duration Factor: 1.00

COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi Cd=0.90 Cf=1.15 Cp=0.61	Fc' = 856 psi
Bending Stress (X-X Axis):	Fbx = 900 psi Cd=0.90 CF=1.50	Fbx' = 1215 psi
Bending Stress (Y-Y Axis):	Fby = 900 psi Cd=0.90 CF=1.50	Fby' = 1215 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 3.5 in	
Area:	A = 12.25 in ²	
Section Modulus (X-X Axis):	Sx = 7.15 in ³	
Section Modulus (Y-Y Axis):	Sy = 7.15 in ³	
Slenderness Ratio:	Lex/dx = 20.57 Ley/dy = 20.57	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load Only (D)

Actual Compressive Stress:	Fc = 794 psi
Allowable Compressive Stress:	Fc' = 856 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1215 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1215 psi
Combined Stress Factor:	CSF = 0.93

NOTES

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Project: Washington5

Location: Upper floor rear carrier joists

Floor Joist

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 8.5 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 69.3%

Controlling Factor: Shear

DEFLECTIONS

Center

Live Load 0.04 IN L/2797

Dead Load 0.02 in

Total Load 0.06 IN L/1774

Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360

REACTIONS

A

B

Live Load 289 lb 697 lb

Dead Load 140 lb 499 lb

Total Load 430 lb 1196 lb

Bearing Length 0.46 in 1.28 in

BEAM DATA

Center

Span Length 8.5 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 0 ft

Floor sheathing applied to top of joists-top of joists fully braced.

Floor Duration Factor 1.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 CF=1.00 Cr=1.15	Fb' = 1035 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 1258 ft-lb

5.86 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -1196 lb

8.0 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	14.59 in3	31.64 in3
Area (Shear):	9.97 in2	16.88 in2
Moment of Inertia (deflection):	36.11 in4	177.98 in4
Moment:	1258 ft-lb	2729 ft-lb
Shear:	-1196 lb	2025 lb

NOTES



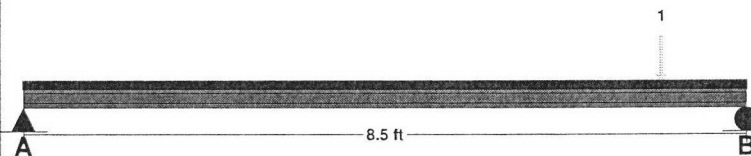
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LOADING DIAGRAM



JOIST LOADING

Uniform Floor Loading

Center

Live Load LL = 40 psf

Dead Load DL = 15 psf

Total Load TL = 55 psf

TL Adj. For Joist Spacing wT = 73.3 plf

Wall Loading

Wall One

Live Load ($\perp$ to Joists): L1 = 400 plf

Dead Load ($\perp$ to Joists) D1 = 352 plf

Load Location X1 = 7.5 ft

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SCAN

17-258823/47/53/57/58-PS

Project: Washington5

Location: Main floor front cantilever joists

Floor Joist

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 11.0 FT (9 + 2) @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 27.4%

Controlling Factor: Moment

DEFLECTIONS

	Center	Right
Live Load	-0.03 IN L/3398	0.04 IN 2L/1076
Dead Load	-0.03 in	0.04 in
Total Load	-0.06 IN L/1878	0.09 IN 2L/548

Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360

REACTIONS

	A	B
Live Load	240 lb	909 lb
Dead Load	-36 lb	803 lb
Total Load	204 lb	1712 lb
Uplift (1.5 F.S)	-148 lb	0 lb
Bearing Length	0.22 in	1.83 in

BEAM DATA

	Center	Right
Span Length	9 ft	2 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	0 ft	0 ft

Floor sheathing applied to top of joists-top of joists fully braced.

Sheathing/sheetrock applied to bottom of joists-bottom of joists fully braced.

Floor Duration Factor 1.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi	Fb' = 1035 psi
	Cd=1.00 CF=1.00 Cr=1.15	
Shear Stress:	Fv = 180 psi	Fv' = 180 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625 psi	Fc - ⊥' = 625 psi

Controlling Moment: -2141 ft-lb

Over right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear: 1144 lb

At left support of span 3 (Right Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	24.83 in3	31.64 in3
Area (Shear):	9.53 in2	16.88 in2
Moment of Inertia (deflection):	116.96 in4	177.98 in4
Moment:	-2141 ft-lb	2729 ft-lb
Shear:	1144 lb	2025 lb

NOTES



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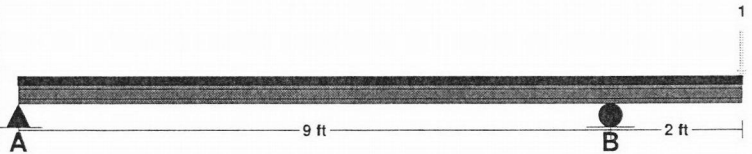
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LOADING DIAGRAM



JOIST LOADING

Uniform Floor Loading	Center	Right
Live Load	LL = 40 psf	40 psf
Dead Load	DL = 15 psf	15 psf
Total Load	TL = 55 psf	55 psf
TL Adj. For Joist Spacing wT =	73.3 plf	73.3 plf

Wall Loading

Wall One		
Live Load (⊥ to Joists): L1 =	0 plf	338 plf
Dead Load (⊥ to Joists) D1 =	0 plf	410 plf
Load Location X1 =	0 ft	2 ft

Project: Washington5

Location: Beam #1 upper floor

Roof Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 6.0 IN x 6.5 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 27.9%

Controlling Factor: Moment

<u>DEFLECTIONS</u>	<u>Center</u>
Live Load	0.15 IN L/534
Dead Load	0.11 in
Total Load	0.25 IN L/309
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240	

<u>REACTIONS</u>	<u>A</u>	<u>B</u>
Live Load	1341 lb	1341 lb
Dead Load	976 lb	976 lb
Total Load	2316 lb	2316 lb
Bearing Length	1.02 in	1.02 in

<u>BEAM DATA</u>	
Span Length	6.5 ft
Unbraced Length-Top	2 ft
Unbraced Length-Bottom	0 ft
Roof Pitch	4 :12
Roof Duration Factor	1.15

<u>MATERIAL PROPERTIES</u>	
24F-V4 - Visually Graded Western Species	
	<u>Base Values</u>
Bending Stress:	Fb = 2400 psi
	Fb_cmpr = 1850 psi
	Cd=1.15 Cl=1.00
Shear Stress:	Fv = 265 psi
	Cd=1.15
Modulus of Elasticity:	E = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi

Adjusted

Controlled by:

Fb' = 2751 psi

Fv' = 305 psi

E' = 1800 ksi

E_min' = 930 ksi

Fc $\perp$ ' = 650 psi

Controlling Moment: 3764 ft-lb

3.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -2316 lb

At support.

Created by combining all dead and live loads.

<u>Comparisons with required sections:</u>	<u>Req'd</u>	<u>Provided</u>
Section Modulus:	16.42 in3	21 in3
Area (Shear):	11.4 in2	21 in2
Moment of Inertia (deflection):	48.93 in4	63 in4
Moment:	3764 ft-lb	4815 ft-lb
Shear:	-2316 lb	4267 lb



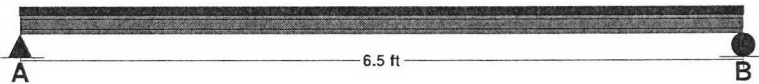
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LOADING DIAGRAM



ROOF LOADING

Side One:

Roof Live Load: LL = 25 psf

Roof Dead Load: DL = 17 psf

Tributary Width: TW = 15.5 ft

Side Two:

Roof Live Load: LL = 25 psf

Roof Dead Load: DL = 17 psf

Tributary Width: TW = 1 ft

Wall Load: WALL = 0 plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS

Adjusted Beam Length: Ladj = 6.5 ft

Beam Self Weight: BSW = 5 plf

Beam Uniform Live Load: wL = 413 plf

Beam Uniform Dead Load: wD_adj = 300 plf

Total Uniform Load: wT = 713 plf

NOTES

Project: Washington5

Location: Beam #2 kitchen header
Uniformly Loaded Floor Beam
[2009 International Building Code(2005 NDS)]
1.5 IN x 11.25 IN x 4.5 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 183.5%
Controlling Factor: Shear

DEFLECTIONS

Center

Live Load 0.01 IN L/9805

Dead Load 0.00 in

Total Load 0.01 IN L/5252

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

REACTIONS

A

B

Live Load 383 lb 383 lb

Dead Load 332 lb 332 lb

Total Load 714 lb 714 lb

Bearing Length 0.76 in 0.76 in

BEAM DATA

Center

Span Length 4.5 ft

Unbraced Length-Top 1.33 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 888 psi
Cd=1.00 Cl=0.99 CF=1.00

Shear Stress: Fv = 180 psi Fv' = 180 psi
Cd=1.00

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment: 803 ft-lb

2.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -714 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 10.85 in³ 31.64 in³

Area (Shear): 5.95 in² 16.88 in²

Moment of Inertia (deflection): 8.13 in⁴ 177.98 in⁴

Moment: 803 ft-lb 2342 ft-lb

Shear: -714 lb 2025 lb

NOTES



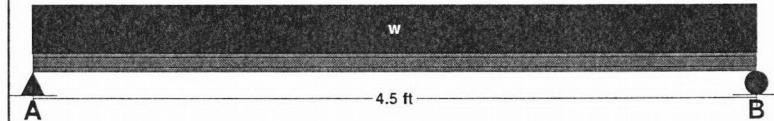
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	4.3 ft	0 ft
Wall Load	WALL =	80 plf	

BEAM LOADING

Beam Total Live Load:	wL =	170 plf
Beam Total Dead Load:	wD =	144 plf
Beam Self Weight:	BSW =	4 plf
Total Maximum Load:	wT =	317 plf

Project: Washington5

Location: Beam #3 over kitchen

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 13.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 42.7%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.14 IN L/1152

Dead Load 0.06 in

Total Load 0.19 IN L/800

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

REACTIONS

A

B

Live Load 910 lb 910 lb

Dead Load 400 lb 400 lb

Total Load 1310 lb 1310 lb

Bearing Length 0.60 in 0.60 in

BEAM DATA

Center

Span Length 13 ft

Unbraced Length-Top 1.33 ft

Unbraced Length-Bottom 13 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 988 psi

Cd=1.00 Cl=1.00 CF=1.10

Shear Stress: Fv = 180 psi Fv' = 180 psi

Cd=1.00

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment: 4257 ft-lb

6.5 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1310 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 51.72 in3 73.83 in3

Area (Shear): 10.92 in2 39.38 in2

Moment of Inertia (deflection): 129.74 in4 415.28 in4

Moment: 4257 ft-lb 6077 ft-lb

Shear: 1310 lb 4725 lb

NOTES



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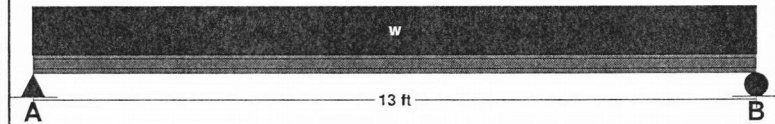
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LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 140 plf

Uniform Dead Load 53 plf

Beam Self Weight 9 plf

Total Uniform Load 202 plf

Project: Washington5

Location: Beam #4 under upper front cant
Combination Roof And Floor Beam
[2009 International Building Code(2005 NDS)]
3.5 IN x 11.25 IN x 7.5 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 8.2%
Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.05 IN L/1708
Dead Load 0.05 in
Total Load 0.10 IN L/915

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

REACTIONS

A B

Live Load 1844 lb 1844 lb
Dead Load 1601 lb 1601 lb
Total Load 3445 lb 3445 lb
Bearing Length 1.57 in 1.57 in

BEAM DATA

Center

Span Length 7.5 ft
Unbraced Length-Top 1.33 ft
Roof Pitch 4 :12
Floor Duration Factor 1.00
Roof Duration Factor 1.15
Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: $F_b = 900$ psi $F_b' = 1136$ psi
 $C_d = 1.15$ $C_t = 1.00$ $C_F = 1.10$
Shear Stress: $F_v = 180$ psi $F_v' = 207$ psi
 $C_d = 1.15$
Modulus of Elasticity: $E = 1600$ ksi $E' = 1600$ ksi
Min. Mod. of Elasticity: $E_{min} = 580$ ksi $E_{min}' = 580$ ksi
Comp. $\perp$ to Grain: $F_c - \perp = 625$ psi $F_c - \perp' = 625$ psi

Controlling Moment:

6459 ft-lb

3.75 ft from left support

Created by combining all dead and live loads.

Controlling Shear:

3445 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 68.25 in³ 73.83 in³
Area (Shear): 24.96 in² 39.38 in²
Moment of Inertia (deflection): 108.97 in⁴ 415.28 in⁴
Moment: 6459 ft-lb 6986 ft-lb
Shear: 3445 lb 5434 lb

NOTES



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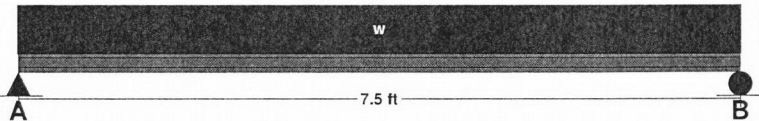
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LOADING DIAGRAM



ROOF LOADING

		Side 1	Side 2
Roof Live Load	RLL =	25 psf	25 psf
Roof Dead Load	RDL =	17 psf	17 psf
Roof Tributary Width	RTW =	13.7 ft	2 ft

FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	2.5 ft	0 ft
Wall Load	WALL =	100 plf	

BEAM LOADING

Roof Uniform Live Load:	wL-roof =	392 plf
Roof Uniform Dead Load:	wD-roof =	281 plf
Floor Uniform Live Load:	wL-floor =	100 plf
Floor Uniform Dead Load:	wD-floor =	38 plf
Beam Self Weight:	BSW =	9 plf
Combined Uniform Live Load:	wL =	492 plf
Combined Uniform Dead Load:	wD =	427 plf
Combined Uniform Total Load:	wT =	919 plf
Controlling Total Design Load:	wT-cont =	919 plf

Project: Washington5

Location: Beam #5 carrier for #4

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 16.5 IN x 13.0 FT (8 + 5)

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 15.4%

Controlling Factor: Moment

DEFLECTIONS	Center		Right	
Live Load	0.00	IN L/Infinity	0.00	IN 2L/Infinity
Dead Load	-0.05	in	0.28	in
Total Load	-0.05	IN L/1867	0.28	IN 2L/424
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240				

REACTIONS	A	B
Live Load	0 lb	0 lb
Dead Load	-1863 lb	6721 lb
Total Load	-1863 lb	6721 lb
Uplift (1.5 F.S)	-1863 lb	0 lb
Bearing Length	0.00 in	2.95 in

BEAM DATA	Center	Right
Span Length	8 ft	5 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	8 ft	5 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values		Adjusted	
Bending Stress:	Fb =	2400 psi	Controlled by:	
	Fb_cmpr =	1850 psi	Fb_cmpr' =	1614 psi
	Cd=0.90 Cl=0.97			
Shear Stress:	Fv =	265 psi	Fv' =	239 psi
	Cd=0.90			
Modulus of Elasticity:	E =	1800 ksi	E' =	1800 ksi
Min. Mod. of Elasticity:	E_min =	930 ksi	E_min' =	930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ =	650 psi	Fc $\perp$ ' =	650 psi

Controlling Moment: -18506 ft-lb
Over right support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 3958 lb
At left support of span 3 (Right Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	137.56 in3	158.81 in3
Area (Shear):	24.89 in2	57.75 in2
Moment of Inertia (deflection):	741.68 in4	1310.2 in4
Moment:	-18506 ft-lb	21366 ft-lb
Shear:	3958 lb	9182 lb

NOTES



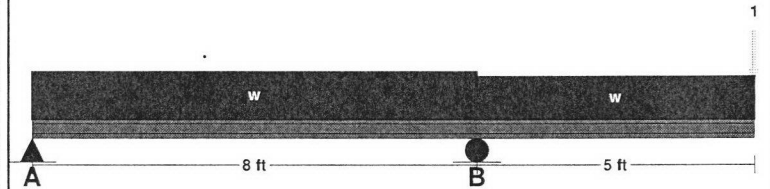
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LOADING DIAGRAM



FLOOR LOADING	Center	Right
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	0 ft
Wall Load	WALL = 100 plf	90 plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	0 lb
Dead Load	3445 lb
Location	5 ft

BEAM LOADING	Center	Right
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	0 plf	0 plf
Total Dead Load	100 plf	90 plf
Beam Self Weight	13 plf	13 plf
Total Load	113 plf	103 plf

Project: Washington5

Location: Beam #6 end unit

Combination Roof And Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 10.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 52.8%

Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.16	IN L/739
Dead Load	0.12	in
Total Load	0.29	IN L/420
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

<u>REACTIONS</u>	<u>A</u>	<u>B</u>
Live Load	2194 lb	2194 lb
Dead Load	1663 lb	1663 lb
Total Load	3857 lb	3857 lb
Bearing Length	1.70 in	1.70 in

BEAM DATA		Center
Span Length	10	ft
Unbraced Length-Top	1.33	ft
Roof Pitch	9	:12
Floor Duration Factor	1.00	
Roof Duration Factor	1.15	
Camber Adj. Factor	1	
Camber Required	0.12	
Notch Depth	0.00	

MATERIAL PROPERTIES		24F-V4 - Visually Graded Western Species	
	Base Values	Adjusted	
Bending Stress:	Fb =	2400	psi
	Fb_cmpr =	1850	psi
	Cd=1.15 Cl=1.00		
Shear Stress:	Fv =	265	psi
	Cd=1.15		
	Fv' =	305	psi
Modulus of Elasticity:	E =	1800	ksi
Min. Mod. of Elasticity:	E_min =	930	ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ =	650	psi

Controlling Moment: 9643 ft-lb
5.0 ft from left support
Created by combining all dead and live loads.

Controlling Shear: 3857 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	42.08 in3	64.31 in3
Area (Shear):	18.98 in2	36.75 in2
Moment of Inertia (deflection):	192.82 in4	337.64 in4
Moment:	9643 ft-lb	14737 ft-lb
Shear:	3857 lb	7466 lb

NOTES



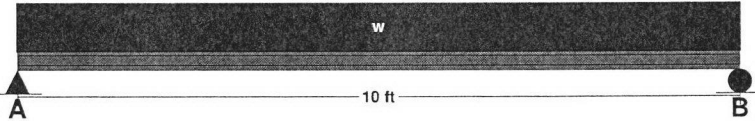
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LOADING DIAGRAM



ROOF LOADING

		Side 1	Side 2
Roof Live Load	RLL =	25	psf
Roof Dead Load	RDL =	17	psf
Roof Tributary Width	RTW =	6.8	ft

FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40	psf
Floor Dead Load	FDL =	15	psf
Floor Tributary Width	FTW =	6.8	ft
Wall Load	WALL =	80	plf

BEAM LOADING

Roof Uniform Live Load:	wL-roof =	169	plf
Roof Uniform Dead Load:	wD-roof =	143	plf
Floor Uniform Live Load:	wL-floor =	270	plf
Floor Uniform Dead Load:	wD-floor =	101	plf
Beam Self Weight:	BSW =	8	plf
Combined Uniform Live Load:	wL =	439	plf
Combined Uniform Dead Load:	wD =	333	plf
Combined Uniform Total Load:	wT =	771	plf
Controlling Total Design Load:	wT-cont =	771	plf

Project: Washington5

Location: Beam #7 end unit

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 12.0 FT (8 + 4)

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 59.4%

Controlling Factor: Moment

DEFLECTIONS	Center	Right
Live Load	0.07 IN L/1442	0.15 IN 2L/656
Dead Load	0.02 in	0.03 in
Total Load	0.09 IN L/1110	0.18 IN 2L/546
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	1756 lb	3951 lb
Dead Load	975 lb	2925 lb
Total Load	2731 lb	6876 lb
Bearing Length	1.20 in	3.02 in

BEAM DATA	Center	Right
Span Length	8 ft	4 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	8 ft	4 ft
Live Load Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi	Controlled by:
	Fb_cmpr = 1850 psi	Fb_cmpr' = 1818 psi
	Cd=1.00 Cl=0.98	
Shear Stress:	Fv = 265 psi	Fv' = 265 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ ' = 650 psi

Controlling Moment: -6112 ft-lb

Over right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 3

Controlling Shear: -3820 lb

At right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Req'd	Provided
Section Modulus:	40.35 in3	64.31 in3
Area (Shear):	21.62 in2	36.75 in2
Moment of Inertia (deflection):	185.43 in4	337.64 in4
Moment:	-6112 ft-lb	9742 ft-lb
Shear:	-3820 lb	6493 lb

NOTES



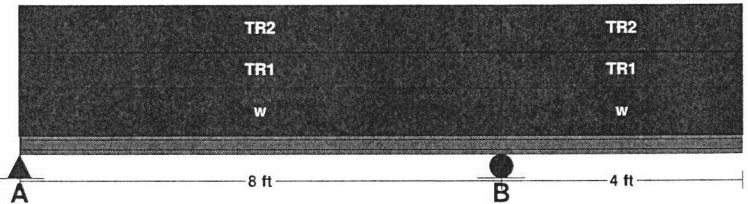
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LOADING DIAGRAM



UNIFORM LOADS	Center	Right
Uniform Live Load	0 plf	0 plf
Uniform Dead Load	100 plf	100 plf
Beam Self Weight	8 plf	8 plf
Total Uniform Load	108 plf	108 plf

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two
Left Live Load	169 plf	270 plf
Left Dead Load	115 plf	102 plf
Right Live Load	169 plf	270 plf
Right Dead Load	115 plf	102 plf
Load Start	0 ft	0 ft
Load End	8 ft	8 ft
Load Length	8 ft	8 ft

RIGHT SPAN

Load Number	One	Two
Left Live Load	169 plf	270 plf
Left Dead Load	115 plf	102 plf
Right Live Load	169 plf	270 plf
Right Dead Load	115 plf	102 plf
Load Start	0 ft	0 ft
Load End	4 ft	4 ft
Load Length	4 ft	4 ft

Project: Washington5

Location: Beam #8 end unit carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 14.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 47.3%

Controlling Factor: Shear

DEFLECTIONS

Center

Live Load 0.11 IN L/1477

Dead Load 0.19 in

Total Load 0.30 IN L/555

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

REACTIONS

A

B

Live Load 560 lb 560 lb

Dead Load 541 lb 3847 lb

Total Load 1101 lb 4407 lb

Bearing Length 0.48 in 1.94 in

BEAM DATA

Center

Span Length 14 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 14 ft

Floor Duration Factor 1.00

Camber Adj. Factor 1

Camber Required 0.19

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:
Fb_cmpr = 1850 psi Fb' = 2400 psi
Cd=1.00

Shear Stress: Fv = 265 psi Fv' = 265 psi
Cd=1.00

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 650 psi Fc $\perp$ ' = 650 psi

Controlling Moment: 5140 ft-lb

9.38 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -4407 lb

At right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 25.7 in³ 64.31 in³

Area (Shear): 24.95 in² 36.75 in²

Moment of Inertia (deflection): 145.94 in⁴ 337.64 in⁴

Moment: 5140 ft-lb 12863 ft-lb

Shear: -4407 lb 6493 lb



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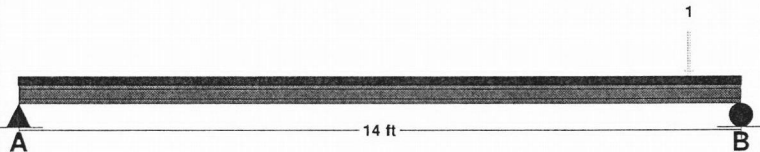
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LOADING DIAGRAM



FLOOR LOADING

Center

Floor Live Load FLL = 40 psf

Floor Dead Load FDL = 15 psf

Floor Tributary Width Side One TW1 = 1 ft

Floor Tributary Width Side Two TW2 = 1 ft

Wall Load WALL = 0 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 0 lb

Dead Load 3857 lb

Location 13 ft

BEAM LOADING

Center

Reduced Floor Live Load 40 psf

Total Live Load 80 plf

Total Dead Load 30 plf

Beam Self Weight 8 plf

Total Load 118 plf

NOTES

Project: Washington5

Location: Beam #9 end unit deck door

Multi-Span Roof Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 9.0 IN x 3.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 5.6%

Controlling Factor: Shear

DEFLECTIONS

Center

Live Load 0.00 IN L/Infinity

Dead Load 0.02 in

Total Load 0.02 IN L/2319

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS

A

B

Live Load 0 lb 0 lb

Dead Load 4744 lb 2452 lb

Total Load 4744 lb 2452 lb

Bearing Length 2.09 in 1.08 in

BEAM DATA

Center

Span Length 3 ft

Unbraced Length-Top 2 ft

Unbraced Length-Bottom 3 ft

Roof Pitch 9 :12

Roof Duration Factor 1.15

Camber Adj. Factor 1

Camber Required 0.02

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:

Fb_cmpr = 1850 psi Fb' = 2152 psi

Cd=0.90 Cl=1.00

Shear Stress: Fv = 265 psi Fv' = 239 psi

Cd=0.90

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc - $\perp$ = 650 psi Fc - $\perp$ ' = 650 psi

Controlling Moment: 4646 ft-lb

1.02 Ft from left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Controlling Shear: 4744 lb

At left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Comparisons with required sections:

Req'd

Provided

Section Modulus: 25.91 in3 47.25 in3

Area (Shear): 29.84 in2 31.5 in2

Moment of Inertia (deflection): 16.5 in4 212.63 in4

Moment: 4646 ft-lb 8473 ft-lb

Shear: 4744 lb 5009 lb



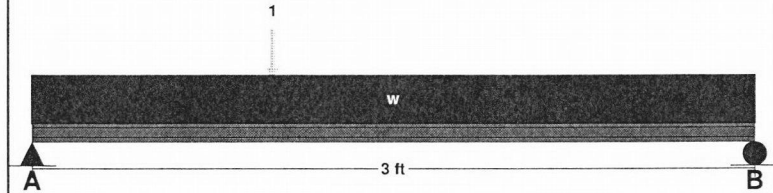
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LOADING DIAGRAM



ROOF LOADING

Center

Roof Live Load RLL = 25 psf

Roof Dead Load RDL = 17 psf

Roof Tributary Width Side One TW1 = 0 ft

Roof Tributary Width Side Two TW2 = 0 ft

Wall Load WALL = 100 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 0 lb

Dead Load 6876 lb

Location 1 ft

BEAM LOADING

Center

Total Live Load 0 plf

Total Dead Load (Adjusted for Roof Pitch) 100 plf

Beam Self Weight 7 plf

Total Load 107 plf

NOTES

Project: Washington5

Location: Beam #10 garage header

Uniformly Loaded Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 8.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 162.8%

Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.03	IN L/3206
Dead Load	0.01	in
Total Load	0.05	IN L/2254
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS		A	B
Live Load	765	lb	765 lb
Dead Load	323	lb	323 lb
Total Load	1088	lb	1088 lb
Bearing Length	0.50	in	0.50 in

BEAM DATA		Center
Span Length	8.5	ft
Unbraced Length-Top	1.33	ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values		Adjusted	
Bending Stress:	Fb =	900 psi	Fb' =	988 psi
	<i>Cd=1.00 Cl=1.00 CF=1.10</i>			
Shear Stress:	Fv =	180 psi	Fv' =	180 psi
	<i>Cd=1.00</i>			
Modulus of Elasticity:	E =	1600 ksi	E' =	1600 ksi
Min. Mod. of Elasticity:	E_min =	580 ksi	E_min' =	580 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ =	625 psi	Fc - $\perp$ ' =	625 psi

Controlling Moment: 2312 ft-lb

4.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -1088 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	28.09 in3	73.83 in3
Area (Shear):	9.07 in2	39.38 in2
Moment of Inertia (deflection):	46.63 in4	415.28 in4
Moment:	2312 ft-lb	6077 ft-lb
Shear:	-1088 lb	4725 lb

NOTES



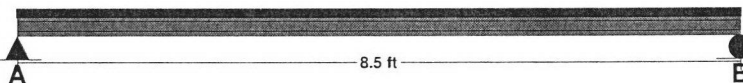
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	4.5 ft	0 ft
Wall Load	WALL =	0 plf	

BEAM LOADING

Beam Total Live Load:	wL =	180 plf
Beam Total Dead Load:	wD =	68 plf
Beam Self Weight:	BSW =	9 plf
Total Maximum Load:	wT =	256 plf

Project: Washington5

Location: Beam #11 in front of garage

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 12.0 IN x 11.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 7.6%

Controlling Factor: Moment

DEFLECTIONS	Center	
Live Load	0.14	IN L/976
Dead Load	0.26	in
Total Load	0.40	IN L/331
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	2461 lb	2461 lb
Dead Load	4321 lb	4321 lb
Total Load	6782 lb	6782 lb
Bearing Length	2.98 in	2.98 in

BEAM DATA	Center
Span Length	11 ft
Unbraced Length-Top	1.33 ft
Unbraced Length-Bottom	11 ft
Live Load Duration Factor	1.00
Camber Adj. Factor	1
Camber Required	0.26
Notch Depth	0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi	Controlled by:
	Fb_cmpr = 1850 psi	Fb' = 2391 psi
	Cd=1.00 Ci=1.00	
Shear Stress:	Fv = 265 psi	Fv' = 265 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ ' = 650 psi

Controlling Moment: 15556 ft-lb
5.5 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -6782 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	78.07 in3	84 in3
Area (Shear):	38.39 in2	42 in2
Moment of Inertia (deflection):	365.75 in4	504 in4
Moment:	15556 ft-lb	16738 ft-lb
Shear:	-6782 lb	7420 lb

NOTES



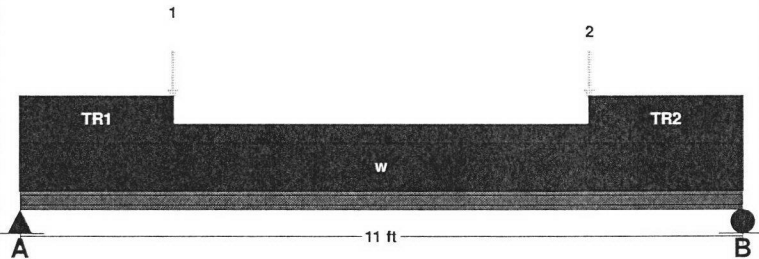
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LOADING DIAGRAM



UNIFORM LOADS

	Center
Uniform Live Load	260 plf
Uniform Dead Load	98 plf
Beam Self Weight	9 plf
Total Uniform Load	367 plf

POINT LOADS - CENTER SPAN

Load Number	One	Two
Live Load	0 lb	0 lb
Dead Load	2816 lb	2816 lb
Location	2.33 ft	8.67 ft

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two	Three
Left Live Load	388 plf	388 plf	40 plf
Left Dead Load	264 plf	264 plf	95 plf
Right Live Load	388 plf	388 plf	40 plf
Right Dead Load	264 plf	264 plf	95 plf
Load Start	0 ft	8.67 ft	2.33 ft
Load End	2.33 ft	11 ft	8.67 ft
Load Length	2.33 ft	2.33 ft	6.34 ft

Project: Washington5

Location: Beam #12 at lower stairs
Uniformly Loaded Floor Beam
[2009 International Building Code(2005 NDS)]
3.5 IN x 11.25 IN x 8.83 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 2.0%
Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.08	IN L/1355
Dead Load	0.05	in
Total Load	0.13	IN L/843
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

<u>REACTIONS</u>	<u>A</u>	<u>B</u>
Live Load	1678 lb	1678 lb
Dead Load	1020 lb	1020 lb
Total Load	2698 lb	2698 lb
Bearing Length	1.23 in	1.23 in

BEAM DATA		Center
Span Length	8.83	ft
Unbraced Length-Top	1.33	ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values		Adjusted	
Bending Stress:	Fb =	900 psi	Fb' =	988 psi
	<i>Cd=1.00 Cl=1.00 CF=1.10</i>			
Shear Stress:	Fv =	180 psi	Fv' =	180 psi
	<i>Cd=1.00</i>			
Modulus of Elasticity:	E =	1600 ksi	E' =	1600 ksi
Min. Mod. of Elasticity:	E_min =	580 ksi	E_min' =	580 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ =	625 psi	Fc - $\perp$ ' =	625 psi

Controlling Moment: 5955 ft-lb
4.415 ft from left support
Created by combining all dead and live loads.
Controlling Shear: 2698 lb
At support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	72.35 in3	73.83 in3
Area (Shear):	22.48 in2	39.38 in2
Moment of Inertia (deflection):	118.3 in4	415.28 in4
Moment:	5955 ft-lb	6077 ft-lb
Shear:	2698 lb	4725 lb

NOTES



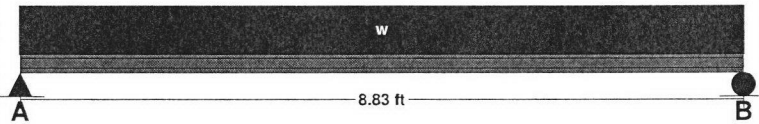
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	0 ft	9.5 ft
Wall Load	WALL =	80 plf	

BEAM LOADING

Beam Total Live Load:	wL =	380 plf
Beam Total Dead Load:	wD =	223 plf
Beam Self Weight:	BSW =	9 plf
Total Maximum Load:	wT =	611 plf

Project: Washington5

Location: Beam #13 lower stairs carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 12.0 IN x 7.33 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 25.3%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.01 IN L/7680

Dead Load 0.10 in

Total Load 0.12 IN L/762

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

REACTIONS

A

B

Live Load 586 lb 586 lb

Dead Load 3574 lb 3288 lb

Total Load 4161 lb 3875 lb

Bearing Length 1.83 in 1.70 in

BEAM DATA

Center

Span Length 7.33 ft

Unbraced Length-Top 1.33 ft

Unbraced Length-Bottom 7.33 ft

Floor Duration Factor 1.00

Camber Adj. Factor 0

Camber Required 0

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:
Fb_cmpr = 1850 psi Fb' = 2153 psi
Cd=0.90 Cl=1.00

Shear Stress: Fv = 265 psi Fv' = 265 psi
Cd=1.00

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 650 psi Fc $\perp$ ' = 650 psi

Controlling Moment: 12031 ft-lb

3.52 Ft from left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Controlling Shear: 4161 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 67.06 in³ 84 in³

Area (Shear): 23.55 in² 42 in²

Moment of Inertia (deflection): 158.74 in⁴ 504 in⁴

Moment: 12031 ft-lb 15070 ft-lb

Shear: 4161 lb 7420 lb



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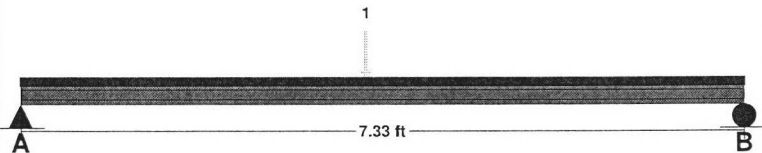
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LOADING DIAGRAM



FLOOR LOADING

Center

Floor Live Load FLL = 40 psf

Floor Dead Load FDL = 15 psf

Floor Tributary Width Side One TW1 = 4 ft

Floor Tributary Width Side Two TW2 = 0 ft

Wall Load WALL = 0 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 0 lb

Dead Load 6356 lb

Location 3.5 ft

BEAM LOADING

Center

Reduced Floor Live Load 40 psf

Total Live Load 160 plf

Total Dead Load 60 plf

Beam Self Weight 9 plf

Total Load 229 plf

NOTES

Project: Washington5

Location: Beam #14 front edge carrier end unit
Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

1.5 IN x 11.25 IN x 9.33 FT (7.3 + 2)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 40.8%

Controlling Factor: Moment

DEFLECTIONS

	Center		Right	
Live Load	-0.01	IN L/5882	0.03	IN 2L/1880
Dead Load	0.01	in	0.00	in
Total Load	0.01	IN L/7065	0.02	IN 2L/1930
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240				

REACTIONS

	A	B
Live Load	0 lb	813 lb
Dead Load	304 lb	1016 lb
Total Load	304 lb	1828 lb
Bearing Length	0.32 in	1.95 in

BEAM DATA

	Center	Right
Span Length	7.33 ft	2 ft
Unbraced Length-Top	1.33 ft	1.33 ft
Unbraced Length-Bottom	7.33 ft	2 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values		Adjusted	
Bending Stress:	Fb =	900 psi	Fb' =	680 psi
	Cd=1.00 Cl=0.76 CF=1.00			
Shear Stress:	Fv =	180 psi	Fv' =	180 psi
	Cd=1.00			
Modulus of Elasticity:	E =	1600 ksi	E' =	1600 ksi
Min. Mod. of Elasticity:	E_min =	580 ksi	E_min' =	580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ =	625 psi	Fc $\perp$ ' =	625 psi

Controlling Moment: -1274 ft-lb

Over right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear: 1274 lb

At left support of span 3 (Right Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	22.47 in ³	31.64 in ³
Area (Shear):	10.62 in ²	16.88 in ²
Moment of Inertia (deflection):	34.09 in ⁴	177.98 in ⁴
Moment:	-1274 ft-lb	1794 ft-lb
Shear:	1274 lb	2025 lb

NOTES



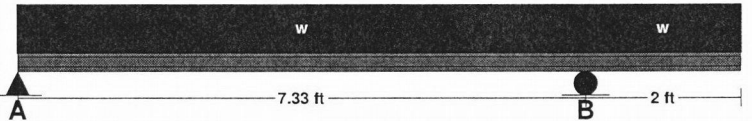
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LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	65 psf
Floor Dead Load	FDL = 15 psf	32 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	5.5 ft
Wall Load	WALL = 100 plf	100 plf

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	65 psf
Total Live Load	0 plf	358 plf
Total Dead Load	100 plf	276 plf
Beam Self Weight	4 plf	4 plf
Total Load	104 plf	637 plf

Project: Washington5

Location: Beam #15 front edge carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 11.25 IN x 9.67 FT (7.7 + 2)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 10.7%

Controlling Factor: Shear

DEFLECTIONS	Center	Right
Live Load	0.00 IN L/MAX	0.01 IN 2L/6862
Dead Load	-0.03 in	0.05 in
Total Load	-0.03 IN L/3100	0.06 IN 2L/862
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	0 lb	497 lb
Dead Load	-83 lb	4742 lb
Total Load	-83 lb	5240 lb
Uplift (1.5 F.S)	-140 lb	0 lb
Bearing Length	0.00 in	2.40 in

BEAM DATA	Center	Right
Span Length	7.67 ft	2 ft
Unbraced Length-Top	1.33 ft	1.33 ft
Unbraced Length-Bottom	7.67 ft	2 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Cl=0.98 CF=1.10	Fb' = 975 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. ⊥ to Grain:	Fc ⊥ = 625 psi	Fc ⊥' = 625 psi

Controlling Moment: -4267 ft-lb

Over right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear: 4267 lb

At left support of span 3 (Right Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Req'd	Provided
Section Modulus:	52.52 in3	73.83 in3
Area (Shear):	35.56 in2	39.38 in2
Moment of Inertia (deflection):	115.72 in4	415.28 in4
Moment:	-4267 ft-lb	5998 ft-lb
Shear:	4267 lb	4725 lb

NOTES



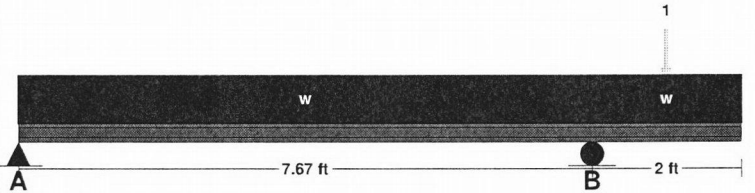
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LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	5.5 ft
Wall Load	WALL = 100 plf	100 plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	0 lb
Dead Load	3445 lb
Location	1 ft

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	0 plf	220 plf
Total Dead Load	100 plf	183 plf
Beam Self Weight	9 plf	9 plf
Total Load	109 plf	411 plf

Project: Washington5

Location: Beam #16 main floor stair beam
Uniformly Loaded Floor Beam
[2009 International Building Code(2005 NDS)]
3.5 IN x 11.25 IN x 9.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 13.6%
Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.07 IN L/1519

Dead Load 0.05 in

Total Load 0.12 IN L/920

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

REACTIONS

A

B

Live Load 1440 lb 1440 lb

Dead Load 938 lb 938 lb

Total Load 2378 lb 2378 lb

Bearing Length 1.09 in 1.09 in

BEAM DATA

Center

Span Length 9 ft

Unbraced Length-Top 1.33 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 988 psi
Cd=1.00 Cl=1.00 CF=1.10

Shear Stress: Fv = 180 psi Fv' = 180 psi
Cd=1.00

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment: 5351 ft-lb

4.5 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -2378 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 65.01 in³ 73.83 in³

Area (Shear): 19.82 in² 39.38 in²

Moment of Inertia (deflection): 108.35 in⁴ 415.28 in⁴

Moment: 5351 ft-lb 6077 ft-lb

Shear: -2378 lb 4725 lb

NOTES



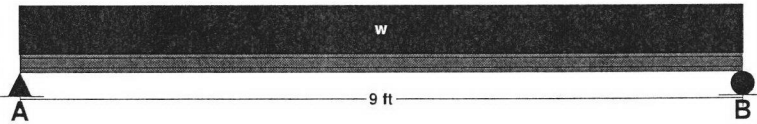
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LOADING DIAGRAM



FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	8 ft	0 ft
Wall Load	WALL =	80 plf	

BEAM LOADING

Beam Total Live Load:	wL =	320 plf
Beam Total Dead Load:	wD =	200 plf
Beam Self Weight:	BSW =	9 plf
Total Maximum Load:	wT =	529 plf

Project: Washington5

Location: Beam #17 over great room
Multi-Loaded Multi-Span Beam
[2009 International Building Code(2005 NDS)]
(2) 1.5 IN x 11.25 IN x 14.83 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 56.5%
Controlling Factor: Moment



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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

Center

Live Load 0.05 IN L/3320

Dead Load 0.11 in

Total Load 0.17 IN L/1065

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

REACTIONS

A

B

Live Load 600 lb 89 lb

Dead Load 680 lb 227 lb

Total Load 1280 lb 316 lb

Bearing Length 0.68 in 0.17 in

BEAM DATA

Center

Span Length 14.83 ft

Unbraced Length-Top 1.33 ft

Unbraced Length-Bottom 14.83 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 897 psi

Cd=1.00 Ci=1.00 CF=1.00

Shear Stress: Fv = 180 psi Fv' = 180 psi

Cd=1.00

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi

Min. Mod. of Elasticity: E_min = 580 ksi E_min' = 580 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 625 psi Fc $\perp$ ' = 625 psi

Controlling Moment: 3024 ft-lb

3.86 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1280 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 40.43 in³ 63.28 in³

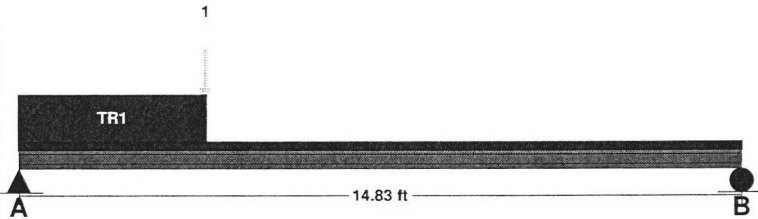
Area (Shear): 10.67 in² 33.75 in²

Moment of Inertia (deflection): 80.21 in⁴ 355.96 in⁴

Moment: 3024 ft-lb 4733 ft-lb

Shear: 1280 lb 4050 lb

LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 0 plf

Uniform Dead Load 0 plf

Beam Self Weight 7 plf

Total Uniform Load 7 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 0 lb

Dead Load 538 lb

Location 3.83 ft

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number One

Left Live Load 180 plf

Left Dead Load 68 plf

Right Live Load 180 plf

Right Dead Load 68 plf

Load Start 0 ft

Load End 3.83 ft

Load Length 3.83 ft

NOTES

Project: Washington5

Location: Beam #18 over end unit lower floor

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 9.5 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 58.4%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.02 IN L/7134

Dead Load 0.15 in

Total Load 0.17 IN L/684

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

REACTIONS

A

B

Live Load 252 lb 252 lb

Dead Load 1148 lb 2975 lb

Total Load 1400 lb 3227 lb

Bearing Length 0.62 in 1.42 in

BEAM DATA

Center

Span Length 9.5 ft

Unbraced Length-Top 1.33 ft

Unbraced Length-Bottom 9.5 ft

Live Load Duration Factor 1.00

Camber Adj. Factor 1

Camber Required 0.15

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:
Fb_cmpr = 1850 psi Fb' = 2154 psi
Cd=0.90 Cl=1.00

Shear Stress: Fv = 265 psi Fv' = 239 psi
Cd=0.90

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 650 psi Fc $\perp$ ' = 650 psi

Controlling Moment: 7288 ft-lb

6.93 Ft from left support of span 2 (Center Span)

Created by dead loads only on all span(s).

Controlling Shear: -2975 lb

At right support of span 2 (Center Span)

Created by dead loads only on all span(s).

Comparisons with required sections:

Req'd

Provided

Section Modulus: 40.6 in3 64.31 in3

Area (Shear): 18.71 in2 36.75 in2

Moment of Inertia (deflection): 118.41 in4 337.64 in4

Moment: 7288 ft-lb 11543 ft-lb

Shear: -2975 lb 5843 lb

NOTES



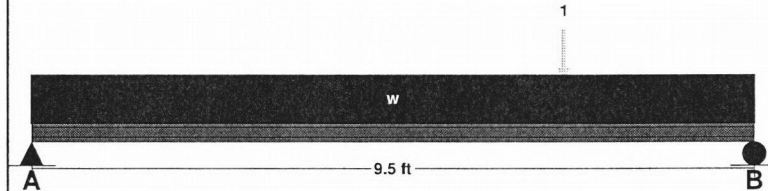
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LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 53 plf

Uniform Dead Load 20 plf

Beam Self Weight 8 plf

Total Uniform Load 81 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 0 lb

Dead Load 3857 lb

Location 7 ft

Project: Washington5

Location: Beam #19 over lower floor garage

Combination Roof And Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 10.5 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 77.1%

Controlling Factor: Moment

DEFLECTIONS

Center

Live Load 0.12 IN L/1077

Dead Load 0.12 in

Total Load 0.24 IN L/533

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

REACTIONS

A

B

Live Load 1365 lb 1365 lb

Dead Load 1394 lb 1394 lb

Total Load 2759 lb 2759 lb

Bearing Length 1.21 in 1.21 in

BEAM DATA

Center

Span Length 10.5 ft

Unbraced Length-Top 1.33 ft

Roof Pitch 10 :12

Floor Duration Factor 1.00

Roof Duration Factor 1.15

Camber Adj. Factor 1

Camber Required 0.12

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi Fb_cmpr = 1850 psi Cd=1.00 Cl=1.00	Controlled by: Fb' = 2392 psi
Shear Stress:	Fv = 265 psi Cd=1.00	Fv' = 265 psi
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ ' = 650 psi

Controlling Moment: 7242 ft-lb

5.25 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -2759 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	36.32 in3	64.31 in3
Area (Shear):	15.62 in2	36.75 in2
Moment of Inertia (deflection):	152.05 in4	337.64 in4
Moment:	7242 ft-lb	12821 ft-lb
Shear:	-2759 lb	6493 lb



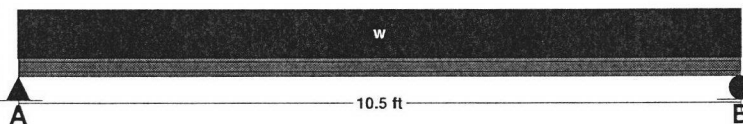
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LOADING DIAGRAM



ROOF LOADING

		Side 1	Side 2
Roof Live Load	RLL =	25 psf	25 psf
Roof Dead Load	RDL =	17 psf	17 psf
Roof Tributary Width	RTW =	0 ft	1.5 ft

FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	40 psf	40 psf
Floor Dead Load	FDL =	15 psf	15 psf
Floor Tributary Width	FTW =	3 ft	3.5 ft
Wall Load	WALL =	160 plf	

BEAM LOADING

Roof Uniform Live Load:	wL-roof =	38 plf
Roof Uniform Dead Load:	wD-roof =	33 plf
Floor Uniform Live Load:	wL-floor =	260 plf
Floor Uniform Dead Load:	wD-floor =	98 plf
Beam Self Weight:	BSW =	8 plf
Combined Uniform Live Load:	wL =	298 plf
Combined Uniform Dead Load:	wD =	299 plf
Combined Uniform Total Load:	wT =	596 plf
Controlling Total Design Load:	wT-cont =	525 plf

NOTES

Project: Washington5

Location: Beam #20 front carrier

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 10.5 IN x 11.0 FT (9 + 2)

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 115.5%

Controlling Factor: Moment

DEFLECTIONS	Center	Right
Live Load	0.00 IN L/Infinity	0.00 IN 2L/Infinity
Dead Load	-0.06 in	0.08 in
Total Load	-0.06 IN L/1854	0.08 IN 2L/582
Live Load Deflection Criteria: L/360		Total Load Deflection Criteria: L/240

REACTIONS	A	B
Live Load	0 lb	0 lb
Dead Load	-416 lb	2820 lb
Total Load	-416 lb	2820 lb
Uplift (1.5 F.S)	-416 lb	0 lb
Bearing Length	0.00 in	1.24 in

BEAM DATA	Center	Right
Span Length	9 ft	2 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	9 ft	2 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi	Controlled by:
	Fb_cmpr = 1850 psi	Fb_cmpr' = 1636 psi
	Cd=0.90 Cl=0.98	
Shear Stress:	Fv = 265 psi	Fv' = 239 psi
	Cd=0.90	
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Min. Mod. of Elasticity:	E_min = 930 ksi	E_min' = 930 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ ' = 650 psi

Controlling Moment: -4069 ft-lb
Over right support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 2332 lb
At left support of span 3 (Right Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	29.84 in3	64.31 in3
Area (Shear):	14.67 in2	36.75 in2
Moment of Inertia (deflection):	139.05 in4	337.64 in4
Moment:	-4069 ft-lb	8769 ft-lb
Shear:	2332 lb	5843 lb

NOTES



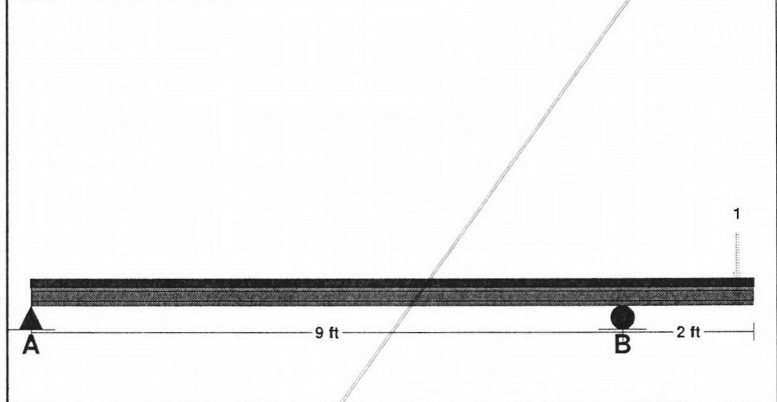
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LOADING DIAGRAM



FLOOR LOADING

	Center	Right
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 0 ft	0 ft
Floor Tributary Width Side Two	TW2 = 0 ft	0 ft
Wall Load	WALL = 0 plf	0 plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	0 lb
Dead Load	2316 lb
Location	1.75 ft

BEAM LOADING

	Center	Right
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	0 plf	0 plf
Total Dead Load	0 plf	0 plf
Beam Self Weight	8 plf	8 plf
Total Load	8 plf	8 plf

Project: Washington5

Location: Beam #21 over rear of garage

Multi-Loaded Multi-Span Beam

[2009 International Building Code(2005 NDS)]

3.5 IN x 12.0 IN x 11.0 FT

24F-V4 - Visually Graded Western Species - Dry Use

Section Adequate By: 39.4%

Controlling Factor: Shear

DEFLECTIONS

Center

Live Load 0.03 IN L/4214

Dead Load 0.27 in

Total Load 0.30 IN L/444

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

REACTIONS

A

B

Live Load 962 lb 962 lb

Dead Load 4361 lb 4361 lb

Total Load 5323 lb 5323 lb

Bearing Length 2.34 in 2.34 in

BEAM DATA

Center

Span Length 11 ft

Unbraced Length-Top 1.33 ft

Unbraced Length-Bottom 11 ft

Live Load Duration Factor 1.00

Camber Adj. Factor 1

Camber Required 0.27

Notch Depth 0.00

MATERIAL PROPERTIES

24F-V4 - Visually Graded Western Species

Base Values

Adjusted

Bending Stress: Fb = 2400 psi Controlled by:
Fb_cmpr = 1850 psi Fb' = 2391 psi
Cd=1.00 Cl=1.00

Shear Stress: Fv = 265 psi Fv' = 265 psi
Cd=1.00

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi

Min. Mod. of Elasticity: E_min = 930 ksi E_min' = 930 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 650 psi Fc $\perp$ ' = 650 psi

Controlling Moment: 11219 ft-lb

5.5 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 5323 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 56.3 in3 84 in3

Area (Shear): 30.13 in2 42 in2

Moment of Inertia (deflection): 272.37 in4 504 in4

Moment: 11219 ft-lb 16738 ft-lb

Shear: 5323 lb 7420 lb

NOTES



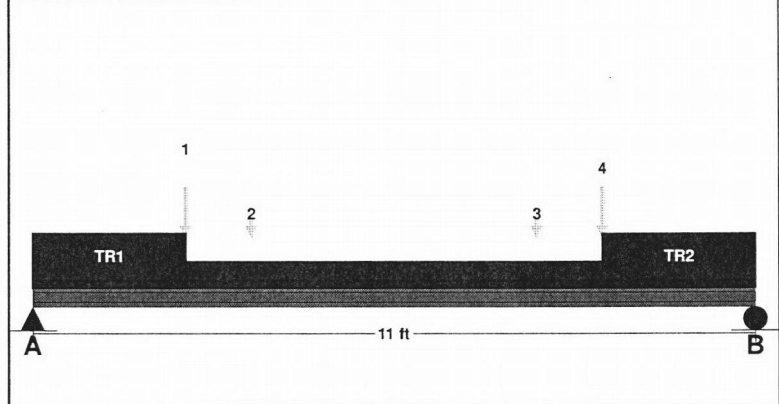
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LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 0 plf

Uniform Dead Load 0 plf

Beam Self Weight 9 plf

Total Uniform Load 9 plf

POINT LOADS - CENTER SPAN

Load Number	One	Two	Three	Four
Live Load	0 lb	0 lb	0 lb	0 lb
Dead Load	2316 lb	714 lb	714 lb	2316 lb
Location	2.33 ft	3.33 ft	7.67 ft	8.67 ft

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two	Three
Left Live Load	413 plf	413 plf	0 plf
Left Dead Load	441 plf	441 plf	80 plf
Right Live Load	413 plf	413 plf	0 plf
Right Dead Load	441 plf	441 plf	80 plf
Load Start	0 ft	8.67 ft	2.33 ft
Load End	2.33 ft	11 ft	8.67 ft
Load Length	2.33 ft	2.33 ft	6.34 ft

Project: Washington5

Location: Beam #22 over main floor stairs
Multi-Loaded Multi-Span Beam
[2009 International Building Code(2005 NDS)]
1.5 IN x 11.25 IN x 14.0 FT (2 + 12)
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 55.0%
Controlling Factor: Moment

DEFLECTIONS	Left	Center
Live Load	-0.06 IN 2L/806	0.12 IN L/1244
Dead Load	-0.01 in	0.03 in
Total Load	-0.07 IN 2L/668	0.14 IN L/1019
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	482 lb	521 lb
Dead Load	131 lb	238 lb
Total Load	613 lb	759 lb
Bearing Length	0.65 in	0.81 in

BEAM DATA	Left	Center
Span Length	2 ft	12 ft
Unbraced Length-Top	0 ft	1.33 ft
Unbraced Length-Bottom	2 ft	12 ft
Live Load Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 Ci=0.99 CF=1.00	Fb' = 888 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 1511 ft-lb
8.04 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -759 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	20.41 in3	31.64 in3
Area (Shear):	6.33 in2	16.88 in2
Moment of Inertia (deflection):	79.43 in4	177.98 in4
Moment:	1511 ft-lb	2342 ft-lb
Shear:	-759 lb	2025 lb

NOTES



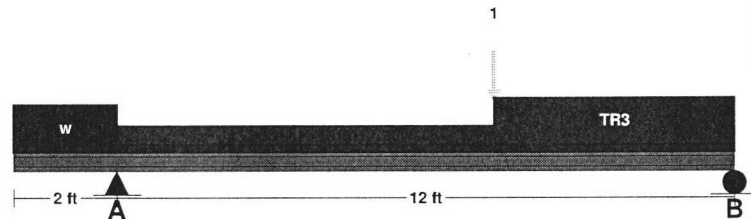
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LOADING DIAGRAM



UNIFORM LOADS	Left	Center
Uniform Live Load	53 plf	0 plf
Uniform Dead Load	13 plf	0 plf
Beam Self Weight	4 plf	4 plf
Total Uniform Load	70 plf	4 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	-200 lb
Location	7.33 ft

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two	Three
Left Live Load	53 plf	53 plf	107 plf
Left Dead Load	13 plf	20 plf	80 plf
Right Live Load	53 plf	53 plf	107 plf
Right Dead Load	13 plf	20 plf	80 plf
Load Start	0 ft	4 ft	7.33 ft
Load End	4 ft	7.33 ft	12 ft
Load Length	4 ft	3.33 ft	4.67 ft

Project: Washington5

Location: Deck Guardrail

Multi-Span Floor Beam

[2009 International Building Code(2005 NDS)]

1.5 IN x 5.5 IN x 8.0 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 48.7%

Controlling Factor: Moment

DEFLECTIONS		Center
Live Load	0.00	IN L/Infinity
Dead Load	0.12	in
Total Load	0.12	IN L/830
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS		A	B
Live Load	0	lb	0 lb
Dead Load	107	lb	107 lb
Total Load	107	lb	107 lb
Bearing Length	0.11	in	0.11 in

BEAM DATA		Center
Span Length	8	ft
Unbraced Length-Top	8	ft
Unbraced Length-Bottom	8	ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi <i>Cd=0.90 Cl=0.93 CF=1.30</i>	Fb' = 978 psi
Shear Stress:	Fv = 180 psi <i>Cd=0.90</i>	Fv' = 162 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Min. Mod. of Elasticity:	E_min = 580 ksi	E_min' = 580 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ ' = 625 psi

Controlling Moment: 414 ft-lb
4.0 Ft from left support of span 2 (Center Span)
Created by dead loads only on all span(s).

Controlling Shear: 107 lb
At left support of span 2 (Center Span)
Created by dead loads only on all span(s).

Comparisons with required sections:	Req'd	Provided
Section Modulus:	5.09 in3	7.56 in3
Area (Shear):	0.99 in2	8.25 in2
Moment of Inertia (deflection):	6.02 in4	20.8 in4
Moment:	414 ft-lb	616 ft-lb
Shear:	107 lb	891 lb

NOTES



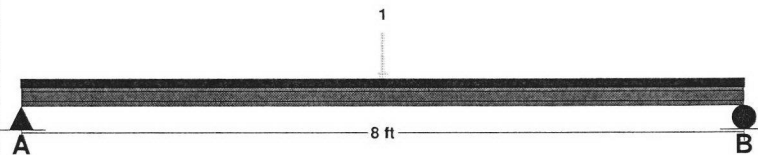
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LOADING DIAGRAM



FLOOR LOADING

	Center
Floor Live Load	FLL = 0 psf
Floor Dead Load	FDL = 0 psf
Floor Tributary Width Side One	TW1 = 0 ft
Floor Tributary Width Side Two	TW2 = 0 ft
Wall Load	WALL = 0 plf

POINT LOADS - CENTER SPAN

Load Number	One
Live Load	0 lb
Dead Load	200 lb
Location	4 ft

BEAM LOADING

	Center
Reduced Floor Live Load	0 psf
Total Live Load	0 plf
Total Dead Load	0 plf
Beam Self Weight	2 plf
Total Load	2 plf

Project: Washington5

Location: Footing A

Footing

[2009 International Building Code(2005 NDS)]

Footing Size: 3.0 FT x 3.0 FT x 12.00 IN

Reinforcement: #4 Bars @ 7.00 IN. O.C. E/W / (5) min.

Section Footing Design Adequate



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FOOTING PROPERTIES

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

FOOTING SIZE

Width: $W = 3$ ft
Length: $L = 3$ ft
Depth: $\text{Depth} = 12$ in
Effective Depth to Top Layer of Steel: $d = 8.25$ in

COLUMN AND BASEPLATE SIZE

Column Type: Wood
Column Width: $m = 3.5$ in
Column Depth: $n = 5.5$ in

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure: $Q_u = 1253$ psf
Effective Allowable Soil Bearing Pressure: $Q_e = 1350$ psf
Required Footing Area: $A_{req} = 8.35$ sf
Area Provided: $A = 9.00$ sf

Baseplate Bearing:

Bearing Required: $\text{Bear} = 15788$ lb
Allowable Bearing: $\text{Bear-A} = 53178$ lb

Beam Shear Calculations (One Way Shear):

Beam Shear: $V_{u1} = 4276$ lb
Allowable Beam Shear: $V_{c1} = 22275$ lb

Punching Shear Calculations (Two Way Shear):

Critical Perimeter: $B_o = 51$ in
Punching Shear: $V_{u2} = 13820$ lb
Allowable Punching Shear (ACI 11-35): $vc2-a = 71719$ lb
Allowable Punching Shear (ACI 11-36): $vc2-b = 133650$ lb
Allowable Punching Shear (ACI 11-37): $vc2-c = 63113$ lb
Controlling Allowable Punching Shear: $vc2 = 63113$ lb

Bending Calculations:

Factored Moment: $M_u = 71045$ in-lb
Nominal Moment Strength: $M_n = 282369$ in-lb

Reinforcement Calculations:

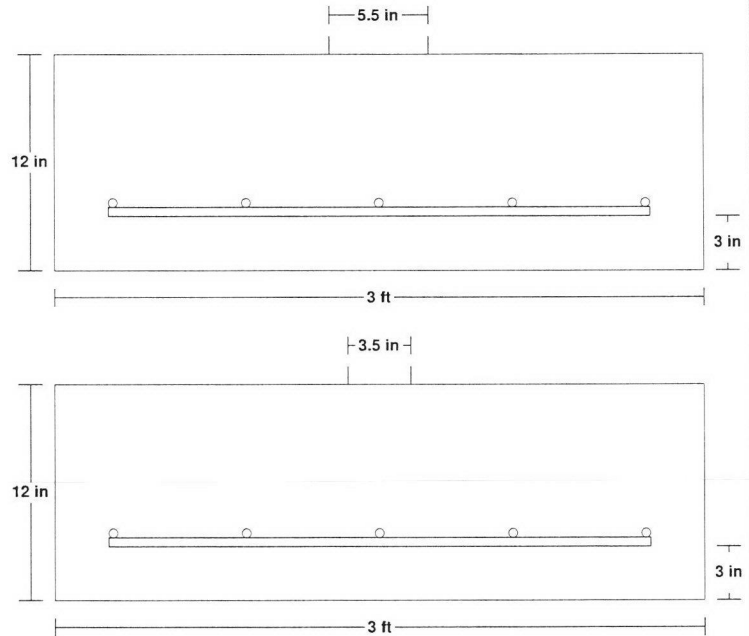
Concrete Compressive Block Depth: $a = 0.51$ in
Steel Required Based on Moment: $A_s(1) = 0.24$ in²
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4): $A_s(2) = 0.86$ in²
Controlling Reinforcing Steel: $A_{s-reqd} = 0.86$ in²
Selected Reinforcement: #4's @ 7.0 in. o.c. e/w (5) Min.
Reinforcement Area Provided: $A_s = 0.98$ in²

Development Length Calculations:

Development Length Required: $L_d = 15$ in
Development Length Supplied: $L_{d-sup} = 15$ in

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

LOADING DIAGRAM



FOOTING LOADING

Live Load: $PL = 0$ lb
Dead Load: $PD = 11277$ lb
Total Load: $PT = 11277$ lb
Ultimate Factored Load: $P_u = 15788$ lb
Weight to resist uplift w/ 1.5 F.S.: $U.R. = 870$ lb

NOTES

Project: Washington5

Location: Footing B

Footing

[2009 International Building Code(2005 NDS)]

Footing Size: 3.17 FT x 3.17 FT x 12.00 IN

Reinforcement: #4 Bars @ 7.00 IN. O.C. E/W / (5) min.

Section Footing Design Adequate



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FOOTING PROPERTIES

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

FOOTING SIZE

Width: $W = 3.17$ ft
Length: $L = 3.17$ ft
Depth: $\text{Depth} = 12$ in
Effective Depth to Top Layer of Steel: $d = 8.25$ in

COLUMN AND BASEPLATE SIZE

Column Type: Wood
Column Width: $m = 3.5$ in
Column Depth: $n = 5.5$ in

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure: $Q_u = 1350$ psf
Effective Allowable Soil Bearing Pressure: $Q_e = 1350$ psf
Required Footing Area: $A_{req} = 10.05$ sf
Area Provided: $A = 10.05$ sf

Baseplate Bearing:

Bearing Required: $\text{Bear} = 18990$ lb
Allowable Bearing: $\text{Bear-A} = 53178$ lb

Beam Shear Calculations (One Way Shear):

Beam Shear: $V_{u1} = 5376$ lb
Allowable Beam Shear: $V_{c1} = 23537$ lb

Punching Shear Calculations (Two Way Shear):

Critical Perimeter: $B_o = 51$ in
Punching Shear: $V_{u2} = 16869$ lb
Allowable Punching Shear (ACI 11-35): $vc2-a = 71719$ lb
Allowable Punching Shear (ACI 11-36): $vc2-b = 133650$ lb
Allowable Punching Shear (ACI 11-37): $vc2-c = 63113$ lb
Controlling Allowable Punching Shear: $vc2 = 63113$ lb

Bending Calculations:

Factored Moment: $M_u = 90296$ in-lb
Nominal Moment Strength: $M_n = 282855$ in-lb

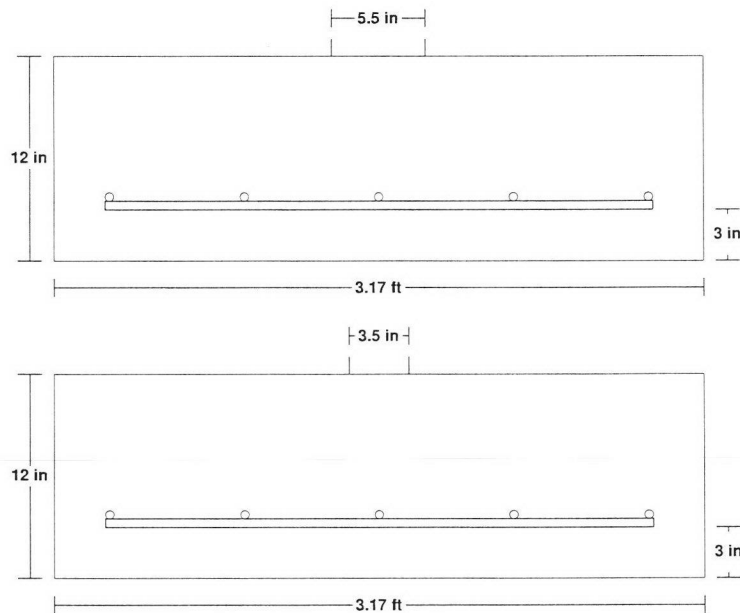
Reinforcement Calculations:

Concrete Compressive Block Depth: $a = 0.49$ in
Steel Required Based on Moment: $A_s(1) = 0.31$ in²
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4): $A_s(2) = 0.91$ in²
Controlling Reinforcing Steel: $A_s\text{-reqd} = 0.91$ in²
Selected Reinforcement: #4's @ 7.0 in. o.c. e/w (5) Min.
Reinforcement Area Provided: $A_s = 0.98$ in²

Development Length Calculations:

Development Length Required: $L_d = 15$ in
Development Length Supplied: $L_d\text{-sup} = 16.02$ in

LOADING DIAGRAM



FOOTING LOADING

Live Load: $PL = 0$ lb
Dead Load: $PD = 13564$ lb
Total Load: $PT = 13564$ lb
Ultimate Factored Load: $P_u = 18990$ lb
Weight to resist uplift w/ 1.5 F.S.: $U.R. = 971$ lb

NOTES

Project: Washington5

Location: Strip footings

Footing

[2009 International Building Code(2005 NDS)]

Footing Size: 15.0 IN Wide x 7.0 IN Deep Continuous Footing With 6.0 IN Thick x 12.0 IN Tall Stemwall

Section Footing Design Adequate



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CAUTIONS

* Footing has been designed without reinforcement

FOOTING PROPERTIES

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

FOOTING SIZE

Width: $W = 15$ in
Depth: $\text{Depth} = 7$ in
Effective Depth to Top Layer of Steel: $d = 5$ in

STEMWALL SIZE

Stemwall Width: 6 in
Stemwall Height: 12 in
Stemwall Weight: 150 pcf

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure: $Q_u = 1389$ psf
Effective Allowable Soil Bearing Pressure: $Q_e = 1413$ psf
Width Required: $W_{req} = 1.23$ in2

Beam Shear Calculations (One Way Shear):

Beam Shear: $V_{u1} = 0$ lb
Allowable Beam Shear: $V_{c1} = 2200$ lb

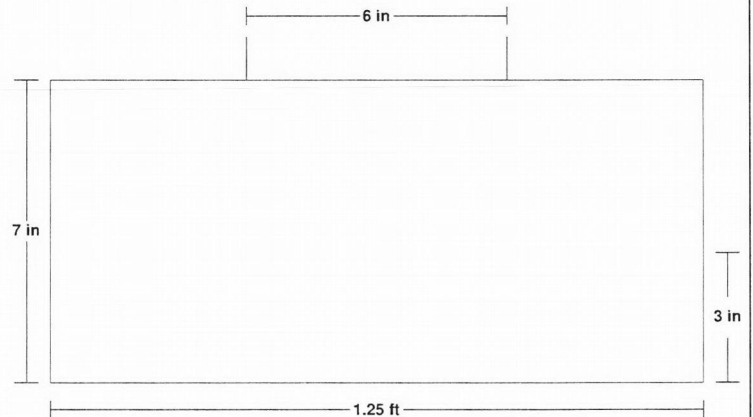
Transverse Direction:

Bending Calculations:

Factored Moment: $M_u = 1673$ in-lb
Nominal Moment Strength: $M_n = 6875$ in-lb

NOTES

LOADING DIAGRAM



FOOTING LOADING

Live Load: $PL = 989$ lb
Dead Load: $PD = 672$ lb
Total Load: $PT = 1736$ lb
Ultimate Factored Load: $P_u = 2479$ lb

LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Roof:	$LL = 25$ psf	$DL = 17$ psf	$TA = 6.8$ ft2
Second Floor:	$LL = 40$ psf	$DL = 15$ psf	$TA = 10.3$ ft2
First Floor:	$LL = 40$ psf	$DL = 15$ psf	$TA = 10.3$ ft2