

**Structural Calculations for Design of deck replacements.**

**Project & Location:**

**Structural Calculations**

**Meridian Firs Apartment Deck Replacement**

2923 S Meridian,  
Puyallup, WA 98373

**Client:**

Meridian Firs, LLC  
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253-314-9822



**Project Number:**

24.049

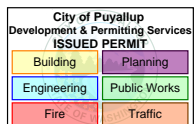
**Code / Location:**

2021 IBC

**Loads:**

I. Vertical Loads:		12.17.2024
Roof (Ground Snow/live)	NA PSF	
Deck (dead)	10 PSF	
Deck (live)	60.0 PSF	
Allowable Soil Bearing	1500.0 Code Min	

II. Lateral Loads: (NA existing)

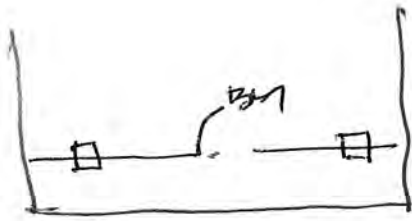
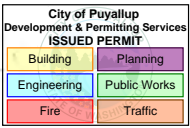


**PRDK20241969**

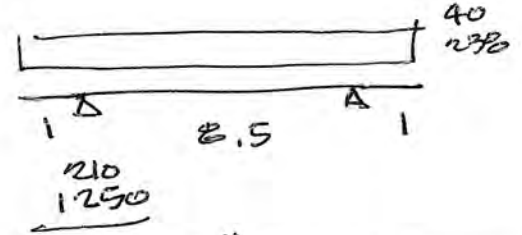
Calculations required to be provided by the Permittee on site for all inspections

**City of Puyallup  
Building  
REVIEWED  
FOR  
COMPLIANCE**

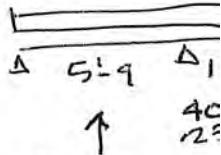
SKinnear  
12/20/2024  
11:34:31 AM



PLAN



∴ 6x8 H.F #2



(E) 2x JOIST  
OK BY W/SPE

$$M = \frac{L^2}{2} > \frac{L^2}{8} \text{ OK}$$

SINGLE DECK



$$5.5 + 3 + 3 = 11.5$$

$$5.5 + 3 + 3 = 11.5$$

$$\frac{1450}{\left(\frac{11.5}{12}\right)^2} = 1590$$

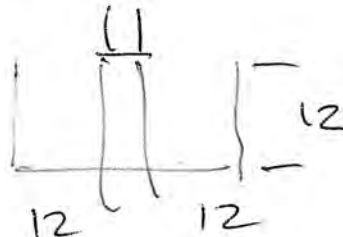
$$\frac{1590}{1500} = 1.06$$

OK  
IF SUAPS 3" + THICK...

DOUBLE DECK

$$(1450)(2)$$

F1.5 18" x 18" x DEPTH FOR FIBER



$$\frac{2900}{1500(2)^2} = 125 \text{ PSF OK}$$

# SOLUTIONS 4 STRUCTURES Inc.

JOB #: 24.049

DESIGNED: TLC

DATE: 12/17/24

Project: Meridian Firs Apartment Deck replacement

## BENDING MEMBER

2018 NDS/2021 IBC

**MEMBER LOADING**

Reactions (Maxiur)  $R_L$  8.5 ft span  $R_R$

	D	L	Lr	S	W	E	Total
$R_L$	170	1012	0	0	0	0	1182
$R_R$	170	1012	0	0	0	0	1182

Uniform (plf) ASD

check	$W_x$	Start	End	D	L	Lr	S	W*	E*
OK	$W_1 = 0$	0	8.5	40	238				
	$W_2 =$								
	$W_3 =$								
	$W_4 =$								
	$W_5 =$								

**Point (lb) ASD**

check	$P_x$	Start	End	D	L	Lr	S	W*	E*
OK	$P_1 = 0$							0	0
OK	$P_2 = 0$							0	0
OK	$P_3 = 0$							0	0
OK	$P_4 = 0$							0	0
	$P_5 =$								
	$P_6 =$								

**Triangular (plf) ASD**

check	$T_{XS} / T_{XE}$	Start	End	D	L	Lr	S	W	E*
Not Yet Useable									

**Moment (lb-ft) ASD**

check	$M_x$	Start	End	D	L	Lr	S	W	E*
Not Yet Useable									

\* W and E is ASD level

- (Eq 16-8) D
- (Eq 16-9) D + L
- (Eq 16-10) D + Lr
- (Eq 16-10) D + S
- (Eq 16-11) D + 0.75(L + Lr)
- (Eq 16-11) D + 0.75(L + S)
- (Eq 16-12) D + W
- (Eq 16-12) D + E
- (Eq 16-13) D + 0.75(W + L + Lr)
- (Eq 16-13) D + 0.75(E + L + Lr)
- (Eq 16-13) D + 0.75(E + L + S)
- (Eq 16-14) 0.6D + W
- (Eq 16-15) 0.6D + E

(1) 6 X 8 Hem Fir #2 N.G. ok by inspection

### MEMBER GEOMETRY

Quantity	1
b (in)	5.5
Custom =	3
d (in)	7.5
Custom =	3.5
A (in <sup>2</sup> )	41.25
S <sub>x</sub> (in <sup>3</sup> )	51.56
I <sub>x</sub> (in <sup>4</sup> )	193.36
Bending X-X axis	

d/b = 1.36

### BRACING COMPRESSION FLANGE

Full ?	YES
I <sub>y</sub> (in)	102
I <sub>e</sub> (in)	189
R <sub>b</sub>	6.84
Emin' (KSI)	402
COV <sub>E</sub>	0.25
F <sub>b</sub> * (PSI)	575
F <sub>be</sub>	28205
F <sub>be</sub> /F <sub>b</sub> *	49.1
CL	1.0000

Table 3.3.3 conservative  
≤50 (eq. 3.5-5)  
D-4  
Table F1  
=(F<sub>b</sub>\*C<sub>1</sub>\*C<sub>2</sub>\*C<sub>3</sub>\*C<sub>4</sub>\*C<sub>5</sub>)  
F<sub>be</sub> = 1.2\*Emin'/R<sub>b</sub>\*2  
[Eq. 3.3-6]

### MATERIAL PROPERTIES

Sawn	
Hem Fir	
#2	
F <sub>b</sub> (PSI)	575
F <sub>v</sub> (PSI)	140
E (KSI)	1100

### MEMBER STATUS

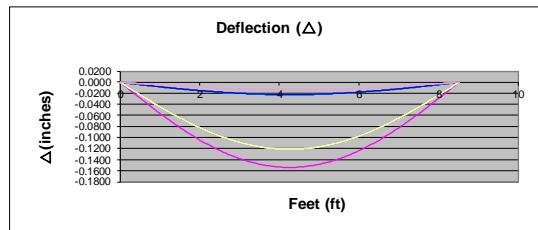
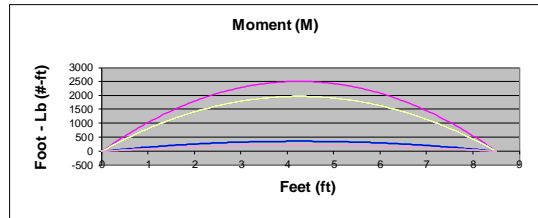
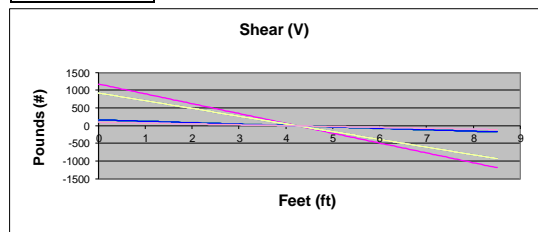
Shear	O.K.	30.7%
V <sub>max</sub> (#)	1182	(Eq 16-9) D + L
f <sub>v</sub> (PSI)	43	1.5VA
F <sub>v</sub> ' (PSI)	140	=(F <sub>v</sub> '*C <sub>1</sub> *C <sub>2</sub> *C <sub>3</sub> )
Moment	N.G.	101.6% ok by inspectic
M <sub>max</sub> (#-ft)	2511	(Eq 16-9) D + L
f <sub>b</sub> (PSI)	584	=M/S
F <sub>b</sub> ' (PSI)	575	=(F <sub>b</sub> '*C <sub>1</sub> *C <sub>2</sub> )

### Adjustment Factors

Size: C <sub>F</sub>	1.00	
Repetitive?	NO	N/A
Cr	1.00	
C <sub>TU</sub>	1.00	N/A
Incising?	NO	
C <sub>i</sub> (Fb)	1.00	N/A
C <sub>i</sub> (E)	1.00	N/A
Form C <sub>F</sub>	1.00	
Temp C <sub>t</sub>	1.00	
Wet Service?	NO	
C <sub>M</sub> (Fv)	1	
C <sub>M</sub> (Fb)	1.00	
C <sub>M</sub> (E)	1.00	
C <sub>D</sub> (Fv)	1.00	(Eq 16-9) D + L
C <sub>D</sub> (Fb)	1.00	(Eq 16-9) D + L

### Deflection O.K.

Include W, E	NO	
E' (KSI)	1100	E'=(E'*C <sub>M</sub> *C <sub>t</sub> *C <sub>i</sub> )
DL (in)	-0.022	D
Δ <sub>LL</sub>	O.K.	46.4%
LL (in)	-0.131	L
L <sub>Live</sub> /	776	
LL (allow) /	360	
Δ <sub>TL</sub>	O.K.	36.1%
TL (in)	-0.15	(Eq 16-9) D + L
L <sub>Total</sub> /	664	
LT (allow) /	240	



(1) 6 X 8 Hem Fir #2 N.G.

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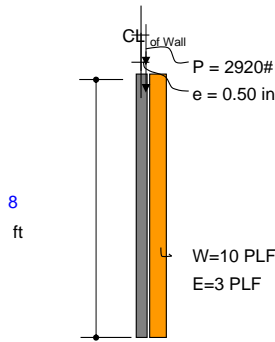
DATE: 12/17/24

PROJECT: Meridian Firs Apartments Deck Replacement

## STUD WALL DESIGN

Typ deck (including double stacked)

2018 NDS/2018 IBC



AXIAL LOADS P	
P <sub>DL</sub> (#/ft) =	420
P <sub>SL</sub> (#/ft) =	0
P <sub>LL</sub> (#/ft) =	2,500
P <sub>TOT</sub> (#/ft) =	2,920
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	20.00
E (PSF) =	5.00
TRIB. (IN) =	6

DESIGN VALUES	
F <sub>b</sub> (psi) =	575
F <sub>v</sub> (psi) =	140
F <sub>c</sub> (psi) =	575
F <sub>cL</sub> (psi) =	405
E (psi) =	1.10E+06
E <sub>min</sub> (psi) =	4.00E+05
L <sub>u</sub> (in) =	48
c =	0.8
K <sub>e</sub> =	1
C <sub>b</sub> =	1.07

Hem Fir	▼
#2	▼
Bending X-X axis	▼
405	▼
Incised, No	▼
Wet Use, No	▼
Full Bracing, Yes	▼
(Sawn Lumber)	▼
(Appendix G)	▼
(Bearing Area Factor)	▼

Bearing wall Fire rated? No  
Fire Retardant FirePRO? No  
Header Bearing Area (in<sup>2</sup>) = 63.25

Use: (1) 6" X 6" @ 6" O.C. OK

625 = F<sub>cL</sub> (psi)

MEMBER SIZE		SECTION PROPERTIES			
QUANTITY	1	A =	30.25 in <sup>2</sup>		
b =	5.5 in	S =	27.73 in <sup>3</sup>		
d =	5.5 in	I =	76.26 in <sup>4</sup>		
	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)
L <sub>u</sub> (ft) =	8	8	8	8	8
V <sub>applied</sub> (#) =	15	2	12	42	42
M <sub>applied</sub> (ft-#) =	61	9	48	89	109
P <sub>applied</sub> (#) =	2920	420	2295	420	2295
C <sub>D</sub> =	1	1.15	1.15	1.6	1.6
BENDING STRESS CALCS	F <sub>bE</sub> (psi) = 213592			C <sub>DF</sub> = 1	
F <sub>b</sub> * (psi) =	575	661	661	920	920
C <sub>L</sub> =	1	1	1	1	1
F <sub>b</sub> ' (psi) =	575	661	661	920	920
AXIAL STRESS CALCS	F <sub>cE</sub> = 1079			C <sub>CF</sub> = 1	
L <sub>e</sub> /d =	17.45	17.45	17.45	17.45	17.45
F <sub>c</sub> * (psi) =	575	661	661	920	920
C <sub>P</sub> =	0.85630919	0.828910674	0.828910674	0.743122182	0.743122182
F <sub>c</sub> ' (psi) =	492	548	548	684	684
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)
V <sub>allow</sub> (#) =	2823	3247	3247	4517	4517
M <sub>allow</sub> (ft - #) =	1329	1528	1528	2126	2126
P <sub>allow</sub> (#) =	14894	16581	16581	20681	20681
(f <sub>v</sub> /F <sub>v</sub> ) <sup>2</sup> + f <sub>v</sub> /(F <sub>v</sub> (1-(f <sub>v</sub> /F <sub>vE</sub> ))) =	0.09	0.01	0.05	0.04	0.07
(f <sub>v</sub> /F <sub>vE</sub> ) + (f <sub>v</sub> /F <sub>vE</sub> ) <sup>2</sup> =	0.09	0.01	0.07	0.01	0.07
P <sub>c,allow</sub> on PL (#) =	13087	13087	13087	13087	13087
P <sub>c,allow</sub> on Beam (#) =	39531	39531	39531	39531	39531
Deflection L/	NA	NA	NA	L/8738	L/11650
240	0.00	0.00	0.00	0.01	0.01
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)
SHEAR V	OK	OK	OK	OK	OK
V <sub>applied</sub> /V <sub>allow</sub>	0.5%	0.1%	0.4%	0.9%	0.9%
MOMENT M	OK	OK	OK	OK	OK
M <sub>applied</sub> /M <sub>allow</sub>	4.6%	0.6%	3.1%	4.2%	5.1%
AXIAL P	OK	OK	OK	OK	OK
P <sub>applied</sub> /P <sub>allow</sub>	19.6%	2.5%	13.8%	2.0%	11.1%
(f <sub>c</sub> /F <sub>c</sub> ) <sup>2</sup> + f <sub>c</sub> /(F <sub>c</sub> (1-(f <sub>c</sub> /F <sub>cE</sub> ))) =	OK	OK	OK	OK	OK
(f <sub>c</sub> /F <sub>cE</sub> ) + (f <sub>c</sub> /F <sub>cE</sub> ) <sup>2</sup> =	8.9%	0.6%	5.3%	4.3%	6.8%
(f <sub>c</sub> /F <sub>cE</sub> ) + (f <sub>v</sub> /F <sub>vE</sub> ) <sup>2</sup> =	OK	OK	OK	OK	OK
(f <sub>c</sub> /F <sub>cE</sub> ) + (f <sub>v</sub> /F <sub>vE</sub> ) <sup>2</sup> =	8.9%	1.3%	7.0%	1.3%	7.0%
AXIAL P <sub>c</sub> on PL	OK	OK	OK	OK	OK
P <sub>c,applied</sub> /P <sub>c,allow</sub>	22.3%	3.2%	17.5%	3.2%	17.5%
AXIAL P <sub>c</sub> on Beam	OK	OK	OK	OK	OK
P <sub>c,applied</sub> /P <sub>c,allow</sub>	7.4%	1.1%	5.8%	1.1%	5.8%
DEFLECTION	OK	OK	OK	OK	OK
D <sub>actual</sub> /D <sub>allowed</sub>	0.0%	0.0%	0.0%	2.7%	2.1%
Overall Check	OK	OK	OK	OK	OK

63.25

625 = F<sub>cL</sub> (psi)

(Table 4a Bending)

(Eq 3.7-1)

(Eq 3.7-1)

(Table 4.3.1)

(Table 4a Compression)

(3.7.1.4) <50

(Eq 3.7-1)

(Eq 3.7-1)

(Table 4.3.1)

V<sub>allow</sub> = A \* F<sub>v</sub> \* C<sub>D</sub> / 1.5

M<sub>allow</sub> = S \* F<sub>b</sub> \* C<sub>D</sub> \* C<sub>F</sub> \* C<sub>L</sub> \* C<sub>r</sub>

P<sub>allow</sub> = A \* F<sub>c</sub> \* C<sub>D</sub> \* C<sub>F</sub> \* C<sub>P</sub>

(Eq 3.9-3)

(Eq 3.9-4)

P<sub>c,allow</sub> = A \* F<sub>c</sub> \* C<sub>b</sub>

P<sub>c,allow</sub> = A \* F<sub>c</sub>

L/(1 \* E / 15 \* L \* M<sub>applied</sub>)

(1.0) \* W

Table 1604.3(f)

Actual Δ