

# PACIFIC NORTHWEST STRUCTURAL GROUP, LLC

A PROFESSIONAL ENGINEERING COMPANY

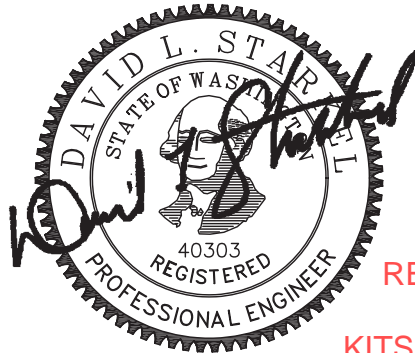
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Kitsap County Building Department  
lasmith@co.kitsap.wa.us  
11/16/2020

6193 NE MALBON CT.  
KINGSTON, WA 98346  
360.903.2803

## STRUCTURAL CALCULATIONS

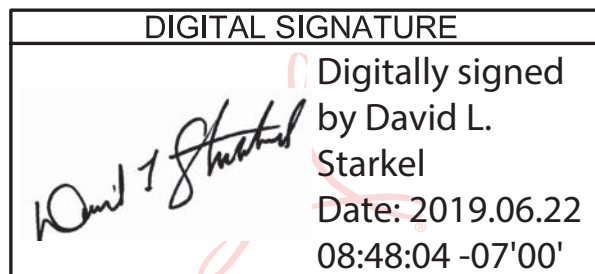
19-002A RED BARN LANE - DUPLEX 1880/1620A  
NW HOGAN LN & NELS NELSON RD NW  
BREMERTON, WA 98311

ALL COMPUTATIONS AND ENGINEERING FOR THIS PROJECT HAVE  
BEEN PERFORMED BY MYSELF OR UNDER MY SUPERVISION.



BASIC PERMIT PACKAGE  
REVIEWED FOR CODE COMPLIANCE  
WITH IRC 2015  
KITSAP COUNTY BUILDING DEPARTMENT

22-JUN-19



Established Basic Permit #

19-03671

Permit Number: 20-04896

# Pacific Northwest Structural Group, LLC

Project	Red Barn Lane - Duplex 1620/1880	Designer	DLS
Location	NW Hogan Ln & Nels Nelson Rd NW, Bremerton, WA	Project No.	19-002
Client	Envision Northwest, LLC	Revised	15-Sep-18
Design Live and Dead Loads, Soil Data			

## DESIGN LIVE AND DEAD LOADS

ROOF LOAD :		
Asphalt Shingles	1.5	PSF
Re-Roof	1.5	PSF
Roof Shtg	1.5	PSF
Truss @ 24" oc	3.3	PSF
Insulation	1.6	PSF
Gypsum Shtg	2.2	PSF
		PSF
		PSF
SUB-TOTAL	11.6	PSF
SLOPE CORRECTION "X:12"	6.00	1.1
MISCELLANEOUS	2.0	PSF
ROOF DEAD LOAD	15.0	PSF
ROOF SNOW LOAD	25.0	PSF
REDUCED SNOW LOAD	N/A	PSF
ROOF LIVE LOAD	16.0	PSF

EXTERIOR WALL LOAD		
Siding	4.0	PSF
Wall Shtg	1.5	PSF
2x6 @ 16" oc	1.7	PSF
Bottom & Top Plates	0.8	PSF
Insulation	0.5	PSF
Gypsum Shtg	2.2	PSF
Mech., Elec., & Misc.	0.3	PSF
EXTER. WALL DEAD LOAD	11.0	PSF

INTERIOR WALL LOAD		
Gypsum Shtg	4.4	PSF
2X4 @ 16" oc	1.1	PSF
Insulation	0.5	PSF
Bottom & Top Plates	0.8	PSF
Mech., Elec., & Misc.	1.2	PSF
INTERIOR WALL DEAD LOAD	8.0	PSF

FLOOR LOAD		
Floor Covering	1.0	PSF
Floor Shtg	2.3	PSF
Floor Joist	3.3	PSF
Insulation	1.3	PSF
Gypsum Sheathing	5.6	PSF
Mech., Elec., & Misc.	1.5	PSF
		PSF
FLOOR DEAD LOAD	15.0	PSF
FLOOR LIVE LOAD	40.0	PSF

DECK OR BALCONY DEAD LOAD		
2x Decking	4.5	PSF
Deck Joist	3.3	PSF
Mech., Elec., & Misc.	4.2	PSF
		PSF
DECK DEAD LOAD	12.0	PSF
DECK LIVE LOAD	60.0	PSF

		PSF
		PSF
		PSF
		PSF
		PSF
		PSF
		PSF
FLOOR DEAD LOAD	-	PSF
FLOOR LIVE LOAD		PSF

## SOILS DATA

SOILS REPORT	N/A		
GEOTECHNICAL ENGINEER	N/A	DATE OF REPORT	N/A
BASIC BEARING PRESSURE		ACTIVE SOIL PRESSURE	
PADS & CONT. FND	1,500	PASSIVE PRESSURE	N/A PCF
INCREASE FOR WIDTH	N/A	SOIL FRICTION	N/A
INCREASE FOR DEPTH	N/A	E.F.P. (Cantilever)	N/A PCF
MAX. SOIL PRESSURE	1,500	E.F.P. (Restrained)	N/A PCF
ISOLATED FOUNDATIONS	N/A		

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C:\Users\dista\Dropbox\PNW Project Files\2019 Projects\19-002 Red Barn Lane Single Family & Duplex\ENGR\19-002 Design Criteria 2018 - Duplex.xlsxLoads

19-03671

Permit Number: 20-04896

Pacific Northwest Structural Group, LLC	Project	Red Barn Lane - Duplex 1620/1880	Designer	DLS
	Location	NW Hogan Ln & Nels Nelson Rd NW, Brem	Project No.	19-002
	Client	Envision Northwest, LLC	Revised 15-Sep-18	
	2015 IBC Section 1609.6 Wind Loads			

# **BUILDING DATA:**

Ultimate Design Wind Speed, $V_{ult}$	110	MPH	Figure 1609 1609.4	Exposure		
Exposure	B			B	C	D
Roof Pitch	6.00	:12				
$\theta =$	26.57					
Condition 1						
Building Length	34.00	ft				
Building Width	40.00	ft				
1st Level Plate Height	8.08	ft				
2nd Level Plate Height	9.08	ft				
3rd Level Plate Height	8.08	ft				
Gable Height	35.24	ft				
Roof Height	10.00	ft				
Mean Roof Height $h =$	30.24	ft				

## **1609.6 Alternate All-Heights Method**

Wind directionality factor, $K_d$	0.85	ASCE 7-10, 27.3-1
Topographic Factor, $K_{zt}$	1.00	
Velocity pressure factor, $K_z$	0.70	

## **IBC 2015 Table 1609.6.2, Net Pressure Coefficients, $C_{net}$**

Description	+ Internal pressure	- Internal pressure
Windward Wall	0.43	0.73
Leeward Wall	(0.51)	(0.21)
Sidewall	(0.66)	(0.35)
Wind perpendicular to ridge Leeward roof or flat roof	(0.66)	(0.35)
Wind parallel to ridge and flat roofs	(1.09)	(0.79)
Windward roof slopes	0.06	0.37

Description	Pressure	
Windward Wall	21.45	psf
Leeward Wall	13.31	psf
Sidewall	18.67	psf
Wind perpendicular to ridge Leeward roof or flat roof	18.67	psf
Windward roof slopes	7.95	psf

Allowable Uniform Wind Load				
Level	Transverse		Longitudinal	
1st Level Plate	178.9	plf	96.1	plf
2nd Level Plate	178.9	plf	96.1	plf
3rd Level Plate	132.0	plf	101.3	plf

Pacific Northwest Structural Group, LLC	Project	Red Barn Lane - Duplex 1620/1880		Designer	DLS
	Location	NW Hogan Ln & Nels Nelson Rd NW, Breme		Project No.	19-002
	Client	Envision Northwest, LLC		Revised	15-Sep-18
	2015 IBC Section 1613 Earthquake Loads				
ASCE 7-10 & IBC 2015 Section 1613, EARTHQUAKE LOADS					
Soil Site Class	D			ASCE 7-10 11.4.2 ( Default=D)	
Response Spectral Acc. (0.2 sec) $S_s$	1.39			ASCE 7-10 Figure(s) 22-1 through 22-18	
Response Spectral Acc. ( 1.0 sec) $S_1$	0.55				
Site Coefficient $F_a$	1.00			ASCE 7-10 Table 11.4-1	
Site Coefficient $F_v$	1.50			ASCE 7-10 Table 11.4-2	
Max Considered Earthquake Acc. $S_{MS}$	1.387	$F_a \cdot S_s$	ASCE 7-10 (11.4-1)		
Max Considered Earthquake Acc. $S_{M1}$	0.828	$F_v \cdot S_1$	ASCE 7-10 (11.4-2)		
@ 5% Damped Design $S_{DS}$	0.925	$2/3 \cdot S_{MS}$	ASCE 7-10 (11.4-3)		
$S_{D1}$	0.552	$2/3 \cdot S_{M1}$	ASCE 7-10 (11.4-4)		
Risk Category			II	ASCE 7-10 Table 1-1	
Design Category Consideration:					
In each of the two orthogonal directions, the approximate fundamental period of the structure, $T_a$ , determined in accordance with Section 12.8.2.1 is less than $0.8T_s$ , where $T_s$ is determined in accordance with Section 11.4.5.			Yes	ASCE 7-10 11.6	
In each of two orthogonal directions, the fundamental period of the structure used to calculate the story drift is less than $T_s$ .			Yes		
Diaphragms are rigid as defined in Section 12.3.1 or for diaphragms that are flexible, the distance between vertical elements of the seismic force-resisting system does not exceed 40 ft.			Yes		
Seismic Design Category (SDC)	-			ASCE 7-10 11.4.1	
Seismic Design Category for 0.1 sec	D			ASCE 7-10 Table 11.6-1	
Seismic Design Category for 1.0 sec	D			ASCE 7-10 Table 11.6-2	
$S_1 < .75g$	-			ASCE 7-10 11.6	
Seismic Design Category (SDC)	D			ASCE 7-10 11.6	
Seismic Force-Resisting System	A. BEARING WALL SYSTEMS				
	15. Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance or steel sheets				
Footnotes	-				
	-				
	-				
ASCE 7 Section Where Detailing Requirements Are Specified	14.1 and 14.5				
Building ht. $h_n$	30.24	ft	Limited Building Height (ft) = 65		
$C_t$	0.020	x	0.75	ASCE 7-10 Table 12.8-2	
$C_u$	1.400	for SD1 of 0.552g		ASCE 7-10 Table 12.8-1	
Approximate Fundamental Period, $T_a$	0.258	sec	$C_t \cdot (h_n)^x$	ASCE 7-10 (12.8-7)	
$T_s$	0.597	sec	$S_{D1}/S_{DS}$	ASCE 7-10 11.4.5	
$T_L$	6.00	sec		ASCE 7-10 11.4.5	
Period for Computing Drift	0.361	sec	$C_u \cdot T_a$		
Fundamental Period, $T$	0.258	sec			
$0.8T_s$	0.478	sec	$0.8(S_{D1}/S_{DS})$	ASCE 7-10 11.6	
Response Modification Coef. $R$	6.50			ASCE 7-10 Table 12.14-1	

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Duplex.xlsxSeismic

6/21/2019

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Permit Number: 20-04896

Pacific Northwest Structural Group, LLC		Project	Red Barn Lane - Duplex 1620/1880	Designer	DLS
		Location	NW Hogan Ln & Nels Nelson Rd NW, Breme	Project No.	19-002
		Client	Envision Northwest, LLC	Revised	15-Sep-18
		2015 IBC Section 1613 Earthquake Loads			
Over Strength Factor $\Omega_o$	3.00		ASCE 7-10 Table 12.14-1		
Deflection Amplification Factor, $C_{db}$	4.00		ASCE 7-10 Table 12.14-1		
Importance factor $I_E$	1.00		ASCE 7-10 Table 1.5-2, UFC 3-301-01 Table 2-2		
$C_s$	0.142	$S_{DS}/R/I_E$	ASCE 7-10 (12.8-2)		
$T \leq T_L$ therefore $C_s$ need not to exceed	0.329	$S_{D1}/(T(R/I_E))$	ASCE 7-10 (12.8-3)		
$T < T_L$ therefore (12.8-4) N/A	N/A	$S_{D1} \cdot T_L/T^2 (R/I_E)$	ASCE 7-10 (12.8-4)		
$C_s$	0.041	$0.044 S_{DS} \cdot I_E \geq 0.01$	ASCE 7-10 (12.8-5)		
$S_1 < 0.6g$ (12.8-6) N/A	N/A	$0.5 S_1/(R/I_E)$	ASCE 7-10 (12.8-6)		
Use $C_s$	0.142				
Design Base Shear $V$	0.142 W	Control	ASCE 7-10 (12.8-1)		
Design Service Level Base Shear $V$	0.1 W				

Seismic Load					
Level	$W_x$ (lbs)	$h_x$ (ft)	$W_x \cdot h_x$	$C_{vx}$	$F_x$ (lbs)
1st Level Plate	32,963	8.1	266,339	0.404	3,177
2nd Level Plate	20,015	9.1	181,734	0.276	2,168
3rd Level Plate	26,097	8.1	210,864	0.320	2,515
	79,075	$\Sigma W_x \cdot h_x$	658,938		

Design Service Level Base Shear $V$	7,860	lbs
	Transverse	
	Longitudinal	
Diaphragm Width	34.00	ft
1st Level Plate	93.4	plf
2nd Level Plate	63.8	plf
3rd Level Plate	74.0	plf

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Pacific Northwest Structural Group, LLC	Project	Red Barn Lane - Duplex 1620/1880	Designer	DLS
	Location	NW Hogan Ln & Nels Nelson Rd NW, Brem	Project No.	19-002
	Client	Envision Northwest, LLC	Revised	18-May-18
	ASCE 7-10 Snow Loads			

ASCE 7-10 7.3 FLAT ROOF SNOW LOAD			
Ground Snow Load, $p_g$	30.0	PSF	ASCE 7-10 7.2
Exposure Category	B		ASCE 7-10 26.7.3 Exposure Categories
Exposure of Roof	Partially Exposed		ASCE 7-10 Table 7-2 Exposure Factor
Thermal Condition	All structures except as indicated below		
Risk Category	II		ASCE 7-10 Table 1.5-1, UFC 3-301-01 Table 2-2
Snow load importance factor, $I_s$	1.0		ASCE 7-10 Table 1.5-2, UFC 3-301-01 Table 2-2
Snow exposure factor, $C_e$	1.00		ASCE 7-10 Table 7-2 Exposure Factor
Thermal factor, $C_t$	1.00		ASCE 7-10 Table 7-3 Thermal Factor
Flat-roof snow load, $p_f$	21.0	PSF	ASCE 7-10 (7.3-1) $0.7C_eC_tI_sp_g$
Min. Design Flat Roof Snow Load, $p_m$	20.0	PSF	ASCE 7-10 7.4 $p_g \leq 20$ PSF $I_sp_g$ , $p_g > 20$ PSF $20I_s$
Design Flat Roof Snow Load, $p_f$	21.0	PSF	

ASCE 7-10 7.4 SLOPE ROOF SNOW LOAD				
Roof Pitch	6	:12		
Roof Slope, $\theta$	26.57	°		
Roof Surface	All Other Surfaces			
Warm Roof Slope Factor, $C_s$	1.00		ASCE 7-10 Section 7.4.1, 7.4.2, 7.4.3 Figure(s)	
Slope Roof Design Snow Load, $p_s$	21.0	PSF	ASCE-7-10 (7-4-1) $C_s \cdot p_f$	

Established Basic Permit # 19-03671  
 C:\Users\jacobr\OneDrive\My Documents\2019 Projects\19-002 Red Barn Lane Single Family & Duplex\ENGR\19-002 Design Criteria 2018 -  
 Duplex.xlsxSnow Load  
 6/21/2019

19-03671

Permit Number: 20-04896

Project:	Red Barn Lane Single Family & Duplex - Duplex	Design By:	DLS
Location:	LF-1 Concrete Shearwall to BM Connection	Checked By:	19-002
Client:	Envision Northwest, LLC	Last Update: 12-Jan-11	
Timber Mechanical Connection - Bolts - Double Shear			

Bolt Material	ASTM A307
Wood Species (Main)	Douglas Fir-Larch
Wood Species (Side)	A36

G <sub>M</sub>	0.50	
G <sub>S</sub>	-	
t <sub>m</sub>	5 1/4	in
t <sub>s</sub>	3/8	in
θ <sub>M</sub>	-	degrees
θ <sub>S</sub>	-	degrees
D	5/8	in
K <sub>θ</sub>	1.00	
F <sub>em par.</sub>	5,600	psi
F <sub>em perp.</sub>	2,824	psi
F <sub>em θ</sub>	5,600	psi
F <sub>es par.</sub>	58,000	psi
F <sub>es perp.</sub>	58,000	psi
F <sub>es θ</sub>	58,000	psi
F <sub>em</sub>	5,600	psi
F <sub>es</sub>	58,000	psi
F <sub>yb</sub>	45,000	psi
R <sub>e</sub>	0.0966	
R <sub>t</sub>	14.0	
k <sub>3</sub>	6.343	

Bolted Connection - Double Shear Yield Modes, (lbs)				
Z	Z <sub>IM</sub>	Z <sub>IS</sub>	Z <sub>III S</sub>	Z <sub>IV</sub>
2,482	4,594	6,797	2,482	3,022

Calculated Allowable Load Per Bolt (Lbs)	Load Duration Factor	Wet Service Factor	Temperature Factor	Group Action Factor	Geometry Factor	Factored Allowable Load (Lbs)
Z	C <sub>D</sub>	C <sub>M</sub>	C <sub>t</sub>	C <sub>g</sub>	C <sub>D</sub>	Z'
2,482	1.60	1.00	1.00	1.00	1.00	7,927

Group Action Factor						
A <sub>m</sub>	52.50	in <sup>2</sup>		u	1.009	
A <sub>s</sub>	3.75	in <sup>2</sup>		m	0.874	
E <sub>m</sub>	1,400,000	psi		R <sub>EA</sub>	0.6759	
E <sub>s</sub>	#####	psi				
s	6.00	in				
n	2	Bolts				
g	133,409	lbs/in				

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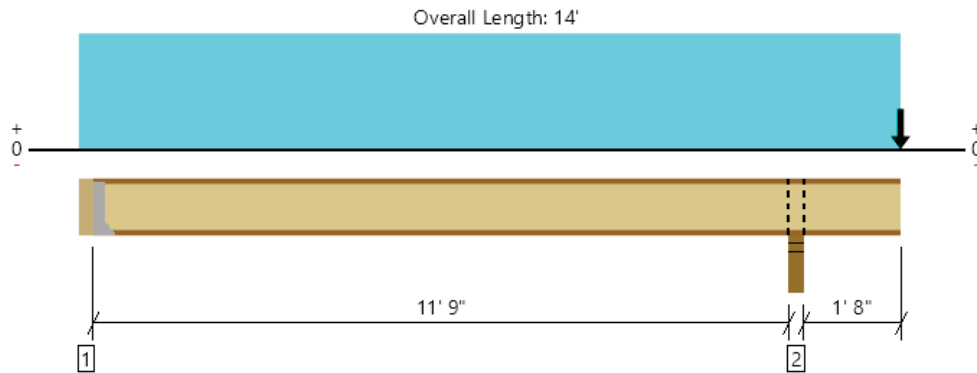
Timber Mechanical Connections\1Bolts - Double Shear

Permit Number: 20-04896

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Level, JST2-1

1 piece(s) 11 7/8" TJI® 360 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1984 @ 12' 2 1/4"	2460 (3.50")	Passed (81%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1341 @ 12' 4"	1705	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-2329 @ 12' 2 1/4"	6180	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.058 @ 14'	0.200	Passed (2L/754)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.098 @ 14'	0.200	Passed (2L/444)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	64	55	Passed	--	--

System : Floor  
Member Type : Joist  
Building Use : Residential  
Building Code : IBC 2015  
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/0.2").
- Top Edge Bracing (Lu): Top compression edge must be braced at 9' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 6' 2" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 7/8", 1" Panel (32" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 1/2" Gypsum ceiling, bridging or blocking at max. 8' o.c..

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 11 7/8" DF beam	3.50"	Hanger <sup>1</sup>	1.75" / 1.75" <sup>2</sup>	35	333/-91	368/-91	See note <sup>1</sup>
2 - Stud wall - DF	3.50"	3.50"	3.50"	816	1168	1984	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

### Connector: Simpson Strong-Tie

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

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 14'	16"	15.0	40.0	Residential - Living Areas
2 - Point (PLF)	14'	16"	428.0	486.0	

### Weyerhaeuser Notes

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

Established Basic Permit #

David L Starkel  
Pacific Northwest Structural Group, Inc.  
(360) 901-2303  
David@PNSWstructure.com

Job Notes

Permit Number: 20-04896

6/21/2019 10:15:20 PM UTC

ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2

File Name: 19-002 Floor Joists\_Imported

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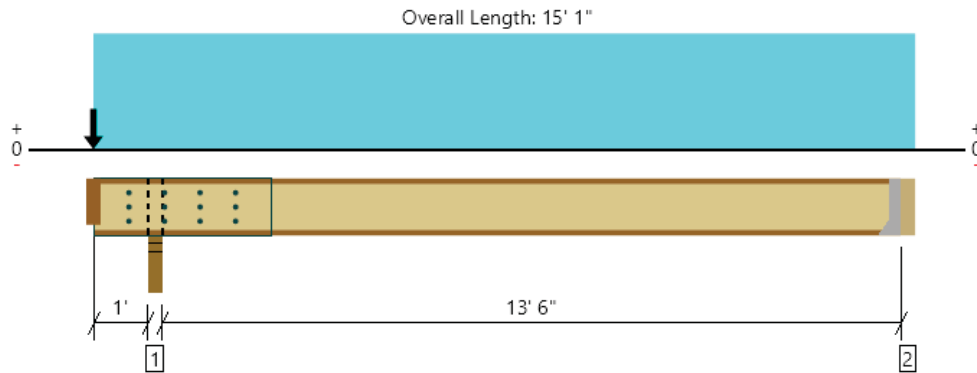
David L Starkel  
Pacific Northwest Structural Group, Inc.  
(360) 901-2303  
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Job Notes

Permit Number: 20-04896

Level, JST2-2

1 piece(s) 11 7/8" TJI® 360 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4201 @ 1' 1 3/4"	4920 (3.50")	Passed (85%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3407 @ 1'	3410	Passed (100%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-3868 @ 1' 1 3/4"	6180	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.106 @ 7' 11 5/8"	0.341	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.114 @ 0	0.200	Passed (2L/242)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	57	55	Passed	--	--

System : Floor  
Member Type : Joist  
Building Use : Residential  
Building Code : IBC 2015  
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/0.2").
- Top Edge Bracing (Lu): Top compression edge must be braced at 9' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 4' 8" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 1/2" Gypsum ceiling, bridging or blocking at max. 8' o.c..

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	3.50"	3.50"	3.50"	1726	2476	4202	Blocking, Cantilever Reinforcement
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger <sup>1</sup>	1.75" / 1.75" <sup>2</sup>	20	379/-146	399/-146	See note <sup>1</sup>

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- Left end cantilever reinforcement: Double joist assembly with filler block per SPECIFIER'S GUIDE detail E4.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 15' 1"	16"	15.0	40.0	Residential - Living Areas
2 - Point (PLF)	0	16"	1083.0	1417.0	

- Web stiffeners required at location 0 due to loads.

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

Established Basic Permit #

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19-003671

Permit Number: 20-04896

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File Name: 19-002 Floor Joists\_Imported

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19-03671

Established Basic Permit #

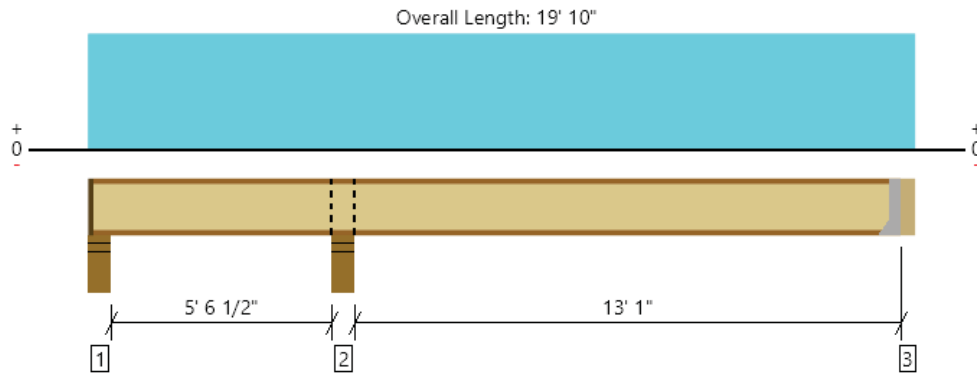
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Job Notes

Permit Number: 20-04896

Level, JST2-3

1 piece(s) 11 7/8" TJI® 360 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	401 @ 19' 6 1/2"	1080 (1.75")	Passed (37%)	1.00	1.0 D + 1.0 L (Alt Spans)
Shear (lbs)	539 @ 6' 5 1/2"	1876	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-1224 @ 6' 2 3/4"	6180	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.066 @ 13' 5 1/2"	0.333	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.089 @ 13' 5 11/16"	0.666	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	56	55	Passed	--	--

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 9' 2" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 8" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: bridging or blocking at max. 8' o.c..

System : Floor  
Member Type : Joist  
Building Use : Residential  
Building Code : IBC 2015  
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	5.50"	4.25"	1.75"	9	164/-135	173/-135	1 1/4" Rim Board
2 - Stud wall - DF	5.50"	5.50"	3.50"	274	730	1004	Blocking
3 - Hanger on 11 7/8" DF beam	3.50"	Hanger <sup>1</sup>	1.75" / 1.75" <sup>2</sup>	114	309	423	See note <sup>1</sup>

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

#### Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
3 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 19' 10"	16"	15.0	40.0	Residential - Living Areas

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File Name: 19-002 Floor Joists\_Imported

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Established Basic Permit #

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Job Notes

Permit Number: 20-04896

19-03671

Established Basic Permit #

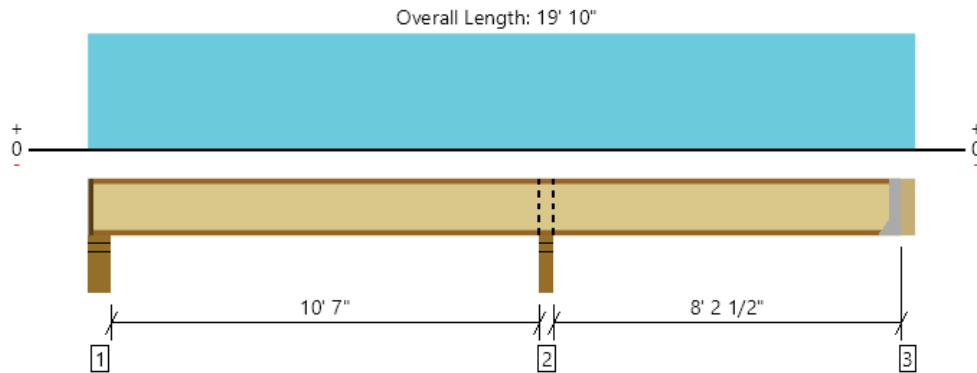
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Job Notes

Permit Number: 20-04896

Level, JST2-4

1 piece(s) 11 7/8" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	890 @ 11' 2 1/4"	1935 (3.50")	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	445 @ 11' 1/2"	1716	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-883 @ 11' 2 1/4"	3160	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.046 @ 5' 5 3/16"	0.270	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.061 @ 5' 4 7/16"	0.541	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	64	55	Passed	--	--

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 6' 1" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 1/2" Gypsum ceiling, bridging or blocking at max. 8' o.c..

System : Floor  
Member Type : Joist  
Building Use : Residential  
Building Code : IBC 2015  
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	5.50"	4.25"	1.75"	93	268/-13	361/-13	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	3.50"	3.50"	243	647	890	Blocking
3 - Hanger on 11 7/8" DF beam	3.50"	Hanger <sup>1</sup>	1.75" / 1.75" <sup>2</sup>	61	214/-37	275/-37	See note <sup>1</sup>

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

## Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
3 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 19' 10"	16"	15.0	40.0	Residential - Living Areas

## Weyerhaeuser Notes

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

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Job Notes

Permit Number: 20-04896

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File Name: 19-002 Floor Joists\_Imported

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19-03671

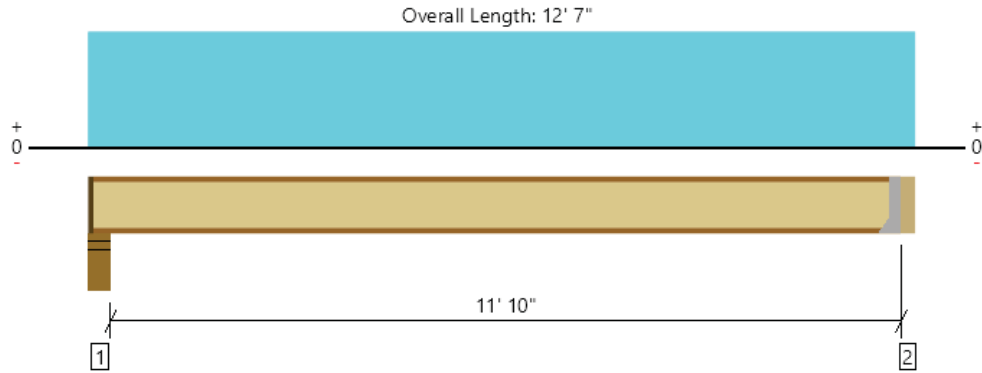
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Job Notes

Permit Number: 20-04896

Level, JST2-5  
**1 piece(s) 11 7/8" TJI® 110 @ 16" OC**



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	413 @ 12' 3 1/2"	910 (1.75")	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	413 @ 12' 3 1/2"	1560	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1231 @ 6' 4"	3160	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.089 @ 6' 4"	0.298	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.116 @ 6' 4"	0.596	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	58	55	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 2" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 2" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 1/2" Gypsum ceiling, bridging or blocking at max. 8' o.c..

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	5.50"	4.25"	1.75"	101	338	439	1 1/4" Rim Board
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger <sup>1</sup>	1.75" / 1.75" <sup>2</sup>	100	333	433	See note <sup>1</sup>

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

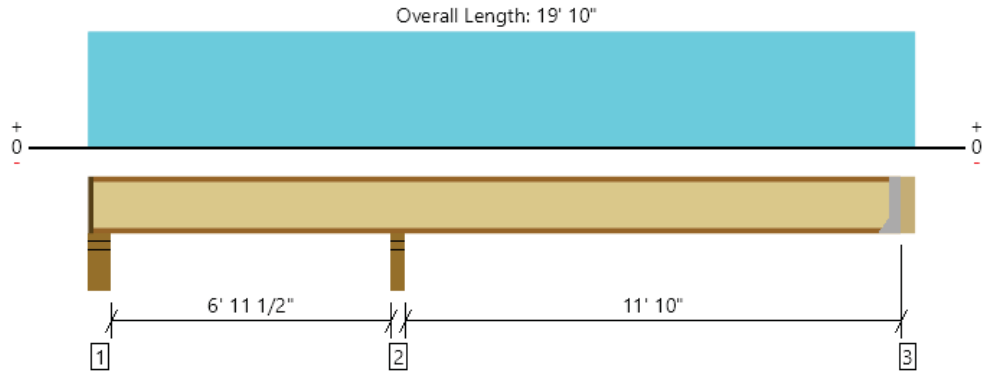
Connector: Simpson Strong-Tie							
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories	
2 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A		

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 12' 7"	16"	12.0	40.0	Residential - Living Areas

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



Level, JST2-6  
**1 piece(s) 11 7/8" TJI® 110 @ 16" OC**



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	925 @ 7' 6 3/4"	1935 (3.50")	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	488 @ 7' 8 1/2"	1716	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-1000 @ 7' 6 3/4"	3160	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.063 @ 13' 11 13/16"	0.299	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.085 @ 14' 1/4"	0.599	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	56	55	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 5' 9" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: bridging or blocking at max. 8' o.c..

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	5.50"	4.25"	1.75"	41	194/-78	235/-78	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	3.50"	3.50"	252	673	925	None
3 - Hanger on 11 7/8" DF beam	3.50"	Hanger <sup>1</sup>	1.75" / 1.75" <sup>2</sup>	103	285	388	See note <sup>1</sup>

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

#### Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
3 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 19' 10"	16"	15.0	40.0	Residential - Living Areas

#### Weyerhaeuser Notes

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Job Notes

**Permit Number: 20-04896**

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File Name: 19-002 Floor Joists\_Imported

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19-03671

Established Basic Permit #

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Job Notes

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Wall-Roof-Exterior

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 5.5 IN x 7.71 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 87.1%

Controlling Factor: Combined Stress Factor



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#### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.06 IN = L/1659

Live Load Deflection Criteria: L/180

#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 0 lb

Dead Load: Vert-DL-Rxn = 113 lb

Total Load: Vert-TL-Rxn = 113 lb

#### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 90 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 90 lb

#### WALL DATA

Total Stud Length: 7.71 ft

Wall Dead Weight: 11 psf

Unbraced Length (X-Axis) Lx: 7.71 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor: 1.15

Lateral Load Duration Factor (Wind/Seismic): 1.60

#### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 1339 psi
	Cd=1.60 Cf=1.10 Cp=0.56	

Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 2153 psi
	Cd=1.60 CF=1.30 Cr=1.15 Cl=1.00	

Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 2153 psi
	Cd=1.60 CF=1.30 Cr=1.15	

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

Stud Section (X-X Axis):	dx = 5.5 in
--------------------------	-------------

Stud Section (Y-Y Axis):	dy = 1.5 in
--------------------------	-------------

Area:	A = 8.25 in <sup>2</sup>
-------	--------------------------

Section Modulus (X-X Axis):	Sx = 7.56 in <sup>3</sup>
-----------------------------	---------------------------

Section Modulus (Y-Y Axis):	Sy = 2.06 in <sup>3</sup>
-----------------------------	---------------------------

Slenderness Ratio:	Lex/dx = 16.82
--------------------	----------------

	Ley/dy = 0
--	------------

#### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress:	Fc = 14 psi
----------------------------	-------------

Allowable Compressive Stress:	Fc' = 1339 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 = 173 ft-lb
---	----------------

Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
---	--------------

Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 275 psi
---	---------------

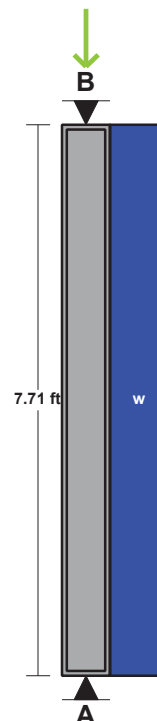
Allowable Bending Stress (X-X Axis):	Fbx' = 2153 psi
--------------------------------------	-----------------

Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
---	-------------

Allowable Bending Stress (Y-Y Axis):	Fby' = 2153 psi
--------------------------------------	-----------------

Combined Stress Factor:	CSF = 0.13
-------------------------	------------

#### LOADING DIAGRAM



#### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 0 plf	DL = 84.8 plf	

#### AXIAL LOADING

Live Load:	PL = 0 plf *
------------	--------------

Dead Load:	PD = 85 plf *
------------	---------------

Total Axial Load:	PT = 85 plf
-------------------	-------------

\* Load obtained from Load Tracker. See Summary Report for details.

#### LATERAL LOADING (Dy Face)

Uniform Lateral Load:	wL-Lat = 18 psf
-----------------------	-----------------

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Wall-Roof-Interior

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 3.5 IN x 7.71 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 90.2%

Controlling Factor: Combined Stress Factor



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of

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#### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.06 IN = L/1497

Live Load Deflection Criteria: L/180

#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 0 lb

Dead Load: Vert-DL-Rxn = 113 lb

Total Load: Vert-TL-Rxn = 113 lb

#### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 26 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 26 lb

#### WALL DATA

Total Stud Length: 7.71 ft

Wall Dead Weight: 11 psf

Unbraced Length (X-Axis) Lx: 7.71 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor 1.15

Lateral Load Duration Factor (Wind/Seismic) 1.33

#### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 627 psi
	Cd=1.33 Cf=1.15 Cp=0.30	

Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 2065 psi
	Cd=1.33 CF=1.50 Cr=1.15 Cl=1.00	

Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 2065 psi
	Cd=1.33 CF=1.50 Cr=1.15	

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

Stud Section (X-X Axis):	dx = 3.5 in
--------------------------	-------------

Stud Section (Y-Y Axis):	dy = 1.5 in
--------------------------	-------------

Area:	A = 5.25 in <sup>2</sup>
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Section Modulus (X-X Axis):	Sx = 3.06 in <sup>3</sup>
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Section Modulus (Y-Y Axis):	Sy = 1.31 in <sup>3</sup>
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Slenderness Ratio:	Lex/dx = 26.43
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	Ley/dy = 0
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#### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress:	Fc = 22 psi
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Allowable Compressive Stress:	Fc' = 627 psi
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Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
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Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
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Moment Due to Lateral Loads (X-X Axis):	Mx = 50 ft-lb
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Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
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Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 194 psi
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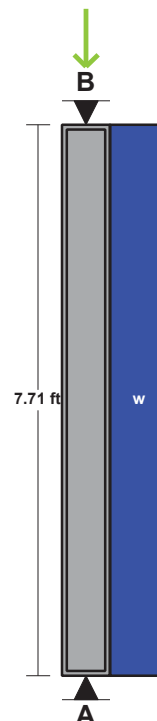
Allowable Bending Stress (X-X Axis):	Fbx' = 2065 psi
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Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
---	-------------

Allowable Bending Stress (Y-Y Axis):	Fby' = 2065 psi
--------------------------------------	-----------------

Combined Stress Factor:	CSF = 0.1
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#### LOADING DIAGRAM



#### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 0 plf	DL = 84.8 plf	

#### AXIAL LOADING

Live Load:	PL = 0 plf *
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Dead Load:	PD = 85 plf *
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Total Axial Load:	PT = 85 plf
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\* Load obtained from Load Tracker. See Summary Report for details.

#### LATERAL LOADING (Dy Face)

Uniform Lateral Load:	wL-Lat = 5 psf
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#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Wall-3rd Flr-Exterior

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 5.5 IN x 9.08 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 83.9%

Controlling Factor: Combined Stress Factor



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#### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.09 IN = L/1170

Live Load Deflection Criteria: L/180

#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 533 lb

Dead Load: Vert-DL-Rxn = 333 lb

Total Load: Vert-TL-Rxn = 867 lb

#### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 92 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 92 lb

#### WALL DATA

Total Stud Length: 9.08 ft

Wall Dead Weight: 11 psf

Unbraced Length (X-Axis) Lx: 9.08 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor 1.15

Lateral Load Duration Factor (Wind/Seismic) 1.60

#### STUD PROPERTIES

#2 - Douglas-Fir-Larch

Base Values Adjusted

Compressive Stress: Fc = 1350 psi Fc' = 1049 psi

Cd=1.60 Cf=1.10 Cp=0.44

Bending Stress (X-X Axis): Fbx = 900 psi Fbx' = 2153 psi

Cd=1.60 CF=1.30 Cr=1.15 Cl=1.00

Bending Stress (Y-Y Axis): Fby = 900 psi Fby' = 2153 psi

Cd=1.60 CF=1.30 Cr=1.15

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

Stud Section (X-X Axis): dx = 5.5 in

Stud Section (Y-Y Axis): dy = 1.5 in

Area: A = 8.25 in<sup>2</sup>

Section Modulus (X-X Axis): Sx = 7.56 in<sup>3</sup>

Section Modulus (Y-Y Axis): Sy = 2.06 in<sup>3</sup>

Slenderness Ratio: Lex/dx = 19.81

Ley/dy = 0

#### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress: Fc = 40 psi

Allowable Compressive Stress: Fc' = 1049 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 = 209 ft-lb

Moment Due to Lateral Loads (Y-Y Axis): My = 0 ft-lb

Bending Stress Lateral Loads Only (X-X Axis): Fbx = 331 psi

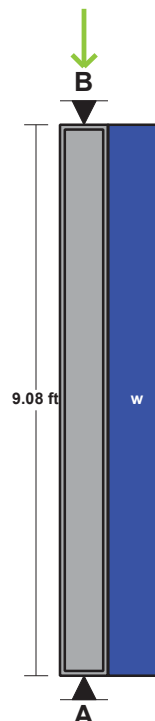
Allowable Bending Stress (X-X Axis): Fbx' = 2153 psi

Bending Stress Lateral Loads Only (Y-Y Axis): Fby = 0 psi

Allowable Bending Stress (Y-Y Axis): Fby' = 2153 psi

Combined Stress Factor: CSF = 0.16

#### LOADING DIAGRAM



#### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 10 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 400 plf	DL = 249.9 plf	

#### AXIAL LOADING

Live Load: PL = 400 plf \*

Dead Load: PD = 250 plf \*

Total Axial Load: PT = 650 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 15 psf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Wall-2nd Flr-Exterior

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 5.5 IN x 9.08 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 84.0%

Controlling Factor: Combined Stress Factor



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### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.09 IN = L/1170

Live Load Deflection Criteria: L/180

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 533 lb

Dead Load: Vert-DL-Rxn = 321 lb

Total Load: Vert-TL-Rxn = 854 lb

### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 92 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 92 lb

### WALL DATA

Total Stud Length: 9.08 ft

Wall Dead Weight: 10 psf

Unbraced Length (X-Axis) Lx: 9.08 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor: 1.15

Lateral Load Duration Factor (Wind/Seismic): 1.60

### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 1049 psi
	Cd=1.60 Cf=1.10 Cp=0.44	

Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 2153 psi
	Cd=1.60 CF=1.30 Cr=1.15 Cl=1.00	

Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 2153 psi
	Cd=1.60 CF=1.30 Cr=1.15	

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

Stud Section (X-X Axis):	dx = 5.5 in
--------------------------	-------------

Stud Section (Y-Y Axis):	dy = 1.5 in
--------------------------	-------------

Area:	A = 8.25 in <sup>2</sup>
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Section Modulus (X-X Axis):	Sx = 7.56 in <sup>3</sup>
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Section Modulus (Y-Y Axis):	Sy = 2.06 in <sup>3</sup>
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Slenderness Ratio:	Lex/dx = 19.81
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	Ley/dy = 0
--	------------

### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress:	Fc = 39 psi
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Allowable Compressive Stress:	Fc' = 1049 psi
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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 = 209 ft-lb
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Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
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Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 331 psi
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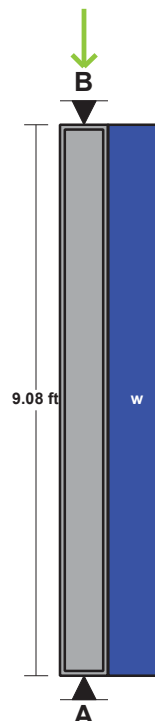
Allowable Bending Stress (X-X Axis):	Fbx' = 2153 psi
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Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
---	-------------

Allowable Bending Stress (Y-Y Axis):	Fby' = 2153 psi
--------------------------------------	-----------------

Combined Stress Factor:	CSF = 0.16
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### LOADING DIAGRAM



### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 10 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 400 plf	DL = 240.8 plf	

### AXIAL LOADING

Live Load:	PL = 400 plf *
------------	----------------

Dead Load:	PD = 241 plf *
------------	----------------

Total Axial Load:	PT = 641 plf
-------------------	--------------

\* Load obtained from Load Tracker. See Summary Report for details.

### LATERAL LOADING (Dy Face)

Uniform Lateral Load:	wL-Lat = 15 psf
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### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Wall-1st Flr-Exterior

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 5.5 IN x 9.08 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 80.7%

Controlling Factor: Combined Stress Factor



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### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.09 IN = L/1170

Live Load Deflection Criteria: L/180

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 533 lb

Dead Load: Vert-DL-Rxn = 333 lb

Total Load: Vert-TL-Rxn = 867 lb

### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 92 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 92 lb

### WALL DATA

Total Stud Length: 9.08 ft

Wall Dead Weight: 11 psf

Unbraced Length (X-Axis) Lx: 9.08 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor: 1.15

Lateral Load Duration Factor (Wind/Seismic): 1.33

### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 1006 psi
	Cd=1.33 Cf=1.10 Cp=0.51	

Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1790 psi
	Cd=1.33 CF=1.30 Cr=1.15 Cl=1.00	

Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1790 psi
	Cd=1.33 CF=1.30 Cr=1.15	

Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
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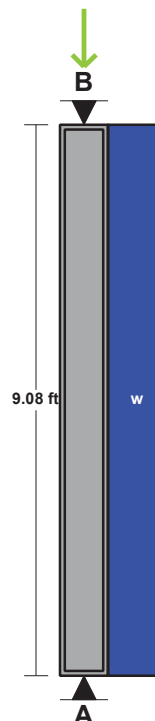
Stud Section (X-X Axis):	dx = 5.5 in
Stud Section (Y-Y Axis):	dy = 1.5 in
Area:	A = 8.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx = 7.56 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy = 2.06 in <sup>3</sup>
Slenderness Ratio:	Lex/dx = 19.81
	Ley/dy = 0

### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress:	Fc = 40 psi
Allowable Compressive Stress:	Fc' = 1006 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 = 209 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 331 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1790 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1790 psi
Combined Stress Factor:	CSF = 0.19

### LOADING DIAGRAM



### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 10 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 400 plf	DL = 249.9 plf	

### AXIAL LOADING

Live Load:	PL = 400 plf *
Dead Load:	PD = 250 plf *
Total Axial Load:	PT = 650 plf

\* Load obtained from Load Tracker. See Summary Report for details.

### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 15 psf

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: FJT3-1

Floor Joist

[2015 International Building Code(2015 NDS)]

1.5 IN x 9.25 IN x 8.0 FT (5.8 + 2.2 ) @ 24 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 248.4%

Controlling Factor: Moment



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#### DEFLECTIONS

	Center		Right
Live Load	0.02 IN L/3701	-0.02	IN 2L/2314
Dead Load	0.00 in	0.00	in
Total Load	0.02 IN L/3196	-0.02	IN 2L/2198
Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360			

#### REACTIONS

	A	B
Live Load	345 lb	668 lb
Dead Load	73 lb	167 lb
Total Load	418 lb	835 lb
Uplift (1.5 F.S)	-4 lb	0 lb
Bearing Length	0.45 in	0.89 in

#### SUPPORT LOADS

	A	B
Live Load	173 plf	334 plf
Dead Load	37 plf	84 plf
Total Load	209 plf	418 plf

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi Cd=1.00 CF=1.10 Cr=1.15	Fb' = 1139 psi
Shear Stress:	Fv = 180 psi Cd=1.00	Fv' = 180 psi
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ = 625 psi

Controlling Moment: 582 ft-lb

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

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

Controlling Shear: -385 lb

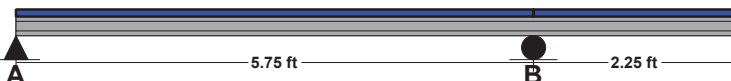
At a distance d from right support of span 2 (Center Span)

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

#### Comparisons with required sections:

	Req'd	Provided
Section Modulus:	6.14 in <sup>3</sup>	21.39 in <sup>3</sup>
Area (Shear):	3.21 in <sup>2</sup>	13.88 in <sup>2</sup>
Moment of Inertia (deflection):	20.53 in <sup>4</sup>	98.93 in <sup>4</sup>
Moment:	582 ft-lb	2029 ft-lb
Shear:	-385 lb	1665 lb

#### LOADING DIAGRAM



#### JOIST DATA

	Center	Right
Span Length	5.75 ft	2.25 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.		
Floor Duration Factor	1.00	

#### JOIST LOADING

Uniform Floor Loading	Center	Right
Live Load	LL = 60 psf	60 psf
Dead Load	DL = 15 psf	15 psf
Total Load	TL = 75 psf	75 psf
TL Adj. For Joist Spacing wT =	150 plf	150 plf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: MLB3-1

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 7.25 IN x 6.33 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 40.9%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.07 IN L/1120

Dead Load 0.02 in

Total Load 0.09 IN L/883

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

#### REACTIONS

A

B

Live Load 1057 lb 1057 lb

Dead Load 283 lb 283 lb

Total Load 1340 lb 1340 lb

Bearing Length 0.61 in 0.61 in

#### BEAM DATA

Center

Span Length 6.33 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 6.33 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 1170$  psi

$C_d = 1.00$   $CF = 1.30$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 2121 ft-lb

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

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

Controlling Shear: 1099 lb

At a distance d 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: 21.76 in<sup>3</sup> 30.66 in<sup>3</sup>

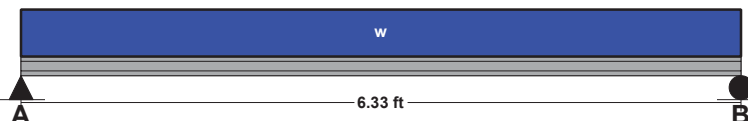
Area (Shear): 9.16 in<sup>2</sup> 25.38 in<sup>2</sup>

Moment of Inertia (deflection): 35.73 in<sup>4</sup> 111.15 in<sup>4</sup>

Moment: 2121 ft-lb 2989 ft-lb

Shear: 1099 lb 3045 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 334 plf

Uniform Dead Load 84 plf

Beam Self Weight 6 plf

Total Uniform Load 424 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLBT3-2

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

( 2 ) 1.5 IN x 9.25 IN x 8.0 FT (5.8 + 2.2)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 158.5%

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	Right
Live Load	0.02 IN L/3567	-0.02 IN 2L/2230
Dead Load	0.01 in	-0.01 in
Total Load	0.03 IN L/2707	-0.03 IN 2L/1772
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

### REACTIONS

	A	B
Live Load	716 lb	877 lb
Dead Load	249 lb	359 lb
Total Load	965 lb	1236 lb
Bearing Length	0.51 in	0.66 in

### BEAM DATA

	Center	Right
Span Length	5.75 ft	2.25 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	5.75 ft	2.25 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
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ = 625 psi

### Controlling Moment:

1365 ft-lb

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

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

### Controlling Shear:

-767 lb

At a distance d from 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:	16.55 in <sup>3</sup>	42.78 in <sup>3</sup>
Area (Shear):	6.39 in <sup>2</sup>	27.75 in <sup>2</sup>
Moment of Inertia (deflection):	31.95 in <sup>4</sup>	197.86 in <sup>4</sup>
Moment:	1365 ft-lb	3529 ft-lb
Shear:	-767 lb	3330 lb

### LOADING DIAGRAM



### UNIFORM LOADS

	Center*	Right
Uniform Live Load	189 plf	0 plf
Uniform Dead Load	71 plf	0 plf
Beam Self Weight	6 plf	6 plf
Total Uniform Load	266 plf	6 plf

\* Load obtained from Load Tracker. See Summary Report for details.

### TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One
Left Live Load	60 plf
Left Dead Load	15 plf
Right Live Load	60 plf
Right Dead Load	15 plf
Load Start	0 ft
Load End	5.75 ft
Load Length	5.75 ft

### RIGHT SPAN

Load Number	One	Two
Left Live Load	60 plf	0 plf
Left Dead Load	15 plf	14 plf
Right Live Load	60 plf	0 plf
Right Dead Load	15 plf	14 plf
Load Start	0 ft	0 ft
Load End	2.25 ft	2.25 ft
Load Length	2.25 ft	2.25 ft

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: FJT3-2

Floor Joist

[2015 International Building Code(2015 NDS)]

1.5 IN x 9.25 IN x 9.42 FT @ 24 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 66.3%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.09 IN L/1263

Dead Load 0.03 in

Total Load 0.12 IN L/918

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

#### REACTIONS

A

B

Live Load 377 lb 377 lb

Dead Load 141 lb 141 lb

Total Load 518 lb 518 lb

Bearing Length 0.55 in 0.55 in

#### SUPPORT LOADS

A

B

Live Load 189 plf 189 plf

Dead Load 71 plf 71 plf

Total Load 259 plf 259 plf

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress: Fb = 900 psi Fb' = 1139 psi

Cd=1.00 CF=1.10 Cr=1.15

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

Cd=1.00

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

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

Controlling Moment: 1220 ft-lb

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

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

Controlling Shear: -435 lb

At a distance d from 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: 12.86 in<sup>3</sup> 21.39 in<sup>3</sup>

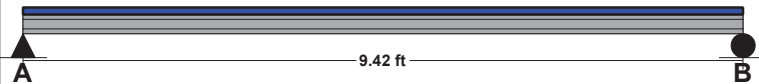
Area (Shear): 3.63 in<sup>2</sup> 13.88 in<sup>2</sup>

Moment of Inertia (deflection): 38.78 in<sup>4</sup> 98.93 in<sup>4</sup>

Moment: 1220 ft-lb 2029 ft-lb

Shear: -435 lb 1665 lb

#### LOADING DIAGRAM



#### JOIST DATA

Center

Span Length 9.42 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

#### 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 = 110 plf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLBT3-3

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 13.25 IN x 12.17 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 29.7%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.11 IN L/1293

Dead Load 0.03 in

Total Load 0.15 IN L/990

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

#### REACTIONS

A

B

Live Load 1542 lb 1390 lb

Dead Load 509 lb 415 lb

Total Load 2051 lb 1805 lb

Bearing Length 0.94 in 0.83 in

#### BEAM DATA

Center

Span Length 12.17 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 12.17 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 900$  psi

$C_d = 1.00$   $CF = 1.00$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 5923 ft-lb

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

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

Controlling Shear: 1980 lb

At a distance d 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: 78.98 in<sup>3</sup> 102.41 in<sup>3</sup>

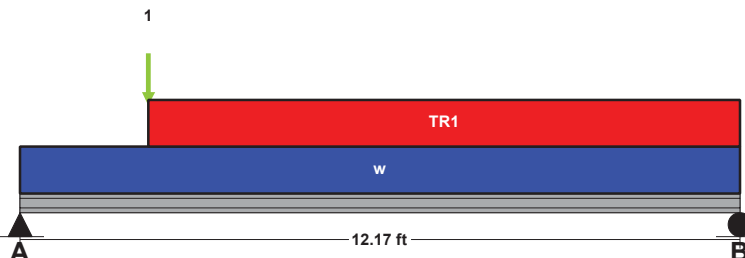
Area (Shear): 16.5 in<sup>2</sup> 46.38 in<sup>2</sup>

Moment of Inertia (deflection): 188.85 in<sup>4</sup> 678.48 in<sup>4</sup>

Moment: 5923 ft-lb 7681 ft-lb

Shear: 1980 lb 5565 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center

Uniform Live Load 40 plf

Uniform Dead Load 15 plf

Beam Self Weight 10 plf

Total Uniform Load 65 plf

#### POINT LOADS - CENTER SPAN

Load Number One \*

Live Load 716 lb

Dead Load 249 lb

Location 2.17 ft

\* Load obtained from Load Tracker. See Summary Report for details.

#### TRAPEZOIDAL LOADS - CENTER SPAN

Load Number One \*

Left Live Load 173 plf

Left Dead Load 37 plf

Right Live Load 173 plf

Right Dead Load 37 plf

Load Start 2.17 ft

Load End 12.17 ft

Load Length 10 ft

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLB3-3

Column

[2015 International Building Code(2015 NDS)]

1.5 IN x 3.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 13.6%



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#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 1542 lb  
Dead Load: Vert-DL-Rxn = 519 lb  
Total Load: Vert-TL-Rxn = 2061 lb

#### COLUMN DATA

Total Column Length: 9.08 ft  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 0 ft  
Column End Condition-K (e): 1  
Axial Load Duration Factor 1.00

#### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

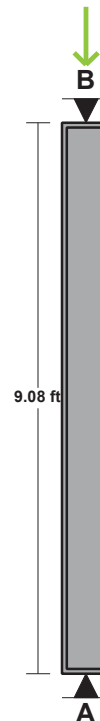
	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 454 psi
	Cd=1.00 Cf=1.15 Cp=0.29	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1350 psi
	Cd=1.00 CF=1.50	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1350 psi
	Cd=1.00 CF=1.50	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 1.5 in	
Area:	A = 5.25 in <sup>2</sup>	
Section Modulus (X-X Axis):	Sx = 3.06 in <sup>3</sup>	
Section Modulus (Y-Y Axis):	Sy = 1.31 in <sup>3</sup>	
Slenderness Ratio:	Lex/dx = 31.13	
	Ley/dy = 0	

#### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc = 393 psi
Allowable Compressive Stress:	Fc' = 454 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' = 1350 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1350 psi
Combined Stress Factor:	CSF = 0.86

#### LOADING DIAGRAM



#### AXIAL LOADING

Live Load: PL = 1542 lb \*  
Dead Load: PD = 509 lb \*  
Column Self Weight: CSW = 10 lb  
Total Axial Load: PT = 2061 lb

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: FJT3-3

Floor Joist

[2015 International Building Code(2015 NDS)]

1.5 IN x 11.25 IN x 12.17 FT @ 24 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 34.0%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.14 IN L/1053

Dead Load 0.05 in

Total Load 0.19 IN L/766

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

#### REACTIONS

A

B

Live Load 487 lb 487 lb

Dead Load 183 lb 183 lb

Total Load 670 lb 670 lb

Bearing Length 0.71 in 0.71 in

#### SUPPORT LOADS

A

B

Live Load 244 plf 244 plf

Dead Load 92 plf 92 plf

Total Load 335 plf 335 plf

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 1035$  psi

$C_d = 1.00$   $CF = 1.00$   $Cr = 1.15$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 2036 ft-lb

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

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

Controlling Shear: -576 lb

At a distance d from 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: 23.61 in<sup>3</sup> 31.64 in<sup>3</sup>

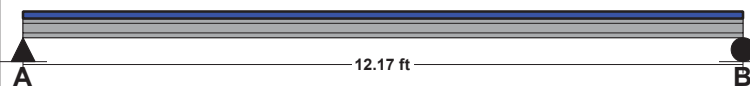
Area (Shear): 4.8 in<sup>2</sup> 16.88 in<sup>2</sup>

Moment of Inertia (deflection): 83.63 in<sup>4</sup> 177.98 in<sup>4</sup>

Moment: 2036 ft-lb 2729 ft-lb

Shear: -576 lb 2025 lb

#### LOADING DIAGRAM



#### JOIST DATA

Center

Span Length 12.17 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

#### 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 = 110 plf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: WALL2-1-I

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 3.5 IN x 9.08 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 86.3%

Controlling Factor: Combined Stress Factor



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#### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.12 IN = L/916  
Live Load Deflection Criteria: L/180

#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 0 lb  
Dead Load: Vert-DL-Rxn = 97 lb  
Total Load: Vert-TL-Rxn = 97 lb

#### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 30 lb  
Total Reaction at Bottom of Column: TL-Rxn-Bottom = 30 lb

#### WALL DATA

Total Stud Length: 9.08 ft  
Wall Dead Weight: 8 psf  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 0 ft  
Stud End Condition-K (e): 1  
Axial Load Duration Factor: 1.00  
Lateral Load Duration Factor (Wind/Seismic): 1.33

#### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 465 psi
	Cd=1.33 Cf=1.15 Cp=0.23	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 2065 psi
	Cd=1.33 CF=1.50 Cr=1.15 Cl=1.00	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 2065 psi
	Cd=1.33 CF=1.50 Cr=1.15	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi

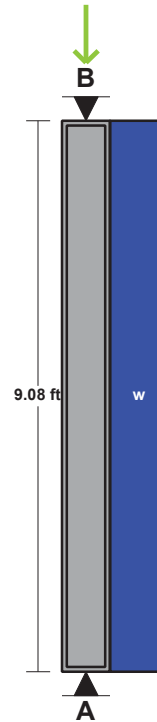
Stud Section (X-X Axis):	dx = 3.5 in
Stud Section (Y-Y Axis):	dy = 1.5 in
Area:	A = 5.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx = 3.06 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy = 1.31 in <sup>3</sup>
Slenderness Ratio:	Lex/dx = 31.13
	Ley/dy = 0

#### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress:	Fc = 18 psi
Allowable Compressive Stress:	Fc' = 465 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 = 69 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 269 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 2065 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 2065 psi
Combined Stress Factor:	CSF = 0.14

#### LOADING DIAGRAM



#### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 0 plf	DL = 72.6 plf	

#### AXIAL LOADING

Live Load:	PL = 0 plf *
Dead Load:	PD = 73 plf *
Total Axial Load:	PT = 73 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 5 psf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: WALL-FJT3-3

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 3.5 IN x 9.08 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 86.3%

Controlling Factor: Combined Stress Factor



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#### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.12 IN = L/916

Live Load Deflection Criteria: L/180

#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 0 lb

Dead Load: Vert-DL-Rxn = 97 lb

Total Load: Vert-TL-Rxn = 97 lb

#### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 30 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 30 lb

#### WALL DATA

Total Stud Length: 9.08 ft

Wall Dead Weight: 8 psf

Unbraced Length (X-Axis) Lx: 9.08 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor: 1.00

Lateral Load Duration Factor (Wind/Seismic): 1.33

#### STUD PROPERTIES

#2 - Douglas-Fir-Larch

Base Values Adjusted

Compressive Stress: Fc = 1350 psi Fc' = 465 psi

Cd=1.33 Cf=1.15 Cp=0.23

Bending Stress (X-X Axis): Fbx = 900 psi Fbx' = 2065 psi

Cd=1.33 CF=1.50 Cr=1.15 Cl=1.00

Bending Stress (Y-Y Axis): Fby = 900 psi Fby' = 2065 psi

Cd=1.33 CF=1.50 Cr=1.15

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

Stud Section (X-X Axis): dx = 3.5 in

Stud Section (Y-Y Axis): dy = 1.5 in

Area: A = 5.25 in<sup>2</sup>

Section Modulus (X-X Axis): Sx = 3.06 in<sup>3</sup>

Section Modulus (Y-Y Axis): Sy = 1.31 in<sup>3</sup>

Slenderness Ratio: Lex/dx = 31.13

Ley/dy = 0

#### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress: Fc = 18 psi

Allowable Compressive Stress: Fc' = 465 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 = 69 ft-lb

Moment Due to Lateral Loads (Y-Y Axis): My = 0 ft-lb

Bending Stress Lateral Loads Only (X-X Axis): Fbx = 269 psi

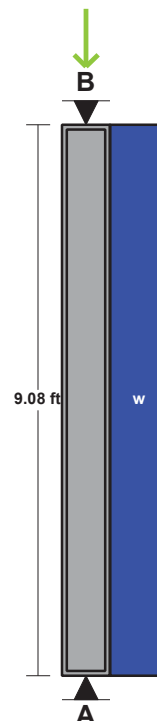
Allowable Bending Stress (X-X Axis): Fbx' = 2065 psi

Bending Stress Lateral Loads Only (Y-Y Axis): Fby = 0 psi

Allowable Bending Stress (Y-Y Axis): Fby' = 2065 psi

Combined Stress Factor: CSF = 0.14

#### LOADING DIAGRAM



#### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 0 plf	DL = 72.6 plf	

#### AXIAL LOADING

Live Load: PL = 0 plf \*

Dead Load: PD = 73 plf \*

Total Axial Load: PT = 73 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 5 psf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: MLBT3-4

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 11.25 IN x 4.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 598.4%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.00 IN L/MAX

Dead Load 0.00 in

Total Load 0.00 IN L/MAX

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

#### REACTIONS

A

B

Live Load 549 lb 549 lb

Dead Load 226 lb 226 lb

Total Load 775 lb 775 lb

Bearing Length 0.35 in 0.35 in

#### BEAM DATA

Center

Span Length 4.5 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 4.5 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 990$  psi

$C_d = 1.00$   $CF = 1.10$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 872 ft-lb

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

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

Controlling Shear: 465 lb

At a distance d 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: 10.57 in<sup>3</sup> 73.83 in<sup>3</sup>

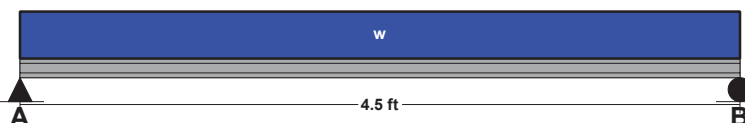
Area (Shear): 3.88 in<sup>2</sup> 39.38 in<sup>2</sup>

Moment of Inertia (deflection): 9.38 in<sup>4</sup> 415.28 in<sup>4</sup>

Moment: 872 ft-lb 6091 ft-lb

Shear: 465 lb 4725 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 244 plf

Uniform Dead Load 92 plf

Beam Self Weight 9 plf

Total Uniform Load 345 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLB3-4

Column

[2015 International Building Code(2015 NDS)]

( 2 ) 1.5 IN x 3.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 83.3%



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### CAUTIONS

\* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 549 lb  
Dead Load: Vert-DL-Rxn = 247 lb  
Total Load: Vert-TL-Rxn = 796 lb

### COLUMN DATA

Total Column Length: 9.08 ft  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 0 ft  
Column End Condition-K (e): 1  
Axial Load Duration Factor: 1.00

### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

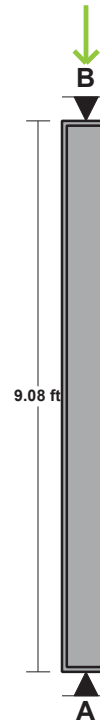
	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 454 psi
	Cd=1.00 Cf=1.15 Cp=0.29	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1350 psi
	Cd=1.00 CF=1.50	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1350 psi
	Cd=1.00 CF=1.50	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 10.5 in <sup>2</sup>	
Section Modulus (X-X Axis):	Sx = 6.13 in <sup>3</sup>	
Section Modulus (Y-Y Axis):	Sy = 2.63 in <sup>3</sup>	
Slenderness Ratio:	Lex/dx = 31.13	
	Ley/dy = 0	

### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc = 76 psi
Allowable Compressive Stress:	Fc' = 454 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' = 1350 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1350 psi
Combined Stress Factor:	CSF = 0.17

### LOADING DIAGRAM



### AXIAL LOADING

Live Load: PL = 549 lb \*  
Dead Load: PD = 226 lb \*  
Column Self Weight: CSW = 21 lb  
Total Axial Load: PT = 796 lb

\* Load obtained from Load Tracker. See Summary Report for details.

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLBT3-5

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 15.25 IN x 19.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 0.6%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.27 IN L/876

Dead Load 0.13 in

Total Load 0.39 IN L/595

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

#### REACTIONS

A

B

Live Load 1200 lb 1055 lb

Dead Load 575 lb 516 lb

Total Load 1775 lb 1571 lb

Bearing Length 0.81 in 0.72 in

#### BEAM DATA

Center

Span Length 19.5 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 19.5 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 900$  psi

$C_d = 1.00$   $CF = 1.00$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 10110 ft-lb

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

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

Controlling Shear: 1697 lb

At a distance d 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: 134.8 in<sup>3</sup> 135.66 in<sup>3</sup>

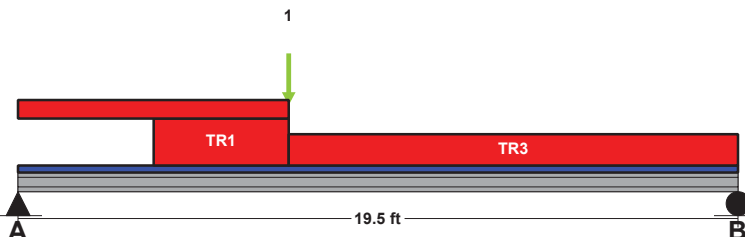
Area (Shear): 14.14 in<sup>2</sup> 53.38 in<sup>2</sup>

Moment of Inertia (deflection): 425.34 in<sup>4</sup> 1034.42 in<sup>4</sup>

Moment: 10110 ft-lb 10175 ft-lb

Shear: 1697 lb 6405 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center

Uniform Live Load 0 plf

Uniform Dead Load 0 plf

Beam Self Weight 12 plf

Total Uniform Load 12 plf

#### POINT LOADS - CENTER SPAN

Load Number One \*

Live Load 549 lb

Dead Load 226 lb

Location 7.33 ft

\* Load obtained from Load Tracker. See Summary Report for details.

#### TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One	Two	Three
Left Live Load	120 plf	40 plf	80 plf
Left Dead Load	45 plf	15 plf	30 plf
Right Live Load	120 plf	40 plf	80 plf
Right Dead Load	45 plf	15 plf	30 plf
Load Start	3.67 ft	0 ft	7.33 ft
Load End	7.33 ft	7.33 ft	19.5 ft
Load Length	3.66 ft	7.33 ft	12.17 ft

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLB3-5

Column

[2015 International Building Code(2015 NDS)]

( 2 ) 1.5 IN x 5.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 88.1%



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### CAUTIONS

\* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 1200 lb  
Dead Load: Vert-DL-Rxn = 607 lb  
Total Load: Vert-TL-Rxn = 1807 lb

### COLUMN DATA

Total Column Length: 9.08 ft  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 0 ft  
Column End Condition-K (e): 1  
Axial Load Duration Factor: 1.00

### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

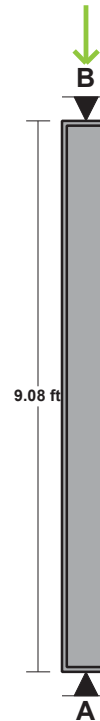
	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 918 psi
	Cd=1.00 Cf=1.10 Cp=0.62	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1170 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1170 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Column Section (X-X Axis):	dx = 5.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 16.5 in <sup>2</sup>	
Section Modulus (X-X Axis):	Sx = 15.13 in <sup>3</sup>	
Section Modulus (Y-Y Axis):	Sy = 4.13 in <sup>3</sup>	
Slenderness Ratio:	Lex/dx = 19.81	
	Ley/dy = 0	

### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc = 110 psi
Allowable Compressive Stress:	Fc' = 918 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' = 1170 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1170 psi
Combined Stress Factor:	CSF = 0.12

### LOADING DIAGRAM



### AXIAL LOADING

Live Load:	PL = 1200 lb *
Dead Load:	PD = 575 lb *
Column Self Weight:	CSW = 32 lb
Total Axial Load:	PT = 1807 lb

\* Load obtained from Load Tracker. See Summary Report for details.

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: FJT3-4

Floor Joist

[2015 International Building Code(2015 NDS)]

3.5 IN x 11.25 IN x 19.5 FT @ 24 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 20.7%

Controlling Factor: Deflection



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#### DEFLECTIONS

Center

Live Load 0.39 IN L/597

Dead Load 0.15 in

Total Load 0.54 IN L/435

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

#### REACTIONS

A

B

Live Load 780 lb 780 lb

Dead Load 293 lb 293 lb

Total Load 1073 lb 1073 lb

Bearing Length 0.49 in 0.49 in

#### SUPPORT LOADS

A

B

Live Load 390 plf 390 plf

Dead Load 147 plf 147 plf

Total Load 537 plf 537 plf

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 1139$  psi

$C_d = 1.00$   $CF = 1.10$   $Cr = 1.15$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 5228 ft-lb

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

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

Controlling Shear: -987 lb

At a distance d from 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: 55.11 in<sup>3</sup> 73.83 in<sup>3</sup>

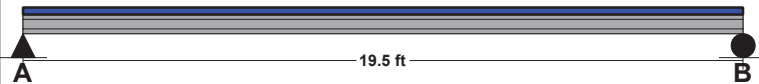
Area (Shear): 8.22 in<sup>2</sup> 39.38 in<sup>2</sup>

Moment of Inertia (deflection): 344.04 in<sup>4</sup> 415.28 in<sup>4</sup>

Moment: 5228 ft-lb 7004 ft-lb

Shear: -987 lb 4725 lb

#### LOADING DIAGRAM



#### JOIST DATA

Center

Span Length 19.5 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

#### 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 = 110 plf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB3-2

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 7.25 IN x 2.83 FT

#2 - Alaska Cedar - Dry Use

Section Adequate By: 389.6%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.00 IN L/8049

Dead Load 0.00 in

Total Load 0.01 IN L/5790

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

#### REACTIONS

A

B

Live Load 552 lb 552 lb

Dead Load 215 lb 215 lb

Total Load 767 lb 767 lb

Bearing Length 0.42 in 0.42 in

#### BEAM DATA

Center

Span Length 2.83 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 2.83 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Alaska Cedar

Base Values

Adjusted

Bending Stress:  $F_b = 800$  psi  $F_b' = 1040$  psi

$C_d = 1.00$   $CF = 1.30$

Shear Stress:  $F_v = 165$  psi  $F_v' = 165$  psi

$C_d = 1.00$

Modulus of Elasticity:  $E = 1200$  ksi  $E' = 1200$  ksi

Comp.  $\perp$  to Grain:  $F_c - \perp = 525$  psi  $F_c - \perp' = 525$  psi

Controlling Moment: 543 ft-lb

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

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

Controlling Shear: -445 lb

At a distance d from 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: 6.26 in<sup>3</sup> 30.66 in<sup>3</sup>

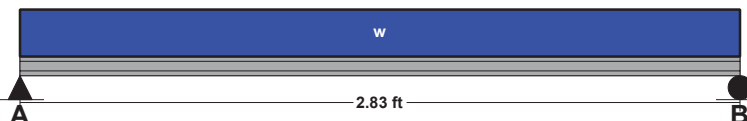
Area (Shear): 4.05 in<sup>2</sup> 25.38 in<sup>2</sup>

Moment of Inertia (deflection): 4.97 in<sup>4</sup> 111.15 in<sup>4</sup>

Moment: 543 ft-lb 2657 ft-lb

Shear: -445 lb 2791 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 390 plf

Uniform Dead Load 147 plf

Beam Self Weight 5 plf

Total Uniform Load 542 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: FJT3-5

Floor Joist

[2015 International Building Code(2015 NDS)]

3.5 IN x 13.25 IN x 14.17 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 379.9%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.04 IN L/3816

Dead Load 0.02 in

Total Load 0.06 IN L/2775

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

#### REACTIONS

A

B

Live Load 378 lb 378 lb

Dead Load 142 lb 142 lb

Total Load 520 lb 520 lb

Bearing Length 0.24 in 0.24 in

#### SUPPORT LOADS

A

B

Live Load 284 plf 284 plf

Dead Load 107 plf 107 plf

Total Load 390 plf 390 plf

#### 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

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

Controlling Moment: 1841 ft-lb

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

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

Controlling Shear: 447 lb

At a distance d 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: 21.34 in<sup>3</sup> 102.41 in<sup>3</sup>

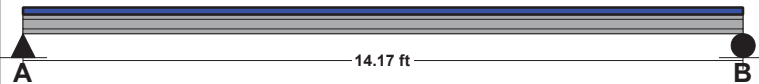
Area (Shear): 3.72 in<sup>2</sup> 46.38 in<sup>2</sup>

Moment of Inertia (deflection): 88.01 in<sup>4</sup> 678.48 in<sup>4</sup>

Moment: 1841 ft-lb 8833 ft-lb

Shear: 447 lb 5565 lb

#### LOADING DIAGRAM



#### JOIST DATA

Center

Span Length 14.17 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

#### 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

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: FJT3-6

Floor Joist

[2015 International Building Code(2015 NDS)]

3.5 IN x 13.25 IN x 15.83 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 284.5%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.07 IN L/2737

Dead Load 0.03 in

Total Load 0.10 IN L/1991

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

#### REACTIONS

A

B

Live Load 422 lb 422 lb

Dead Load 158 lb 158 lb

Total Load 580 lb 580 lb

Bearing Length 0.27 in 0.27 in

#### SUPPORT LOADS

A

B

Live Load 317 plf 317 plf

Dead Load 119 plf 119 plf

Total Load 435 plf 435 plf

#### 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

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

Controlling Moment: 2297 ft-lb

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

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

Controlling Shear: -511 lb

At a distance d from 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: 26.63 in<sup>3</sup> 102.41 in<sup>3</sup>

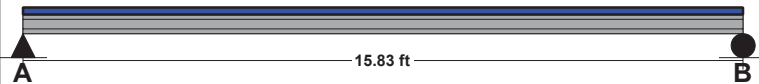
Area (Shear): 4.26 in<sup>2</sup> 46.38 in<sup>2</sup>

Moment of Inertia (deflection): 122.7 in<sup>4</sup> 678.48 in<sup>4</sup>

Moment: 2297 ft-lb 8833 ft-lb

Shear: -511 lb 5565 lb

#### LOADING DIAGRAM



#### JOIST DATA

Center

Span Length 15.83 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

#### 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

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: MLBT3-6

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 11.25 IN x 4.42 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 524.3%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.00 IN L/MAX

Dead Load 0.00 in

Total Load 0.01 IN L/MAX

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

#### REACTIONS

A

B

Live Load 628 lb 628 lb

Dead Load 255 lb 255 lb

Total Load 883 lb 883 lb

Bearing Length 0.40 in 0.40 in

#### BEAM DATA

Center

Span Length 4.42 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 4.42 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 990$  psi

$C_d = 1.00$   $CF = 1.10$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 976 ft-lb

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

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

Controlling Shear: -512 lb

At a distance d from 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: 11.83 in<sup>3</sup> 73.83 in<sup>3</sup>

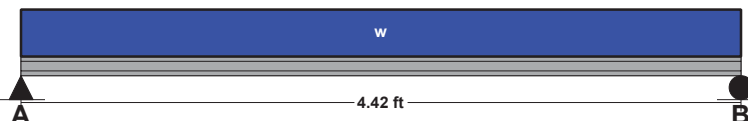
Area (Shear): 4.27 in<sup>2</sup> 39.38 in<sup>2</sup>

Moment of Inertia (deflection): 10.34 in<sup>4</sup> 415.28 in<sup>4</sup>

Moment: 976 ft-lb 6091 ft-lb

Shear: -512 lb 4725 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 284 plf

Uniform Dead Load 107 plf

Beam Self Weight 9 plf

Total Uniform Load 400 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLBT3-7

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 13.25 IN x 9.17 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 63.8%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.05 IN L/2369

Dead Load 0.02 in

Total Load 0.07 IN L/1684

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

#### REACTIONS

A

B

Live Load 1453 lb 1453 lb

Dead Load 592 lb 592 lb

Total Load 2045 lb 2045 lb

Bearing Length 0.93 in 0.93 in

#### BEAM DATA

Center

Span Length 9.17 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 9.17 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 900$  psi

$C_d = 1.00$   $CF = 1.00$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 4689 ft-lb

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

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

Controlling Shear: -1554 lb

At a distance d from 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: 62.51 in<sup>3</sup> 102.41 in<sup>3</sup>

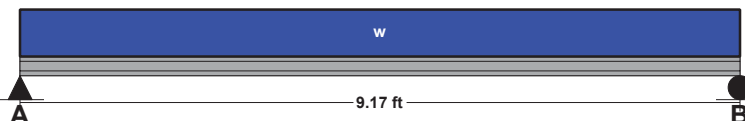
Area (Shear): 12.95 in<sup>2</sup> 46.38 in<sup>2</sup>

Moment of Inertia (deflection): 103.11 in<sup>4</sup> 678.48 in<sup>4</sup>

Moment: 4689 ft-lb 7681 ft-lb

Shear: -1554 lb 5565 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 317 plf

Uniform Dead Load 119 plf

Beam Self Weight 10 plf

Total Uniform Load 446 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLBT3-8

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 11.25 IN x 15.83 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 121.8%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.12 IN L/1521

Dead Load 0.07 in

Total Load 0.19 IN L/994

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

#### REACTIONS

A

B

Live Load 379 lb 816 lb

Dead Load 212 lb 391 lb

Total Load 591 lb 1207 lb

Bearing Length 0.27 in 0.55 in

#### BEAM DATA

Center

Span Length 15.83 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 15.83 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 990$  psi

$C_d = 1.00$   $CF = 1.10$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 2746 ft-lb

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

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

Controlling Shear: -1200 lb

At a distance d from 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: 33.28 in<sup>3</sup> 73.83 in<sup>3</sup>

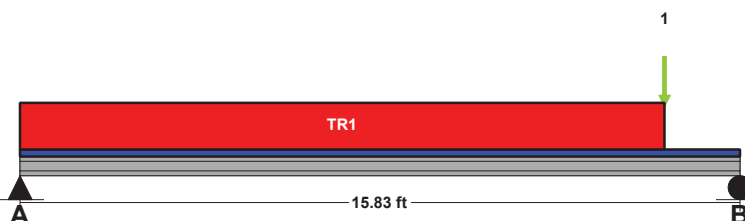
Area (Shear): 10 in<sup>2</sup> 39.38 in<sup>2</sup>

Moment of Inertia (deflection): 100.32 in<sup>4</sup> 415.28 in<sup>4</sup>

Moment: 2746 ft-lb 6091 ft-lb

Shear: -1200 lb 4725 lb

#### 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 \*

Live Load 628 lb

Dead Load 255 lb

Location 14.17 ft

\* Load obtained from Load Tracker. See Summary Report for details.

#### TRAPEZOIDAL LOADS - CENTER SPAN

Load Number One

Left Live Load 40 plf

Left Dead Load 15 plf

Right Live Load 40 plf

Right Dead Load 15 plf

Load Start 0 ft

Load End 14.17 ft

Load Length 14.17 ft

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLBT3-7-MLBT3-8

Column

[2015 International Building Code(2015 NDS)]

3.5 IN x 3.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 41.1%



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#### VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	2269 lb
Dead Load:	Vert-DL-Rxn =	1007 lb
Total Load:	Vert-TL-Rxn =	3276 lb

#### COLUMN DATA

Total Column Length:	9.08 ft
Unbraced Length (X-Axis) Lx:	9.08 ft
Unbraced Length (Y-Axis) Ly:	9.08 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

#### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

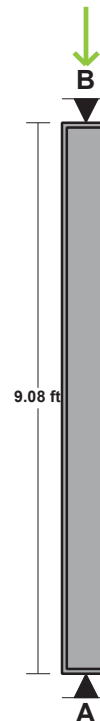
	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 454 psi
	Cd=1.00 Cf=1.15 Cp=0.29	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1350 psi
	Cd=1.00 CF=1.50	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1350 psi
	Cd=1.00 CF=1.50	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 3.5 in	
Area:	A = 12.25 in <sup>2</sup>	
Section Modulus (X-X Axis):	Sx = 7.15 in <sup>3</sup>	
Section Modulus (Y-Y Axis):	Sy = 7.15 in <sup>3</sup>	
Slenderness Ratio:	Lex/dx = 31.13	
	Ley/dy = 31.13	

#### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	267 psi
Allowable Compressive Stress:	Fc' =	454 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' =	1350 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1350 psi
Combined Stress Factor:	CSF =	0.59

#### LOADING DIAGRAM



#### AXIAL LOADING

Live Load:	PL =	2269 lb *
Dead Load:	PD =	983 lb *
Column Self Weight:	CSW =	24 lb
Total Axial Load:	PT =	3276 lb

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLBT3-9

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

5.5 IN x 15.25 IN x 19.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 36.8%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.24 IN L/991

Dead Load 0.12 in

Total Load 0.36 IN L/657

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

#### REACTIONS

A

B

Live Load 1089 lb 2305 lb

Dead Load 595 lb 1080 lb

Total Load 1684 lb 3385 lb

Bearing Length 0.49 in 0.98 in

#### BEAM DATA

Center

Span Length 19.5 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 19.5 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 875$  psi  $F_b' = 852$  psi

$C_d = 1.00$   $CF = 0.97$

Shear Stress:  $F_v = 170$  psi  $F_v' = 170$  psi

$C_d = 1.00$

Modulus of Elasticity:  $E = 1300$  ksi  $E' = 1300$  ksi

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

Controlling Moment: 11062 ft-lb

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

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

Controlling Shear: -3068 lb

At a distance d from 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: 155.8 in<sup>3</sup> 213.18 in<sup>3</sup>

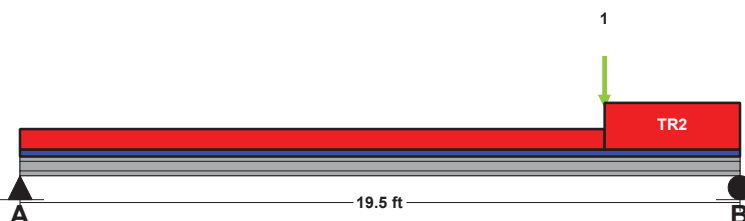
Area (Shear): 27.07 in<sup>2</sup> 83.88 in<sup>2</sup>

Moment of Inertia (deflection): 593.38 in<sup>4</sup> 1625.52 in<sup>4</sup>

Moment: 11062 ft-lb 15136 ft-lb

Shear: -3068 lb 9506 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center

Uniform Live Load 0 plf

Uniform Dead Load 0 plf

Beam Self Weight 18 plf

Total Uniform Load 18 plf

#### POINT LOADS - CENTER SPAN

Load Number One \*

Live Load 1453 lb

Dead Load 592 lb

Location 15.83 ft

\* Load obtained from Load Tracker. See Summary Report for details.

#### TRAPEZOIDAL LOADS - CENTER SPAN

Load Number One Two

Left Live Load 80 plf 184 plf

Left Dead Load 30 plf 69 plf

Right Live Load 80 plf 184 plf

Right Dead Load 30 plf 69 plf

Load Start 0 ft 15.83 ft

Load End 15.83 ft 19.5 ft

Load Length 15.83 ft 3.67 ft

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLBT3-9B

Column

[2015 International Building Code(2015 NDS)]

( 2 ) 1.5 IN x 5.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 77.4%



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### CAUTIONS

\* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 2305 lb  
Dead Load: Vert-DL-Rxn = 1112 lb  
Total Load: Vert-TL-Rxn = 3417 lb

### COLUMN DATA

Total Column Length: 9.08 ft  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 0 ft  
Column End Condition-K (e): 1  
Axial Load Duration Factor: 1.00

### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

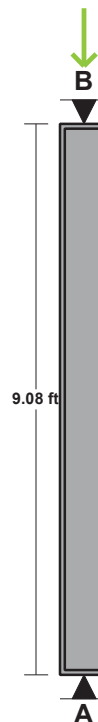
	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 918 psi
	Cd=1.00 Cf=1.10 Cp=0.62	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1170 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1170 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Column Section (X-X Axis):	dx = 5.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 16.5 in <sup>2</sup>	
Section Modulus (X-X Axis):	Sx = 15.13 in <sup>3</sup>	
Section Modulus (Y-Y Axis):	Sy = 4.13 in <sup>3</sup>	
Slenderness Ratio:	Lex/dx = 19.81	
	Ley/dy = 0	

### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc = 207 psi
Allowable Compressive Stress:	Fc' = 918 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' = 1170 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1170 psi
Combined Stress Factor:	CSF = 0.23

### LOADING DIAGRAM



### AXIAL LOADING

Live Load: PL = 2305 lb \*  
Dead Load: PD = 1080 lb \*  
Column Self Weight: CSW = 32 lb  
Total Axial Load: PT = 3417 lb

\* Load obtained from Load Tracker. See Summary Report for details.

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB3-3

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.125 IN x 10.5 IN x 6.33 FT

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

Section Adequate By: 32.3%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.07 IN L/1075

Dead Load 0.04 in

Total Load 0.12 IN L/658

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

#### REACTIONS

A

B

Live Load 3361 lb 3361 lb

Dead Load 2124 lb 2124 lb

Total Load 5485 lb 5485 lb

Bearing Length 2.70 in 2.70 in

#### BEAM DATA

Center

Span Length 6.33 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 6.33 ft

Live Load Duration Factor 1.00

Camber Adj. Factor 1

Camber Required 0.04

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

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

Controlling Moment: 8680 ft-lb

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

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

Controlling Shear: -4059 lb

At a distance d from 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: 43.4 in<sup>3</sup> 57.42 in<sup>3</sup>

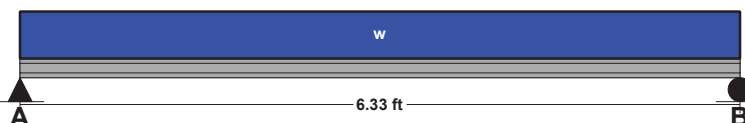
Area (Shear): 22.98 in<sup>2</sup> 32.81 in<sup>2</sup>

Moment of Inertia (deflection): 109.88 in<sup>4</sup> 301.46 in<sup>4</sup>

Moment: 8680 ft-lb 11484 ft-lb

Shear: -4059 lb 5797 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 1062 plf

Uniform Dead Load 664 plf

Beam Self Weight 7 plf

Total Uniform Load 1733 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB3-4

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 7.25 IN x 4.33 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 30.1%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.03 IN L/1984

Dead Load 0.02 in

Total Load 0.04 IN L/1192

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

#### REACTIONS

A

B

Live Load 1275 lb 1275 lb

Dead Load 848 lb 848 lb

Total Load 2123 lb 2123 lb

Bearing Length 0.97 in 0.97 in

#### BEAM DATA

Center

Span Length 4.33 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 4.33 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 1170$  psi

$C_d = 1.00$   $CF = 1.30$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 2298 ft-lb

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

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

Controlling Shear: -1571 lb

At a distance d from 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: 23.57 in<sup>3</sup> 30.66 in<sup>3</sup>

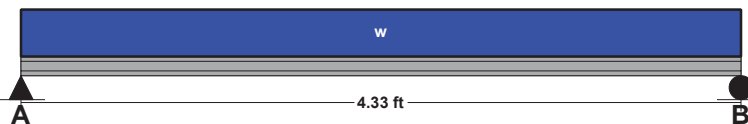
Area (Shear): 13.09 in<sup>2</sup> 25.38 in<sup>2</sup>

Moment of Inertia (deflection): 22.38 in<sup>4</sup> 111.15 in<sup>4</sup>

Moment: 2298 ft-lb 2989 ft-lb

Shear: -1571 lb 3045 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 589 plf

Uniform Dead Load 386 plf

Beam Self Weight 6 plf

Total Uniform Load 981 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: WALL2-EXT-1

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 5.5 IN x 9.08 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 83.2%

Controlling Factor: Combined Stress Factor



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#### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.09 IN = L/1170

Live Load Deflection Criteria: L/180

#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 648 lb

Dead Load: Vert-DL-Rxn = 571 lb

Total Load: Vert-TL-Rxn = 1220 lb

#### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 92 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 92 lb

#### WALL DATA

Total Stud Length: 9.08 ft  
Wall Dead Weight: 11 psf  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 0 ft  
Stud End Condition-K (e): 1  
Axial Load Duration Factor: 1.00  
Lateral Load Duration Factor (Wind/Seismic): 1.60

#### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 1049 psi
	Cd=1.60 Cf=1.10 Cp=0.44	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 2153 psi
	Cd=1.60 CF=1.30 Cr=1.15 Cl=1.00	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 2153 psi
	Cd=1.60 CF=1.30 Cr=1.15	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi

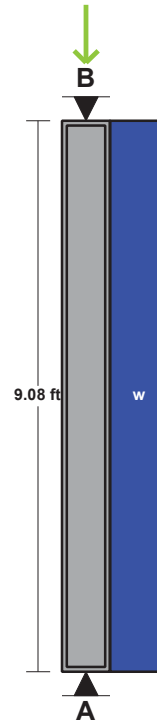
Stud Section (X-X Axis):	dx = 5.5 in
Stud Section (Y-Y Axis):	dy = 1.5 in
Area:	A = 8.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx = 7.56 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy = 2.06 in <sup>3</sup>
Slenderness Ratio:	Lex/dx = 19.81
	Ley/dy = 0

#### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress:	Fc = 69 psi
Allowable Compressive Stress:	Fc' = 1049 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 = 209 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 331 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 2153 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 2153 psi
Combined Stress Factor:	CSF = 0.17

#### LOADING DIAGRAM



#### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 8.3 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 7 ft
Upper Floor Height:	9.1 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 486.3 plf	DL = 428.5 plf	

#### AXIAL LOADING

Live Load:	PL = 486 plf
Dead Load:	PD = 429 plf
Total Axial Load:	PT = 915 plf

#### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 15 psf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: WALL2-EXT-2

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 5.5 IN x 9.08 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 84.1%

Controlling Factor: Combined Stress Factor



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### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.09 IN = L/1170

Live Load Deflection Criteria: L/180

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 0 lb

Dead Load: Vert-DL-Rxn = 266 lb

Total Load: Vert-TL-Rxn = 266 lb

### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 92 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 92 lb

### WALL DATA

Total Stud Length: 9.08 ft  
Wall Dead Weight: 11 psf  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 0 ft  
Stud End Condition-K (e): 1  
Axial Load Duration Factor: 1.00  
Lateral Load Duration Factor (Wind/Seismic): 1.60

### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 1049 psi
	Cd=1.60 Cf=1.10 Cp=0.44	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 2153 psi
	Cd=1.60 CF=1.30 Cr=1.15 Cl=1.00	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 2153 psi
	Cd=1.60 CF=1.30 Cr=1.15	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi

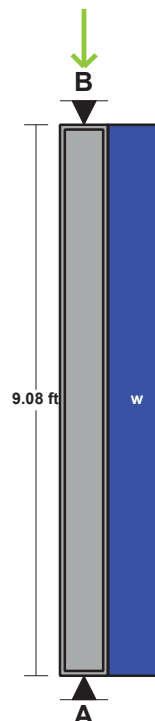
Stud Section (X-X Axis):	dx =	5.5 in
Stud Section (Y-Y Axis):	dy =	1.5 in
Area:	A =	8.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx =	7.56 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy =	2.06 in <sup>3</sup>
Slenderness Ratio:	Lex/dx =	19.81
	Ley/dy =	0

### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress:	Fc =	32 psi
Allowable Compressive Stress:	Fc' =	1049 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 =	209 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	331 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	2153 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	2153 psi
Combined Stress Factor:	CSF =	0.16

### LOADING DIAGRAM



### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Upper Floor Height:	9.1 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 0 plf	DL = 199.8 plf	

### AXIAL LOADING

Live Load:	PL =	0 plf *
Dead Load:	PD =	200 plf *
Total Axial Load:	PT =	200 plf

\* Load obtained from Load Tracker. See Summary Report for details.

### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 15 psf

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: DJST2-1

Floor Joist

[2015 International Building Code(2015 NDS)]

1.5 IN x 9.25 IN x 7.75 FT Pressure Treated @ 16 O.C.

#2 - Hem-Fir - Dry Use

Section Adequate By: 104.2%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.05 IN L/1750

Dead Load 0.01 in

Total Load 0.07 IN L/1400

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

#### REACTIONS

A

B

Live Load 310 lb 310 lb

Dead Load 78 lb 78 lb

Total Load 388 lb 388 lb

Bearing Length 0.64 in 0.64 in

#### SUPPORT LOADS

A

B

Live Load 233 plf 233 plf

Dead Load 59 plf 59 plf

Total Load 291 plf 291 plf

#### MATERIAL PROPERTIES

#2 - Hem-Fir

Base Values

Adjusted

Bending Stress:  $F_b = 850$  psi  $F_b' = 860$  psi

$C_d = 1.00$   $C_F = 1.10$   $C_r = 1.15$   $C_i = 0.80$

Shear Stress:  $F_v = 150$  psi  $F_v' = 120$  psi

$C_d = 1.00$   $C_i = 0.80$

Modulus of Elasticity:  $E = 1300$  ksi  $E' = 1235$  ksi

$C_i = 0.95$

Comp.  $\perp$  to Grain:  $F_c - \perp = 405$  psi  $F_c - \perp' = 405$  psi

Controlling Moment: 751 ft-lb

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

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

Controlling Shear: 318 lb

At a distance d 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: 10.47 in<sup>3</sup> 21.39 in<sup>3</sup>

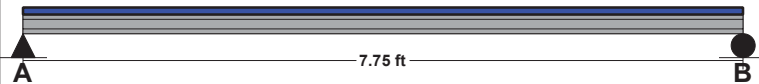
Area (Shear): 3.97 in<sup>2</sup> 13.88 in<sup>2</sup>

Moment of Inertia (deflection): 20.35 in<sup>4</sup> 98.93 in<sup>4</sup>

Moment: 751 ft-lb 1533 ft-lb

Shear: 318 lb 1110 lb

#### LOADING DIAGRAM



#### JOIST DATA

Center

Span Length 7.75 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

#### JOIST LOADING

Uniform Floor Loading

Center

Live Load LL = 60 psf

Dead Load DL = 15 psf

Total Load TL = 75 psf

TL Adj. For Joist Spacing wT = 100 plf

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLBD-2-1

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 9.25 IN x 8.83 FT Pressure Treated

#2 - Hem-Fir - Dry Use

Section Adequate By: 16.8%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.11 IN L/948

Dead Load 0.03 in

Total Load 0.14 IN L/741

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

#### REACTIONS

A

B

Live Load 1029 lb 1029 lb

Dead Load 287 lb 287 lb

Total Load 1316 lb 1316 lb

Bearing Length 0.93 in 0.93 in

#### BEAM DATA

Center

Span Length 8.83 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 8.83 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Hem-Fir

Base Values

Adjusted

Bending Stress:  $F_b = 850$  psi  $F_b' = 816$  psi

$C_d=1.00$   $CF=1.20$   $C_i=0.80$

Shear Stress:  $F_v = 150$  psi  $F_v' = 120$  psi

$C_d=1.00$   $C_i=0.80$

Modulus of Elasticity:  $E = 1300$  ksi  $E' = 1235$  ksi

$C_i=0.95$

Comp.  $\perp$  to Grain:  $F_c - \perp = 405$  psi  $F_c - \perp' = 405$  psi

Controlling Moment: 2905 ft-lb

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

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

Controlling Shear: 1105 lb

At a distance d 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: 42.72 in<sup>3</sup> 49.91 in<sup>3</sup>

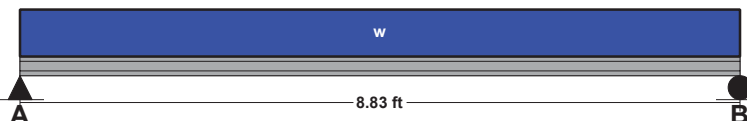
Area (Shear): 13.82 in<sup>2</sup> 32.38 in<sup>2</sup>

Moment of Inertia (deflection): 87.66 in<sup>4</sup> 230.84 in<sup>4</sup>

Moment: 2905 ft-lb 3394 ft-lb

Shear: 1105 lb 2590 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 233 plf

Uniform Dead Load 59 plf

Beam Self Weight 6 plf

Total Uniform Load 298 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: FJT3-7

Floor Joist

[2015 International Building Code(2015 NDS)]

5.5 IN x 15.5 IN x 19.5 FT (5 + 14.5) @ 24 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 563.4%

Controlling Factor: Moment



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#### DEFLECTIONS

	Left	Center
Live Load	0.00 IN L/MAX	0.02 IN L/8651
Dead Load	0.00 in	0.01 in
Total Load	0.00 IN L/MAX	0.03 IN L/6422
Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360		

#### REACTIONS

	A	B	C
Live Load	1455 lb	1296 lb	472 lb
Dead Load	929 lb	517 lb	173 lb
Total Load	2384 lb	1813 lb	645 lb
Bearing Length	0.69 in	0.53 in	0.19 in

#### SUPPORT LOADS

	A	B	C
Live Load	728 plf	648 plf	236 plf
Dead Load	465 plf	259 plf	87 plf
Total Load	1192 plf	907 plf	323 plf

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 875 psi Cd=1.00 Cl=0.98 CF=0.97	Fb' = 836 psi
Shear Stress:	Fv = 170 psi Cd=1.00	Fv' = 170 psi
Modulus of Elasticity:	E = 1300 ksi	E' = 1300 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ = 625 psi

#### Controlling Moment:

-2314 ft-lb

Over left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 1, 2

#### Controlling Shear:

-904 lb

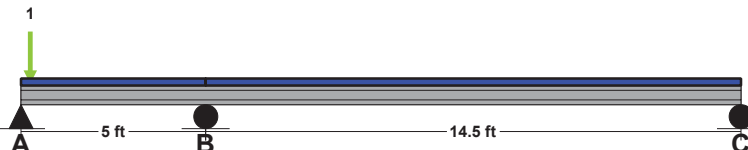
At a distance d from left support of span 1 (Left Span)

Created by combining all dead loads and live loads on span(s) 1, 2

#### Comparisons with required sections:

	Req'd	Provided
Section Modulus:	33.19 in <sup>3</sup>	220.23 in <sup>3</sup>
Area (Shear):	7.98 in <sup>2</sup>	85.25 in <sup>2</sup>
Moment of Inertia (deflection):	95.68 in <sup>4</sup>	1706.78 in <sup>4</sup>
Moment:	-2314 ft-lb	15351 ft-lb
Shear:	-904 lb	9662 lb

#### LOADING DIAGRAM



#### JOIST DATA

	Left	Center
Span Length	5 ft	14.5 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.		
Floor Duration Factor	1.00	

#### JOIST LOADING

##### Uniform Floor Loading

	Left	Center
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 =	110 plf	110 plf

##### Wall Loading

###### Wall One

Live Load ( $\perp$ to Joists): L1 =	672 plf	0 plf
Dead Load ( $\perp$ to Joists) D1 =	517 plf	0 plf
Load Location	X1 = 0.25 ft	0 ft

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB2-1

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 7.25 IN x 2.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 459.0%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.00 IN L/MAX

Dead Load 0.00 in

Total Load 0.00 IN L/8869

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

#### REACTIONS

A

B

Live Load 618 lb 618 lb

Dead Load 238 lb 238 lb

Total Load 856 lb 856 lb

Bearing Length 0.39 in 0.39 in

#### BEAM DATA

Center

Span Length 2.5 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 2.5 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 1170$  psi

$C_d = 1.00$   $CF = 1.30$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 535 ft-lb

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

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

Controlling Shear: 445 lb

At a distance d 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: 5.48 in<sup>3</sup> 30.66 in<sup>3</sup>

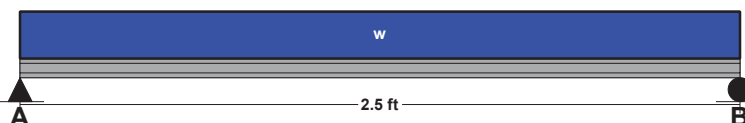
Area (Shear): 3.71 in<sup>2</sup> 25.38 in<sup>2</sup>

Moment of Inertia (deflection): 3.26 in<sup>4</sup> 111.15 in<sup>4</sup>

Moment: 535 ft-lb 2989 ft-lb

Shear: 445 lb 3045 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 494 plf

Uniform Dead Load 185 plf

Beam Self Weight 6 plf

Total Uniform Load 685 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB2-2

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 7.25 IN x 2.5 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 445.5%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.00 IN L/MAX

Dead Load 0.00 in

Total Load 0.00 IN L/8654

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

#### REACTIONS

A

B

Live Load 633 lb 633 lb

Dead Load 244 lb 244 lb

Total Load 877 lb 877 lb

Bearing Length 0.40 in 0.40 in

#### BEAM DATA

Center

Span Length 2.5 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 2.5 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 1170$  psi

$C_d = 1.00$   $CF = 1.30$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 548 ft-lb

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

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

Controlling Shear: -456 lb

At a distance d from 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: 5.62 in<sup>3</sup> 30.66 in<sup>3</sup>

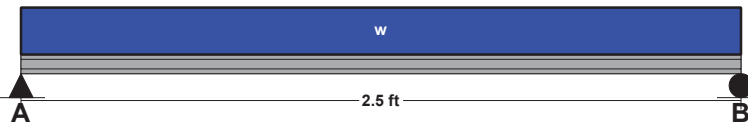
Area (Shear): 3.8 in<sup>2</sup> 25.38 in<sup>2</sup>

Moment of Inertia (deflection): 3.33 in<sup>4</sup> 111.15 in<sup>4</sup>

Moment: 548 ft-lb 2989 ft-lb

Shear: -456 lb 3045 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 506 plf

Uniform Dead Load 190 plf

Beam Self Weight 6 plf

Total Uniform Load 702 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB2-3

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 7.25 IN x 2.67 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 131.3%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.01 IN L/5782

Dead Load 0.00 in

Total Load 0.01 IN L/3436

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

#### REACTIONS

A

B

Live Load 1151 lb 1151 lb

Dead Load 786 lb 786 lb

Total Load 1937 lb 1937 lb

Bearing Length 0.89 in 0.89 in

#### BEAM DATA

Center

Span Length 2.67 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 2.67 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base Values

Adjusted

Bending Stress:  $F_b = 900$  psi  $F_b' = 1170$  psi

$C_d = 1.00$   $CF = 1.30$

Shear Stress:  $F_v = 180$  psi  $F_v' = 180$  psi

$C_d = 1.00$

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

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

Controlling Moment: 1293 ft-lb

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

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

Controlling Shear: -1084 lb

At a distance d from 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: 13.26 in<sup>3</sup> 30.66 in<sup>3</sup>

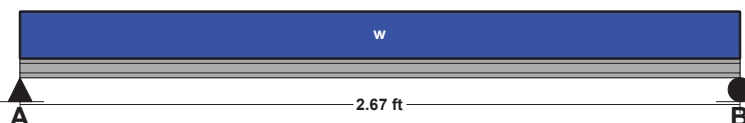
Area (Shear): 9.04 in<sup>2</sup> 25.38 in<sup>2</sup>

Moment of Inertia (deflection): 7.76 in<sup>4</sup> 111.15 in<sup>4</sup>

Moment: 1293 ft-lb 2989 ft-lb

Shear: -1084 lb 3045 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 862 plf

Uniform Dead Load 583 plf

Beam Self Weight 6 plf

Total Uniform Load 1451 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: MLB2-5

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 11.25 IN x 13.67 FT (12 + 1.7)

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 381.2%

Controlling Factor: Deflection



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#### DEFLECTIONS

	Center	Right
Live Load	0.05 IN L/2772	-0.02 IN 2L/1732
Dead Load	-0.02 in	0.01 in
Total Load	0.03 IN L/5228	-0.01 IN 2L/3154
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

#### REACTIONS

	A	B
Live Load	444 lb	576 lb
Dead Load	-215 lb	-284 lb
Total Load	229 lb	292 lb
Uplift (1.5 F.S)	-223 lb	-284 lb
Bearing Length	0.10 in	0.13 in

#### BEAM DATA

	Center	Right
Span Length	12 ft	1.67 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	12 ft	1.67 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' = 872 psi
	Cd=0.90 Cl=0.98 CF=1.10	
Shear Stress:	Fv = 180 psi	Fv' = 162 psi
	Cd=0.90	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 625 psi	Fc $\perp$ = 625 psi

#### Controlling Moment:

-631 ft-lb

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

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

#### Controlling Shear:

192 lb

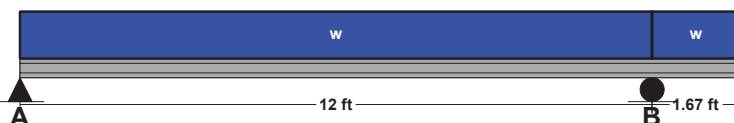
At a distance d from right support of span 2 (Center Span)

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

#### Comparisons with required sections:

	Req'd	Provided
Section Modulus:	8.69 in3	73.83 in3
Area (Shear):	1.78 in2	39.38 in2
Moment of Inertia (deflection):	86.31 in4	415.28 in4
Moment:	-631 ft-lb	5362 ft-lb
Shear:	192 lb	4253 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

	Center*	Right*
Uniform Live Load	74 plf	74 plf
Uniform Dead Load	-45 plf	-45 plf
Beam Self Weight	9 plf	9 plf
Total Uniform Load	38 plf	38 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: JST2-11

Floor Joist

[2015 International Building Code(2015 NDS)]

1.5 IN x 11.25 IN x 3.42 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 2445.3%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.00 IN L/MAX

Dead Load 0.00 in

Total Load 0.00 IN L/MAX

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

#### REACTIONS

A

B

Live Load 91 lb 91 lb

Dead Load 34 lb 34 lb

Total Load 125 lb 125 lb

Bearing Length 0.13 in 0.13 in

#### SUPPORT LOADS

A

B

Live Load 68 plf 68 plf

Dead Load 26 plf 26 plf

Total Load 94 plf 94 plf

#### 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

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

Controlling Moment: 107 ft-lb

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

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

Controlling Shear: -58 lb

At a distance d from 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: 1.24 in3 31.64 in3

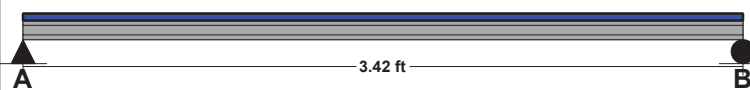
Area (Shear): 0.48 in2 16.88 in2

Moment of Inertia (deflection): 1.24 in4 177.98 in4

Moment: 107 ft-lb 2729 ft-lb

Shear: -58 lb 2025 lb

#### LOADING DIAGRAM



#### JOIST DATA

Center

Span Length 3.42 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

#### 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

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: JST2-10

Floor Joist

[2015 International Building Code(2015 NDS)]

1.5 IN x 11.25 IN x 15.67 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 21.2%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.25 IN L/740

Dead Load 0.10 in

Total Load 0.35 IN L/538

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

#### REACTIONS

A

B

Live Load 418 lb 418 lb

Dead Load 157 lb 157 lb

Total Load 575 lb 575 lb

Bearing Length 0.61 in 0.61 in

#### SUPPORT LOADS

A

B

Live Load 314 plf 314 plf

Dead Load 118 plf 118 plf

Total Load 431 plf 431 plf

#### 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

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

Controlling Moment: 2251 ft-lb

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

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

Controlling Shear: -517 lb

At a distance d from 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: 26.1 in<sup>3</sup> 31.64 in<sup>3</sup>

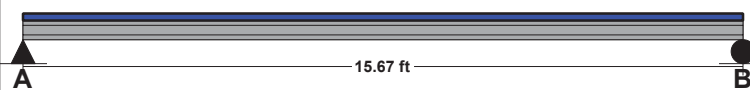
Area (Shear): 4.31 in<sup>2</sup> 16.88 in<sup>2</sup>

Moment of Inertia (deflection): 119.02 in<sup>4</sup> 177.98 in<sup>4</sup>

Moment: 2251 ft-lb 2729 ft-lb

Shear: -517 lb 2025 lb

#### LOADING DIAGRAM



#### JOIST DATA

Center

Span Length 15.67 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

#### 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

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLB2-6B

Column

[2015 International Building Code(2015 NDS)]

3.5 IN x 5.5 IN x 12.0 FT

#1 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 6.5%



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#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 3724 lb  
Dead Load: Vert-DL-Rxn = 1477 lb  
Total Load: Vert-TL-Rxn = 5201 lb

#### COLUMN DATA

Total Column Length: 12 ft  
Unbraced Length (X-Axis) Lx: 12 ft  
Unbraced Length (Y-Axis) Ly: 12 ft  
Column End Condition-K (e): 1  
Axial Load Duration Factor 1.00

#### COLUMN PROPERTIES

#1 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1500 psi	Fc' = 289 psi
	Cd=1.00 Cf=1.10 Cp=0.18	
Bending Stress (X-X Axis):	Fbx = 1000 psi	Fbx' = 1300 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 1000 psi	Fby' = 1300 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1700 ksi	E' = 1700 ksi

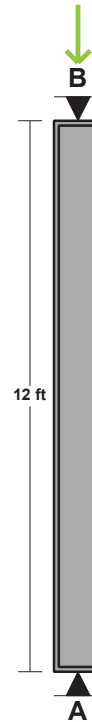
Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	3.5 in
Area:	A =	19.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx =	17.65 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy =	11.23 in <sup>3</sup>
Slenderness Ratio:	Lex/dx =	26.18
	Ley/dy =	41.14

#### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	270 psi
Allowable Compressive Stress:	Fc' =	289 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' =	1300 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1300 psi
Combined Stress Factor:	CSF =	0.94

#### LOADING DIAGRAM



#### AXIAL LOADING

Live Load:	PL =	3724 lb *
Dead Load:	PD =	1427 lb *
Column Self Weight:	CSW =	50 lb
Total Axial Load:	PT =	5201 lb

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB2-7

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.125 IN x 10.5 IN x 7.33 FT

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

Section Adequate By: 864.2%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.02 IN L/5072

Dead Load 0.00 in

Total Load 0.02 IN L/4754

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

#### REACTIONS

A

B

Live Load 382 lb 393 lb

Dead Load 53 lb 52 lb

Total Load 435 lb 445 lb

Bearing Length 0.21 in 0.22 in

#### BEAM DATA

Center

Span Length 7.33 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 7.33 ft

Live Load Duration Factor 1.00

Camber Adj. Factor 1.5

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' = 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

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

Controlling Moment: 1191 ft-lb

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

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

Controlling Shear: -394 lb

At a distance d from 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: 5.96 in<sup>3</sup> 57.42 in<sup>3</sup>

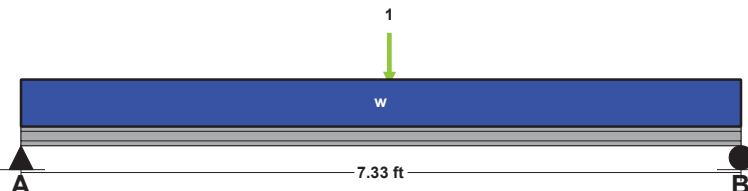
Area (Shear): 2.23 in<sup>2</sup> 32.81 in<sup>2</sup>

Moment of Inertia (deflection): 21.4 in<sup>4</sup> 301.46 in<sup>4</sup>

Moment: 1191 ft-lb 11484 ft-lb

Shear: -394 lb 5797 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center

Uniform Live Load 40 plf

Uniform Dead Load 15 plf

Beam Self Weight 7 plf

Total Uniform Load 62 plf

#### POINT LOADS - CENTER SPAN

Load Number One \*

Live Load 481 lb

Dead Load -57 lb

Location 3.75 ft

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLB2-6A

Column

[2015 International Building Code(2015 NDS)]

3.5 IN x 5.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 81.5%



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#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 2289 lb  
Dead Load: Vert-DL-Rxn = 971 lb  
Total Load: Vert-TL-Rxn = 3260 lb

#### COLUMN DATA

Total Column Length: 9.08 ft  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 0 ft  
Column End Condition-K (e): 1  
Axial Load Duration Factor 1.00

#### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 918 psi
	Cd=1.00 Cf=1.10 Cp=0.62	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1170 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1170 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi

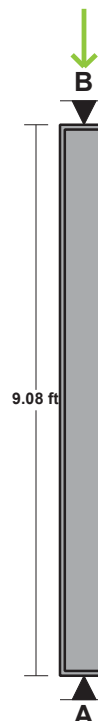
Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	3.5 in
Area:	A =	19.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx =	17.65 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy =	11.23 in <sup>3</sup>
Slenderness Ratio:	Lex/dx =	19.81
	Ley/dy =	0

#### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	169 psi
Allowable Compressive Stress:	Fc' =	918 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' =	1170 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1170 psi
Combined Stress Factor:	CSF =	0.18

#### LOADING DIAGRAM



#### AXIAL LOADING

Live Load:	PL =	2289 lb *
Dead Load:	PD =	933 lb *
Column Self Weight:	CSW =	38 lb
Total Axial Load:	PT =	3260 lb

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB2-8

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

5.5 IN x 12.0 IN x 8.83 FT

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

Section Adequate By: 55.0%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.12 IN L/914

Dead Load 0.08 in

Total Load 0.19 IN L/550

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

#### REACTIONS

A

B

Live Load 5333 lb 5333 lb

Dead Load 3538 lb 3538 lb

Total Load 8871 lb 8871 lb

Bearing Length 2.48 in 2.48 in

#### BEAM DATA

Center

Span Length 8.83 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 8.83 ft

Live Load Duration Factor 1.15

Camber Adj. Factor 1

Camber Required 0.08

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' = 2760 psi  
Cd=1.15

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

Modulus of Elasticity: E = 1800 ksi E' = 1800 ksi  
Comp.  $\perp$  to Grain: Fc  $\perp$  = 650 psi Fc  $\perp$ ' = 650 psi

Controlling Moment: 19583 ft-lb

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

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

Controlling Shear: -6919 lb

At a distance d from 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: 85.14 in<sup>3</sup> 132 in<sup>3</sup>

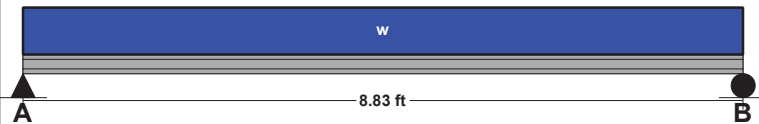
Area (Shear): 34.06 in<sup>2</sup> 66 in<sup>2</sup>

Moment of Inertia (deflection): 345.78 in<sup>4</sup> 792 in<sup>4</sup>

Moment: 19583 ft-lb 30360 ft-lb

Shear: -6919 lb 13409 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 1208 plf

Uniform Dead Load 787 plf

Beam Self Weight 14 plf

Total Uniform Load 2009 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLB2-8A

Column

[2015 International Building Code(2015 NDS)]

5.5 IN x 5.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 46.9%



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#### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 5333 lb  
Dead Load: Vert-DL-Rxn = 3598 lb  
Total Load: Vert-TL-Rxn = 8931 lb

#### COLUMN DATA

Total Column Length: 9.08 ft  
Unbraced Length (X-Axis) Lx: 9.08 ft  
Unbraced Length (Y-Axis) Ly: 9.08 ft  
Column End Condition-K (e): 1  
Axial Load Duration Factor 1.00

#### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 700 psi	Fc' = 556 psi
	Cd=1.00 Cp=0.79	
Bending Stress (X-X Axis):	Fbx = 750 psi	Fbx' = 750 psi
	Cd=1.00 CF=1.00	
Bending Stress (Y-Y Axis):	Fby = 750 psi	Fby' = 750 psi
	Cd=1.00 CF=1.00	
Modulus of Elasticity:	E = 1300 ksi	E' = 1300 ksi

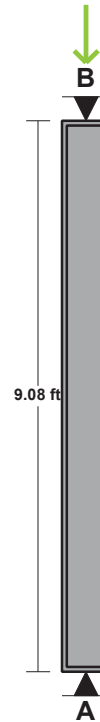
Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	5.5 in
Area:	A =	30.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx =	27.73 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy =	27.73 in <sup>3</sup>
Slenderness Ratio:	Lex/dx =	19.81
	Ley/dy =	19.81

#### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	295 psi
Allowable Compressive Stress:	Fc' =	556 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' =	750 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	750 psi
Combined Stress Factor:	CSF =	0.53

#### LOADING DIAGRAM



#### AXIAL LOADING

Live Load:	PL =	5333 lb *
Dead Load:	PD =	3538 lb *
Column Self Weight:	CSW =	60 lb
Total Axial Load:	PT =	8931 lb

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: PST-MLB2-8B

Column

[2015 International Building Code(2015 NDS)]

( 2 ) 1.5 IN x 5.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 38.8%



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### CAUTIONS

\* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 5333 lb  
Dead Load: Vert-DL-Rxn = 3570 lb  
Total Load: Vert-TL-Rxn = 8903 lb

### COLUMN DATA

Total Column Length: 9.08 ft  
Unbraced Length (X-Axis) Lx: 1 ft  
Unbraced Length (Y-Axis) Ly: 1 ft  
Column End Condition-K (e): 1  
Axial Load Duration Factor: 1.00

### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

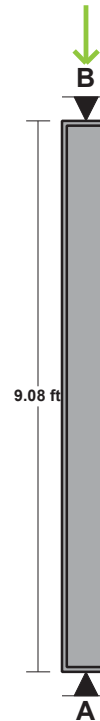
	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 882 psi
	Cd=1.00 Cf=1.10 Cp=0.59	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1170 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1170 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Column Section (X-X Axis):	dx = 5.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 16.5 in <sup>2</sup>	
Section Modulus (X-X Axis):	Sx = 15.13 in <sup>3</sup>	
Section Modulus (Y-Y Axis):	Sy = 4.13 in <sup>3</sup>	
Slenderness Ratio:	Lex/dx = 2.18	
	Ley/dy = 4	

### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc = 540 psi
Allowable Compressive Stress:	Fc' = 882 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' = 1170 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1170 psi
Combined Stress Factor:	CSF = 0.61

### LOADING DIAGRAM



### AXIAL LOADING

Live Load: PL = 5333 lb \*  
Dead Load: PD = 3538 lb \*  
Column Self Weight: CSW = 32 lb  
Total Axial Load: PT = 8903 lb

\* Load obtained from Load Tracker. See Summary Report for details.

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB2-6

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 12.0 IN x 17.17 FT (9.2 + 8)

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

Section Adequate By: 82.7%

Controlling Factor: Moment



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DEFLECTIONS	Center	Right
Live Load	0.09 IN L/1286	-0.03 IN L/3324
Dead Load	0.03 in	-0.01 in
Total Load	0.12 IN L/917	-0.04 IN L/2511
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS	A	B	C
Live Load	2289 lb	3724 lb	481 lb
Dead Load	933 lb	1427 lb	-57 lb
Total Load	3222 lb	5151 lb	424 lb
Uplift (1.5 F.S)	0 lb	0 lb	-519 lb
Bearing Length	1.42 in	2.26 in	0.19 in

BEAM DATA	Center	Right
Span Length	9.17 ft	8 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	9.17 ft	8 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 Fb_cmpr = 1850 psi Cd=1.00	Controlled by: Fb' = 2400 psi
Shear Stress:	Fv = 265 psi Cd=1.00	Fv' = 265 psi
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 650 psi	Fc $\perp$ = 650 psi

Controlling Moment: 9195 ft-lb

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

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

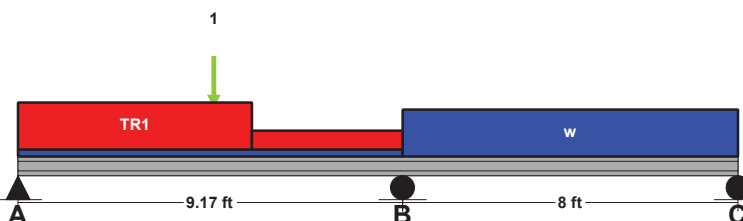
Controlling Shear: -3561 lb

At a distance d from 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:	45.97 in3	84 in3
Area (Shear):	20.15 in2	42 in2
Moment of Inertia (deflection):	141.1 in4	504 in4
Moment:	9195 ft-lb	16800 ft-lb
Shear:	-3561 lb	7420 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

	Center	Right*
Uniform Live Load	0 plf	136 plf
Uniform Dead Load	0 plf	29 plf
Beam Self Weight	9 plf	9 plf
Total Uniform Load	9 plf	174 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### POINT LOADS - CENTER SPAN

Load Number	One *
Live Load	2269 lb
Dead Load	1007 lb
Location	4.67 ft

\* Load obtained from Load Tracker. See Summary Report for details.

#### TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One *	Two *
Left Live Load	382 plf	136 plf
Left Dead Load	144 plf	29 plf
Right Live Load	382 plf	136 plf
Right Dead Load	144 plf	29 plf
Load Start	0 ft	5.58 ft
Load End	5.58 ft	9.17 ft
Load Length	5.58 ft	3.59 ft

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Wall-3rd Flr-Interior

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 3.5 IN x 9.08 FT @ 16 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 67.1%

Controlling Factor: Combined Stress Factor



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### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.12 IN = L/916

Live Load Deflection Criteria: L/180

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 533 lb

Dead Load: Vert-DL-Rxn = 261 lb

Total Load: Vert-TL-Rxn = 794 lb

### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 30 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 30 lb

### WALL DATA

Total Stud Length: 9.08 ft

Wall Dead Weight: 5 psf

Unbraced Length (X-Axis) Lx: 9.08 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor: 1.15

Lateral Load Duration Factor (Wind/Seismic): 1.33

### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 460 psi
	Cd=1.15 Cf=1.15 Cp=0.26	

Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1785 psi
	Cd=1.15 CF=1.50 Cr=1.15	

Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1785 psi
	Cd=1.15 CF=1.50 Cr=1.15	

Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
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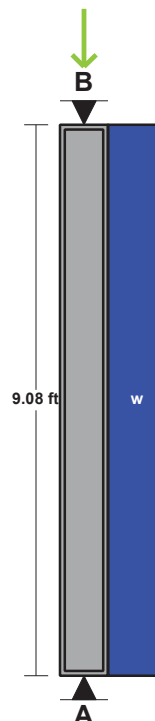
Stud Section (X-X Axis):	dx = 3.5 in
Stud Section (Y-Y Axis):	dy = 1.5 in
Area:	A = 5.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx = 3.06 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy = 1.31 in <sup>3</sup>
Slenderness Ratio:	Lex/dx = 31.13
	Ley/dy = 0

### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc = 151 psi
Allowable Compressive Stress:	Fc' = 460 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' = 1785 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1785 psi
Combined Stress Factor:	CSF = 0.33

### LOADING DIAGRAM



### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 10 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 400 plf	DL = 195.4 plf	

### AXIAL LOADING

Live Load:	PL = 400 plf *
Dead Load:	PD = 195 plf *
Total Axial Load:	PT = 595 plf

\* Load obtained from Load Tracker. See Summary Report for details.

### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 5 psf

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Wall-1st Flr-Interior

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 3.5 IN x 9.08 FT @ 8 O.C.

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 83.6%

Controlling Factor: Combined Stress Factor



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### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.06 IN = L/1833

Live Load Deflection Criteria: L/180

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 267 lb

Dead Load: Vert-DL-Rxn = 130 lb

Total Load: Vert-TL-Rxn = 397 lb

### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 15 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 15 lb

### WALL DATA

Total Stud Length: 9.08 ft

Wall Dead Weight: 5 psf

Unbraced Length (X-Axis) Lx: 9.08 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor: 1.15

Lateral Load Duration Factor (Wind/Seismic): 1.33

### STUD PROPERTIES

#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 460 psi
	Cd=1.15 Cf=1.15 Cp=0.26	

Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1785 psi
	Cd=1.15 CF=1.50 Cr=1.15	

Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1785 psi
	Cd=1.15 CF=1.50 Cr=1.15	

Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
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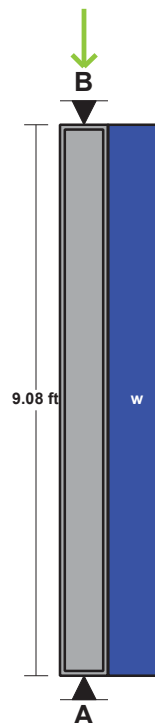
Stud Section (X-X Axis):	dx = 3.5 in
Stud Section (Y-Y Axis):	dy = 1.5 in
Area:	A = 5.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx = 3.06 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy = 1.31 in <sup>3</sup>
Slenderness Ratio:	Lex/dx = 31.13
	Ley/dy = 0

### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc = 76 psi
Allowable Compressive Stress:	Fc' = 460 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' = 1785 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1785 psi
Combined Stress Factor:	CSF = 0.16

### LOADING DIAGRAM



### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 10 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 400 plf	DL = 195.4 plf	

### AXIAL LOADING

Live Load:	PL = 400 plf *
Dead Load:	PD = 195 plf *
Total Axial Load:	PT = 595 plf

\* Load obtained from Load Tracker. See Summary Report for details.

### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 5 psf

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Wall-2nd Flr-Interior

Wall

[2015 International Building Code(2015 NDS)]

1.5 IN x 3.5 IN x 9.08 FT @ 16 O.C.

#1 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 69.3%

Controlling Factor: Combined Stress Factor



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### DEFLECTIONS

Deflection due to lateral loads only: Defl = 0.11 IN = L/974

Live Load Deflection Criteria: L/180

### VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 533 lb

Dead Load: Vert-DL-Rxn = 261 lb

Total Load: Vert-TL-Rxn = 794 lb

### HORIZONTAL REACTIONS

Total Reaction at Top of Column: TL-Rxn-Top = 30 lb

Total Reaction at Bottom of Column: TL-Rxn-Bottom = 30 lb

### WALL DATA

Total Stud Length: 9.08 ft

Wall Dead Weight: 5 psf

Unbraced Length (X-Axis) Lx: 9.08 ft

Unbraced Length (Y-Axis) Ly: 0 ft

Stud End Condition-K (e): 1

Axial Load Duration Factor: 1.15

Lateral Load Duration Factor (Wind/Seismic): 1.33

### STUD PROPERTIES

#1 - Douglas-Fir-Larch

	Base Values	Adjusted
Compressive Stress:	Fc = 1500 psi	Fc' = 493 psi

Bending Stress (X-X Axis):	Fbx = 1000 psi	Fbx' = 1984 psi
	Cd=1.15 Cf=1.15 Cp=0.25	

Bending Stress (Y-Y Axis):	Fby = 1000 psi	Fby' = 1984 psi
	Cd=1.15 CF=1.50 Cr=1.15	

Modulus of Elasticity:	E = 1700 ksi	E' = 1700 ksi
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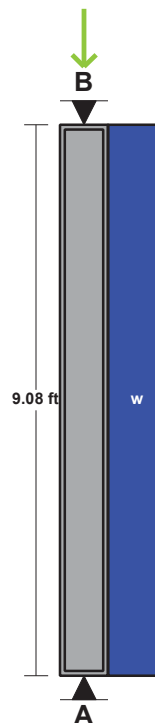
Stud Section (X-X Axis):	dx = 3.5 in
Stud Section (Y-Y Axis):	dy = 1.5 in
Area:	A = 5.25 in <sup>2</sup>
Section Modulus (X-X Axis):	Sx = 3.06 in <sup>3</sup>
Section Modulus (Y-Y Axis):	Sy = 1.31 in <sup>3</sup>
Slenderness Ratio:	Lex/dx = 31.13
	Ley/dy = 0

### Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc = 151 psi
Allowable Compressive Stress:	Fc' = 493 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' = 1984 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1984 psi
Combined Stress Factor:	CSF = 0.31

### LOADING DIAGRAM



### WALL LOAD CALCULATOR

	Live Load	Dead Load	Tributary Width
Load Tracker:	LL = 0 plf	DL = 0 plf	
Roof:	LL = 25 psf	DL = 15 psf	TA = 0 ft
Upper Floor:	LL = 40 psf	DL = 15 psf	TA = 10 ft
Upper Floor Height:	0 ft		
Middle Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft
Middle Floor Height:	0 ft		
Calculated Load:	LL = 400 plf	DL = 195.4 plf	

### AXIAL LOADING

Live Load:	PL = 400 plf *
Dead Load:	PD = 195 plf *
Total Axial Load:	PT = 595 plf

\* Load obtained from Load Tracker. See Summary Report for details.

### LATERAL LOADING (Dy Face)

Uniform Lateral Load: wL-Lat = 5 psf

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: FTG-PST-MLB2-8A

Footing

[2015 International Building Code(2015 NDS)]

Footing Size: 2.0 FT x 2.0 FT x 10.00 IN

Reinforcement: #4 Bars @ 8.00 IN. O.C. E/W / (3) min.

Section Footing Design Adequate



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#### FOOTING PROPERTIES

Allowable Soil Bearing Pressure:  $Q_s = 2500$  psf  
Concrete Compressive Strength:  $F'_c = 2500$  psi  
Reinforcing Steel Yield Strength:  $F_y = 60000$  psi  
Concrete Reinforcement Cover:  $c = 3$  in

#### FOOTING SIZE

Width:  $W = 2$  ft  
Length:  $L = 2$  ft  
Depth:  $\text{Depth} = 10$  in  
Effective Depth to Top Layer of Steel:  $d = 6.25$  in

#### COLUMN AND BASEPLATE SIZE

Column Type: Steel  
Column Width:  $m = 4$  in  
Column Depth:  $n = 4$  in  
Baseplate Width:  $bsw = 6$  in  
Baseplate Length:  $bsl = 6$  in

#### FOOTING CALCULATIONS

##### Bearing Calculations:

Ultimate Bearing Pressure:  $Q_u = 2233$  psf  
Effective Allowable Soil Bearing Pressure:  $Q_e = 2375$  psf  
Required Footing Area:  $A_{req} = 3.76$  sf  
Area Provided:  $A = 4.00$  sf

##### Baseplate Bearing:

Bearing Required:  $Bear = 12850$  lb  
Allowable Bearing:  $Bear-A = 99450$  lb

##### Beam Shear Calculations (One Way Shear):

Beam Shear:  $V_{u1} = 1740$  lb  
Allowable Beam Shear:  $V_{c1} = 11250$  lb

##### Punching Shear Calculations (Two Way Shear):

Critical Perimeter:  $B_o = 45$  in  
Punching Shear:  $V_{u2} = 10027$  lb  
Allowable Punching Shear (ACI 11-35):  $vc2-a = 63281$  lb  
Allowable Punching Shear (ACI 11-36):  $vc2-b = 79688$  lb  
Allowable Punching Shear (ACI 11-37):  $vc2-c = 42188$  lb  
Controlling Allowable Punching Shear:  $vc2 = 42188$  lb

##### Bending Calculations:

Factored Moment:  $M_u = 24161$  in-lb  
Nominal Moment Strength:  $M_n = 187693$  in-lb

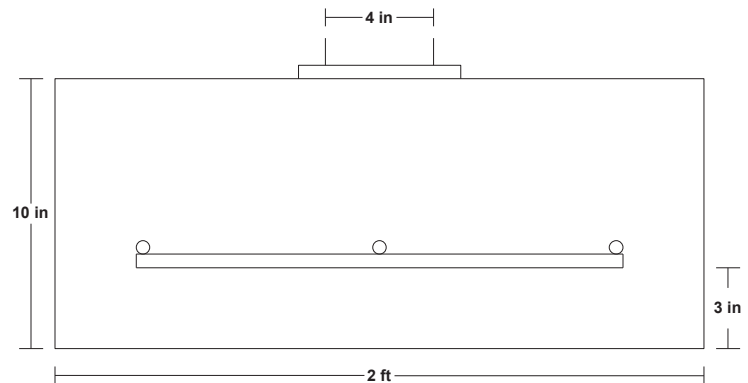
##### Reinforcement Calculations:

Concrete Compressive Block Depth:  $a = 0.69$  in  
Steel Required Based on Moment:  $As(1) = 0.07$  in<sup>2</sup>  
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):  $As(2) = 0.43$  in<sup>2</sup>  
Controlling Reinforcing Steel:  $As-reqd = 0.43$  in<sup>2</sup>  
Selected Reinforcement: #4's @ 8.0 in. o.c. e/w (3) Min.  
Reinforcement Area Provided:  $As = 0.59$  in<sup>2</sup>

##### Development Length Calculations:

Development Length Required:  $L_d = 15$  in  
Development Length Supplied:  $L_{d-sup} = 6.5$  in  
Note: Plain concrete adequate for bending,  
therefore adequate development length not required.

#### LOADING DIAGRAM



#### FOOTING LOADING

Live Load:  $PL = 5333$  lb \*  
Dead Load:  $PD = 3598$  lb \*  
Total Load:  $PT = 8931$  lb \*  
Ultimate Factored Load:  $P_u = 12850$  lb  
Footing plus soil above footing weight:  $W_t = 322$  lb  
\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: Ftg-Wall-1st-Exterior

Footing

[2015 International Building Code(2015 NDS)]

Footing Size: 16.0 IN Wide x 8.0 IN Deep Continuous Footing With 8.0 IN Thick x 18.0 IN Tall Stemwall

Longitudinal Reinforcement: (2) Continuous #4 Bars

Transverse Reinforcement: #4 Bars @ 13.00 IN. O.C. (unnecessary)

Section Footing Design Adequate



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#### FOOTING PROPERTIES

Allowable Soil Bearing Pressure:  $Q_s = 2500$  psf  
Concrete Compressive Strength:  $F'_c = 2500$  psi  
Reinforcing Steel Yield Strength:  $F_y = 60000$  psi  
Concrete Reinforcement Cover:  $c = 3$  in

#### FOOTING SIZE

Width:  $W = 16$  in  
Depth:  $\text{Depth} = 8$  in  
Effective Depth to Top Layer of Steel:  $d = 4.25$  in

#### STEMWALL SIZE

Stemwall Width: 8 in  
Stemwall Height: 18 in  
Stemwall Weight: 150 pcf

#### FOOTING CALCULATIONS

##### Bearing Calculations:

Ultimate Bearing Pressure:  $Q_u = 1973$  psf  
Effective Allowable Soil Bearing Pressure:  $Q_e = 2400$  psf  
Width Required:  $W_{req} = 1.1$  ft

##### Beam Shear Calculations (One Way Shear):

Beam Shear:  $V_{u1} = 0$  lb  
Allowable Beam Shear:  $V_{c1} = 3825$  lb

##### Transverse Direction:

##### Bending Calculations:

Factored Moment:  $M_u = 1872$  in-lb  
Nominal Moment Strength:  $M_n = 0$  in-lb

##### Reinforcement Calculations:

Concrete Compressive Block Depth:  $a = 0.41$  in  
Steel Required Based on Moment:  $A_s(1) = 0.01$  in<sup>2</sup>  
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4)  $A_s(2) = 0.17$  in<sup>2</sup>  
Controlling Reinforcing Steel:  $A_{s-reqd} = 0.17$  in<sup>2</sup>  
Selected Reinforcement: Trans: #4's @ 13.0 in. o.c.  
Reinforcement Area Provided:  $A_s = 0.17$  in<sup>2</sup>

##### Development Length Calculations:

Development Length Required:  $L_d = 15$  in  
Development Length Supplied:  $L_{d-sup} = 1$  in

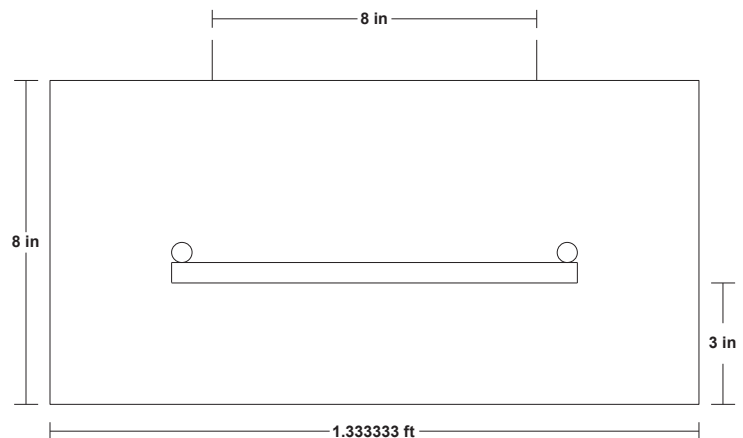
##### Longitudinal Direction:

##### Reinforcement Calculations:

Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):  $A_s(2) = 0.23$  in<sup>2</sup>  
Controlling Reinforcing Steel:  $A_{s-reqd} = 0.23$  in<sup>2</sup>  
Selected Reinforcement: Longitudinal: (2) Cont. #4 Bars  
Reinforcement Area Provided:  $A_s = 0.39$  in<sup>2</sup>

#### NOTES

#### LOADING DIAGRAM



#### FOOTING LOADING

Live Load:  $PL = 1472$  plf \*  
Dead Load:  $PD = 1008$  plf \*  
Total Load:  $PT = 2630$  plf \*  
Ultimate Factored Load:  $P_u = 3745$  plf

\* Load obtained from Load Tracker. See Summary Report for details.

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: Ftg-Wall-1st Flr-Interior

Footing

[2015 International Building Code(2015 NDS)]

Footing Size: 48.0 IN Wide x 10.0 IN Deep Continuous Footing With 11.0 IN Thick x 18.0 IN Tall Stemwall

Longitudinal Reinforcement: (5) Continuous #4 Bars

Transverse Reinforcement: #4 Bars @ 10.00 IN. O.C.

Section Footing Design Adequate



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#### FOOTING PROPERTIES

Allowable Soil Bearing Pressure:  $Q_s = 2500$  psf  
Concrete Compressive Strength:  $F'_c = 2500$  psi  
Reinforcing Steel Yield Strength:  $F_y = 60000$  psi  
Concrete Reinforcement Cover:  $c = 3$  in

#### FOOTING SIZE

Width:  $W = 48$  in  
Depth:  $\text{Depth} = 10$  in  
Effective Depth to Top Layer of Steel:  $d = 6.25$  in

#### STEMWALL SIZE

Stemwall Width: 11 in  
Stemwall Height: 18 in  
Stemwall Weight: 150 pcf

#### FOOTING CALCULATIONS

##### Bearing Calculations:

Ultimate Bearing Pressure:  $Q_u = 1215$  psf  
Effective Allowable Soil Bearing Pressure:  $Q_e = 2375$  psf  
Width Required:  $W_{req} = 2.05$  ft

##### Beam Shear Calculations (One Way Shear):

Beam Shear:  $V_u = 1789$  lb  
Allowable Beam Shear:  $V_c = 5625$  lb

##### Transverse Direction:

##### Bending Calculations:

Factored Moment:  $M_u = 24991$  in-lb  
Nominal Moment Strength:  $M_n = 0$  in-lb

##### Reinforcement Calculations:

Concrete Compressive Block Depth:  $a = 0.51$  in  
Steel Required Based on Moment:  $A_s(1) = 0.08$  in<sup>2</sup>  
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4)  $A_s(2) = 0.22$  in<sup>2</sup>  
Controlling Reinforcing Steel:  $A_{s-reqd} = 0.22$  in<sup>2</sup>  
Selected Reinforcement: Trans: #4's @ 10.0 in. o.c.  
Reinforcement Area Provided:  $A_s = 0.22$  in<sup>2</sup>

##### Development Length Calculations:

Development Length Required:  $L_d = 15$  in  
Development Length Supplied:  $L_{d-sup} = 15.5$  in

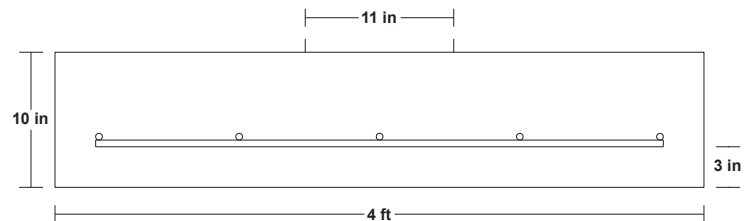
##### Longitudinal Direction:

##### Reinforcement Calculations:

Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):  $A_s(2) = 0.86$  in<sup>2</sup>  
Controlling Reinforcing Steel:  $A_{s-reqd} = 0.86$  in<sup>2</sup>  
Selected Reinforcement: Longitudinal: (5) Cont. #4 Bars  
Reinforcement Area Provided:  $A_s = 0.98$  in<sup>2</sup>

#### NOTES

#### LOADING DIAGRAM



#### FOOTING LOADING

Live Load:  $PL = 2944$  plf \*  
Dead Load:  $PD = 1710$  plf \*  
Total Load:  $PT = 4860$  plf \*  
Ultimate Factored Load:  $P_u = 7010$  plf

\* Load obtained from Load Tracker. See Summary Report for details.

Established Basic Permit #

19-03671

Permit Number: 20-04896



Project: 19-002 Framing - Duplex

Location: FTG-PST-MLB2-6B

Footing

[2015 International Building Code(2015 NDS)]

Footing Size: 2.0 FT x 2.0 FT x 10.00 IN

Reinforcement: #4 Bars @ 8.00 IN. O.C. E/W / (3) min.

Section Footing Design Adequate



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#### FOOTING PROPERTIES

Allowable Soil Bearing Pressure:  $Q_s = 2500$  psf  
Concrete Compressive Strength:  $F'_c = 2500$  psi  
Reinforcing Steel Yield Strength:  $F_y = 60000$  psi  
Concrete Reinforcement Cover:  $c = 3$  in

#### FOOTING SIZE

Width:  $W = 2$  ft  
Length:  $L = 2$  ft  
Depth:  $\text{Depth} = 10$  in  
Effective Depth to Top Layer of Steel:  $d = 6.25$  in

#### COLUMN AND BASEPLATE SIZE

Column Type: Steel  
Column Width:  $m = 4$  in  
Column Depth:  $n = 4$  in  
Baseplate Width:  $bsw = 6$  in  
Baseplate Length:  $bsl = 6$  in

#### FOOTING CALCULATIONS

##### Bearing Calculations:

Ultimate Bearing Pressure:  $Q_u = 1300$  psf  
Effective Allowable Soil Bearing Pressure:  $Q_e = 2375$  psf  
Required Footing Area:  $A_{req} = 2.19$  sf  
Area Provided:  $A = 4.00$  sf

##### Baseplate Bearing:

Bearing Required:  $Bear = 7731$  lb  
Allowable Bearing:  $Bear-A = 99450$  lb

##### Beam Shear Calculations (One Way Shear):

Beam Shear:  $V_{u1} = 1047$  lb  
Allowable Beam Shear:  $V_{c1} = 11250$  lb

##### Punching Shear Calculations (Two Way Shear):

Critical Perimeter:  $B_o = 45$  in  
Punching Shear:  $V_{u2} = 6032$  lb  
Allowable Punching Shear (ACI 11-35):  $vc2-a = 63281$  lb  
Allowable Punching Shear (ACI 11-36):  $vc2-b = 79688$  lb  
Allowable Punching Shear (ACI 11-37):  $vc2-c = 42188$  lb  
Controlling Allowable Punching Shear:  $vc2 = 42188$  lb

##### Bending Calculations:

Factored Moment:  $M_u = 14536$  in-lb  
Nominal Moment Strength:  $M_n = 187693$  in-lb

##### Reinforcement Calculations:

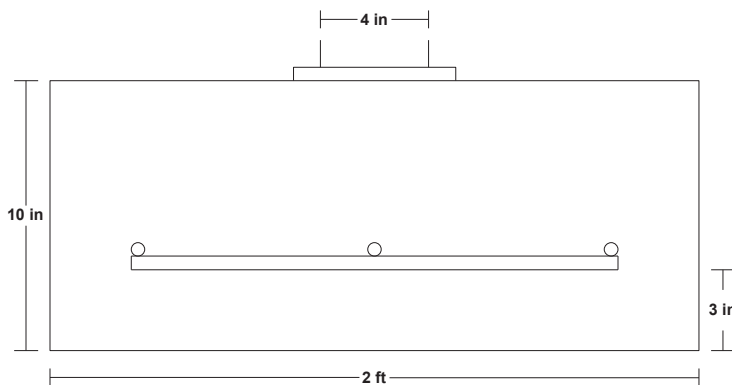
Concrete Compressive Block Depth:  $a = 0.69$  in  
Steel Required Based on Moment:  $As(1) = 0.04$  in<sup>2</sup>  
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):  $As(2) = 0.43$  in<sup>2</sup>  
Controlling Reinforcing Steel:  $As-reqd = 0.43$  in<sup>2</sup>  
Selected Reinforcement: #4's @ 8.0 in. o.c. e/w (3) Min.  
Reinforcement Area Provided:  $As = 0.59$  in<sup>2</sup>

##### Development Length Calculations:

Development Length Required:  $L_d = 15$  in  
Development Length Supplied:  $L_{d-sup} = 6.5$  in

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

#### LOADING DIAGRAM



#### FOOTING LOADING

Live Load:  $PL = 3724$  lb \*  
Dead Load:  $PD = 1477$  lb \*  
Total Load:  $PT = 5201$  lb \*  
Ultimate Factored Load:  $P_u = 7731$  lb  
Footing plus soil above footing weight:  $W_t = 322$  lb

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB2-4

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 11.875 IN x 9.33 FT

1.55E Timberstrand LSL - iLevel Trus Joist

Section Adequate By: 148.9%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.05 IN L/2240

Dead Load 0.08 in

Total Load 0.13 IN L/844

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

#### REACTIONS

A

B

Live Load 1036 lb 1036 lb

Dead Load 1712 lb 1712 lb

Total Load 2748 lb 2748 lb

Bearing Length 0.87 in 0.87 in

#### BEAM DATA

Center

Span Length 9.33 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 9.33 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

1.55E Timberstrand LSL - iLevel Trus Joist

	Base Values	Adjusted
Bending Stress:	$F_b = 2325 \text{ psi}$ $C_d=1.00 \text{ CF}=1.00$	$F_b' = 2327 \text{ psi}$

Shear Stress:	$F_v = 310 \text{ psi}$ $C_d=1.00$	$F_v' = 310 \text{ psi}$
---------------	---------------------------------------	--------------------------

Modulus of Elasticity:	$E = 1550 \text{ ksi}$	$E' = 1550 \text{ ksi}$
Comp. $\perp$ to Grain:	$F_c - \perp = 900 \text{ psi}$	$F_c - \perp' = 900 \text{ psi}$

Controlling Moment: 6409 ft-lb

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

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

Controlling Shear: -2198 lb

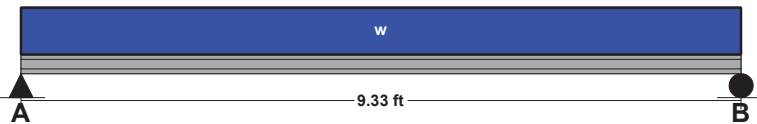
At a distance d from right support of span 2 (Center Span)

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

#### Comparisons with required sections:

	Req'd	Provided
Section Modulus:	33.05 in <sup>3</sup>	82.26 in <sup>3</sup>
Area (Shear):	10.64 in <sup>2</sup>	41.56 in <sup>2</sup>
Moment of Inertia (deflection):	138.86 in <sup>4</sup>	488.41 in <sup>4</sup>
Moment:	6409 ft-lb	15953 ft-lb
Shear:	-2198 lb	8590 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 222 plf

Uniform Dead Load 354 plf

Beam Self Weight 13 plf

Total Uniform Load 589 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: MLB2-9

Multi-Loaded Multi-Span Beam

[2015 International Building Code(2015 NDS)]

3.5 IN x 11.875 IN x 9.0 FT

1.55E Timberstrand LSL - iLevel Trus Joist

Section Adequate By: 20.2%

Controlling Factor: Moment



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#### DEFLECTIONS

Center

Live Load 0.15 IN L/710

Dead Load 0.10 in

Total Load 0.26 IN L/423

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

#### REACTIONS

A

B

Live Load 3510 lb 3510 lb

Dead Load 2389 lb 2389 lb

Total Load 5899 lb 5899 lb

Bearing Length 1.87 in 1.87 in

#### BEAM DATA

Center

Span Length 9 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 9 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

#### MATERIAL PROPERTIES

1.55E Timberstrand LSL - iLevel Trus Joist

	Base Values	Adjusted
Bending Stress:	$F_b = 2325 \text{ psi}$ $C_d=1.00 \text{ CF}=1.00$	$F_b' = 2327 \text{ psi}$

Shear Stress:	$F_v = 310 \text{ psi}$ $C_d=1.00$	$F_v' = 310 \text{ psi}$
---------------	---------------------------------------	--------------------------

Modulus of Elasticity:	$E = 1550 \text{ ksi}$	$E' = 1550 \text{ ksi}$
------------------------	------------------------	-------------------------

Comp. $\perp$ to Grain:	$F_c - \perp = 900 \text{ psi}$	$F_c - \perp' = 900 \text{ psi}$
-------------------------	---------------------------------	----------------------------------

Controlling Moment: 13274 ft-lb

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

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

Controlling Shear: 4720 lb

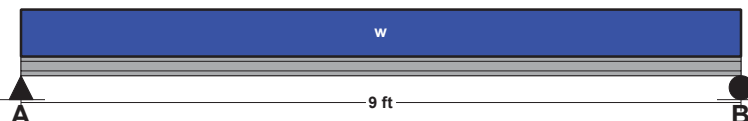
At a distance d from left support of span 2 (Center Span)

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

#### Comparisons with required sections:

	Req'd	Provided
Section Modulus:	68.44 in <sup>3</sup>	82.26 in <sup>3</sup>
Area (Shear):	22.84 in <sup>2</sup>	41.56 in <sup>2</sup>
Moment of Inertia (deflection):	277.42 in <sup>4</sup>	488.41 in <sup>4</sup>
Moment:	13274 ft-lb	15953 ft-lb
Shear:	4720 lb	8590 lb

#### LOADING DIAGRAM



#### UNIFORM LOADS

Center\*

Uniform Live Load 780 plf

Uniform Dead Load 518 plf

Beam Self Weight 13 plf

Total Uniform Load 1311 plf

\* Load obtained from Load Tracker. See Summary Report for details.

#### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Project: 19-002 Framing - Duplex

Location: PST-MLB2-7

Column

[2015 International Building Code(2015 NDS)]

( 2 ) 1.5 IN x 3.5 IN x 9.08 FT

#2 - Douglas-Fir-Larch - Dry Use

Section Adequate By: 78.9%



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### CAUTIONS

\* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

### VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	382 lb
Dead Load:	Vert-DL-Rxn =	74 lb
Total Load:	Vert-TL-Rxn =	456 lb

### COLUMN DATA

Total Column Length:	9.08 ft
Unbraced Length (X-Axis) Lx:	9.08 ft
Unbraced Length (Y-Axis) Ly:	9.08 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

### COLUMN PROPERTIES

#2 - Douglas-Fir-Larch

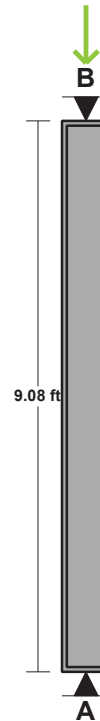
	Base Values	Adjusted
Compressive Stress:	Fc = 1350 psi	Fc' = 205 psi
	Cd=1.00 Cf=1.15 Cp=0.13	
Bending Stress (X-X Axis):	Fbx = 900 psi	Fbx' = 1350 psi
	Cd=1.00 CF=1.50	
Bending Stress (Y-Y Axis):	Fby = 900 psi	Fby' = 1350 psi
	Cd=1.00 CF=1.50	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 10.5 in <sup>2</sup>	
Section Modulus (X-X Axis):	Sx = 6.13 in <sup>3</sup>	
Section Modulus (Y-Y Axis):	Sy = 2.63 in <sup>3</sup>	
Slenderness Ratio:	Lex/dx = 31.13	
	Ley/dy = 36.32	

### Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	43 psi
Allowable Compressive Stress:	Fc' =	205 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' =	1350 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1350 psi
Combined Stress Factor:	CSF =	0.21

### LOADING DIAGRAM



### AXIAL LOADING

Live Load:	PL =	382 lb *
Dead Load:	PD =	53 lb *
Column Self Weight:	CSW =	21 lb
Total Axial Load:	PT =	456 lb

\* Load obtained from Load Tracker. See Summary Report for details.

### NOTES

Established Basic Permit #

19-03671

Permit Number: 20-04896

Pacific Northwest Structural  
Group, LLC

Project:	Red Barn Lane - Duplex 1880/1620	By:	DLS
Location:	NW Hogan Ln & Nels Nelson Rd NW, Bremerton, WA 98311	Project No.:	19-002
Client:	Envision Northwest, LLC	Last Update:	22-Feb-19
AWC SDPWS-2008 - Wood Shear Wall Design Aid ALLOWABLE STRESS DESIGN			

Mark	Sheathing Type, Nail Size, Panel Edges Fastener Spacing, & Capacity	Capacity (plf)
A	15/32" Sheathing W/ 8d @ 6" oc	365
B	15/32" Sheathing W/ 8d @ 4" oc	533
C	15/32" Sheathing W/ 8d @ 3" oc	685
	None	#N/A
	None	#N/A
	None	#N/A

Mark	Simpson Strong-Tie Holdowns	Capacity (lb)	Holdown Deflection at Highest Load (in)
①	HDU2-SDS2.5 W/ 3" Post	3,075	0.088
②	HDU5-SDS2.5 W/ 3" Post	5,645	0.115
○	None	N/A	N/A
○	None	N/A	N/A
○	None	N/A	N/A
○	None	N/A	N/A
○	None	N/A	N/A
○	None	N/A	N/A
○	None	N/A	N/A
○	None	N/A	N/A
○	None	N/A	N/A
○	None	N/A	N/A

○ SEISMIC  
● WIND

Shear Wall Deflection		
G	90,000	psi
E	1,200,000	psi
A	8.25	in <sup>2</sup>

Established Basic Permit #

19-03671

C:\Users\dstal\Dropbox\PNW Project Files\2019 Projects\19-002 Red Barn Lane Single Family & Duplex\ENGR\19-002 Timber Shear Wall 2018 - Duplex.xlsx\Shear Wall & Hold Down Schedule 6/21/2019 4:08 PM

Permit Number: 20-04896

3rd Level									
Lateral Trib. Width	ft	10.0	Shearwall Type						
V from above	k	-	A						
Uniform v this level	psf	101.3							
Total Wall Length	ft	31.92							
V this level	k	1.0							
V accum	k	1.0							
Unit Wall Shear	psf	32							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.09							
Apparent Stiffness, Ga	K/ft	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	8.08	8.08	8.08	8.08	8.08	-		
Length	ft	6.00	8.25	3.92	6.92	6.83	-		
Diaphragm Ratio		1.35	0.98	2.06	1.17	1.16	-		
Modified Capacity		365	365	365	365	365	NA		
M <sub>OT</sub>	k-ft	1.5	2.1	1.0	1.8	1.8	-		
M <sub>OT</sub> accum	k-ft	1.5	2.1	1.0	1.8	1.8	-		
Shear Wall Deflection									
A <sub>B</sub>	in	0.027	0.020	0.041	0.023	0.024	-		
A <sub>V</sub>	in	0.246	0.246	0.246	0.246	0.246	-		
A <sub>HD</sub>	in	-	-	-	-	-	-		
A <sub>SW</sub>	in	0.273	0.265	0.287	0.269	0.270	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	-	-	-	-	-	-		
Distr Wall Wt	psf	11.0	11.0	11.0	11.0	11.0	-		
Trib above	ft	11.0	11.0	11.0	11.0	11.0	-		
Wts. Above	psf	15.0	15.0	15.0	15.0	15.0	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts.	ft	-	-	-	-	-	-		
Wts. to take	psf	-	-	-	-	-	-		
Perp. Wall	ft	6.00	8.25	3.92	6.92	6.83	-		
Wt of wall	lb	350	350	375	350	350	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	6.67	11.53	3.42	8.50	8.31	-		
M <sub>R</sub> accum	k-ft	6.67	11.53	3.42	8.50	8.31	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>E</sub> accum	k	1.11	1.40	0.87	1.23	1.22	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	-	-	-	-	-	-		
HD Capacity	k	-	-	-	-	-	-		
Hold Down Type		-	-	-	-	-	-		

2nd Level									
Lateral Trib. Width	ft	10.0	Shearwall Type						
V from above	k	1.0	A						
Uniform v this level	psf	96.1							
Total Wall Length	ft	30.42							
V this level	k	1.0							
V accum	k	2.0							
Unit Wall Shear	psf	65							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.18							
Apparent Stiffness, Ga	K/ft	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	9.08	9.08	9.08	9.08	9.08	-		
Length	ft	6.00	4.00	4.17	9.42	6.83	-		
Diaphragm Ratio		1.51	2.27	2.18	0.96	1.53	-		
Modified Capacity		365	365	365	365	365	NA		
M <sub>OT</sub>	k-ft	3.5	2.4	2.5	5.6	4.0	-		
M <sub>OT</sub> accum	k-ft	5.1	4.5	3.5	7.3	5.8	-		
Shear Wall Deflection									
A <sub>B</sub>	in	0.079	0.116	0.113	0.050	0.069	-		
A <sub>V</sub>	in	0.276	0.276	0.276	0.276	0.276	-		
A <sub>HD</sub>	in	-	-	-	-	-	-		
A <sub>SW</sub>	in	0.355	0.394	0.389	0.326	0.345	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	6.7	11.5	3.4	8.5	8.3	-		
Distr Wall Wt	psf	11.0	11.0	11.0	11.0	11.0	-		
Trib above	ft	10.0	10.0	10.0	10.0	10.0	-		
Wts. Above	psf	15.0	15.0	15.0	15.0	15.0	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts.	ft	-	-	-	-	-	-		
Wts. to take	psf	-	-	-	-	-	-		
Perp. Wall	ft	6.00	4.00	4.17	9.42	6.83	-		
Wt of wall	lb	500	-	650	500	500	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	7.50	2.00	4.88	15.80	9.24	-		
M <sub>R</sub> accum	k-ft	14.17	13.53	8.30	24.30	17.56	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>E</sub> accum	k	2.36	3.36	1.99	2.58	2.57	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	-	-	-	-	-	-		
HD Capacity	k	-	-	-	-	-	-		
Hold Down Type		-	-	-	-	-	-		

1st Level									
Lateral Trib. Width	ft	10.0	Shearwall Type						
V from above	k	2.0	A						
Uniform v this level	psf	96.1							
Total Wall Length	ft	36.75							
V this level	k	1.0							
V accum	k	2.8							
Unit Wall Shear	psf	80							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.22							
Apparent Stiffness, Ga	K/ft	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	5.1	4.5	3.5	7.3	5.8	-		
Length	ft	9.08	-	9.08	9.08	9.08	-		
Diaphragm Ratio		14.33	-	6.17	9.42	6.83	-		
Modified Capacity		365	NA	365	365	365	NA		
M <sub>OT</sub>	k-ft	10.4	-	4.5	6.8	5.0	-		
M <sub>OT</sub> accum	k-ft	15.5	4.5	7.9	14.2	10.7	-		
Shear Wall Deflection									
A <sub>B</sub>	in	0.040	-	0.094	0.062	0.085	-		
A <sub>V</sub>	in	0.276	-	0.276	0.276	0.276	-		
A <sub>HD</sub>	in	-	-	-	-	-	-		
A <sub>SW</sub>	in	0.317	-	0.370	0.338	0.361	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	14.2	13.5	8.3	24.3	17.6	-		
Distr Wall Wt	psf	11.0	-	11.0	11.0	11.0	-		
Trib above	ft	10.0	-	10.0	10.0	10.0	-		
Wts. Above	psf	15.0	-	15.0	15.0	15.0	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts.	ft	-	-	-	-	-	-		
Wts. to take	psf	-	-	-	-	-	-		
Perp. Wall	ft	11.50	-	6.17	9.42	6.83	-		
Wt of wall	lb	250	-	250	250	250	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	28.53	-	6.30	13.44	7.54	-		
M <sub>R</sub> accum	k-ft	42.70	13.53	14.60	37.74	25.09	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>E</sub> accum	k	2.98	-	2.37	4.01	3.67	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	-	-	-	-	-	-		
HD Capacity	k	-	-	-	-	-	-		
Hold Down Type		-	-	-	-	-	-		

Project:		Red Barn Lane - Duplex 1880/1620							
Location:		LF-1							
Client:		Envision Northwest, LLC							
Wood Shear Wall Design Aid		Comments:							
By:		DLS							
Job No.:		19-002							
Last Update:		22 Feb-2019							

3rd Level									
Lateral Trib. Width	ft	20.0	Shearwall Type						
V from above	k	-	A						
Uniform v this level	psf	101.3							
Total Wall Length	ft	24.00							
V this level	k	2.0							
V accum	k	2.0							
Unit Wall Shear	psf	54							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.23							
Apparent Stiffness, Ga	K/in	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	8.08	8.08	-	-	-	-		
Length	ft	12.00	12.00	-	-	-	-		
Diaphragm Ratio		0.67	0.67	-	-	-	-		
Modified Capacity		365	365	NA	NA	NA	NA		
M <sub>OT</sub>	k-ft	8.2	8.2	-	-	-	-		
M <sub>OT</sub> accum	k-ft	8.2	8.2	-	-	-	-		
Shear Wall Deflection									
Δ <sub>B</sub>	in	0.036	0.036	-	-	-	-		
Δ <sub>V</sub>	in	0.246	0.246	-	-	-	-		
Δ <sub>HD</sub>	in	-	-	-	-	-	-		
Δ <sub>SW</sub>	in	0.282	0.282	-	-	-	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	-	-	-	-	-	-		
Distr Wall Wt	psf	11.0	11.0	-	-	-	-		
Trib above	ft	10.0	10.0	-	-	-	-		
Wts	psf	15.0	15.0	-	-	-	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp Wall	psf	-	-	-	-	-	-		
Dist to wall	ft	12.00	12.00	-	-	-	-		
Wt of wall	lb	350	350	-	-	-	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	21.40	21.40	-	-	-	-		
M <sub>R</sub> accum	k-ft	21.40	21.40	-	-	-	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>g</sub> accum		1.78	1.78	-	-	-	-		
HD Offset		-	-	-	-	-	-		
HD Force		-	-	-	-	-	-		
HD Capacity		-	-	-	-	-	-		
Hold Down Type		-	-	-	-	-	-		
Project:		Red Barn Lane - Duplex 1 & 2 / 620							
Location:		LF-2							
Client:		Envision Northwest, LLC							
Wood Shear Wall Design Aid									
Comments:									

2nd Level									
Lateral Trib. Width	ft	20.0	Shearwall Type						
V from above	k	2.0	A						
Uniform v this level	psf	96.1							
Total Wall Length	ft	24.00							
V this level	k	1.9							
V accum	k	3.9							
Unit Wall Shear	psf	165							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.45							
Apparent Stiffness, Ga	K/in	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	8.2	8.2	-	-	-	-		
Length	ft	9.08	9.08	9.08	9.08	9.08	-		
Diaphragm Ratio		0.76	0.76	-	-	-	-		
Modified Capacity		365	365	NA	NA	NA	NA		
M <sub>OT</sub>	k-ft	17.9	17.9	-	-	-	-		
M <sub>OT</sub> accum	k-ft	26.1	26.1	-	-	-	-		
Shear Wall Deflection									
Δ <sub>B</sub>	in	0.100	0.100	-	-	-	-		
Δ <sub>V</sub>	in	0.276	0.276	-	-	-	-		
Δ <sub>HD</sub>	in	-	-	-	-	-	-		
Δ <sub>SW</sub>	in	0.376	0.376	-	-	-	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	21.4	21.4	-	-	-	-		
Distr Wall Wt	psf	11.0	11.0	-	-	-	-		
Trib above	ft	10.0	10.0	-	-	-	-		
Wts	psf	15.0	15.0	-	-	-	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp Wall	psf	-	-	-	-	-	-		
Dist to wall	ft	12.00	12.00	-	-	-	-		
Wt of wall	lb	500	500	-	-	-	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	23.99	23.99	-	-	-	-		
M <sub>R</sub> accum	k-ft	45.39	45.39	-	-	-	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>g</sub> accum		3.78	3.78	-	-	-	-		
HD Offset		-	-	-	-	-	-		
HD Force		-	-	-	-	-	-		
HD Capacity		-	-	-	-	-	-		
Hold Down Type		-	-	-	-	-	-		
By:		DLS							
Job No.:		19-002							
Last Update: 22-Feb-2019									

1st Level									
Lateral Trib. Width	ft	20.0	Shearwall Type						
V from above	k	3.9	A						
Uniform v this level	psf	96.1							
Total Wall Length	ft	24.00							
V this level	k	1.9							
V accum	k	5.8							
Unit Wall Shear	psf	245							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.67							
Apparent Stiffness, Ga	K/in	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	26.1	26.1	-	-	-	-		
Length	ft	12.00	12.00	-	-	-	-		
Diaphragm Ratio		0.76	0.76	-	-	-	-		
Modified Capacity		365	365	NA	NA	NA	NA		
M <sub>OT</sub>	k-ft	26.6	26.6	-	-	-	-		
M <sub>OT</sub> accum	k-ft	52.8	52.8	-	-	-	-		
Shear Wall Deflection									
Δ <sub>B</sub>	in	0.148	0.148	-	-	-	-		
Δ <sub>V</sub>	in	0.276	0.276	-	-	-	-		
Δ <sub>HD</sub>	in	0.067	0.067	-	-	-	-		
Δ <sub>SW</sub>	in	0.491	0.491	-	-	-	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	45.4	45.4	-	-	-	-		
Distr Wall Wt	psf	11.0	11.0	-	-	-	-		
Trib above	ft	10.0	10.0	-	-	-	-		
Wts	psf	15.0	15.0	-	-	-	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp Wall	psf	-	-	-	-	-	-		
Dist to wall	ft	10.00	10.00	-	-	-	-		
Wt of wall	lb	750	750	-	-	-	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	25.49	25.49	-	-	-	-		
M <sub>R</sub> accum	k-ft	70.88	70.88	-	-	-	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>g</sub> accum		5.91	5.91	-	-	-	-		
HD Offset		-	-	-	-	-	-		
HD Force		0.85	0.85	-	-	-	-		
HD Capacity		3.08	3.08	-	-	-	-		
Hold Down Type		I	I	-	-	-	-		

Established Basic Permit #

19-03671

Permit Number: 20-04896

3rd Level									
Lateral Trib. Width	ft	10.0	Shearwall Type						
V from above	k	-	A						
Uniform v this level	psf	101.3							
Total Wall Length	ft	32.41							
V this level	k	1.0							
V accum	k	1.0							
Unit Wall Shear	psf	31							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.09							
Apparent Stiffness, Ga	K/in	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	8.08	-	8.08	-	8.08	-		
Length	ft	9.00	-	11.83	-	11.58	-		
Diaphragm Ratio		0.90	-	0.68	-	0.70	-		
Modified Capacity		365	NA	365	NA	365	NA		
M <sub>OT</sub>	k-ft	2.3	-	3.0	-	2.9	-		
M <sub>OT</sub> accum	k-ft	2.3	-	3.0	-	2.9	-		
Shear Wall Deflection									
A <sub>B</sub>	in	0.018	-	0.014	-	0.014	-		
A <sub>V</sub>	in	0.246	-	0.246	-	0.246	-		
A <sub>HD</sub>	in	-	-	-	-	-	-		
A <sub>SW</sub>	in	0.264	-	0.259	-	0.260	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	-	-	-	-	-	-		
Distr Wall Wt	psf	11.0	-	11.0	-	11.0	-		
Trib above	ft	11.0	-	11.0	-	11.0	-		
Wts	psf	15.0	-	15.0	-	15.0	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts	ft	-	-	-	-	-	-		
Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp Wall	ft	9.00	-	11.83	-	-	-		
Wt of wall	lb	-	-	-	-	-	-		
Wts	lb	-	-	-	-	-	-		
Dist to wall	ft	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	10.28	-	17.77	-	17.02	-		
M <sub>R</sub> accum	k-ft	10.28	-	17.77	-	17.02	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>e</sub> accum	k	1.14	-	1.50	-	1.47	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	-	-	-	-	-	-		
HD Capacity	k	-	-	-	-	-	-		
Hold Down Type		-	-	-	-	-	-		

2nd Level									
Lateral Trib. Width	ft	10.0	Shearwall Type						
V from above	k	1.0	A						
Uniform v this level	psf	96.1							
Total Wall Length	ft	23.24							
V this level	k	1.0							
V accum	k	2.0							
Unit Wall Shear	psf	85							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.23							
Apparent Stiffness, Ga	K/in	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	9.06	-	9.06	-	9.06	-		
Length	ft	2.75	-	4.33	-	4.58	-		
Diaphragm Ratio		3.30	-	2.10	-	1.98	-		
Modified Capacity		365	NA	365	365	365	NA		
M <sub>OT</sub>	k-ft	2.1	-	3.3	-	3.5	-		
M <sub>OT</sub> accum	k-ft	4.4	-	6.3	-	3.5	-		
Shear Wall Deflection									
A <sub>B</sub>	in	0.224	-	0.142	-	0.135	-		
A <sub>V</sub>	in	0.276	-	0.276	-	0.276	-		
A <sub>HD</sub>	in	-	-	-	-	0.174	-		
A <sub>SW</sub>	in	0.500	-	0.419	-	0.585	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	10.3	-	17.8	-	17.0	-		
Distr Wall Wt	psf	11.0	-	11.0	-	11.0	-		
Trib above	ft	11.0	-	11.0	-	11.0	-		
Wts	psf	15.0	-	15.0	-	15.0	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts	ft	-	-	-	-	-	-		
Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp Wall	ft	2.75	-	4.33	-	4.58	-		
Wt of wall	lb	500	-	500	-	500	-		
Wts	lb	-	-	-	-	-	-		
Dist to wall	ft	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	2.38	-	4.65	-	5.07	-		
M <sub>R</sub> accum	k-ft	12.66	-	22.41	-	5.07	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>e</sub> accum	k	4.60	-	5.18	-	1.11	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	-	-	-	-	0.11	-		
HD Capacity	k	-	-	-	-	3.08	-		
Hold Down Type		-	-	-	I	-	-		

1st Level									
Lateral Trib. Width	ft	10.0	Shearwall Type						
V from above	k	2.0	A						
Uniform v this level	psf	96.1							
Total Wall Length	ft	36.63							
V this level	k	1.0							
V accum	k	2.8							
Unit Wall Shear	psf	80							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.22							
Apparent Stiffness, Ga	K/in	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	8.08	-	8.08	-	8.08	-		
Length	ft	16.33	-	2.58	-	17.92	-		
Diaphragm Ratio		0.49	-	3.13	-	0.45	-		
Modified Capacity		365	NA	365	NA	365	NA		
M <sub>OT</sub>	k-ft	10.5	-	1.7	-	11.5	-		
M <sub>OT</sub> accum	k-ft	14.9	-	8.0	-	3.5	-		
Shear Wall Deflection									
A <sub>B</sub>	in	0.025	-	0.158	-	0.023	-		
A <sub>V</sub>	in	0.246	-	0.246	-	0.246	-		
A <sub>HD</sub>	in	-	-	-	-	-	-		
A <sub>SW</sub>	in	0.271	-	0.404	-	0.269	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	12.7	-	22.4	-	5.1	-		
Distr Wall Wt	psf	11.0	-	11.0	-	11.0	-		
Trib above	ft	11.0	-	11.0	-	11.0	-		
Wts	psf	15.0	-	15.0	-	15.0	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End Wts	ft	-	-	-	-	-	-		
Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp Wall	ft	17.00	-	2.58	-	17.92	-		
Wt of wall	lb	1,000	-	1,000	-	1,000	-		
Wts	lb	-	-	-	-	-	-		
Dist to wall	ft	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	50.85	-	3.42	-	56.68	-		
M <sub>R</sub> accum	k-ft	63.51	-	25.84	-	5.07	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>e</sub> accum	k	3.89	-	10.01	-	5.54	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	-	-	-	-	-	-		
HD Capacity	k	-	-	-	-	-	-		
Hold Down Type		-	-	-	-	-	-		

Project: Red Barn Lane - Duplex 1880/1620			By: DLS		
Location: LP-3			Job No.: 19-002		
Client: Envision Northwest, LLC			Last Update: 22 Feb-2019		
Wood Shear Wall Design Aid			Comments: See Perforated Shear Calculations		



2nd Level								
Lateral Trib. Width	ft	20.5	<div>Shearwall Type</div> <div>A</div>					
V from above	k	-						
Uniform v this level	plf	132.0						
Total Wall Length	ft	16.34						
V this level	k	2.7						
V accum.	k	2.7						
Unit Wall Shear	plf	166						
Shear Wall Capacity	plf	365						
Demand vs. Capacity Ratio		0.45						
Apparent Stiffness, Ga	K/in	10.00						
Overturning Moment								
		Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6	
M <sub>OT</sub> from above	k-ft	-	-	-	-	-	-	
Story Ht	ft	8.08	8.08	8.08	8.08	-	-	
Length	ft	4.50	4.50	3.67	3.67	-	-	
Diaphragm Ratio		1.80	1.80	2.20	2.20	-	-	
Modified Capacity		365	365	365	365	NA	NA	
M <sub>OT</sub>	k-ft	6.0	6.0	4.9	4.9	-	-	
M <sub>OT</sub> accum	k-ft	6.0	6.0	4.9	4.9	-	-	
Shear Wall Deflection								
Δ <sub>B</sub>	in	0.188	0.188	0.231	0.231	-	-	
Δ <sub>V</sub>	in	0.246	0.246	0.246	0.246	-	-	
Δ <sub>HD</sub>	in	0.158	0.158	0.194	0.194	-	-	
Δ <sub>SW</sub>	in	0.592	0.592	0.670	0.670	-	-	
Resisting Moment								
M <sub>R</sub> from above	k-ft	-	-	-	-	-	-	
Distr.	Wall Wt	psf	11.0	11.0	11.0	-	-	
Wts.	Trib above	ft	6.0	6.0	6.0	-	-	
	Wt above	psf	15.0	15.0	15.0	-	-	
End Wts.	Hdr. Trib	ft	-	-	-	-	-	
	trib to hdr	ft	-	-	-	-	-	
Perp. Wall Wts.	Wt to hdr	psf	-	-	-	-	-	
	Dist to wall	ft	4.50	4.50	3.67	3.67	-	-
Wts.	Wt of wall	lb	250	250	250	250	-	-
	Dist to wall	ft	-	-	-	-	-	-
Wts.	Wt of wall	lb	-	-	-	-	-	-
M <sub>R</sub> this level	k-ft	2.94	2.94	2.12	2.12	-	-	
M <sub>R</sub> accum	k-ft	2.94	2.94	2.12	2.12	-	-	
Hold Down Forces								
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60	
T <sub>R</sub> accum	k	0.65	0.65	0.58	0.58	-	-	
HD Offset	ft	-	-	-	-	-	-	
HD Force	k	0.95	0.95	0.99	0.99	-	-	
HD Capacity	k	3.08	3.08	3.08	3.08	-	-	
Hold Down Type		<div>I</div>	<div>I</div>	<div>I</div>	<div>I</div>	<div>-</div>	<div>-</div>	
		Project:	Red Barn Lane - Duplex 1880/1620					
		Location:	(Enter Shear Wall Line)					
		Client:	Envision Northwest, LLC					
		Wood Shear Wall Design Aid						

1st Level							
Lateral Trib. Width	ft	20.5	<div>Shearwall Type</div> <div>C</div>				
V from above	k	2.7					
Uniform v this level	plf	178.9					
Total Wall Length	ft	10.66					
V this level	k	3.7					
V accum.	k	6.4					
Unit Wall Shear	plf	598					
Shear Wall Capacity	plf	685					
Demand vs. Capacity Ratio		0.87					
Apparent Stiffness, Ga	K/in	15.00					
Overturning Moment							
		Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6
M <sub>OT</sub> from above	k-ft	-	-	-	-	-	-
Story Ht	ft	9.09	9.09	9.09	9.09	-	-
Length	ft	3.58	3.58	1.75	1.75	-	-
Diaphragm Ratio		2.54	2.54	5.19	5.19	-	-
Modified Capacity		685	685	685	685	NA	NA
M <sub>OT</sub>	k-ft	19.5	19.5	9.5	9.5	-	-
M <sub>OT</sub> accum	k-ft	19.5	19.5	9.5	9.5	-	-
Shear Wall Deflection							
Δ <sub>B</sub>	in	1.216	1.216	2.488	2.488	-	-
Δ <sub>V</sub>	in	0.519	0.519	0.519	0.519	-	-
Δ <sub>HD</sub>	in	0.292	0.292	0.597	0.597	-	-
Δ <sub>SW</sub>	in	2.027	2.027	3.605	3.605	-	-
Resisting Moment							
M <sub>R</sub> from above	k-ft	2.9	2.9	2.1	2.1	-	-
Distr.	Wall Wt	psf	11.0	11.0	11.0	-	-
	Trib above	ft	6.0	6.0	6.0	-	-
Wts.	Wt above	psf	15.0	15.0	15.0	-	-
End	Hdr. Trib	ft	-	-	-	-	-
Wts.	trib to hdr	ft	-	-	-	-	-
	Wt to hdr	psf	-	-	-	-	-
Perp.	Dist to wall	ft	3.58	3.58	1.75	1.83	-
Wall	Wt of wall	lb	500	500	500	500	-
Wts.	Dist to wall	ft	-	-	-	-	-
	Wt of wall	lb	-	-	-	-	-
M <sub>R</sub> this level	k-ft	3.01	3.01	1.17	1.21	-	-
M <sub>R</sub> accum	k-ft	5.94	5.94	3.29	3.33	-	-
Hold Down Forces							
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60
T <sub>R</sub> accum	k	1.66	1.66	1.88	1.90	-	-
HD Offset	ft	-	-	-	-	-	-
HD Force	k	4.44	4.44	4.31	4.29	-	-
HD Capacity	k	5.65	5.65	5.65	5.65	-	-
Hold Down Type		②	②	②	②	-	-
					By:	DLS	
					Job No.:	19-002	
					Last Update:	22-Feb-19	
Comments:		See Perforated Shear Calculations & FTAD for 2nd Floor					

Established Basic Permit #

19-03671

Permit Number: 20-04896

3rd Level									
Lateral Trib. Width	ft	20.5		<div>A</div>					
V from above	k	132.0							
Uniform v this level	psf	19.42							
Total Wall Length	ft	2.7							
V this level	k	2.7							
V accum	k	1.39							
Unit Wall Shear	psf	365							
Shear Wall Capacity	psf	0.38							
Demand vs. Capacity Ratio		10.00							
Apparent Stiffness, Ga	K/in	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	8.08	8.08	8.08	8.08	-	-		
Length	ft	4.00	3.92	3.00	8.50	-	-		
Diaphragm Ratio		2.02	2.06	2.69	0.95	-	-		
Modified Capacity		365	365	365	365	NA	NA		
M <sub>OT</sub>	k-ft	4.5	4.4	3.4	9.6	-	-		
M <sub>OT</sub> accum	k-ft	4.5	4.4	3.4	9.6	-	-		
Shear Wall Deflection									
Δ <sub>B</sub>	in	0.178	0.182	0.238	0.084	-	-		
Δ <sub>V</sub>	in	0.246	0.246	0.246	0.246	-	-		
Δ <sub>HD</sub>	in	0.178	0.181	0.237	0.084	-	-		
Δ <sub>SW</sub>	in	0.602	0.609	0.720	0.413	-	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	-	-	-	-	-	-		
Distr Wall Wt	psf	11.0	11.0	11.0	11.0	-	-		
Trib above	ft	6.0	6.0	6.0	6.0	-	-		
Wts	psf	15.0	15.0	15.0	15.0	-	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End	ft	-	-	-	-	-	-		
Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp. Wall	ft	4.00	3.92	3.00	8.50	-	-		
Wt of wall	lb	250	250	250	250	-	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	2.43	2.35	1.55	8.59	-	-		
M <sub>R</sub> accum	k-ft	2.43	2.35	1.55	8.59	-	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>E</sub> accum	k	0.61	0.60	0.52	1.01	-	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	0.76	0.77	0.81	0.52	-	-		
HD Capacity	k	3.08	3.08	3.08	3.08	-	-		
Hold Down Type		1	1	1	1	-	-		

2nd Level									
Lateral Trib. Width	ft	20.5		<div>B</div>					
V from above	k	178.9							
Uniform v this level	psf	14.63							
Total Wall Length	ft	3.7							
V this level	k	6.4							
V accum	k	430							
Unit Wall Shear	psf	533							
Shear Wall Capacity	psf	0.81							
Demand vs. Capacity Ratio		13.00							
Apparent Stiffness, Ga	K/in	13.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	9.06	9.06	9.06	9.06	9.06	-		
Length	ft	2.63	-	7.50	2.50	2.00	-		
Diaphragm Ratio		3.21	-	1.21	3.63	4.54	-		
Modified Capacity		533	NA	533	533	533	NA		
M <sub>OT</sub>	k-ft	11.0	-	29.3	9.6	7.8	-		
M <sub>OT</sub> accum	k-ft	15.5	4.4	32.6	19.3	7.8	-		
Shear Wall Deflection									
Δ <sub>B</sub>	in	1.102	-	0.416	1.248	1.560	-		
Δ <sub>V</sub>	in	0.403	-	0.403	0.403	0.403	-		
Δ <sub>HD</sub>	in	0.369	-	0.139	0.418	0.522	-		
Δ <sub>SW</sub>	in	1.874	-	0.958	2.069	2.485	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	2.4	2.4	1.6	8.6	-	-		
Distr Wall Wt	psf	11.0	11.0	11.0	11.0	-	-		
Trib above	ft	6.0	6.0	6.0	6.0	-	-		
Wts	psf	15.0	15.0	15.0	15.0	-	-		
Hdr. Trib	ft	-	-	-	-	-	-		
End	ft	-	-	-	-	-	-		
Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp. Wall	ft	2.63	5.75	7.50	5.83	-	-		
Wt of wall	lb	500	500	500	500	-	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	2.18	2.88	0.09	3.51	-	-		
M <sub>R</sub> accum	k-ft	4.61	5.23	10.65	12.10	-	-		
Hold Down Forces									
Wt. Reduction		0.60	0.60	0.60	0.60	0.60	0.60		
T <sub>E</sub> accum	k	1.63	-	1.42	4.84	-	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	4.52	-	3.50	4.83	3.90	-		
HD Capacity	k	5.65	-	5.65	5.65	5.65	-		
Hold Down Type		2	-	2	2	2	-		

1st Level									
Lateral Trib. Width	ft	20.5		<div>A</div>					
V from above	k	6.4							
Uniform v this level	psf	178.9							
Total Wall Length	ft	33.91							
V this level	k	3.7							
V accum	k	10.0							
Unit Wall Shear	psf	296							
Shear Wall Capacity	psf	365							
Demand vs. Capacity Ratio		0.81							
Apparent Stiffness, Ga	K/in	10.00							
Overturning Moment									
M <sub>OT</sub> from above	k-ft	Wall 1	Wall 2	Wall 3	Wall 4	Wall 5	Wall 6		
Story Ht	ft	-	4.4	32.6	19.3	7.8	-		
Length	ft	-	8.08	6.08	6.08	5.75	-		
Diaphragm Ratio		-	1.00	0.40	1.41	-	-		
Modified Capacity		NA	365	365	365	365	NA		
M <sub>OT</sub>	k-ft	-	19.3	48.0	13.8	-	-		
M <sub>OT</sub> accum	k-ft	-	15.5	23.7	60.7	33.1	7.8		
Shear Wall Deflection									
Δ <sub>B</sub>	in	-	0.187	0.075	0.263	-	-		
Δ <sub>V</sub>	in	-	0.246	0.246	0.246	-	-		
Δ <sub>HD</sub>	in	-	0.088	0.035	0.162	-	-		
Δ <sub>SW</sub>	in	-	0.521	0.357	0.671	-	-		
Resisting Moment									
M <sub>R</sub> from above	k-ft	-	4.6	5.2	10.6	12.1	-		
Distr Wall Wt	psf	-	-	-	-	-	-		
Trib above	ft	-	11.0	11.0	11.0	11.0	-		
Wts	psf	-	6.0	6.0	6.0	6.0	-		
Hdr. Trib	ft	-	15.0	15.0	15.0	15.0	-		
End	ft	-	-	-	-	-	-		
Wts	psf	-	-	-	-	-	-		
Wt to hdr	psf	-	-	-	-	-	-		
Perp. Wall	ft	-	10.58	11.58	8.75	-	-		
Wt of wall	lb	-	750	750	750	-	-		
Wts	lb	-	-	-	-	-	-		
M <sub>R</sub> this level	k-ft	-	10.09	21.99	7.65	-	-		
M <sub>R</sub> accum	k-ft	-	4.61	15.32	32.64	19.75	-		
Hold Down Forces									
Wt. Reduction		-	0.60	0.60	0.60	0.60	0.60		
T <sub>E</sub> accum	k	-	1.90	1.63	3.43	-	-		
HD Offset	ft	-	-	-	-	-	-		
HD Force	k	-	1.80	3.04	3.69	-	-		
HD Capacity	k	-	3.08	3.08	5.65	-	-		
Hold Down Type		-	1	1	1	2	-		

Project	Red Barn Lane - Duplex 1 & 2 / 620						
Location	TF-2						
Client	Envision Northwest, LLC						
Wood Shear Wall Design Aid	Comments: See Perforated Shear Calculations						
By	DLS						
Job No.	19-002						
Last Update	22-Feb-2019						

Established Basic Permit #

19-03671

Permit Number: 20-04896



# Force Transfer Around Openings Calculator

## THREE OPENINGS

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

### Project Information

Code: 2015 IBC

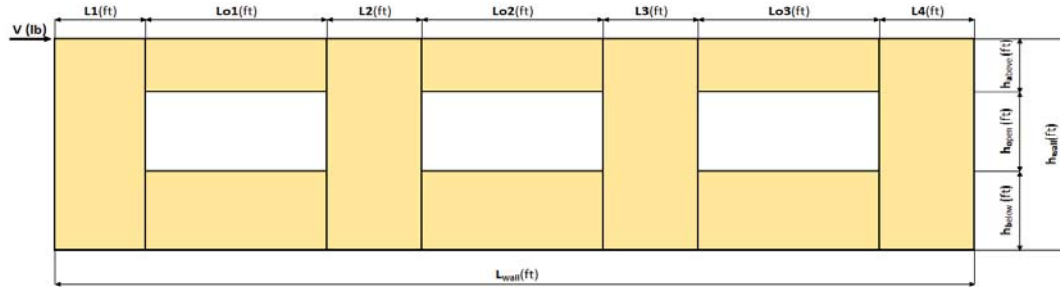
Date:

Designer: DLS

Client:

Project:

Wall Line: TF-2 2nd Level



### Input Variables

V	6400 lbf	Opening 1	Opening 2	Opening 3	Wall Pier Aspect Ratio	Adj. Factor
h <sub>wall</sub>	9.00 ft	ha1	ha2	ha3	P1=ho1/L1=	N/A
L1	2.83 ft	ho1	ho2	ho3	P2=ho2/L2=	N/A
L2	7.50 ft	hb1	hb2	hb3	P3=ho3/L3=	N/A
L3	2.50 ft	Lo1	Lo2	Lo3	P4=ho3/L4=	N/A
L4	2.00 ft					
L <sub>wall</sub>	24.83 ft					

1. Hold-down forces:  $H = Vh_{wall}/L_{wall}$  2320 lbf

### 2. Unit shear above + below opening

First opening:  $va1 = vb1 = H/(ha1+hb1) = 464$  plf  
 Second opening:  $va2 = vb2 = H/(ha2+hb2) = 464$  plf  
 Third opening:  $va3 = vb3 = H/(ha3+hb3) = 464$  plf

### 3. Total boundary force above + below openings

First opening:  $O1 = va1 \times (Lo1) = 928$  lbf  
 Second opening:  $O2 = va2 \times (Lo2) = 2784$  lbf  
 Third opening:  $O3 = va3 \times (Lo3) = 928$  lbf

### 4. Corner forces

$F1 = O1(L1)/(L1+L2) = 254$  lbf  
 $F2 = O1(L2)/(L1+L2) = 674$  lbf  
 $F3 = O2(L2)/(L2+L3) = 2088$  lbf  
 $F4 = O2(L3)/(L2+L3) = 696$  lbf  
 $F5 = O3(L3)/(L3+L4) = 516$  lbf  
 $F6 = O3(L4)/(L3+L4) = 412$  lbf

### 5. Tributary length of openings

$T1 = (L1*Lo1)/(L1+L2) = 0.55$  ft  
 $T2 = (L2*Lo1)/(L1+L2) = 1.45$  ft  
 $T3 = (L2*Lo2)/(L2+L3) = 4.50$  ft  
 $T4 = (L3*Lo2)/(L2+L3) = 1.50$  ft  
 $T5 = (L3*Lo3)/(L3+L4) = 1.11$  ft  
 $T6 = (L4*Lo3)/(L3+L4) = 0.89$  ft

### 6. Unit shear beside opening

$V1 = (V/L)(L1+T1)/L1 = 308$  plf  
 $V2 = (V/L)(T2+L2+T3)/L2 = 462$  plf  
 $V3 = (V/L)(T4+L3+T5)/L3 = 527$  plf  
 $V4 = (V/L)(T6+L4)/L4 = 372$  plf  
 Check  $V1*L1+V2*L2+V3*L3+V4*L4=V?$  6400 lbf OK

### 7. Resistance to corner forces

$R1 = V1*L1 = 871$  lbf  
 $R2 = V2*L2 = 3467$  lbf  
 $R3 = V3*L3 = 1317$  lbf  
 $R4 = V4*L4 = 745$  lbf

### 8. Difference corner force + resistance

$R1-F1 = 616$  lbf  
 $R2-F2-F3 = 706$  lbf  
 $R3-F4-F5 = 106$  lbf  
 $R4-F6 = 332$  lbf

### 9. Unit shear in corner zones

$vc1 = (R1-F1)/L1 = 218$  plf  
 $vc2 = (R2-F2-F3)/L2 = 94$  plf  
 $vc3 = (R3-F4-F5)/L3 = 42$  plf  
 $vc4 = (R4-F6)/L4 = 166$  plf

Established Basic Permit #

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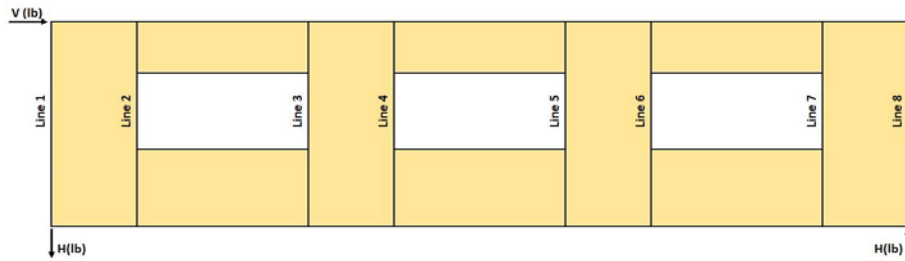
### APA Disclaimer

The information contained herein is intended for use as a resource to aid in the shear wall design based on APA – The Engineered Wood Association's testing and knowledge of wood-framed shear wall system design utilizing the force transfer around openings (FTAO) methodology. Neither APA, nor its member manufacturers, make any warranty, expressed or implied, or assume any legal liability or responsibility for the accuracy, use, application, or results of the design, findings, conclusions, or recommendations included in this calculator. Consult your local jurisdiction or design professional to assure compliance with code, construction, and performance requirements. Because APA has no control over quality of workmanship or the conditions under which engineered wood products are used, it cannot accept responsibility of product performance or designs as actually constructed.

Permit Number: 20-04896

**Project Information**

Code: 2015 IBC Date: \_\_\_\_\_  
 Designer: DLS  
 Client: \_\_\_\_\_  
 Project: \_\_\_\_\_  
 Wall Line: TF-2 2nd Level


**Check Summary of Shear Values for Three Openings**

Line 1: $vc1(ha1+hb1)+V1(ho1)=H?$		1089	1231	2320 lbf
Line 2: $va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?$	2320	1089	1231	0
Line 3: $vc2(ha1+hb1)+V2(ho1)-va1(ha1+hb1)=0?$	471	1849	2320	0
Line 4: $va2(ha2+hb2)-V2(ho2)-vc2(ha2+hb2)=0?$	2320	1849	471	0
Line 5: $va2(ha2+hb2)-vc3(ha2+hb2)-V3(ho2)=0?$	2320	212	2108	0
Line 6: $va3(ha3+hb3)-V3(ho3)-vc3(ha3+hb3)=0?$	2320	2108	212	0
Line 7: $va3(ha3+hb3)-vc4(ha3+hb3)-V4(ho3)=0?$	2320	831	1489	0
Line 8: $vc4(ha3+hb3)+V4(ho3)=H?$		831	1489	2320 lbf

**Design Summary**

Req. Sheathing Capacity	527 lbf
Req. Strap Force	2088 lbf
Req. HD Force	2320 plf

4-Term Deflection	0.552 in.
4-Term Story Drift %	0.020 %
See Page 3	

3-Term Deflection	0.562 in.
3-Term Story Drift %	0.021 %
See Page 4	

Established Basic Permit #

19-03671

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Permit Number: 20-04896

## Project Information

Code: 2015 IBC

Date:

Designer: DLS

Client:

Project:

Wall Line: TF-2 2nd Level

## Deflection Calculation Input Variables

Sheathing:

Plywood	Sheathing Material
15/32	Performance Category
APA Rated Sheathing	Grade

	Gt Override
	Ga Override

Wood End Post Values:

Species:	
E:	1.60E+06 (psi)
Qty:	2
Stud Size:	2x6
A:	16.5 (in. <sup>2</sup> )
A Override:	(in. <sup>2</sup> )

Nails: 8d common (penny weight)

	Pier 1	Pier 4	
Nail Spacing:	4	4	(in.)
HD Capacity:	2490	2490	(lbf)
HD Deflection:	0.08	0.08	(in.)

## Four-Term Equation Deflection Check

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_a + d_a \frac{h}{b} \quad (\text{Equation 23-2})$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	Pier 3-L	Pier 3-R	Pier 4-L	Pier 4-R	
Sheathing:	15/32	15/32	15/32	15/32	15/32	15/32	15/32	15/32	
Nail:	8d common	8d common	8d common	8d common	8d common	8d common	8d common	8d common	
V <sub>base</sub> :	308	308	462	462	527	527	372	372	(plf)
V <sub>strength</sub> :	440	440	660	660	753	753	532	532	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	9.00	6.00	6.00	6.00	6.00	6.00	6.00	9.00	(ft)
A:	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	(in. <sup>2</sup> )
Gt:	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	(lbf/in.)
Nail Spacing:	4	4	3	3	4	4	4	4	(in.)
Vn:	147	147	165	165	251	251	177	177	(plf)
e:	0.0131	0.0131	0.0188	0.0188	0.0665	0.0665	0.0233	0.0233	(in.)
b:	2.83	2.83	7.50	7.50	2.50	2.50	2.00	2.00	(ft)
HD Capacity:	2490	2490	5715	5715	5715	5715	2490	2490	(lbf)
HD Defl:	0.08	0.08	0.064	0.064	0.064	0.064	0.08	0.08	(in.)

## Check Total Deflection of Wall System

Pier 1 (left)				Pier 1 (right)			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Bending	Shear	Fastener	HD-1	Bending	Shear	Fastener	HD-2
0.034	0.147	0.088	0.404	0.010	0.098	0.059	0.180
Sum			0.673	Sum			0.346
Pier 2 (left)				Pier 2 (right)			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Bending	Shear	Fastener	HD-1	Bending	Shear	Fastener	HD-2
0.006	0.147	0.085	0.036	0.006	0.147	0.085	0.036
Sum			0.273	Sum			0.273
Pier 3 (left)				Pier 3 (right)			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Bending	Shear	Fastener	HD-1	Bending	Shear	Fastener	HD-2
0.020	0.167	0.299	0.121	0.020	0.167	0.299	0.121
Sum			0.608	Sum			0.608
Pier 4 (left)				Pier 4 (right)			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Bending	Shear	Fastener	HD-1	Bending	Shear	Fastener	HD-2
0.017	0.118	0.105	0.308	0.059	0.177	0.157	0.692
Sum			0.548	Sum			1.085

Total	
Defl.	(in.)
0.552	
0.0204	%drift

Established Basic Permit #

APA Disclaimer

19-03671

Permit Number: 20-04896

**Project Information**

<b>Code:</b>	2015 IBC	<b>Date:</b>	
<b>Designer:</b>	DLS		
<b>Client:</b>			
<b>Project:</b>			
<b>Wall Line:</b>	TF-2 2nd Level		

**Three-Term Equation Deflection Check**

$$\delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b} \quad (4.3-1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	Pier 3-L	Pier 3-R	Pier 4-L	Pier 4-R	
Sheathing:	15/32	15/32	15/32	15/32	15/32	15/32	15/32	15/32	
Nail:	8d common	8d common	8d common	8d common	8d common	8d common	8d common	8d common	
V <sub>asd</sub> :	308	308	462	462	527	527	372	372	(plf)
V <sub>strength</sub> :	440	440	660	660	753	753	532	532	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	9.00	6.00	6.00	6.00	6.00	6.00	6.00	9.00	(ft)
A:	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	(in. <sup>2</sup> )
G <sub>a</sub> :	13	13	13	13	13	13	13	13	(kips/in.)
b:	2.83	2.83	7.50	7.50	2.50	2.50	2.00	2.00	(ft)
HD Capacity:	2490	2490	5715	5715	5715	5715	2490	2490	(lbf)
HD Defl:	0.08	0.08	0.064	0.064	0.064	0.064	0.08	0.08	(in.)

**Check Total Deflection of Wall System**

Pier 1 (left)			Pier 1 (right)		
Term 1	Term 2	Term 3	Term 1	Term 2	Term 3
Bending	Shear	Fastener	Bending	Shear	Fastener
0.034	0.304	0.404	0.010	0.203	0.180
Sum		0.743	Sum		0.393
Pier 2 (left)			Pier 2 (right)		
Term 1	Term 2	Term 3	Term 1	Term 2	Term 3
Bending	Shear	Fastener	Bending	Shear	Fastener
0.006	0.305	0.036	0.006	0.305	0.036
Sum		0.346	Sum		0.346
Pier 3 (left)			Pier 3 (right)		
Term 1	Term 2	Term 3	Term 1	Term 2	Term 3
Bending	Shear	Fastener	Bending	Shear	Fastener
0.020	0.347	0.121	0.020	0.347	0.121
Sum		0.489	Sum		0.489
Pier 4 (left)			Pier 4 (right)		
Term 1	Term 2	Term 3	Term 1	Term 2	Term 3
Bending	Shear	Fastener	Bending	Shear	Fastener
0.017	0.245	0.308	0.059	0.368	0.692
Sum		0.570	Sum		1.119

Total	
Defl.	0.562 (in.)
	0.0208 %drift

Comment: The 3-term equation is calibrated to be approximately equal to 4-term equation at 1.4\*ASD capacity.

Established Basic Permit #

19-03671

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**Permit Number: 20-04896**