City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning
Engineering | Public Works
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PRMU20240404

ENGINEERING ANALYSIS FOR: EAST TOWN CROSSING APARTMENTS PIONEER & SHAW PUYALLUP, WA BUILDING G

DESIGN CRITERIA

BUILDING CODE: 2018 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED BY THE LOCAL JURISDICTION.

VERTICAL LOADS

ROOF LIVE LOAD:	25 PSF (SNOW)
ROOF DEAD LOAD:	25 PSF
RESIDENTIAL FLOOR LIVE LOAD:	40 PSF (REDUCIBLE) : 60 PSF (FOR DECKS)
STAIRWAY LANDING AREAS:	150 PSF (INCLUDING Ip=1.5)
FLOOR DEAD LOAD:	30 PSF (INCLUDES 1 ½" GYP TOPPING)

SNOW DESIGN DATA (ASCE 7-16)

FLAT SNOW LOAD: N/A
SNOW EXPOSURE FACTOR, Ce=1.0,
SNOW IMPORTANCE FACTOR, Is=1.0,
THERMAL FACTOR, Ct=1.1

WIND DESIGN DATA (ASCE 7-16)

BASIC WIND SPEED (ASD) V= 85MPH
ULTIMATE WIND SPEED V= 110MPH
RISK CATEGORY: II EXPOSURE: B
IMPORTANCE FACTOR, Iw= 1.0
TOPOGRAPHIC FACTOR, Kzt= 1.0

SEISMIC DESIGN DATA (ASCE7-16)

SEISMIC RESPONSE SYSTEM: WOOD SHEARWALLS
EQUIVALENT LATERAL FORCE PROCEDURE (ASCE 7-16)
RISK CATEGORY: II SEISMIC IMPORTANCE FACTOR, Ie= 1.0
MAPPED SPECTRAL RESPONSE ACCELERATION: Ss=1.24, S1=0.476
DESIGN SPECTRAL RESPONSE ACCELERATION: Sds=0.831, Sd1=0.476
SITE CLASS: D SEISMIC DESIGN CATEGORY: D
SEISMIC RESPONSE COEFFICIENT: Cs= 0.091
DESIGN BASE SHEAR: 82,321#

SOIL PROPERTIES:

BEARING CAPACITY: 2,000 PSF
LATERAL CAPACITY: 250 PSF/FT

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

PIERUCCIONI E&C, LLC
CHON PIERUCCIONI, PE
3128 N. BENNETT ST.
TACOMA, WA 98407

EAST TOWN CROSSING
BUILDING "G"
PIONEER & SHAW PUYALLUP WA

REVISIONS

01	CITY REVIEW

REVISIONS

ENGINEER:	CP
CHECKED BY:	CP
DATE:	2024.02.28
TITLE:	STRUCTURAL ANALYSIS
PROJECT # :	----

2nd Floor Framing			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
Floor Joist 16' and Under	Passed (96% M)	1 piece(s) 11 7/8" TJI® 110 @ 16" OC	
8'-5" Landing Joists	Passed (90% R)	1 piece(s) 2 x 12 HF No.2 @ 12" OC	
Short Stair Stringers	Passed (72% R)	1 piece(s) 4 x 12 HF No.2	
Long Short Stair Stringers	Passed (98% R)	1 piece(s) 3 1/2" x 12" 24F-V4 DF Glulam	
Top Landing Beam	Passed (100% R)	1 piece(s) 5 1/2" x 13 1/2" 24F-V4 DF Glulam	
8'-10" Deck Joist	Passed (55% R)	1 piece(s) 2 x 12 HF No.2 @ 16" OC	
6' Window Header	Passed (79% M)	1 piece(s) 4 x 10 DF No.2	
Grid 2 (B.6-B.8) Flush Beam	Passed (57% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 12 (B.6-B.8) Flush Beam	Passed (57% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 3.1 (B.6-B.8) Flush Beam	Passed (56% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 10.9 (B.6-B.8) Flush Beam	Passed (56% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 5.2 (B.5-B.7) Flush Beam	Passed (74% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 8.8 (B.5-B.7) Flush Beam	Passed (74% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 5.2 (B.9-C) Bathroom Door Header	Passed (83% M)	1 piece(s) 4 x 8 DF No.2	
Grid 8.8 (B.9-C) Bathroom Door Header	Passed (83% M)	1 piece(s) 4 x 8 DF No.2	
Grid 6.2 (B.4-B.5) Bedroom Door Header	Passed (74% R)	1 piece(s) 4 x 8 DF No.2	
Grid 7.8 (B.4-B.5) Bedroom Door Header	Passed (74% R)	1 piece(s) 4 x 8 DF No.2	
Grid 6.2 (B.7-C) Flush Beam	Passed (63% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	Squash Blocks Required
Grid 7.8 (B.7-C) Flush Beam	Passed (63% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	Squash Blocks Required
Grid 2.3 (D-D.1) Bedroom Door Header	Passed (60% R)	1 piece(s) 4 x 8 DF No.2	
Grid 11.7 (D-D.1) Bedroom Door Header	Passed (60% R)	1 piece(s) 4 x 8 DF No.2	
Grid 2.7 (D.2-D.4) Flush Beam	Passed (70% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 11.3 (D.2-D.4) Flush Beam	Passed (70% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 5.6 (D-D.3) Flush Beam	Passed (90% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 8.4 (D-D.3) Flush Beam	Passed (90% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 6 (D.5-D.6) Bedroom Door Header	Passed (83% R)	1 piece(s) 4 x 8 DF No.2	
Main Landing Post	Passed (97% B/C)	1 piece(s) 6 x 10 DF No.2	
Grid 6.2B.6 Post	Passed (80% f_{cp})	1 piece(s) 4 x 6 DF No.2	
Grid 7.8B.6 Post	Passed (80% f_{cp})	1 piece(s) 4 x 6 DF No.2	

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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3rd Floor Framing			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
Floor Joist 16' and Under	Passed (96% M)	1 piece(s) 11 7/8" TJI® 110 @ 16" OC	
8'-5" Landing Joists	Passed (90% R)	1 piece(s) 2 x 12 HF No.2 @ 12" OC	
Short Stair Stringers	Passed (72% R)	1 piece(s) 4 x 12 HF No.2	
Top Landing Beam	Passed (84% ΔL)	1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam	
4' Mid Landing Joists	Passed (77% R)	1 piece(s) 2 x 8 HF No.2 @ 16" OC	
Mid Landing Inner Beam	Passed (81% ΔL)	1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam	
Mid Landing Outer Beam	Passed (102% ΔL)	1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam	
8'-10" Deck Joist	Passed (55% R)	1 piece(s) 2 x 12 HF No.2 @ 16" OC	
6' Window Header	Passed (79% M)	1 piece(s) 4 x 10 DF No.2	
Grid 2 (B.6-B.8) Flush Beam	Passed (28% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 12 (B.6-B.8) Flush Beam	Passed (28% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 3.1 (B.6-B.8) Flush Beam	Passed (28% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 10.9 (B.6-B.8) Flush Beam	Passed (28% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 5.2 (B.6-B.8) Flush Beam	Passed (34% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 8.8 (B.6-B.8) Flush Beam	Passed (34% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 5.2 (B.8-B.9) Bathroom Door Header	Passed (33% R)	1 piece(s) 4 x 8 DF No.2	
Grid 8.8 (B.8-B.9) Bathroom Door Header	Passed (33% R)	1 piece(s) 4 x 8 DF No.2	
Grid 6.2 (B.4-B.5) Bedroom Door Header	Passed (37% R)	1 piece(s) 4 x 8 DF No.2	
Grid 7.8 (B.4-B.5) Bedroom Door Header	Passed (37% R)	1 piece(s) 4 x 8 DF No.2	
Grid 6.2 (B.7-C) Flush Beam	Passed (63% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 7.8 (B.7-C) Flush Beam	Passed (63% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 2.3 (D-D.1) Bedroom Door Header	Passed (30% R)	1 piece(s) 4 x 8 DF No.2	
Grid 11.7 (D-D.1) Bedroom Door Header	Passed (30% R)	1 piece(s) 4 x 8 DF No.2	
Grid 2.7 (D.2-D.4) Flush Beam	Passed (35% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 11.3 (D.2-D.4) Flush Beam	Passed (35% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 5.6 (D-D.3) Flush Beam	Passed (62% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 8.4 (D-D.3) Flush Beam	Passed (62% R)	1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam	
Grid 6 (D.5-D.6) Bedroom Door Header	Passed (42% R)	1 piece(s) 4 x 8 DF No.2	
Grid 8 (D.5-D.6) Bedroom Door Header	Passed (42% R)	1 piece(s) 4 x 8 DF No.2	
Roof Framing			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
Grid D.7 Entry Roof Beam	Passed (102% R)	1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam	
Grid A 7'-3" Deck Roof Beam	Passed (77% M+)	1 piece(s) 3 1/2" x 7 1/2" 24F-V4 DF Glulam	
Grid G 9' Deck Roof Beam	Passed (91% M+)	1 piece(s) 3 1/2" x 9" 24F-V4 DF Glulam	
6' Window Header	Passed (90% R)	1 piece(s) 4 x 10 DF No.2	

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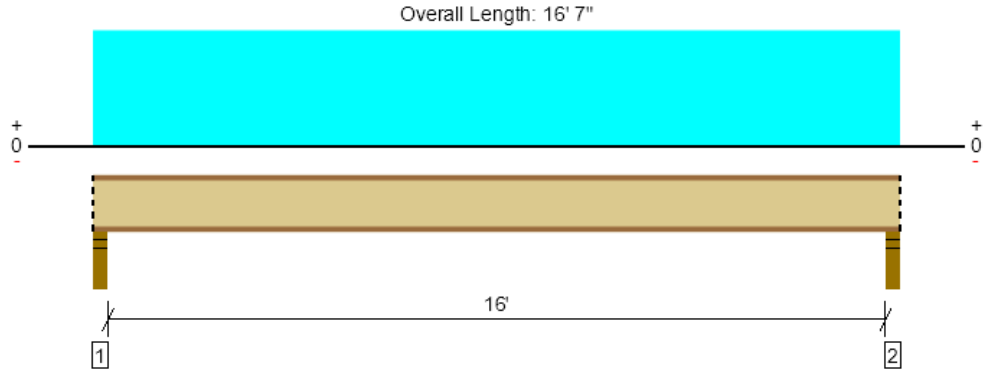
2nd Floor Framing, Floor Joist 16' and Under

1 piece(s) 11 7/8" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	774 @ 2 1/2"	1375 (3.50")	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	747 @ 3 1/2"	1560	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3049 @ 8' 3 1/2"	3160	Passed (96%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.275 @ 8' 3 1/2"	0.539	Passed (L/704)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.482 @ 8' 3 1/2"	0.808	Passed (L/403)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	48	40	Passed	--	--

Member Length : 16' 7"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.75"	332	442	774	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.75"	332	442	774	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 1" o/c	
Bottom Edge (Lu)	16' 7" o/c	

•TJI joists are only analyzed using Maximum Allowable bracing solutions.
•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 16' 7"	16"	30.0	40.0	Default Load

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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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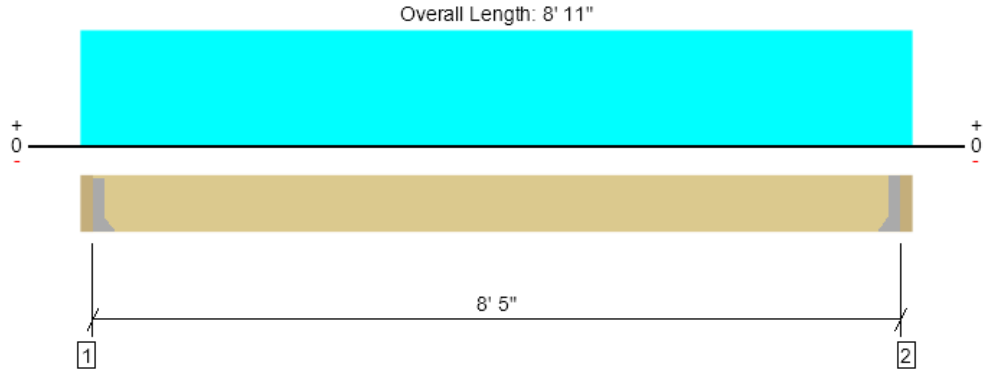
2nd Floor Framing, 8'-5" Landing Joists

1 piece(s) 2 x 12 HF No.2 @ 12" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	821 @ 3"	911 (1.50")	Passed (90%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	638 @ 1' 2 1/4"	1688	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1727 @ 4' 5 1/2"	2577	Passed (67%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.073 @ 4' 5 1/2"	0.281	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.095 @ 4' 5 1/2"	0.421	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 8' 5"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 11 1/4" LSL beam	3.00"	Hanger[1]	1.50"	201	669	869	See note [1]
2 - Hanger on 11 1/4" LSL beam	3.00"	Hanger[1]	1.50"	201	669	869	See note [1]

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 4" o/c	
Bottom Edge (Lu)	8' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	3-10d	
2 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	3-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 8' 11"	12"	45.0	150.0	Default Load

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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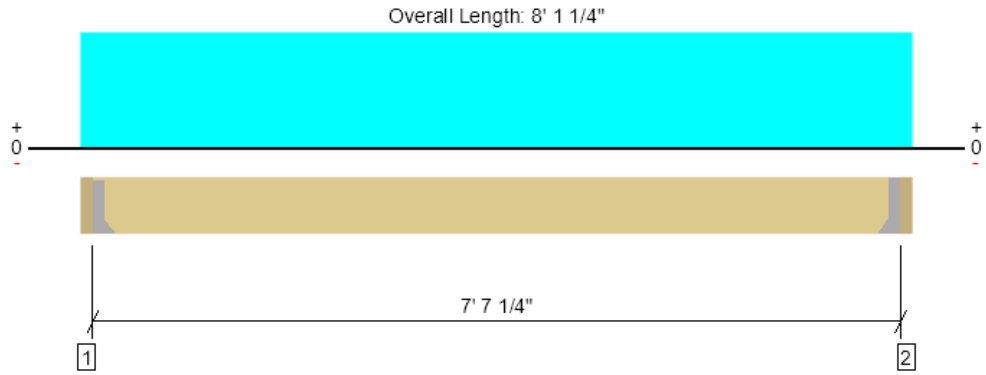
2nd Floor Framing, Short Stair Stringers

1 piece(s) 4 x 12 HF No.2



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1521 @ 3"	2126 (1.50")	Passed (72%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1146 @ 1' 2 1/4"	3938	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2891 @ 4' 5/8"	5752	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.042 @ 4' 5/8"	0.190	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.056 @ 4' 5/8"	0.380	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 7' 7 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 11 1/4" GLB beam	3.00"	Hanger[1]	1.50"	403	1216	1618	See note [1]
2 - Hanger on 11 1/4" GLB beam	3.00"	Hanger[1]	1.50"	403	1216	1618	See note [1]

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 7" o/c	
Bottom Edge (Lu)	7' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS410	2.00"	N/A	8-16d	6-16d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-16d	6-16d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3" to 7' 10 1/4"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 8' 1 1/4" (Front)	2'	45.0	150.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

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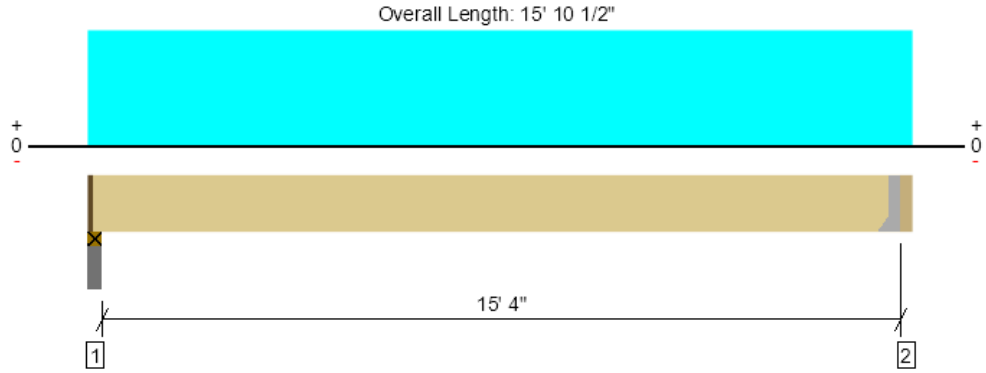
2nd Floor Framing, Long Short Stair Stringers

1 piece(s) 3 1/2" x 12" 24F-V4 DF Glulam



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3118 @ 2"	3189 (2.25")	Passed (98%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2693 @ 14' 7 1/2"	7420	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	11954 @ 7' 10 3/4"	16800	Passed (71%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.425 @ 7' 10 3/4"	0.515	Passed (L/437)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.567 @ 7' 10 3/4"	0.773	Passed (L/327)	--	1.0 D + 1.0 L (All Spans)

Member Length : 15' 6 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 15' 5 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Plate on concrete - HF	3.50"	2.25"	2.20"	790	2369	3159	1 1/4" Rim Board
2 - Hanger on 12" GLB beam	3.00"	Hanger[1]	1.50"	797	2394	3191	See note [1]

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	15' 6" o/c	
Bottom Edge (Lu)	15' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	HHUS410	3.00"	N/A	30-10d	10-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 15' 7 1/2"	N/A	10.2	--	
1 - Uniform (PSF)	0 to 15' 10 1/2" (Front)	2'	45.0	150.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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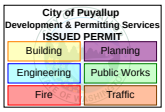
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator



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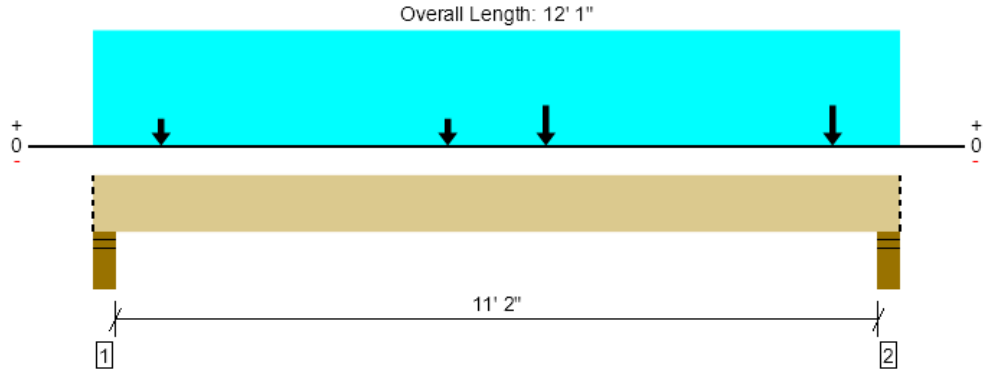
2nd Floor Framing, Top Landing Beam

1 piece(s) 5 1/2" x 13 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	12196 @ 11' 9"	12251 (5.50")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	8941 @ 10' 6"	13118	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	31638 @ 6' 9"	33413	Passed (95%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.265 @ 6' 1"	0.285	Passed (L/516)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.352 @ 6' 1 1/16"	0.571	Passed (L/389)	--	1.0 D + 1.0 L (All Spans)

Member Length : 12' 1"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 5".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	5.50"	4.76"	2604	7997	10601	Blocking
2 - Stud wall - HF	5.50"	5.50"	5.48"	3004	9192	12196	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 1" o/c	
Bottom Edge (Lu)	12' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 1"	N/A	18.0	--	
1 - Uniform (PSF)	0 to 12' 1" (Front)	5' 6"	45.0	150.0	Default Load
2 - Point (lb)	5' 3 3/4" (Front)	N/A	403	1216	Linked from: Short Stair Stringers, Support 1
3 - Point (lb)	1' 1/4" (Front)	N/A	403	1216	Linked from: Short Stair Stringers, Support 1
4 - Point (lb)	6' 9 3/8" (Front)	N/A	797	2394	Linked from: Long Short Stair Stringers, Support 2
5 - Point (lb)	11' 7/8" (Front)	N/A	797	2394	Linked from: Long Short Stair Stringers, Support 2

• Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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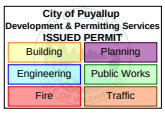

2nd Floor Framing, 8'-10" Deck Joist

1 piece(s) 2 x 12 HF No.2 @ 16" OC

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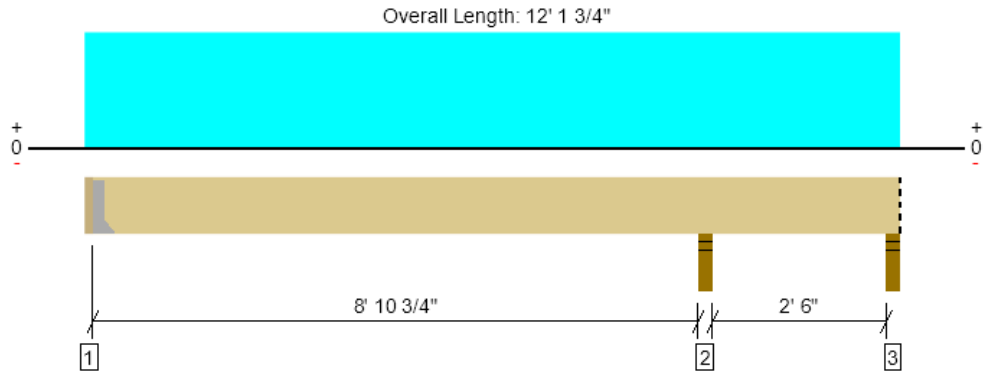

Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1168 @ 9' 2 1/2"	2126 (3.50")	Passed (55%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	520 @ 8' 1 1/2"	1688	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-968 @ 9' 2 1/2"	2577	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.028 @ 4' 2 7/8"	0.301	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.042 @ 4' 2 3/4"	0.452	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 11' 11 3/4"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- -285 lbs uplift at support located at 11' 11 1/4". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 11 1/4" HF beam	2.00"	Hanger[1]	1.50"	152	306	457	See note [1]
2 - Stud wall - HF	3.50"	3.50"	1.92"	389	779	1168	None
3 - Stud wall - HF	3.50"	3.50"	1.50"	-55	120/-230	64/-285	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
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' o/c	
Bottom Edge (Lu)	12' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	3-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 12' 1 3/4"	16"	30.0	60.0	Default Load

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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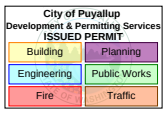

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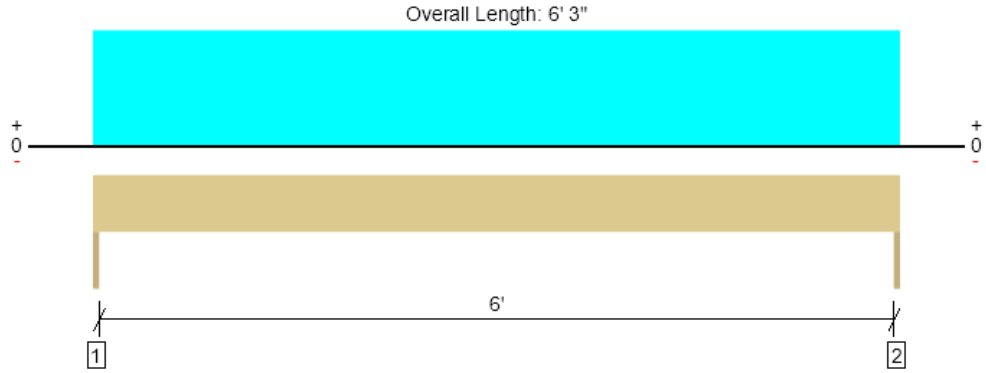
2nd Floor Framing, 6' Window Header

1 piece(s) 4 x 10 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2272 @ 0	3281 (1.50")	Passed (69%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1621 @ 10 3/4"	3885	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3550 @ 3' 1 1/2"	4492	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.031 @ 3' 1 1/2"	0.208	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.068 @ 3' 1 1/2"	0.313	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 6' 3"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1215	1057	2272	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1215	1057	2272	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 3" o/c	
Bottom Edge (Lu)	6' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 3"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 6' 3"	6' 7"	30.0	40.0	Floor
2 - Uniform (PLF)	0 to 6' 3"	N/A	108.0	-	Wall
3 - Uniform (PSF)	0 to 6' 3"	3'	25.0	25.0	Roof

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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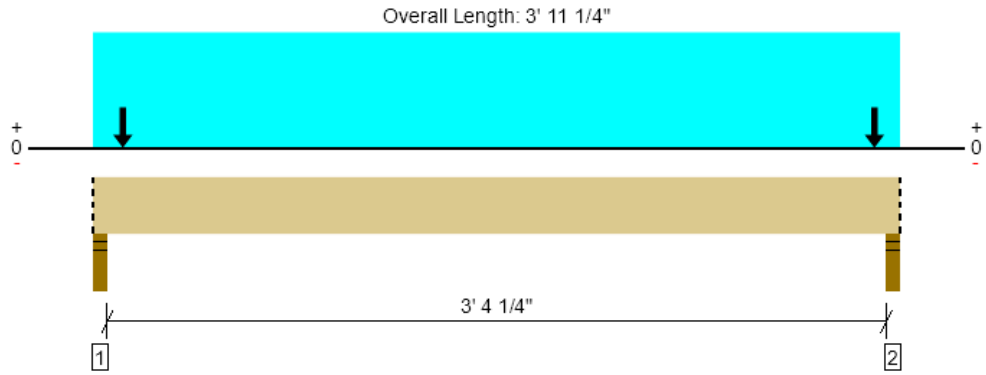
2nd Floor Framing, Grid 2 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2818 @ 2"	4961 (3.50")	Passed (57%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	492 @ 1' 3 3/8"	7343	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1163 @ 1' 11 5/8"	16452	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.002 @ 1' 11 5/8"	0.090	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.003 @ 1' 11 5/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 11 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.99"	1230	1588	2818	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.99"	1230	1588	2818	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	3' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 11 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 3' 11 1/4" (Front)	10' 1"	30.0	40.0	Default Load
2 - Point (lb)	1 3/4" (Top)	N/A	615	794	Linked from: Grid 2 (B.6-B.8) Flush Beam, Support 1
3 - Point (lb)	3' 9 3/4" (Top)	N/A	615	794	Linked from: Grid 2 (B.6-B.8) Flush Beam, Support 2

• Side loads are assumed to not induce cross-grain tension.

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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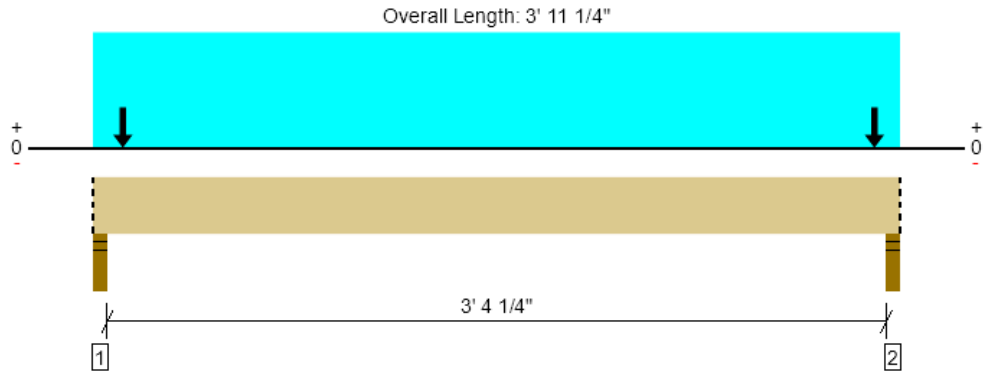
2nd Floor Framing, Grid 12 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2818 @ 2"	4961 (3.50")	Passed (57%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	492 @ 1' 3 3/8"	7343	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1163 @ 1' 11 5/8"	16452	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.002 @ 1' 11 5/8"	0.090	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.003 @ 1' 11 5/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 11 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.99"	1230	1588	2818	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.99"	1230	1588	2818	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	3' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 11 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 3' 11 1/4" (Front)	10' 1"	30.0	40.0	Default Load
2 - Point (lb)	1 3/4" (Top)	N/A	615	794	Linked from: Grid 2 (B.6-B.8) Flush Beam, Support 1
3 - Point (lb)	3' 9 3/4" (Top)	N/A	615	794	Linked from: Grid 2 (B.6-B.8) Flush Beam, Support 2

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

City of Puyallup
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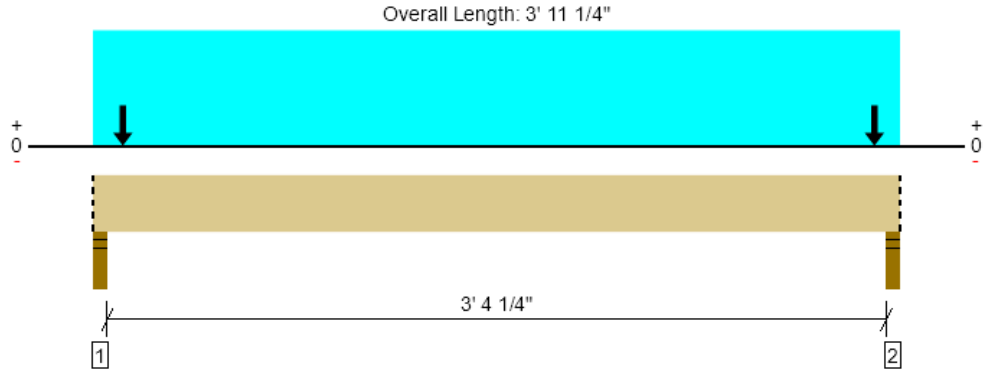
2nd Floor Framing, Grid 3.1 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2797 @ 2"	4961 (3.50")	Passed (56%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	488 @ 1' 3 3/8"	7343	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1153 @ 1' 11 5/8"	16452	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.002 @ 1' 11 5/8"	0.090	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.003 @ 1' 11 5/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 11 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.97"	1222	1576	2797	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.97"	1222	1576	2797	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	3' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 11 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 3' 11 1/4" (Front)	10'	30.0	40.0	Default Load
2 - Point (lb)	1 3/4" (Top)	N/A	611	788	Linked from: Grid 3.1 (B.6-B.8) Flush Beam, Support 1
3 - Point (lb)	3' 9 3/4" (Top)	N/A	611	788	Linked from: Grid 3.1 (B.6-B.8) Flush Beam, Support 2

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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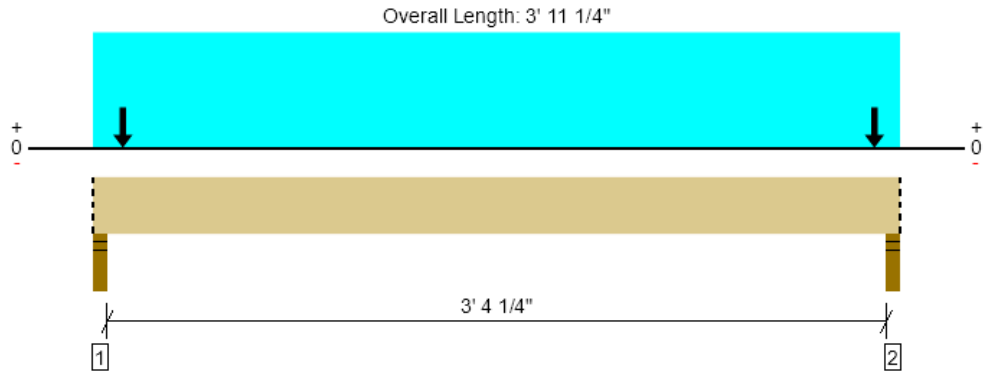
2nd Floor Framing, Grid 10.9 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2797 @ 2"	4961 (3.50")	Passed (56%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	488 @ 1' 3 3/8"	7343	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1153 @ 1' 11 5/8"	16452	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.002 @ 1' 11 5/8"	0.090	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.003 @ 1' 11 5/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 11 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.97"	1222	1576	2797	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.97"	1222	1576	2797	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	3' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 11 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 3' 11 1/4" (Front)	10'	30.0	40.0	Default Load
2 - Point (lb)	1 3/4" (Top)	N/A	611	788	Linked from: Grid 3.1 (B.6-B.8) Flush Beam, Support 1
3 - Point (lb)	3' 9 3/4" (Top)	N/A	611	788	Linked from: Grid 3.1 (B.6-B.8) Flush Beam, Support 2

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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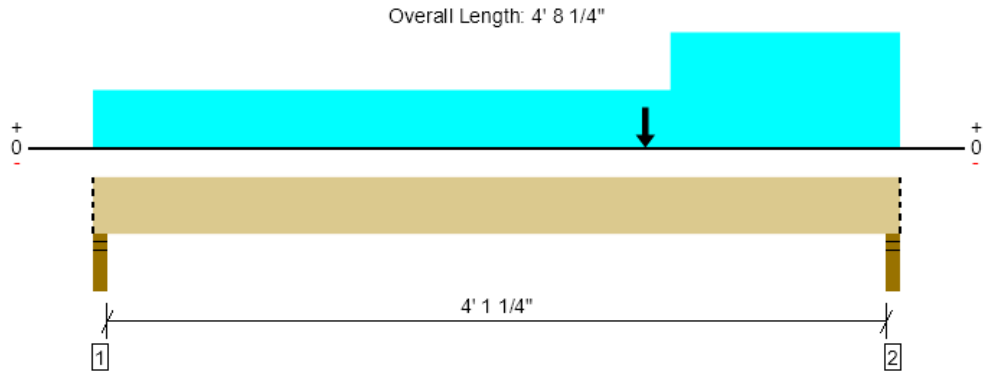
2nd Floor Framing, Grid 5.2 (B.5-B.7) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3651 @ 4' 6 1/4"	4961 (3.50")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1845 @ 3' 4 7/8"	7343	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	3277 @ 3' 2 7/16"	16452	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.007 @ 2' 5 1/4"	0.109	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.012 @ 2' 5 1/4"	0.218	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 4' 8 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 4' 4 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.61"	993	1283	2276	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.58"	1588	2064	3651	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 8" o/c	
Bottom Edge (Lu)	4' 8" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 8 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 4' 8 1/4" (Front)	10'	30.0	40.0	2nd Floor
2 - Uniform (PSF)	3' 4 1/4" to 4' 8 1/4" (Front)	10'	30.0	40.0	3rd Floor
3 - Point (lb)	3' 2 1/2" (Top)	N/A	727	938	Linked from: Grid 5.2 (B.6-B.8) Flush Beam, Support 2

• Side loads are assumed to not induce cross-grain tension.

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Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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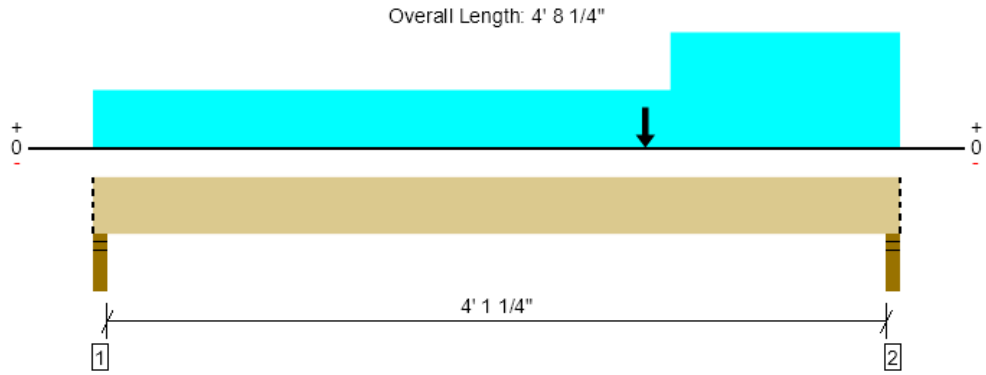
2nd Floor Framing, Grid 8.8 (B.5-B.7) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3651 @ 4' 6 1/4"	4961 (3.50")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1845 @ 3' 4 7/8"	7343	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	3277 @ 3' 2 7/16"	16452	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.007 @ 2' 5 1/4"	0.109	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.012 @ 2' 5 1/4"	0.218	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 4' 8 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 4' 4 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.61"	993	1283	2276	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.58"	1588	2064	3651	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 8" o/c	
Bottom Edge (Lu)	4' 8" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 8 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 4' 8 1/4" (Front)	10'	30.0	40.0	2nd Floor
2 - Uniform (PSF)	3' 4 1/4" to 4' 8 1/4" (Front)	10'	30.0	40.0	3rd Floor
3 - Point (lb)	3' 2 1/2" (Top)	N/A	727	938	Linked from: Grid 5.2 (B.6-B.8) Flush Beam, Support 2

• Side loads are assumed to not induce cross-grain tension.

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Weyerhaeuser

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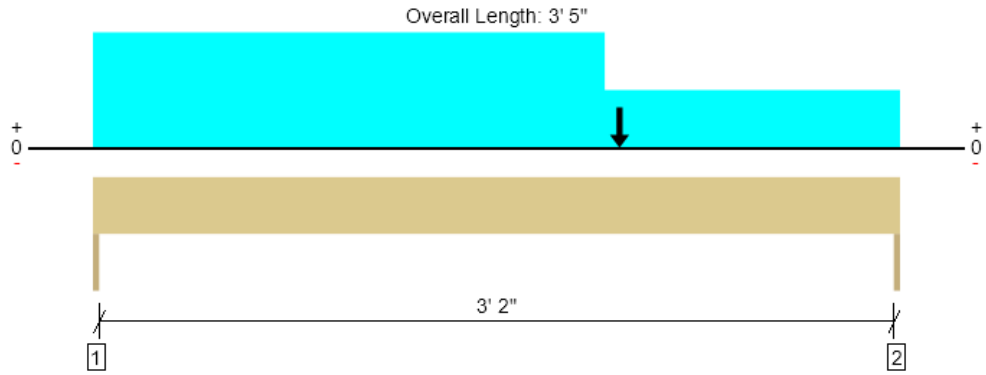
2nd Floor Framing, Grid 5.2 (B.9-C) Bathroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2637 @ 0	3281 (1.50")	Passed (80%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1911 @ 2' 8 1/4"	3045	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2472 @ 1' 10 1/2"	2989	Passed (83%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.016 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.029 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1138	1499	2637	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1050	1377	2426	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	10'	30.0	40.0	Default Load
2 - Uniform (PSF)	0 to 2' 2"	10'	30.0	40.0	Default Load
3 - Point (lb)	2' 2 3/4"	N/A	472	617	Linked from: Grid 5.2 (B.8-B.9) Bathroom Door Header, Support 1

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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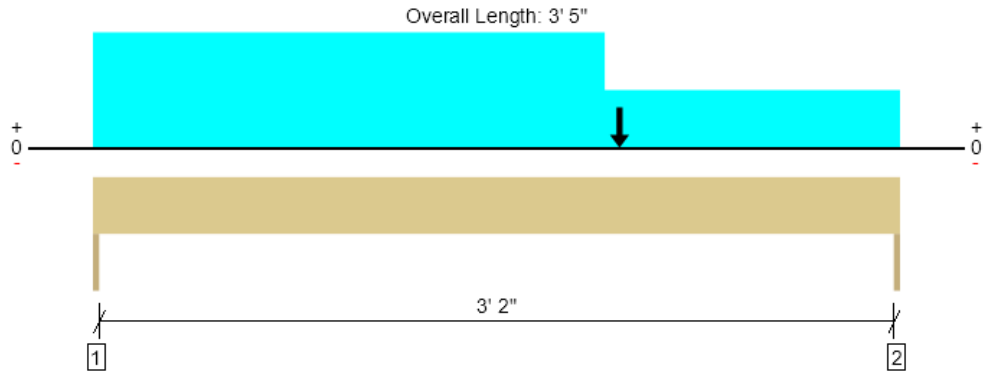
2nd Floor Framing, Grid 8.8 (B.9-C) Bathroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2637 @ 0	3281 (1.50")	Passed (80%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1911 @ 2' 8 1/4"	3045	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2472 @ 1' 10 1/2"	2989	Passed (83%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.016 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.029 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1138	1499	2637	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1050	1377	2426	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	10'	30.0	40.0	Default Load
2 - Uniform (PSF)	0 to 2' 2"	10'	30.0	40.0	Default Load
3 - Point (lb)	2' 2 3/4"	N/A	472	617	Linked from: Grid 5.2 (B.8-B.9) Bathroom Door Header, Support 1

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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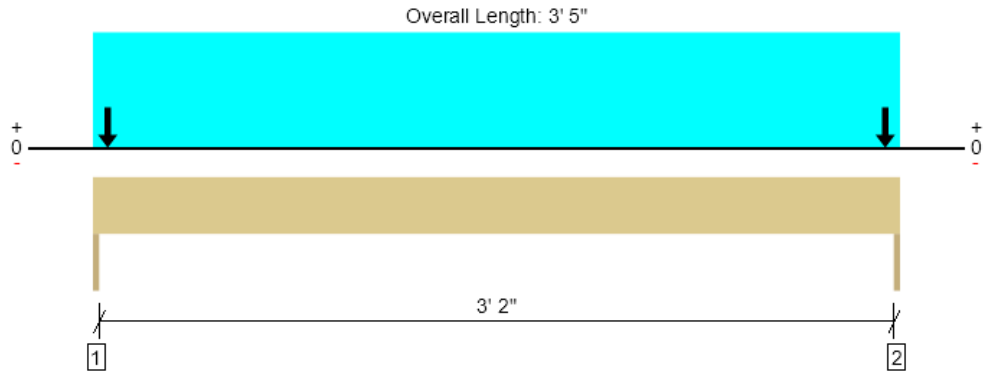
2nd Floor Framing, Grid 6.2 (B.4-B.5) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2413 @ 0	3281 (1.50")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	692 @ 8 3/4"	3045	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1031 @ 1' 8 1/2"	2989	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.007 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.012 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1046	1366	2413	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1046	1366	2413	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	10'	30.0	40.0	Default Load
2 - Point (lb)	3/4"	N/A	523	683	Linked from: Grid 6.2 (B.4-B.5) Bedroom Door Header, Support 1
3 - Point (lb)	3' 4 1/4"	N/A	523	683	Linked from: Grid 6.2 (B.4-B.5) Bedroom Door Header, Support 2

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Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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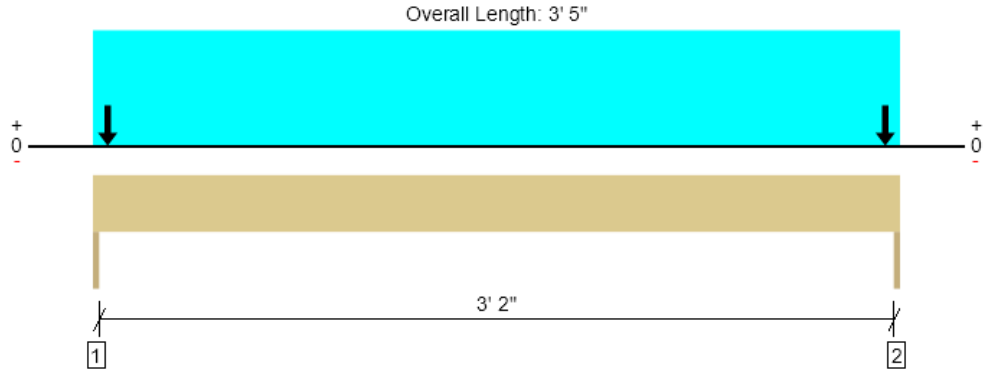
2nd Floor Framing, Grid 7.8 (B.4-B.5) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2413 @ 0	3281 (1.50")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	692 @ 8 3/4"	3045	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1031 @ 1' 8 1/2"	2989	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.007 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.012 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1046	1366	2413	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1046	1366	2413	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	10'	30.0	40.0	Default Load
2 - Point (lb)	3/4"	N/A	523	683	Linked from: Grid 6.2 (B.4-B.5) Bedroom Door Header, Support 1
3 - Point (lb)	3' 4 1/4"	N/A	523	683	Linked from: Grid 6.2 (B.4-B.5) Bedroom Door Header, Support 2

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Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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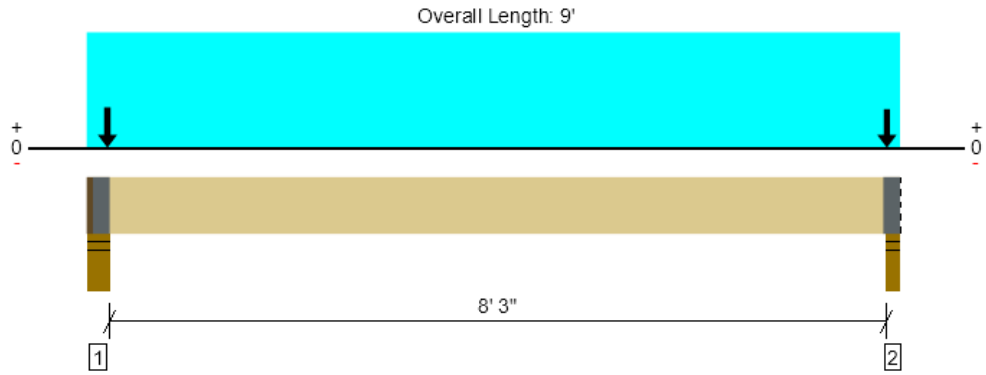
2nd Floor Framing, Grid 6.2 (B.7-C) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3136 @ 8' 10"	4961 (3.50")	Passed (63%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2226 @ 1' 5 3/8"	7343	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	6413 @ 4' 7"	16452	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.053 @ 4' 7"	0.213	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.095 @ 4' 7"	0.425	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 8' 10 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 6".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	4.00"	2.23"	2840	3666	6506	1 1/2" Rim Board, Squash Blocks
2 - Stud wall - HF	3.50"	3.50"	2.21"	2740	3534	6273	Blocking, Squash Blocks

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Squash Blocks must match bearing length and are assumed to carry all loads applied directly above them, 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.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 11" o/c	
Bottom Edge (Lu)	8' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/2" to 9'	N/A	10.1	--	
1 - Uniform (PSF)	0 to 9' (Front)	10'	30.0	40.0	Default Load
2 - Point (lb)	8' 10 1/4" (Top)	N/A	1370	1767	Linked from: Grid 6.2 (B.7-C) Flush Beam, Support 2
3 - Point (lb)	2 3/4" (Top)	N/A	1420	1833	Linked from: Grid 6.2 (B.7-C) Flush Beam, Support 1

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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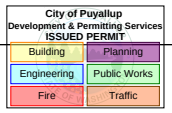

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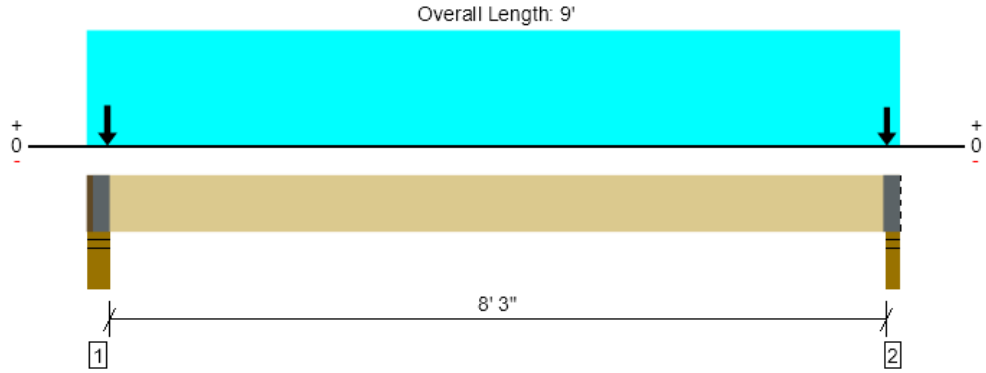
2nd Floor Framing, Grid 7.8 (B.7-C) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3136 @ 8' 10"	4961 (3.50")	Passed (63%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2226 @ 1' 5 3/8"	7343	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	6413 @ 4' 7"	16452	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.053 @ 4' 7"	0.213	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.095 @ 4' 7"	0.425	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 8' 10 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 6".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	4.00"	2.23"	2840	3666	6506	1 1/2" Rim Board, Squash Blocks
2 - Stud wall - HF	3.50"	3.50"	2.21"	2740	3534	6273	Blocking, Squash Blocks

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Squash Blocks must match bearing length and are assumed to carry all loads applied directly above them, 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.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 11" o/c	
Bottom Edge (Lu)	8' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/2" to 9'	N/A	10.1	--	
1 - Uniform (PSF)	0 to 9' (Front)	10'	30.0	40.0	Default Load
2 - Point (lb)	8' 10 1/4" (Top)	N/A	1370	1767	Linked from: Grid 6.2 (B.7-C) Flush Beam, Support 2
3 - Point (lb)	2 3/4" (Top)	N/A	1420	1833	Linked from: Grid 6.2 (B.7-C) Flush Beam, Support 1

- Side loads are assumed to not induce cross-grain tension.

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Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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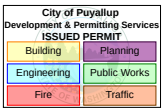

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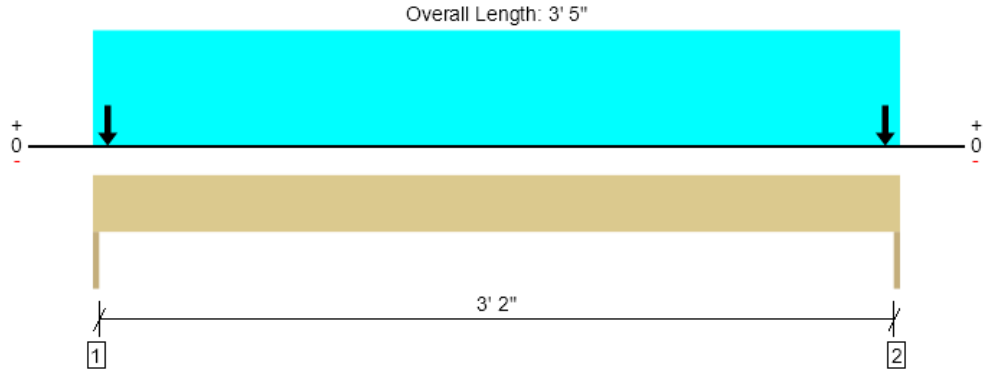
2nd Floor Framing, Grid 2.3 (D-D.1) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1976 @ 0	3281 (1.50")	Passed (60%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	566 @ 8 3/4"	3045	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	844 @ 1' 8 1/2"	2989	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.006 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.010 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	860	1116	1976	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	860	1116	1976	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	8' 2"	30.0	40.0	Default Load
2 - Point (lb)	3/4"	N/A	430	558	Linked from: Grid 2.3 (D-D.1) Bedroom Door Header, Support 1
3 - Point (lb)	3' 4 1/4"	N/A	430	558	Linked from: Grid 2.3 (D-D.1) Bedroom Door Header, Support 2

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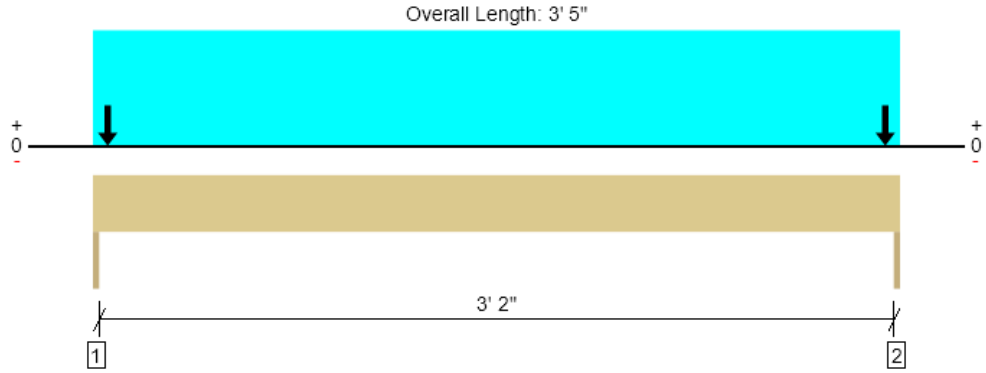
2nd Floor Framing, Grid 11.7 (D-D.1) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1976 @ 0	3281 (1.50")	Passed (60%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	566 @ 8 3/4"	3045	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	844 @ 1' 8 1/2"	2989	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.006 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.010 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	860	1116	1976	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	860	1116	1976	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	8' 2"	30.0	40.0	Default Load
2 - Point (lb)	3/4"	N/A	430	558	Linked from: Grid 2.3 (D-D.1) Bedroom Door Header, Support 1
3 - Point (lb)	3' 4 1/4"	N/A	430	558	Linked from: Grid 2.3 (D-D.1) Bedroom Door Header, Support 2

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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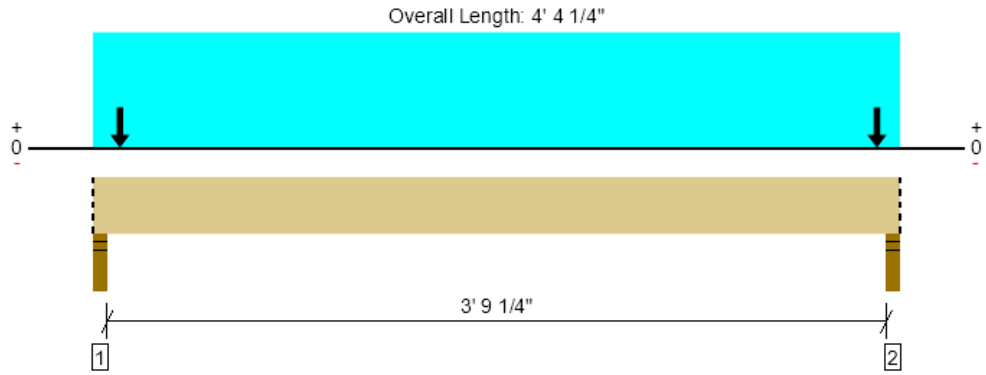
2nd Floor Framing, Grid 2.7 (D.2-D.4) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3473 @ 2"	4961 (3.50")	Passed (70%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	715 @ 1' 3 3/8"	7343	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1612 @ 2' 2 1/8"	16452	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.003 @ 2' 2 1/8"	0.101	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.005 @ 2' 2 1/8"	0.201	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 4' 4 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 4' 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	2.45"	1514	1960	3473	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.45"	1514	1960	3473	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 4" o/c	
Bottom Edge (Lu)	4' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 4 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 4' 4 1/4" (Front)	11' 3"	30.0	40.0	Default Load
2 - Point (lb)	1 3/4" (Top)	N/A	757	980	Linked from: Grid 2.7 (D.2-D.4) Flush Beam, Support 1
3 - Point (lb)	4' 2 3/4" (Top)	N/A	757	980	Linked from: Grid 2.7 (D.2-D.4) Flush Beam, Support 2

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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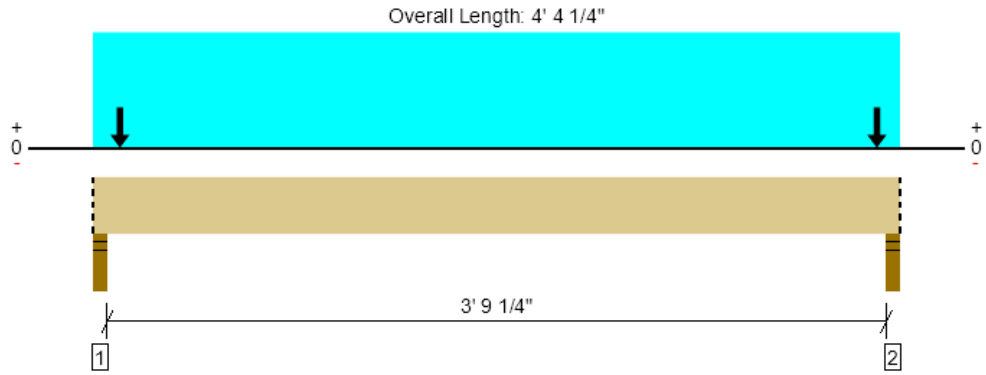
2nd Floor Framing, Grid 11.3 (D.2-D.4) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3473 @ 2"	4961 (3.50")	Passed (70%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	715 @ 1' 3 3/8"	7343	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1612 @ 2' 2 1/8"	16452	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.003 @ 2' 2 1/8"	0.101	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.005 @ 2' 2 1/8"	0.201	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 4' 4 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 4' 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	2.45"	1514	1960	3473	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.45"	1514	1960	3473	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 4" o/c	
Bottom Edge (Lu)	4' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 4 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 4' 4 1/4" (Front)	11' 3"	30.0	40.0	Default Load
2 - Point (lb)	1 3/4" (Top)	N/A	757	980	Linked from: Grid 2.7 (D.2-D.4) Flush Beam, Support 1
3 - Point (lb)	4' 2 3/4" (Top)	N/A	757	980	Linked from: Grid 2.7 (D.2-D.4) Flush Beam, Support 2

- Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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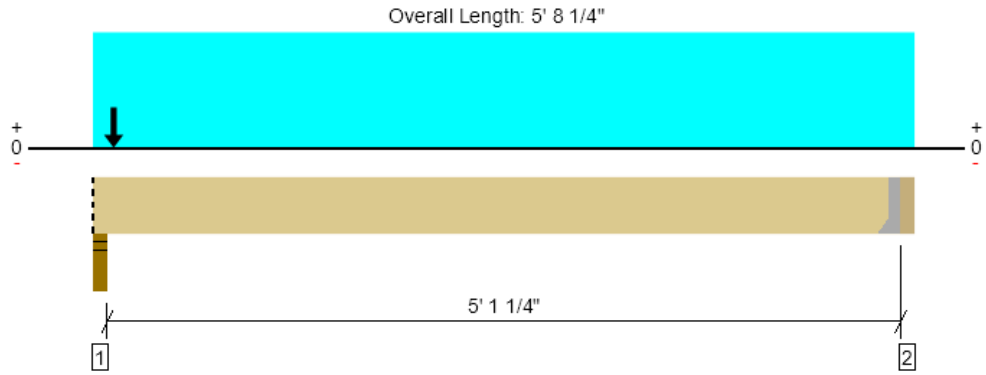
2nd Floor Framing, Grid 5.6 (D-D.3) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4470 @ 2"	4961 (3.50")	Passed (90%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1306 @ 4' 4 7/8"	7343	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	2746 @ 2' 9 3/8"	16452	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.009 @ 2' 9 3/8"	0.131	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.015 @ 2' 9 3/8"	0.261	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 5' 4 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 5' 2 3/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	3.15"	1948	2522	4470	Blocking
2 - Hanger on 11 7/8" LSL beam	3.50"	Hanger[1]	1.50"	1015	1318	2332	See note [1]

- 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
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 5" o/c	
Bottom Edge (Lu)	5' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LUS414	2.00"	N/A	10-16d	6-16d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 5' 4 3/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 5' 8 1/4" (Front)	11' 4"	30.0	40.0	Default Load
2 - Point (lb)	1 3/4" (Top)	N/A	974	1261	Linked from: Grid 5.6 (D-D.3) Flush Beam, Support 1

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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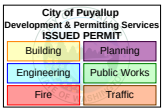

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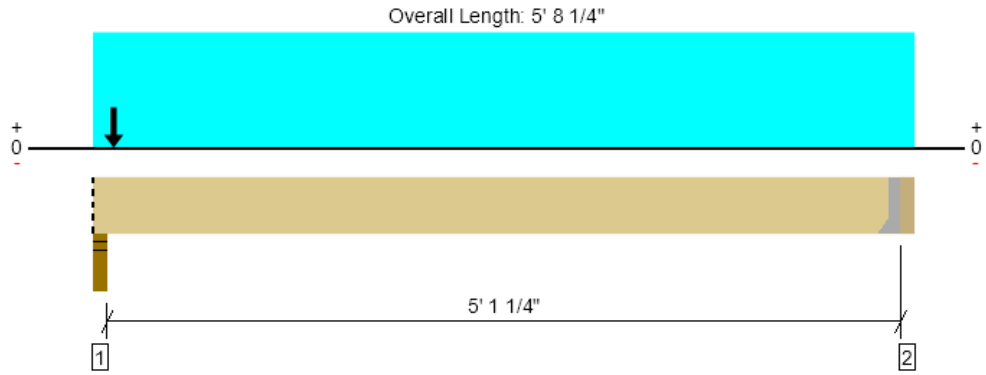
2nd Floor Framing, Grid 8.4 (D-D.3) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4470 @ 2"	4961 (3.50")	Passed (90%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1306 @ 4' 4 7/8"	7343	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	2746 @ 2' 9 3/8"	16452	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.009 @ 2' 9 3/8"	0.131	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.015 @ 2' 9 3/8"	0.261	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 5' 4 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 5' 2 3/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	3.15"	1948	2522	4470	Blocking
2 - Hanger on 11 7/8" LSL beam	3.50"	Hanger[1]	1.50"	1015	1318	2332	See note [1]

- 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
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 5" o/c	
Bottom Edge (Lu)	5' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LUS414	2.00"	N/A	10-16d	6-16d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 5' 4 3/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 5' 8 1/4" (Front)	11' 4"	30.0	40.0	Default Load
2 - Point (lb)	1 3/4" (Top)	N/A	974	1261	Linked from: Grid 5.6 (D-D.3) Flush Beam, Support 1

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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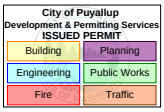

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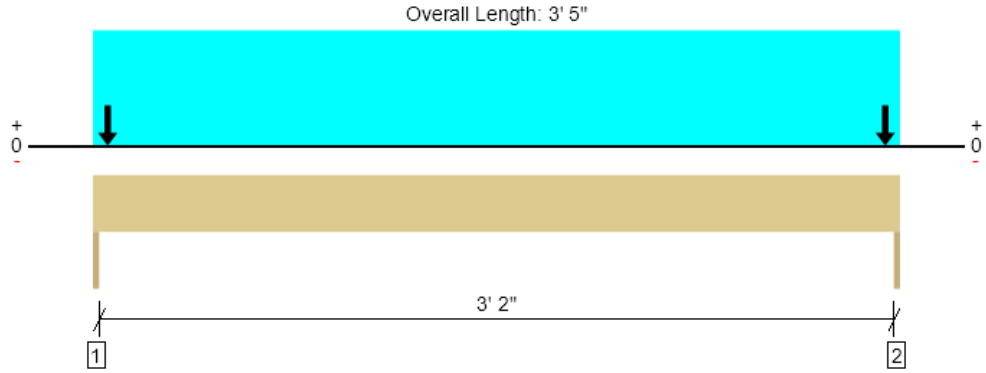
2nd Floor Framing, Grid 6 (D.5-D.6) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2732 @ 0	3281 (1.50")	Passed (83%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	783 @ 8 3/4"	3045	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1167 @ 1' 8 1/2"	2989	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.008 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.014 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1184	1548	2732	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1184	1548	2732	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	11' 4"	30.0	40.0	Default Load
2 - Point (lb)	3/4"	N/A	592	774	Linked from: Grid 6 (D.5-D.6) Bedroom Door Header, Support 1
3 - Point (lb)	3' 4 1/4"	N/A	592	774	Linked from: Grid 6 (D.5-D.6) Bedroom Door Header, Support 2

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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FORTEWEB

MEMBER REPORT

2nd Floor Framing, Main Landing Post

1 piece(s) 6 x 10 DF No.2

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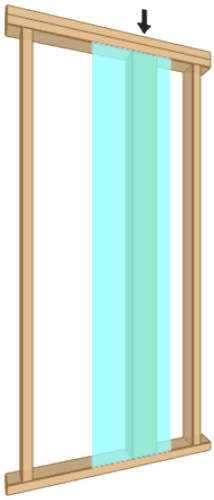
Wall Height: 9' | Member Height: 8' 7 1/2" | Tributary Width: 1' 4"



Drawing is Conceptual

Design Results	Actual	Allowed	Result	LDF	Load: Combination
Slenderness	11	50	Passed (22%)	--	--
Compression (lbs)	20238	30059	Passed (67%)	1.00	1.0 D + 1.0 L
Plate Bearing (lbs)	20238	21161	Passed (96%)	--	1.0 D + 1.0 L
Lateral Reaction (lbs)	79	--	--	1.60	1.0 D + 0.6 W
Lateral Shear (lbs)	65	9475	Passed (1%)	1.60	1.0 D + 0.6 W
Lateral Moment (ft-lbs)	171 @ mid-span	9642	Passed (2%)	1.60	1.0 D + 0.6 W
Total Deflection (in)	0.04 @ mid-span	0.86	Passed (L/2401)	--	1.0 D + 1.0 L
Bending/Compression	0.97	1	Passed (97%)	1.00	1.0 D + 1.0 L

- Lateral deflection criteria: Wind (L/120)
- Input axial load eccentricity for this design is 16.67% of applicable member side dimension.
- Applicable calculations are based on NDS.
- Bearing shall be on a metal plate or strap, or on other equivalently durable, rigid, homogeneous material with sufficient stiffness to distribute applied load.
- Special detailing and installation procedures are necessary for large wall construction.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.

Supports	Type	Material
Top	Dbl 2X	Hem Fir
Base	2X	Hem Fir

System : Wall
Member Type : Column
Building Code : IBC 2018
Design Methodology : ASD

Max Unbraced Length	Comments
1'	

Lateral Connections

Supports	Connector	Type/Model	Quantity	Connector Nailing
Top	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A
Base	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A

- Nailed connection at the top of the member is assumed to be nailed through the bottom 2x plate prior to placement of the top 2x of the double top plate assembly.

Vertical Loads	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
1 - Point (lb)	N/A	3004	9192	Linked from: Top Landing Beam, Support 2
2 - Point (lb)	N/A	1975	6067	Linked from: Top Landing Beam, Support 1

Lateral Load	Location	Tributary Width	Wind (1.60)	Comments
1 - Uniform (PSF)	Full Length	1' 4"	22.9	

- ASCE/SEI 7 Sec. 30.4: Exposure Category (B), Mean Roof Height (33'), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (110), Risk Category(II), Wind Zone (4), GCpi (+/- 0.18), Effective Wind Area determined using full member span and trib. width.
- IBC Table 1604.3, footnote f: Deflection checks are performed using 42% of this lateral wind load.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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MEMBER REPORT

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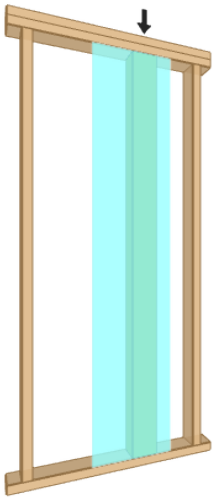
2nd Floor Framing, Grid 6.2B.6 Post

1 piece(s) 4 x 6 DF No.2

Wall Height: 9' Member Height: 8' 7 1/2" Tributary Width: 0



Drawing is Conceptual

Design Results	Actual	Allowed	Result	LDF	Load: Combination
Slenderness	19	50	Passed (38%)	--	--
Compression (lbs)	6274	18757	Passed (33%)	1.00	1.0 D + 1.0 L
Plate Bearing (lbs)	6274	7796	Passed (80%)	--	1.0 D + 1.0 L
Lateral Reaction (lbs)	0	--	--	--	N/A
Lateral Shear (lbs)	0	N/A	Passed (N/A)	--	N/A
Lateral Moment (ft-lbs)	0 @ mid-span	N/A	Passed (N/A)	--	N/A
Total Deflection (in)	0.00 @ mid-span	N/A	Passed (N/A)	--	N/A
Bending/Compression	N/A	1	Passed (N/A)	--	N/A

- Lateral deflection criteria: Wind (L/180)
- Input axial load eccentricity for the design is zero
- Applicable calculations are based on NDS.
- Bearing shall be on a metal plate or strap, or on other equivalently durable, rigid, homogeneous material with sufficient stiffness to distribute applied load.

Supports	Type	Material
Top	Dbl 2X	Hem Fir
Base	2X	Hem Fir

System : Wall
Member Type : Column
Building Code : IBC 2018
Design Methodology : ASD

Max Unbraced Length	Comments
1'	

Lateral Connections

Supports	Connector	Type/Model	Quantity	Connector Nailing
Top	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A
Base	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A

- Nailed connection at the top of the member is assumed to be nailed through the bottom 2x plate prior to placement of the top 2x of the double top plate assembly.

Vertical Load	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
1 - Point (lb)	N/A	2740	3534	Linked from: Grid 6.2 (B.7-C) Flush Beam, Support 2

Lateral Load	Location	Tributary Width	Wind (1.60)	Comments
1 - Uniform (PSF)	Full Length	N/A	22.9	

- ASCE/SEI 7 Sec. 30.4: Exposure Category (B), Mean Roof Height (33'), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (110), Risk Category(II), Wind Zone (4), GCpi (+/- 0.18), Effective Wind Area determined using full member span and trib. width.
- IBC Table 1604.3, footnote f: Deflection checks are performed using 42% of this lateral wind load.

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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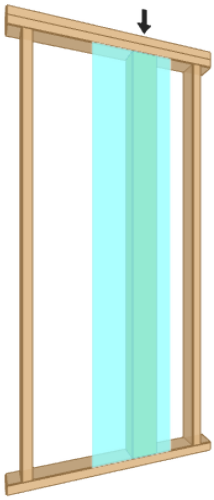
2nd Floor Framing, Grid 7.8B.6 Post

1 piece(s) 4 x 6 DF No.2

Wall Height: 9' | Member Height: 8' 7 1/2" | Tributary Width: 0



Drawing is Conceptual

Design Results	Actual	Allowed	Result	LDF	Load: Combination
Slenderness	19	50	Passed (38%)	--	--
Compression (lbs)	6274	18757	Passed (33%)	1.00	1.0 D + 1.0 L
Plate Bearing (lbs)	6274	7796	Passed (80%)	--	1.0 D + 1.0 L
Lateral Reaction (lbs)	0	--	--	--	N/A
Lateral Shear (lbs)	0	N/A	Passed (N/A)	--	N/A
Lateral Moment (ft-lbs)	0 @ mid-span	N/A	Passed (N/A)	--	N/A
Total Deflection (in)	0.00 @ mid-span	N/A	Passed (N/A)	--	N/A
Bending/Compression	N/A	1	Passed (N/A)	--	N/A

- Lateral deflection criteria: Wind (L/180)
- Input axial load eccentricity for the design is zero
- Applicable calculations are based on NDS.
- Bearing shall be on a metal plate or strap, or on other equivalently durable, rigid, homogeneous material with sufficient stiffness to distribute applied load.

Supports	Type	Material
Top	Dbl 2X	Hem Fir
Base	2X	Hem Fir

System : Wall
Member Type : Column
Building Code : IBC 2018
Design Methodology : ASD

Max Unbraced Length	Comments
1'	

Lateral Connections

Supports	Connector	Type/Model	Quantity	Connector Nailing
Top	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A
Base	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A

- Nailed connection at the top of the member is assumed to be nailed through the bottom 2x plate prior to placement of the top 2x of the double top plate assembly.

Vertical Load	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
1 - Point (lb)	N/A	2740	3534	Linked from: Grid 6.2 (B.7-C) Flush Beam, Support 2

Lateral Load	Location	Tributary Width	Wind (1.60)	Comments
1 - Uniform (PSF)	Full Length	N/A	22.9	

- ASCE/SEI 7 Sec. 30.4: Exposure Category (B), Mean Roof Height (33'), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (110), Risk Category(II), Wind Zone (4), GCpi (+/- 0.18), Effective Wind Area determined using full member span and trib. width.
- IBC Table 1604.3, footnote f: Deflection checks are performed using 42% of this lateral wind load.

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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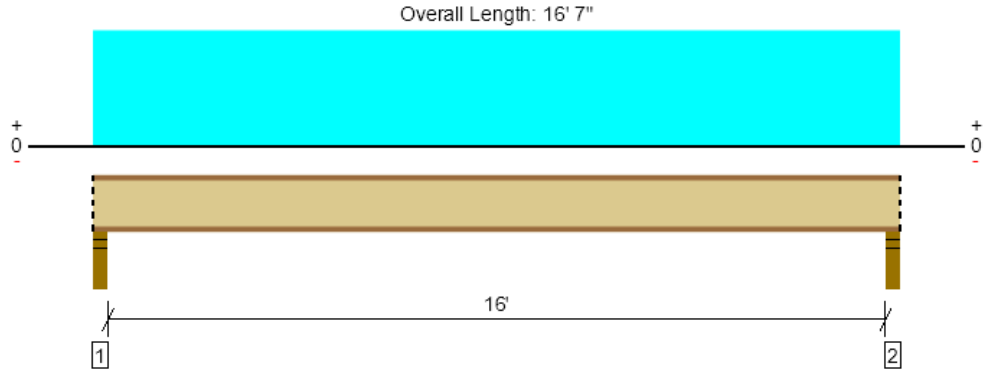
3rd Floor Framing, Floor Joist 16' and Under

1 piece(s) 11 7/8" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	774 @ 2 1/2"	1375 (3.50")	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	747 @ 3 1/2"	1560	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3049 @ 8' 3 1/2"	3160	Passed (96%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.275 @ 8' 3 1/2"	0.539	Passed (L/704)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.482 @ 8' 3 1/2"	0.808	Passed (L/403)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	48	40	Passed	--	--

Member Length : 16' 7"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.75"	332	442	774	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.75"	332	442	774	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 1" o/c	
Bottom Edge (Lu)	16' 7" o/c	

•TJI joists are only analyzed using Maximum Allowable bracing solutions.
•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 16' 7"	16"	30.0	40.0	Default Load

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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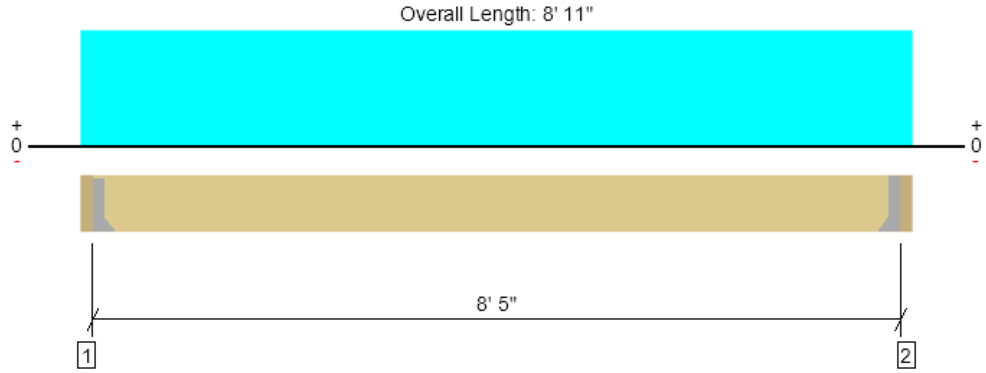
3rd Floor Framing, 8'-5" Landing Joists

1 piece(s) 2 x 12 HF No.2 @ 12" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	821 @ 3"	911 (1.50")	Passed (90%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	638 @ 1' 2 1/4"	1688	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1727 @ 4' 5 1/2"	2577	Passed (67%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.073 @ 4' 5 1/2"	0.281	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.095 @ 4' 5 1/2"	0.421	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 8' 5"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 11 1/4" LSL beam	3.00"	Hanger[1]	1.50"	201	669	869	See note [1]
2 - Hanger on 11 1/4" LSL beam	3.00"	Hanger[1]	1.50"	201	669	869	See note [1]

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 4" o/c	
Bottom Edge (Lu)	8' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	3-10d	
2 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	3-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 8' 11"	12"	45.0	150.0	Default Load

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

3rd Floor Framing, Short Stair Stringers

1 piece(s) 4 x 12 HF No.2

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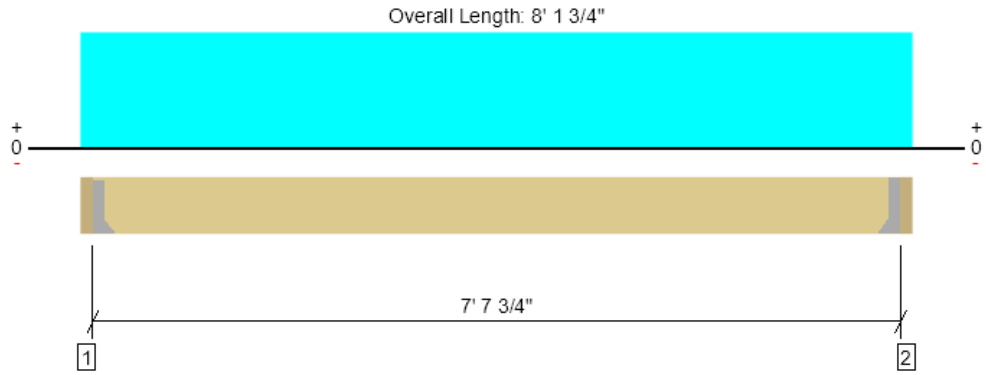

Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1529 @ 3"	2126 (1.50")	Passed (72%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1154 @ 1' 2 1/4"	3938	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2923 @ 4' 7/8"	5752	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.043 @ 4' 7/8"	0.191	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.057 @ 4' 7/8"	0.382	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 7' 7 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 11 1/4" GLB beam	3.00"	Hanger[1]	1.50"	405	1222	1627	See note [1]
2 - Hanger on 11 1/4" GLB beam	3.00"	Hanger[1]	1.50"	405	1222	1627	See note [1]

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 8" o/c	
Bottom Edge (Lu)	7' 8" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS410	2.00"	N/A	8-16d	6-16d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-16d	6-16d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3" to 7' 10 3/4"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 8' 1 3/4" (Front)	2'	45.0	150.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

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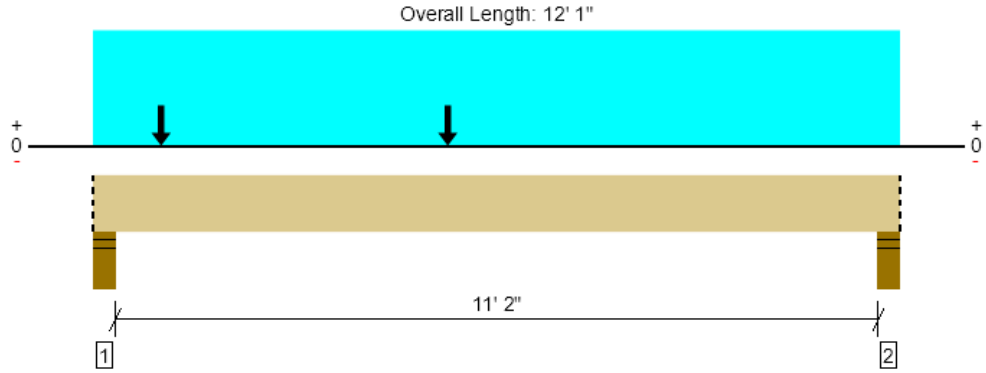
3rd Floor Framing, Top Landing Beam

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8041 @ 4"	12251 (5.50")	Passed (66%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	6022 @ 1' 5 1/2"	11660	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	20040 @ 5' 3 3/4"	26400	Passed (76%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.241 @ 5' 11 13/16"	0.285	Passed (L/569)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.319 @ 5' 11 3/4"	0.571	Passed (L/429)	--	1.0 D + 1.0 L (All Spans)

Member Length : 12' 1"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 5".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	5.50"	3.61"	1975	6067	8041	Blocking
2 - Stud wall - HF	5.50"	5.50"	2.87"	1567	4836	6402	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 1" o/c	
Bottom Edge (Lu)	12' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 1"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 12' 1" (Front)	4' 8"	45.0	150.0	Default Load
2 - Point (lb)	1' 1/4" (Front)	N/A	405	1222	Linked from: Short Stair Stringers, Support 1
3 - Point (lb)	5' 3 3/4" (Front)	N/A	405	1222	Linked from: Short Stair Stringers, Support 1

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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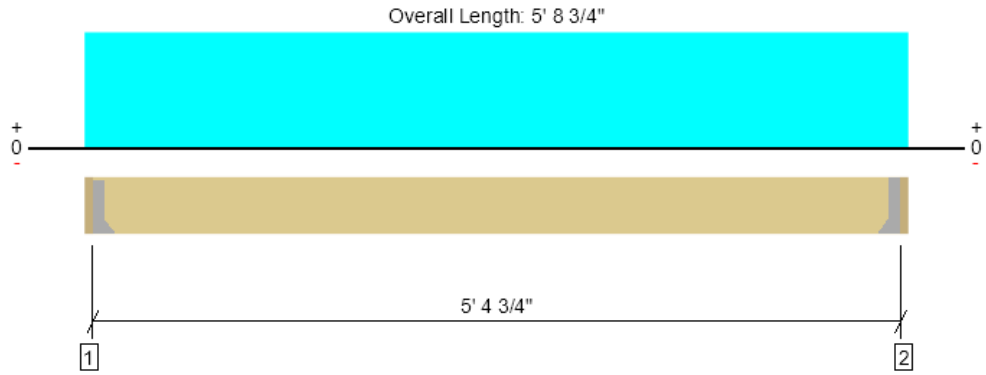
3rd Floor Framing, 4' Mid Landing Joists

1 piece(s) 2 x 8 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	701 @ 2"	911 (1.50")	Passed (77%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	544 @ 9 1/4"	1088	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	946 @ 2' 10 3/8"	1284	Passed (74%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.062 @ 2' 10 3/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.080 @ 2' 10 3/8"	0.270	Passed (L/809)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 5' 4 3/4"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 7 1/4" LSL beam	2.00"	Hanger[1]	1.50"	172	573	745	See note [1]
2 - Hanger on 7 1/4" LSL beam	2.00"	Hanger[1]	1.50"	172	573	745	See note [1]

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 5" o/c	
Bottom Edge (Lu)	5' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LU26	1.50"	N/A	6-16d	4-10dx1.5	
2 - Face Mount Hanger	LU26	1.50"	N/A	6-16d	4-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 5' 8 3/4"	16"	45.0	150.0	Default Load

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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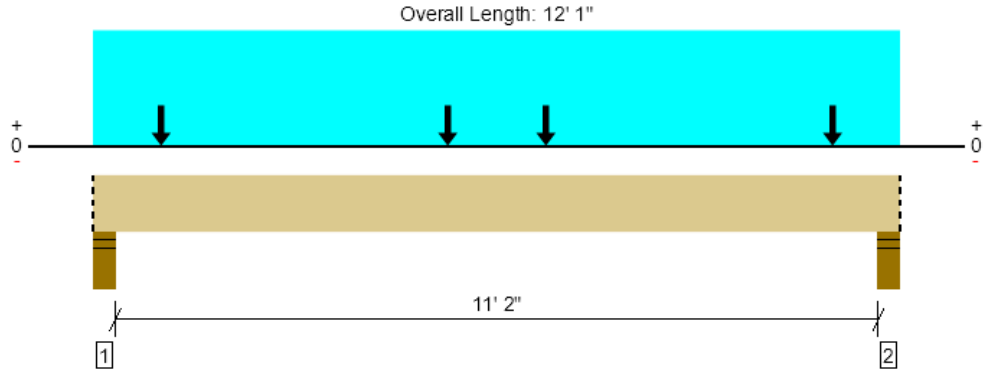
3rd Floor Framing, Mid Landing Inner Beam

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6986 @ 11' 9"	12251 (5.50")	Passed (57%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5411 @ 1' 5 1/2"	11660	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	19260 @ 6' 7/16"	26400	Passed (73%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.230 @ 6' 1/2"	0.285	Passed (L/596)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.307 @ 6' 1/2"	0.571	Passed (L/447)	--	1.0 D + 1.0 L (All Spans)

Member Length : 12' 1"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 5".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	5.50"	3.13"	1744	5236	6981	Blocking
2 - Stud wall - HF	5.50"	5.50"	3.14"	1746	5241	6986	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 1" o/c	
Bottom Edge (Lu)	12' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 1"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 12' 1" (Front)	3' 1"	45.0	150.0	Default Load
2 - Point (lb)	1' 1/4" (Front)	N/A	405	1222	Linked from: Short Stair Stringers, Support 1
3 - Point (lb)	5' 3 3/4" (Front)	N/A	405	1222	Linked from: Short Stair Stringers, Support 1
4 - Point (lb)	6' 9 3/8" (Front)	N/A	405	1222	Linked from: Short Stair Stringers, Support 1
5 - Point (lb)	11' 7/8" (Front)	N/A	405	1222	Linked from: Short Stair Stringers, Support 1

• Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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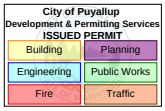

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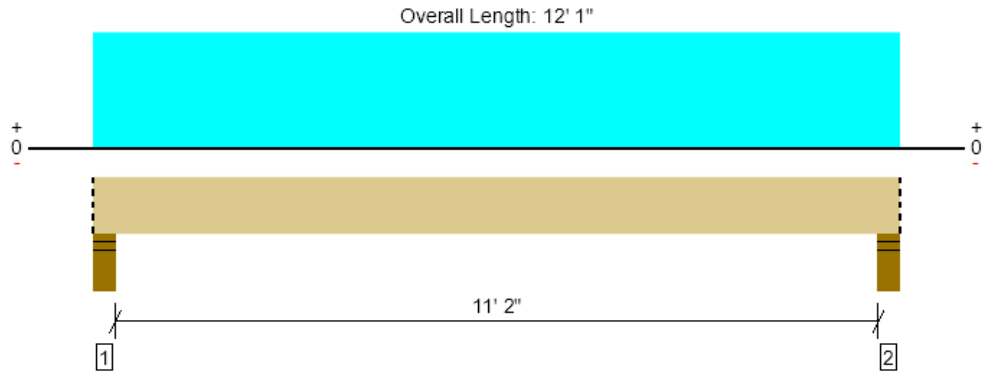
3rd Floor Framing, Mid Landing Outer Beam

1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3687 @ 4"	7796 (5.50")	Passed (47%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2873 @ 1' 4"	6493	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	9941 @ 6' 1/2"	12863	Passed (77%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.291 @ 6' 1/2"	0.285	Passed (L/471)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.384 @ 6' 1/2"	0.571	Passed (L/357)	--	1.0 D + 1.0 L (All Spans)

Member Length : 12' 1"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 5".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	5.50"	2.60"	892	2794	3687	Blocking
2 - Stud wall - HF	5.50"	5.50"	2.60"	892	2794	3687	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 1" o/c	
Bottom Edge (Lu)	12' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 1"	N/A	8.9	--	
1 - Uniform (PSF)	0 to 12' 1" (Front)	3' 1"	45.0	150.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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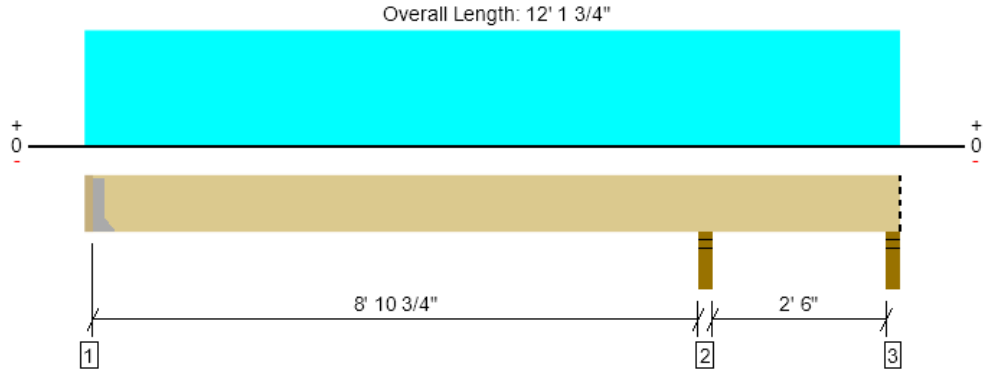
3rd Floor Framing, 8'-10" Deck Joist

1 piece(s) 2 x 12 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1168 @ 9' 2 1/2"	2126 (3.50")	Passed (55%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	520 @ 8' 1 1/2"	1688	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-968 @ 9' 2 1/2"	2577	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.028 @ 4' 2 7/8"	0.301	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.042 @ 4' 2 3/4"	0.452	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 11' 11 3/4"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- -285 lbs uplift at support located at 11' 11 1/4". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 11 1/4" HF beam	2.00"	Hanger[1]	1.50"	152	306	457	See note [1]
2 - Stud wall - HF	3.50"	3.50"	1.92"	389	779	1168	None
3 - Stud wall - HF	3.50"	3.50"	1.50"	-55	120/-230	64/-285	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
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' o/c	
Bottom Edge (Lu)	12' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	3-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 12' 1 3/4"	16"	30.0	60.0	Default Load

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Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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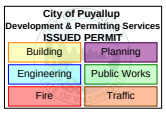

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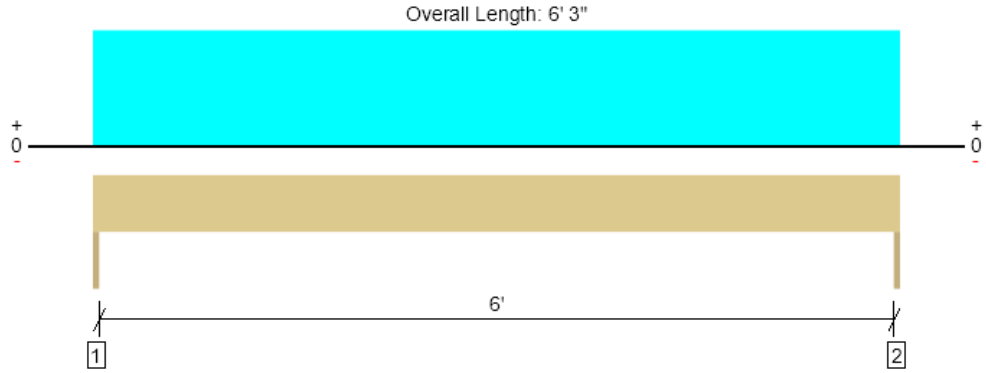
3rd Floor Framing, 6' Window Header

1 piece(s) 4 x 10 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2272 @ 0	3281 (1.50")	Passed (69%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1621 @ 10 3/4"	3885	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3550 @ 3' 1 1/2"	4492	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.031 @ 3' 1 1/2"	0.208	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.068 @ 3' 1 1/2"	0.313	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 6' 3"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1215	1057	2272	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1215	1057	2272	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 3" o/c	
Bottom Edge (Lu)	6' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 3"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 6' 3"	6' 7"	30.0	40.0	Floor
2 - Uniform (PLF)	0 to 6' 3"	N/A	108.0	-	Wall
3 - Uniform (PSF)	0 to 6' 3"	3'	25.0	25.0	Roof

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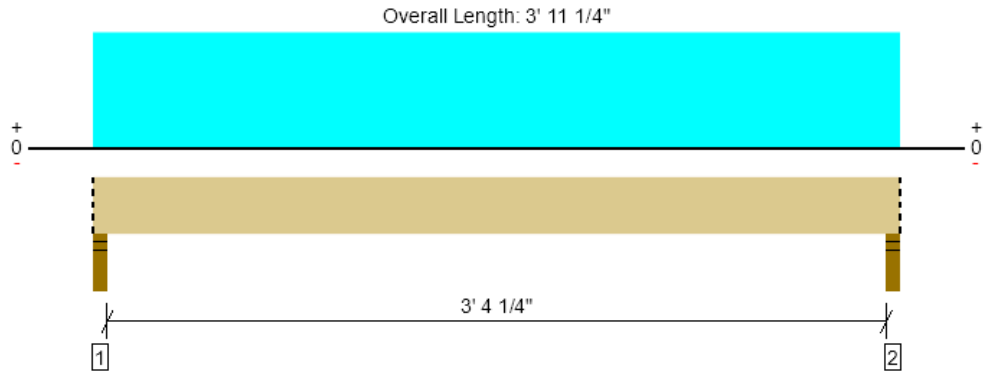
3rd Floor Framing, Grid 2 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1409 @ 2"	4961 (3.50")	Passed (28%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	492 @ 1' 3 3/8"	7343	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1163 @ 1' 11 5/8"	16452	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.002 @ 1' 11 5/8"	0.090	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.003 @ 1' 11 5/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 11 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	615	794	1409	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	615	794	1409	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	3' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 11 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 3' 11 1/4" (Front)	10' 1"	30.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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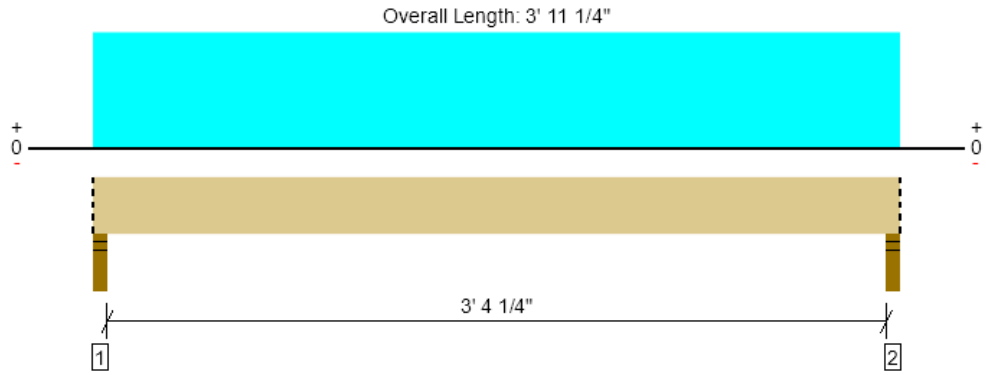
3rd Floor Framing, Grid 12 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1409 @ 2"	4961 (3.50")	Passed (28%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	492 @ 1' 3 3/8"	7343	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1163 @ 1' 11 5/8"	16452	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.002 @ 1' 11 5/8"	0.090	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.003 @ 1' 11 5/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 11 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	615	794	1409	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	615	794	1409	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	3' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 11 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 3' 11 1/4" (Front)	10' 1"	30.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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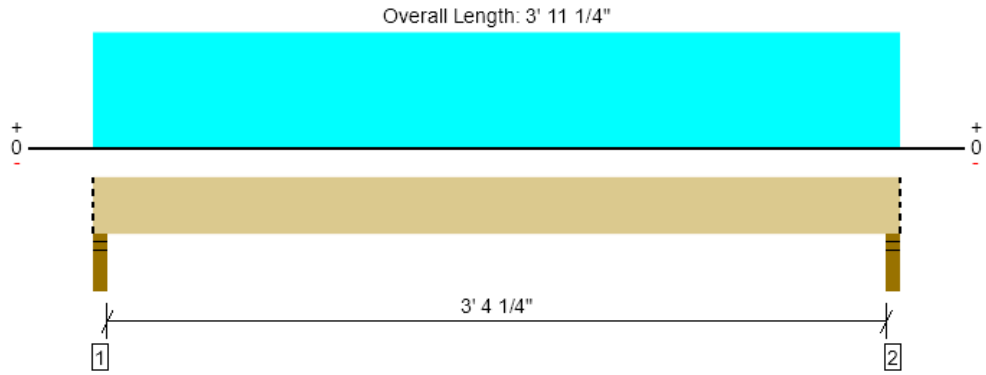
3rd Floor Framing, Grid 3.1 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1398 @ 2"	4961 (3.50")	Passed (28%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	488 @ 1' 3 3/8"	7343	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1153 @ 1' 11 5/8"	16452	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.002 @ 1' 11 5/8"	0.090	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.003 @ 1' 11 5/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 11 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	611	788	1398	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	611	788	1398	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	3' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 11 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 3' 11 1/4" (Front)	10'	30.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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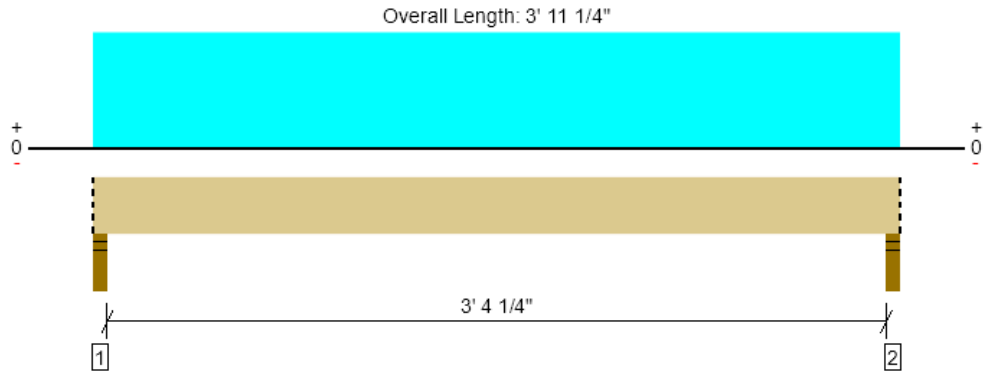
3rd Floor Framing, Grid 10.9 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1398 @ 2"	4961 (3.50")	Passed (28%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	488 @ 1' 3 3/8"	7343	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1153 @ 1' 11 5/8"	16452	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.002 @ 1' 11 5/8"	0.090	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.003 @ 1' 11 5/8"	0.180	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 11 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	611	788	1398	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	611	788	1398	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	3' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 11 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 3' 11 1/4" (Front)	10'	30.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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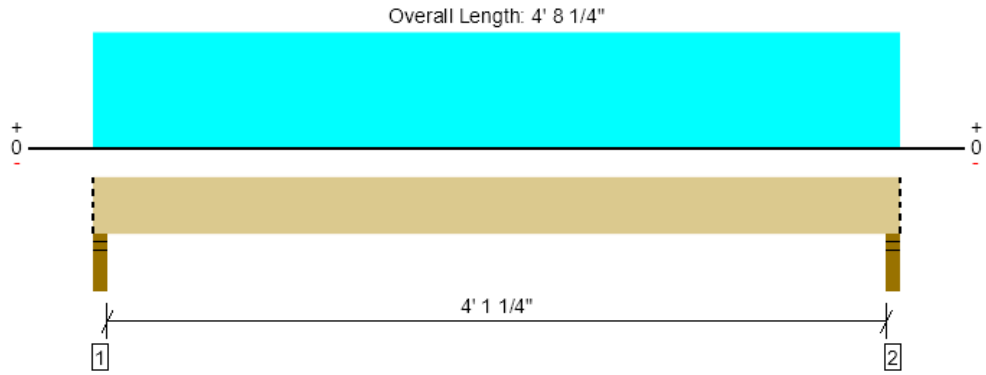
3rd Floor Framing, Grid 5.2 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1664 @ 2"	4961 (3.50")	Passed (34%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	754 @ 1' 3 3/8"	7343	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1683 @ 2' 4 1/8"	16452	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.004 @ 2' 4 1/8"	0.109	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.007 @ 2' 4 1/8"	0.218	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 4' 8 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 4' 4 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	727	938	1664	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	727	938	1664	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 8" o/c	
Bottom Edge (Lu)	4' 8" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 8 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 4' 8 1/4" (Front)	10'	30.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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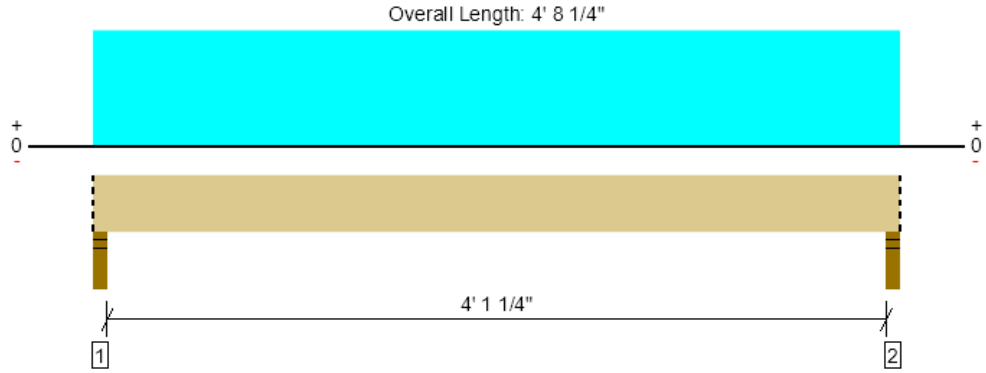
3rd Floor Framing, Grid 8.8 (B.6-B.8) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1664 @ 2"	4961 (3.50")	Passed (34%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	754 @ 1' 3 3/8"	7343	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1683 @ 2' 4 1/8"	16452	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.004 @ 2' 4 1/8"	0.109	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.007 @ 2' 4 1/8"	0.218	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 4' 8 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 4' 4 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	727	938	1664	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	727	938	1664	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 8" o/c	
Bottom Edge (Lu)	4' 8" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 8 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 4' 8 1/4" (Front)	10'	30.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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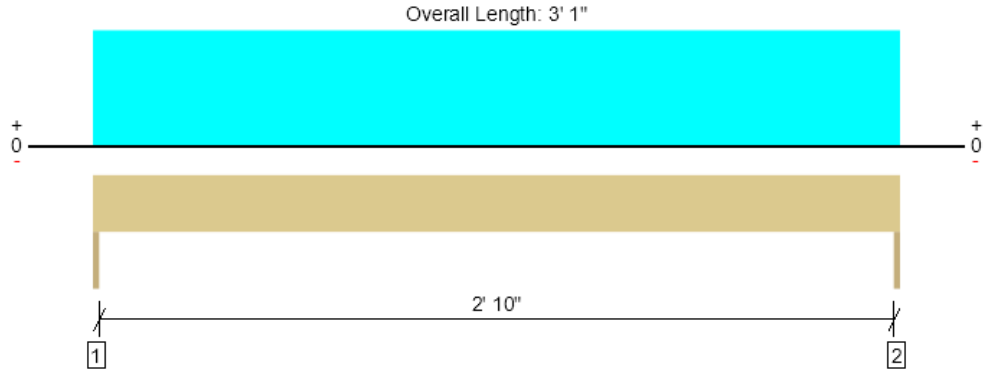
3rd Floor Framing, Grid 5.2 (B.8-B.9) Bathroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1089 @ 0	3281 (1.50")	Passed (33%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	574 @ 8 3/4"	3045	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	839 @ 1' 6 1/2"	2989	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.005 @ 1' 6 1/2"	0.103	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.008 @ 1' 6 1/2"	0.154	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 1"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	472	617	1089	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	472	617	1089	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 1" o/c	
Bottom Edge (Lu)	3' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 1"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 1"	10'	30.0	40.0	Default Load

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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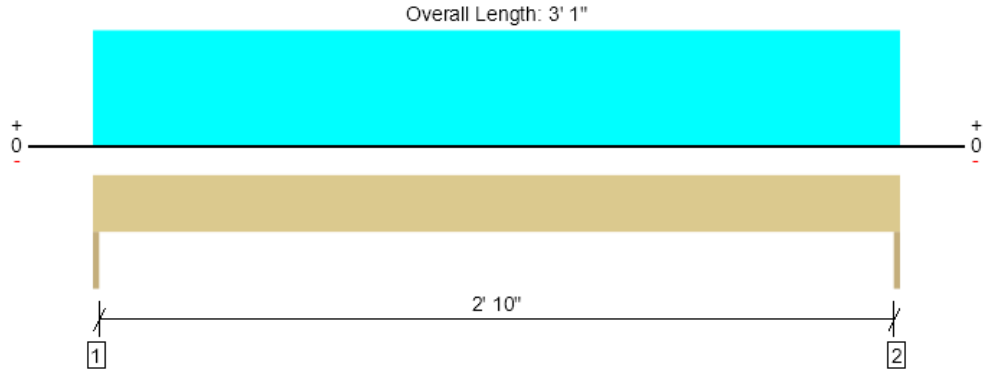
3rd Floor Framing, Grid 8.8 (B.8-B.9) Bathroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1089 @ 0	3281 (1.50")	Passed (33%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	574 @ 8 3/4"	3045	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	839 @ 1' 6 1/2"	2989	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.005 @ 1' 6 1/2"	0.103	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.008 @ 1' 6 1/2"	0.154	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 1"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	472	617	1089	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	472	617	1089	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 1" o/c	
Bottom Edge (Lu)	3' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 1"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 1"	10'	30.0	40.0	Default Load

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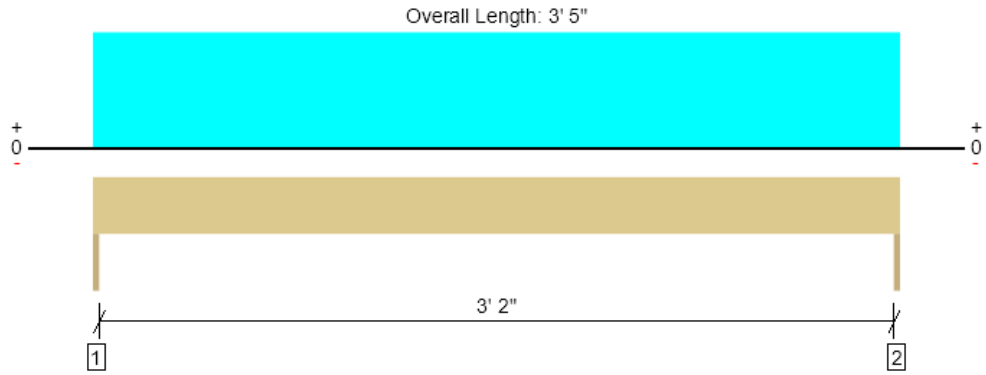
3rd Floor Framing, Grid 6.2 (B.4-B.5) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1207 @ 0	3281 (1.50")	Passed (37%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	692 @ 8 3/4"	3045	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1031 @ 1' 8 1/2"	2989	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.007 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.012 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	523	683	1207	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	523	683	1207	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	10'	30.0	40.0	Default Load

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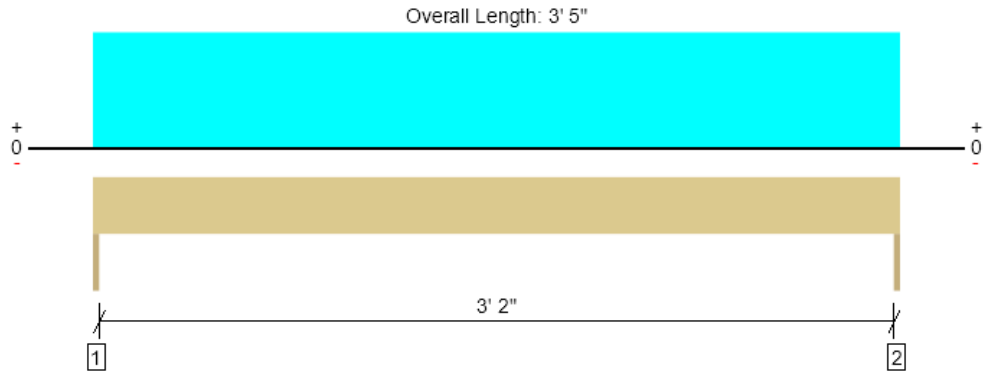
3rd Floor Framing, Grid 7.8 (B.4-B.5) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1207 @ 0	3281 (1.50")	Passed (37%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	692 @ 8 3/4"	3045	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1031 @ 1' 8 1/2"	2989	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.007 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.012 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	523	683	1207	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	523	683	1207	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	10'	30.0	40.0	Default Load

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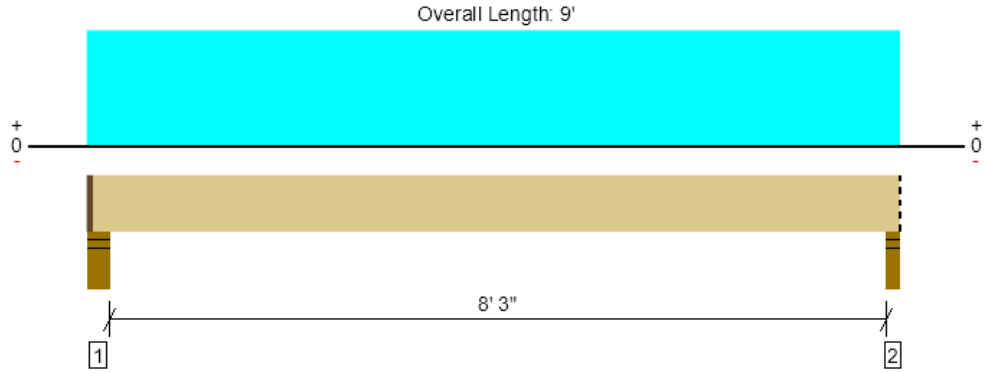
3rd Floor Framing, Grid 6.2 (B.7-C) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3136 @ 8' 10"	4961 (3.50")	Passed (63%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2226 @ 1' 5 3/8"	7343	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	6413 @ 4' 7"	16452	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.053 @ 4' 7"	0.213	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.095 @ 4' 7"	0.425	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 8' 10 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 6".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	4.00"	2.23"	1420	1833	3253	1 1/2" Rim Board
2 - Stud wall - HF	3.50"	3.50"	2.21"	1370	1767	3136	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 11" o/c	
Bottom Edge (Lu)	8' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/2" to 9'	N/A	10.1	--	
1 - Uniform (PSF)	0 to 9' (Front)	10'	30.0	40.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

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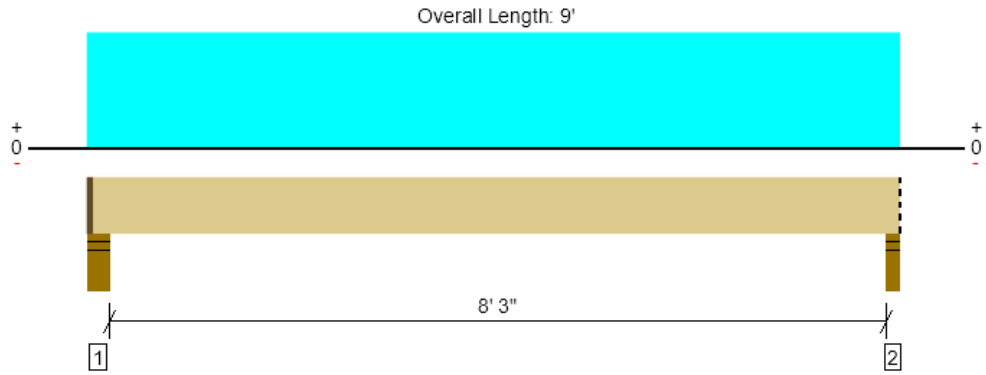
3rd Floor Framing, Grid 7.8 (B.7-C) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3136 @ 8' 10"	4961 (3.50")	Passed (63%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2226 @ 1' 5 3/8"	7343	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	6413 @ 4' 7"	16452	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.053 @ 4' 7"	0.213	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.095 @ 4' 7"	0.425	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 8' 10 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 6".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	4.00"	2.23"	1420	1833	3253	1 1/2" Rim Board
2 - Stud wall - HF	3.50"	3.50"	2.21"	1370	1767	3136	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 11" o/c	
Bottom Edge (Lu)	8' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/2" to 9'	N/A	10.1	--	
1 - Uniform (PSF)	0 to 9' (Front)	10'	30.0	40.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

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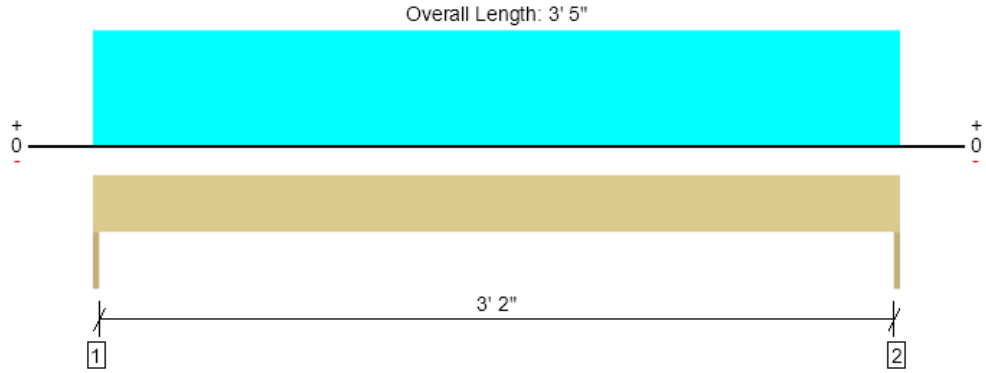
3rd Floor Framing, Grid 2.3 (D-D.1) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	988 @ 0	3281 (1.50")	Passed (30%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	566 @ 8 3/4"	3045	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	844 @ 1' 8 1/2"	2989	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.006 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.010 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	430	558	988	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	430	558	988	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	8' 2"	30.0	40.0	Default Load

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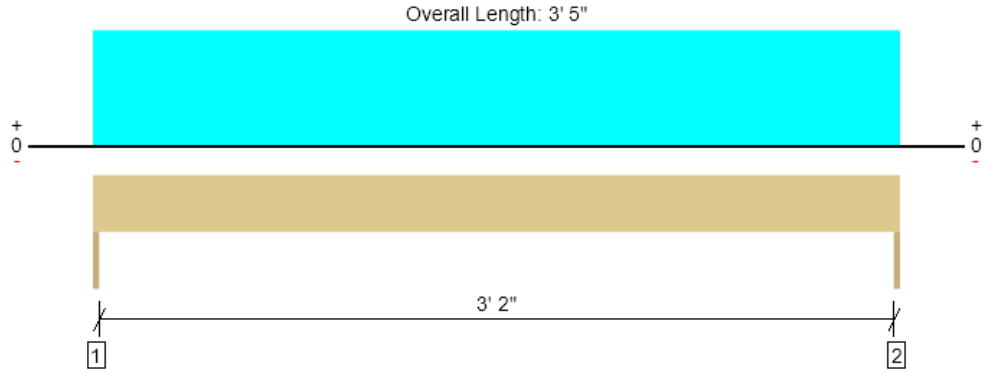
3rd Floor Framing, Grid 11.7 (D-D.1) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	988 @ 0	3281 (1.50")	Passed (30%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	566 @ 8 3/4"	3045	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	844 @ 1' 8 1/2"	2989	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.006 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.010 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	430	558	988	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	430	558	988	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	8' 2"	30.0	40.0	Default Load

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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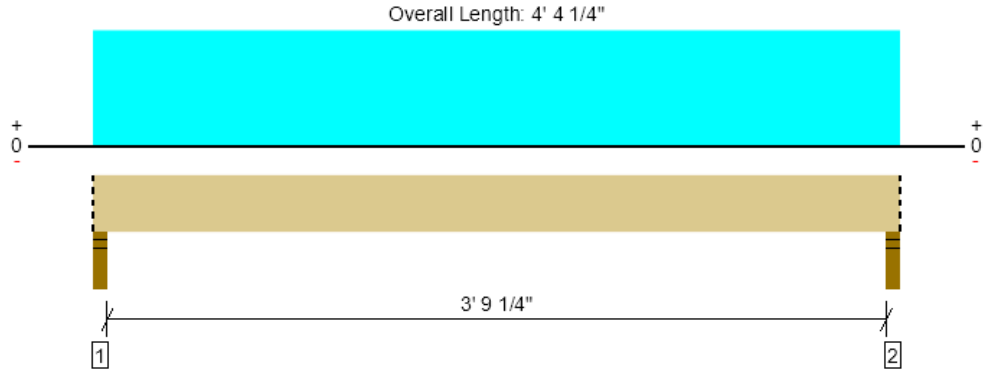
3rd Floor Framing, Grid 2.7 (D.2-D.4) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1736 @ 2"	4961 (3.50")	Passed (35%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	715 @ 1' 3 3/8"	7343	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1612 @ 2' 2 1/8"	16452	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.003 @ 2' 2 1/8"	0.101	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.005 @ 2' 2 1/8"	0.201	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 4' 4 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 4' 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	757	980	1736	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	757	980	1736	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 4" o/c	
Bottom Edge (Lu)	4' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 4 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 4' 4 1/4" (Front)	11' 3"	30.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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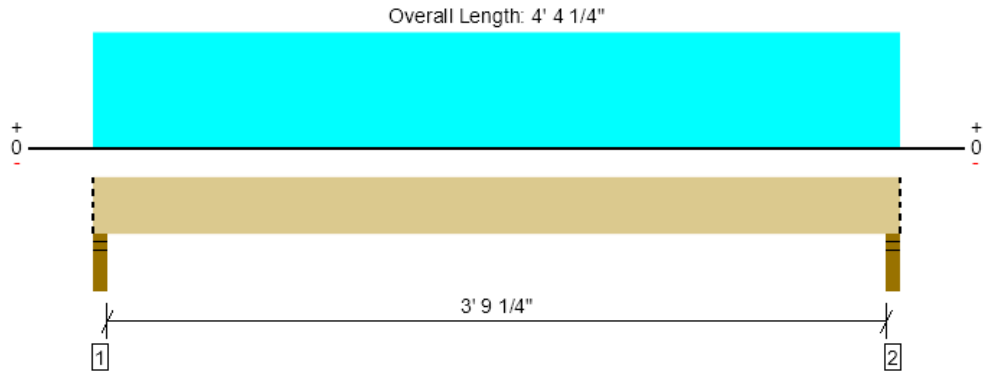
3rd Floor Framing, Grid 11.3 (D.2-D.4) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1736 @ 2"	4961 (3.50")	Passed (35%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	715 @ 1' 3 3/8"	7343	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1612 @ 2' 2 1/8"	16452	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.003 @ 2' 2 1/8"	0.101	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.005 @ 2' 2 1/8"	0.201	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 4' 4 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 4' 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	757	980	1736	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	757	980	1736	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 4" o/c	
Bottom Edge (Lu)	4' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 4 1/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 4' 4 1/4" (Front)	11' 3"	30.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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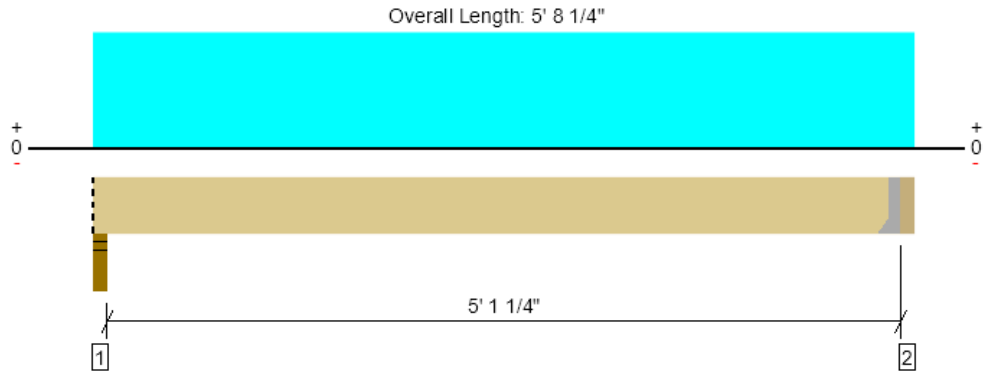
3rd Floor Framing, Grid 5.6 (D-D.3) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2101 @ 5' 4 3/4"	3413 (1.50")	Passed (62%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1306 @ 4' 4 7/8"	7343	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	2746 @ 2' 9 3/8"	16452	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.009 @ 2' 9 3/8"	0.131	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.015 @ 2' 9 3/8"	0.261	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 5' 4 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 5' 2 3/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.58"	974	1261	2235	Blocking
2 - Hanger on 11 7/8" LSL beam	3.50"	Hanger[1]	1.50"	1015	1318	2332	See note [1]

- 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
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 5" o/c	
Bottom Edge (Lu)	5' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LUS414	2.00"	N/A	10-16d	6-16d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 5' 4 3/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 5' 8 1/4" (Front)	11' 4"	30.0	40.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

Weyerhaeuser

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File Name: East Town Crossing Building G

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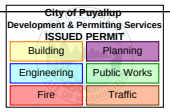

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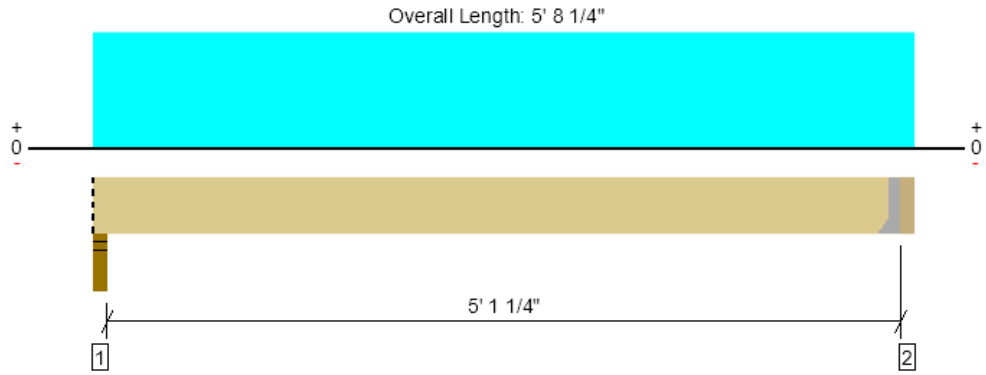
3rd Floor Framing, Grid 8.4 (D-D.3) Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2101 @ 5' 4 3/4"	3413 (1.50")	Passed (62%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1306 @ 4' 4 7/8"	7343	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	2746 @ 2' 9 3/8"	16452	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.009 @ 2' 9 3/8"	0.131	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.015 @ 2' 9 3/8"	0.261	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 5' 4 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 5' 2 3/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.58"	974	1261	2235	Blocking
2 - Hanger on 11 7/8" LSL beam	3.50"	Hanger[1]	1.50"	1015	1318	2332	See note [1]

- 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
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 5" o/c	
Bottom Edge (Lu)	5' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LUS414	2.00"	N/A	10-16d	6-16d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 5' 4 3/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 5' 8 1/4" (Front)	11' 4"	30.0	40.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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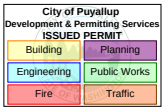

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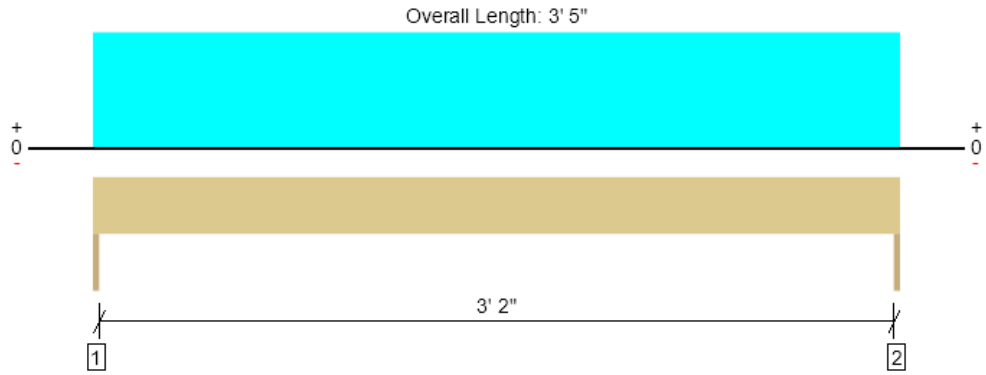
3rd Floor Framing, Grid 6 (D.5-D.6) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1366 @ 0	3281 (1.50")	Passed (42%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	783 @ 8 3/4"	3045	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1167 @ 1' 8 1/2"	2989	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.008 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.014 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	592	774	1366	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	592	774	1366	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	11' 4"	30.0	40.0	Default Load

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Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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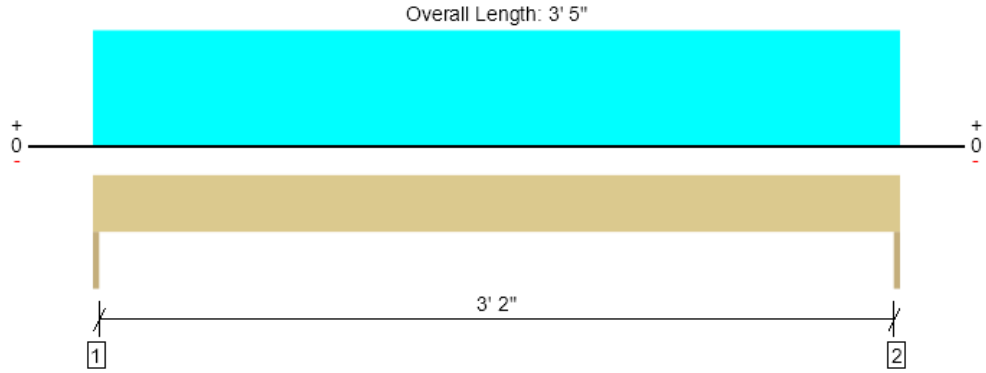
3rd Floor Framing, Grid 8 (D.5-D.6) Bedroom Door Header

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1366 @ 0	3281 (1.50")	Passed (42%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	783 @ 8 3/4"	3045	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1167 @ 1' 8 1/2"	2989	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.008 @ 1' 8 1/2"	0.114	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.014 @ 1' 8 1/2"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 5"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	592	774	1366	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	592	774	1366	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	3' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 5"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 5"	11' 4"	30.0	40.0	Default Load

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ForteWEB Software Operator	Job Notes
Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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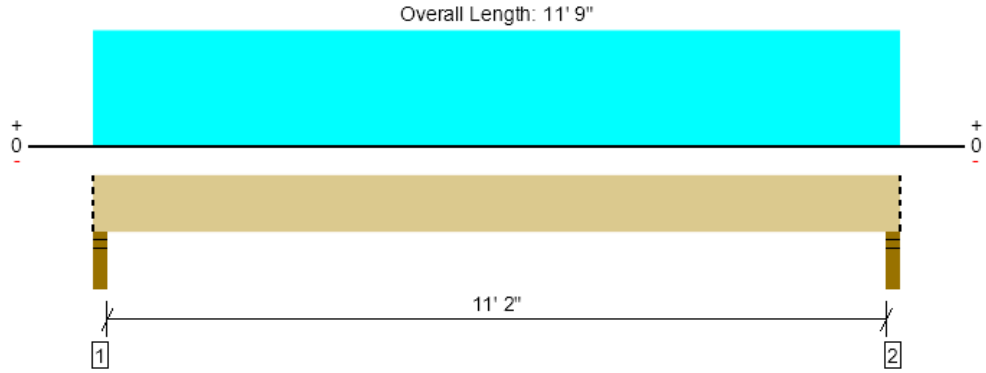
Roof Framing, Grid D.7 Entry Roof Beam

1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5084 @ 2"	4961 (3.50")	Passed (102%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4075 @ 1' 2"	7466	Passed (55%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	14099 @ 5' 10 1/2"	14792	Passed (95%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.269 @ 5' 10 1/2"	0.571	Passed (L/509)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.545 @ 5' 10 1/2"	0.761	Passed (L/252)	--	1.0 D + 1.0 S (All Spans)

Member Length : 11' 9"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0.25/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 5".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - HF	3.50"	3.50"	3.59"	2569	2515	5084	Blocking
2 - Stud wall - HF	3.50"	3.50"	3.59"	2569	2515	5084	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	11' 2" o/c	
Bottom Edge (Lu)	11' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 11' 9"	N/A	8.9	--	
1 - Uniform (PSF)	0 to 11' 9" (Front)	17' 1 1/2"	25.0	25.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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Chon Pieruccioni Pieruccioni Engineering (206) 949-7866 cpieru@hotmail.com	

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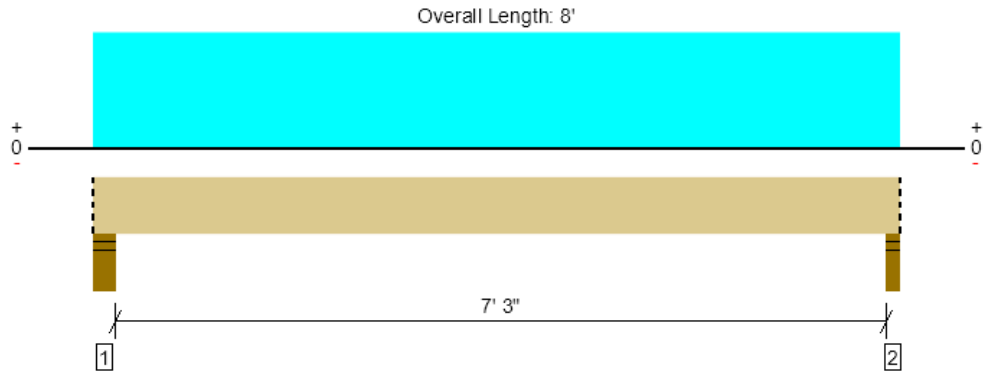
Roof Framing, Grid A 7'-3" Deck Roof Beam

1 piece(s) 3 1/2" x 7 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3257 @ 7' 10"	4961 (3.50")	Passed (66%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2495 @ 1' 1"	5333	Passed (47%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	5847 @ 4' 1"	7547	Passed (77%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.133 @ 4' 1"	0.375	Passed (L/679)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.267 @ 4' 1"	0.500	Passed (L/337)	--	1.0 D + 1.0 S (All Spans)

Member Length : 8'
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0.25/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 7' 6".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - HF	5.50"	5.50"	2.40"	1711	1684	3396	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.30"	1641	1616	3257	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' o/c	
Bottom Edge (Lu)	8' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8'	N/A	6.4	--	
1 - Uniform (PSF)	0 to 8' (Front)	16' 6"	25.0	25.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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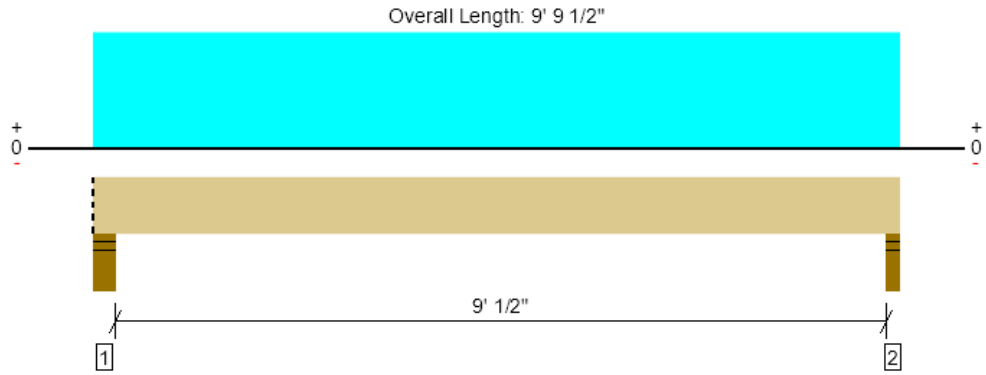
Roof Framing, Grid G 9' Deck Roof Beam

1 piece(s) 3 1/2" x 9" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4414 @ 9' 7 1/2"	4961 (3.50")	Passed (89%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3459 @ 1' 2 1/2"	6400	Passed (54%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	9899 @ 4' 11 3/4"	10868	Passed (91%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.199 @ 4' 11 3/4"	0.465	Passed (L/559)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.402 @ 4' 11 3/4"	0.620	Passed (L/277)	--	1.0 D + 1.0 S (All Spans)

Member Length : 9' 9 1/2"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0.25/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 9' 3 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - HF	5.50"	5.50"	3.22"	2303	2264	4567	Blocking
2 - Stud wall - HF	3.50"	3.50"	3.11"	2226	2188	4414	None

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' 10" o/c	
Bottom Edge (Lu)	9' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 9' 9 1/2"	N/A	7.7	--	
1 - Uniform (PSF)	0 to 9' 9 1/2" (Front)	18' 2 1/4"	25.0	25.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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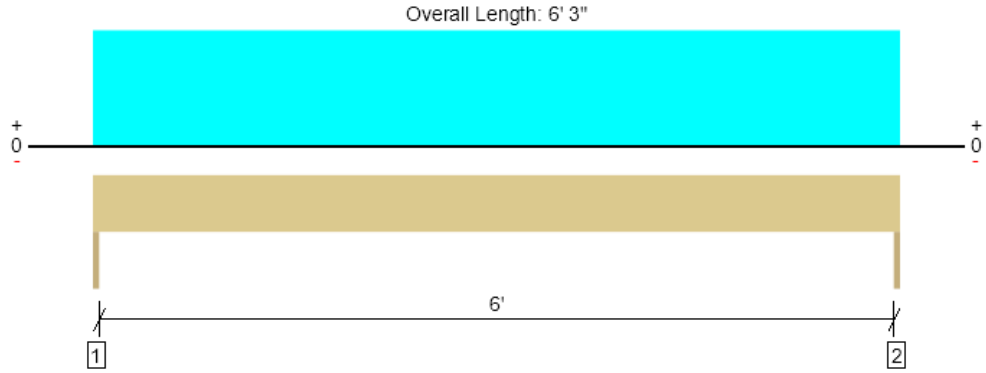
Roof Framing, 6' Window Header

1 piece(s) 4 x 10 DF No.2



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2956 @ 0	3281 (1.50")	Passed (90%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2108 @ 10 3/4"	4468	Passed (47%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4618 @ 3' 1 1/2"	5166	Passed (89%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.044 @ 3' 1 1/2"	0.208	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.088 @ 3' 1 1/2"	0.313	Passed (L/853)	--	1.0 D + 1.0 S (All Spans)

Member Length : 6' 3"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1491	1465	2956	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1491	1465	2956	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 3" o/c	
Bottom Edge (Lu)	6' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 3"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 6' 3"	18' 9"	25.0	25.0	Default Load

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ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*

GEOMETRY

Footing Length (X-dir)	3.50	ft	
Footing Width (Z-dir)	3.50	ft	
Footing Thickness	8.0	in	OK
Soil Cover	0.00	ft	
Column Length (X-dir)	6.0	in	
Column Width (Z-dir)	6.0	in	
Offset (X-dir)	0.00	in	OK
Offset (Z-dir)	0.00	in	OK
Base Plate (L x W)	6.0 x 6.0	in	

SOIL PRESSURES (D+L)

Gross Allow. Soil Pressure	2.0	ksf	
Soil Pressure at Corner 1	1.5	ksf	
Soil Pressure at Corner 2	1.5	ksf	
Soil Pressure at Corner 3	1.5	ksf	
Soil Pressure at Corner 4	1.5	ksf	
Bearing Pressure Ratio	0.76		OK
Ftg. Area in Contact with Soil	100.0	%	
X-eccentricity / Ftg. Length	0.00		OK
Z-eccentricity / Ftg. Width	0.00		OK

APPLIED LOADS

	Dead	Live	RLive	Snow	Wind	Seismic	
Axial Force P	5.2	12.8	0.0	0.0	0.0	0.0	kip
Moment about X Mx ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Moment about Z Mz ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Shear Force Vx	0.0	0.0	0.0	0.0	0.0	0.0	kip
Shear Force Vz	0.0	0.0	0.0	0.0	0.0	0.0	kip

OVERTURNING CALCULATIONS (Comb: 0.6D+0.6W)

- Overturning about X-X
- Moment Mx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft
- Shear Force Vz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

  Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft
- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft
- Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

- Resisting about X-X
- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 3.50 * 3.50 * 8.0 / 12 * 0.15 = 0.7 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.7 * 1.75 = 1.3 k-ft
- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

  Arm = *W / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft
- Soil cover = *0.6 * W * L * SC * Density* 0=6 * (3.50 * 3.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft
- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 3.50 * 3.50 * 62 * (0.67) = -0.3 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.3 * 1.75 = -0.5 k-ft
- Axial force P = 0.6 * 5.2 + 0.6 * 0.0 = 3.1 kip

  Arm = *W / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 3.1 * 1.75 = 5.5 k-ft
- Resisting moment X-X = 1.3 + 0.0 + 0.0 + 5.5 + -0.5 = 6.2 k-ft
- Overturning safety factor X-X = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{6.2}{0.0}$ = 62.11 > 1.50 OK

- Overturning about Z-Z

- Moment Mz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft

- Shear Force Vx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft

- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft

- Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

- Resisting about Z-Z

- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 3.50 * 3.50 * 8.0 / 12 * 0.15 = 0.7 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.7 * 1.75 = 1.3 k-ft

- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

Arm = *L / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft

- Soil cover = *0.6 * W * L * SC * Density* = 0.6 * (3.50 * 3.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft

- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 3.50 * 3.50 * 62 * (0.67) = -0.3 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.3 * 1.75 = -0.5 k-ft

- Axial force P = 0.6 * 5.2 + 0.6 * 0.0 = 3.1 kip

Arm = *L / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 3.1 * 1.75 = 5.5 k-ft

- Resisting moment Z-Z = 1.3 + 0.0 + 0.0 + 5.5 + -0.5 = 6.2 k-ft

- Overturning safety factor Z-Z = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{6.2}{0.0}$ = 62.11 > 1.50 OK

SOIL BEARING PRESSURES (Comb: D+L)

Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

Resisting moment X-X = 2.1 + 0.0 + 0.0 + -0.9 + 31.5 = 32.8 k-ft

Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

Resisting moment Z-Z = 2.1 + 0.0 + 0.0 + -0.9 + 31.5 = 32.8 k-ft

Resisting force = *Footing + Pedestal + Soil - Buoyancy + P* = 1.2 + 0.0 + 0.0 - 0.5 + 18.0 = 18.7 kip

X-coordinate of resultant from maximum bearing corner:

$$Xp = \frac{\textit{Z-Resisting moment - Z-Overturning moment}}{\textit{Resisting force}} = \frac{32.8 - 0.0}{18.7} = 1.75 \text{ ft}$$

Z-coordinate of resultant from maximum bearing corner:

$$Zp = \frac{\textit{X-Resisting moment - X-Overturning moment}}{\textit{Resisting force}} = \frac{32.8 - 0.0}{18.7} = 1.75 \text{ ft}$$

X-ecc = *Length / 2 - Xp* =3.50 / 2 - 1.75 = 0.00 ft

Z-ecc = *Width / 2 - Zp* = 3.50 / 2 - 1.75 = 0.00 ft

Area = *Width * Length* = 3.50 * 3.50 = 12.3 ft²

Sx = *Length * Width² / 6* = 3.50 * 3.50² / 6 = 7.1 ft³

Sz = *Width * Length² / 6* = 3.50 * 3.50² / 6 = 7.1 ft³

- Footing is in full bearing. Soil pressures are as follows:

P1 = *P * (1/ A + Z-ecc / Sx + X-ecc / Sz)* = 18.7 * (1 / 12.3 + 0.00 / 7.1 + 0.00 / 7.1) = 1.53 ksf

P2 = *P * (1/ A - Z-ecc / Sx + X-ecc / Sz)* = 18.7 * (1 / 12.3 - 0.00 / 7.1 + 0.00 / 7.1) = 1.53 ksf

P3 = *P * (1/ A - Z-ecc / Sx - X-ecc / Sz)* = 18.7 * (1 / 12.3 - 0.00 / 7.1 - 0.00 / 7.1) = 1.53 ksf

P4 = *P * (1/ A + Z-ecc / Sx - X-ecc / Sz)* = 18.7 * (1 / 12.3 + 0.00 / 7.1 - 0.00 / 7.1) = 1.53 ksf

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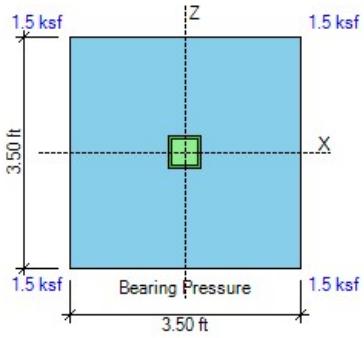
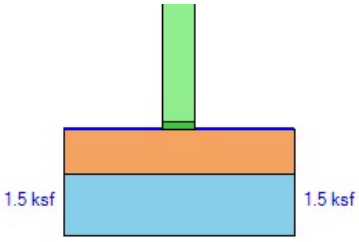




SLIDING CALCULATIONS (Comb: 0.6D+0.6W)

Internal friction angle = 28.0 deg

Passive coefficient *kp = 4.33 (per Coulomb)*

Pressure at mid-depth = *kp * Density * (Cover + Thick / 2)* = 4.33 * 110 * (0.00 + 8.0 / 12 / 2) = 0.16 ksf

X-Passive force = *Pressure * Thick * Width* = 0.16 * 8.0 / 12 * 3.50 = 0.4 kip

Z-Passive force = *Pressure * Thick * Length* = 0.16 * 8.0 / 12 * 3.50 = 0.4 kip

Friction force = *Resisting force * Friction coeff.* = Max (0, 3.5 * 0.35) = 1.2 kip

Use 100% of Passive + 100% of Friction for sliding resistance

- Sliding safety factor X-X = $\frac{\textit{X-Passive force + Friction}}{\textit{X-Horizontal load}} = \frac{1.00 * 0.4 + 1.00 * 1.2}{0.0}$ = 16.12 > 1.50 OK

- Sliding safety factor Z-Z = $\frac{\textit{Z-Passive force + Friction}}{\textit{Z-Horizontal load}} = \frac{1.00 * 0.4 + 1.00 * 1.2}{0.0}$ = 16.12 > 1.50 OK

UPLIFT CALCULATIONS (Comb: 0.6D+0.6W)

- Uplift safety factor = $\frac{\textit{Pedestal + Footing + Cover - Buoyancy}}{\textit{Uplift load}} = \frac{0.0 + 0.7 + 0.0 - 0.3}{0.0}$ = 99.99 > 1.00 OK

ONE-WAY SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Concrete f'c = 2.5 ksi Steel fy = 40.0 ksi Soil density = 110 pcf

d Top X-dir = *Thick - Cover - X-diameter / 2* = 8.0 - 2.0 - 0.8 / 2 = 5.6 in

d Top Z-dir = *Thick - Cover - X-diameter - Z-diameter / 2* = 8.0 - 2.0 - 0.8 - 0.8 / 2 = 4.9 in

d Bot X-dir = *Thick - Cover - X-diameter / 2* = 8.0 - 3.0 - 0.5 / 2 = 4.8 in

d Bot Z-dir = *Thick - Cover - X-diameter - Z-diameter / 2* = 8.0 - 3.0 - 0.5 - 0.5 / 2 = 4.3 in

$\phi Vcx = 2 * \phi * \sqrt{f'c} * Width * d / 1000$ = 2 * 0.75 * √(2500) * 3.5 * 12 * 4.8 / 1000 = 15.0 kip ACI Eq. (22.5.5.1)

$\phi Vcz = 2 * \phi * \sqrt{f'c} * Length * d / 1000$ = 2 * 0.75 * √(2500) * 3.5 * 12 * 4.3 / 1000 = 13.4 kip

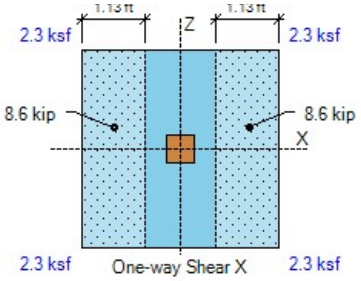
- Shear forces calculated as the volume of the bearing pressures under the effective areas:

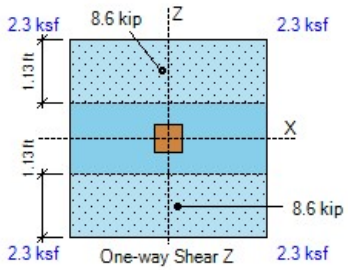
One-way shear Vux (- Side) = 8.6 kip < 15.0 kip OK

One-way shear Vux (+ Side) = 8.6 kip < 15.0 kip OK

One-way shear Vuz (- Side) = 8.6 kip < 13.4 kip OK

One-way shear Vuz (+ Side) = 8.6 kip < 13.4 kip OK





FLEXURE CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Plain ϕMnx = *5 * ϕ * √(f'c) * L * Thick² / 6* = 5 * 0.60 * √(2500) * 3.50 * 8.0² / 6 / 1000 = 1.5 k-ft ACI Eq. (14.5.2.1a)

Plain ϕMnz = *5 * ϕ * √(f'c) * W * Thick² / 6* = 5 * 0.60 * √(2500) * 3.50 * 8.0² / 6 / 1000 = 1.5 k-ft

- Top Bars

No Top Reinforcement Provided at the Footing

Use Plain Concrete Flexural Strength at Top

- Top moments calculated as the overburden minus the bearing pressures times the lever arm:

Top moment -Mux (- Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Mux (+ Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Muz (- Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Muz (+ Side) = 0.0 k-ft < 5.6 k-ft OK

- Bottom Bars

Use 5 #4 Z-Bars *ρ = As / b d* = 1.0 / (3.50 * 12 * 4.3) = 0.0056 q = 0.0056 * 40 / 2.5 = 0.090

Use 5 #4 X-Bars *ρ = As / b d* = 1.0 / (3.50 * 12 * 4.8) = 0.0050 q = 0.0050 * 40 / 2.5 = 0.080

β = L / W = 3.50 / 3.50 = 1.00 *γs = 2 * β / (β + 1)* = 2 * 1.00 / (1.00 + 1) = 1.00 ACI 13.3.3.3

Bending strength *ϕMn = ϕ * b * d² * f'c * q * (1 - 0.59 * q)* ACI 22.2.2

ϕMnx = 0.90 * 3.50 * 12 * 4.3² * 2.5 * 0.090 * (1 - 0.59 * 0.090) = 12.1 k-ft

ϕMnz = 0.90 * 3.50 * 12 * 4.8² * 2.5 * 0.080 / 1.00 * (1 - 0.59 * 0.080 / 1.00) = 13.6 k-ft

- Bottom moments calculated as the bearing minus the overburden pressures times the lever arm:

Bottom moment Mux (- Side) = 8.6 k-ft < 12.1 k-ft OK ratio = 0.71

Bottom moment Mux (+ Side) = 8.6 k-ft < 12.1 k-ft OK ratio = 0.71

Bottom moment Muz (- Side) = 8.6 k-ft < 13.6 k-ft OK ratio = 0.63

Bottom moment Muz (+ Side) = 8.6 k-ft < 13.6 k-ft OK ratio = 0.63

X-As min = *0.0018 * Width * Thick* = 0.0018 * 3.50 * 12 * 8.0 = 0.6 in² < 1.0 in² OK ACI 8.6.1.1

Z-As min = *0.0018 * Length * Thick* = 0.0018 * 3.50 * 12 * 8.0 = 0.6 in² < 1.0 in² OK ACI 8.6.1.1

X-As max for 0.005 tension strain = 3.20 in² > 1.00 in² OK ACI 21.2.2

Z-As max for 0.005 tension strain = 3.20 in² > 1.00 in² OK ACI 21.2.2

X-Cover factor = *Min (2.5, (Cover + db /2, Spacing / 2) / db)* = Min (2.5, (3.0 + 0.50 / 2, 9.0 / 2) / 0.50) = 2.5

Straight *X-Ld = Max (12.0, 3 / 40 * fy / (f'c)½ * Grade * Size * Casting / Cover * db * ratio)* ACI Eq. (25.4.2.3a)

X-Ld = Max (12.0, 3 / 40 * 40.0 * 1000 / (2500)½ * 1.0 * 0.8 * 1.0 / 2.5 * 0.50 * 0.63) = 12.0 in

Hooked *X-Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* = ACI 25.4.3

X-Ldh = Max (8 db, 6, 0.02 * 40.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.50 * 0.63) = 6.0 in

-X Ld provided = *(Length - Col) / 2 + Offset - Cover* = 3.50 * 12 / 2 + 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

+X Ld provided = *(Length - Col) / 2 - Offset - Cover* = 3.50 * 12 / 2 - 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

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Z-Cover factor = *Min (2.5, (Cover + db /2, Spacing / 2) / db)* = Min (2.5, (3.0 + 0.50 / 2, 9.0 / 2) / 0.50) = 2.5

Straight *Z-Ld = Max (12.0, 3 / 40 * fy / (f'c)½ * Grade * Size * Casting / Cover * db * ratio)* ACI Eq. (25.4.2.3a)

Z-Ld = Max (12.0, 3 / 40 * 40.0 * 1000 / (2500)½ * 1.0 * 0.8 * 1.0 / 2.5 * 0.50 * 0.63) = 12.0 in

Hooked *Z-Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* = ACI 25.4.3

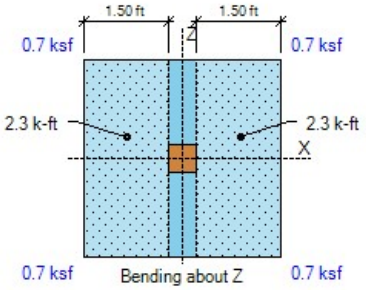
Z-Ldh = Max (8 db, 6, 0.02 * 40.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.50 * 0.71) = 6.0 in

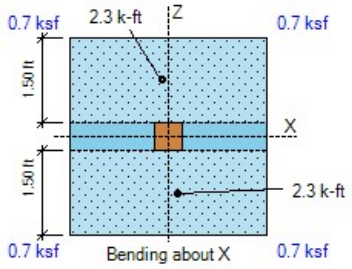
-Z Ld provided = *(Width - Col) / 2 + Offset - Cover* = 3.50 * 12 / 2 + 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

+Z Ld provided = *(Width - Col) / 2 - Offset - Cover* = 3.50 * 12 / 2 - 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

X-bar spacing = 9.0 in < Min (3 * t, 18.0) = 18.0 in OK ACI 7.7.2.3

Z-bar spacing = 9.0 in < Min (3 * t, 18.0) = 18.0 in OK





LOAD TRANSFER CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Area *A1 = col L * col W* = 6.0 * 6.0 = 36.0 in²

Sx = *col W * col L² / 6* = 6.0 * 6.0² / 6 = 36.0 in³

Sz = *col L * col W² / 6* = 6.0 * 6.0² / 6 = 36.0 in³

Bearing *Pbu = P / A1 + Mz / Sx + Mx / Sz* = 26.7 / 36.0 + 0.0 * 12 / 36.0 + 0.0 * 12 / 36.0 = 0.7 ksi

Min edge = *Min (L / 2 - X-offset - col L / 2, W / 2 - Z-offset - col W / 2)*

Min edge = Min (3.50 * 12 / 2 - 0.0 - 6.0 / 2, 3.50 * 12 / 2 - 0.0 - 6.0 / 2 = 18.0 in

Area *A2 = Min [L * W, (col L + 2 * Min edge) * (col W + 2 * Min edge)]* ACI R22.8.3.2

A2 = Min [3.50 * 12 * 3.5 * 12, (6.0 + 2 * 18.0) * (6.0 + 2 * 18.0)] = 1764.0 in²

Footing *ϕPnc = ϕ * 0.85 * f'c * Min [2, √(A2 / A1)]* = 0.65 * 0.85 * 2.5 * Min [2, √(1764.0 / 36.0)] = 2.8 ksi

Footing *ϕPns = ϕ * As * Fy / A1* = 0.0 ksi ACI 22.8.3.2

Footing bearing *ϕPn = ϕPnc + ϕPns* = 2.8 + 0.0 = 2.8 ksi > 0.7 psi OK

Hooked *Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* ACI 25.4.3

Ldh = Max (8 db, 6, 0.02 * 60.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.75 * 0.13) = 6.0 in

Ld provided = *Dowel length* = 3.00 * 12 = 36.0 in > 23.1 in OK

Ldh provided = *Footing thickness - Cover* = 8.00 - 3.0 = 5.0 in < 6.0 in NG

PUNCHING SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

X-Edge = *d /2* = 4.5 / 2 = 2.3 in αsx = 20

Z-Edge = *d /2* = 4.5 / 2 = 2.3 in αsz = 20

αs = *αsx + αsz* = 20 + 20 = 40 Col type = Interior β = *L / W* = 6.0 / 6.0 = 1.00 ACI 22.6.5.2

Perimeter *bo = αsz / 10 * (L + d / 2 + X-Edge) + αsx / 10 * (W + d / 2 + Z-Edge)* ACI 22.6.4.2

bo = 20 / 10 * (6.0 + 4.5 / 2 + 2.3) + 20 / 10 * (6.0 + 4.5 / 2 + 2.3) = 42.0 in

Area *Abo = (L + d / 2 + X-Edge) * (W + d / 2 + Z-Edge)* = (6.0 + 4.5 / 2 + 2.3) * (6.0 + 4.5 / 2 + 2.3) = 110.3 in²

ϕVc = *ϕ * Min (2 + 4 / β, αs * d / bo + 2, 4) * √(f'c)* ACI 22.6.5.2

ϕVc = 0.75 * Min (2 + 4 / 1.00, 40 * 4.5 / 42.0 + 2, 4) * √(2500) = 150.0 psi

Punching force *F = P + Overburden * Abo - Bearing*

F = 26.7 + 0.07 * 110.3 / 144 - 1.7 = 25.1 kip

b1 = *L + d / 2 + X-Edge* = 6.0 + 4.5 / 2 + 2.3 = 10.5 in b2 = *W + d / 2 + Z-Edge* = 6.0 + 4.5 / 2 + 2.3 = 10.5 in

γvx factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b2 / b1)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(10.5 / 10.5)}} = 0.40$ ACI Eq. (8.4.4.2.2)

γvz factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b1 / b2)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(10.5 / 10.5)}} = 0.40$ ACI Eq. (8.4.2.3.2)

X2z = *b1 / 2* = 10.5 / 2 = 5.3 in X2x = *b2 / 2* = 10.5 / 2 = 5.3 in

Jcz = *b1 * d³ / 6 + b1³ * d / 6 + b1² * b2 * d / 2* ACI R8.4.4.2.3

Jcz = 10.5 * 4.5³ / 6 + 10.5³ * 4.5 / 6 + 10.5² * 10.5 * 4.5 / 2 = 3632 in⁴

Jcx = *b2 * d³ / 6 + b2³ * d / 6 + b2² * b1 * d / 2* ACI R8.4.4.2.3

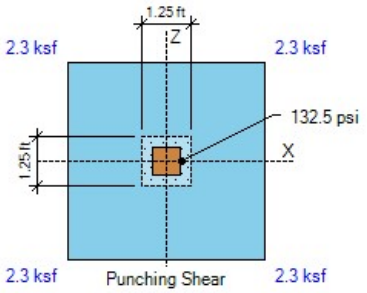
Jcx = 10.5 * 4.5³ / 6 + 10.5³ * 4.5 / 6 + 10.5² * 10.5 * 4.5 / 2 = 3632 in⁴

Stress due to P = *F / (bo * d) * 1000* = 25.1 / (42.0 * 4.5) * 1000 = 132.5 psi

Stress due to Mx = *γvx * X-OTM * X2x / Jcx* = 0.40 * 0.0 * 12 * 5.3 / 3632 * 1000 = 0.0 psi

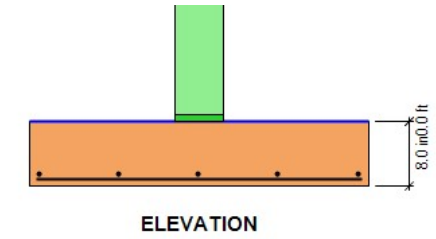
Stress due to Mz = *γvz * Z-OTM * X2z / Jcz* = 0.40 * 0.0 * 12 * 5.3 / 3632 * 1000 = 0.0 psi

Punching stress = *P-stress + Mx-stress + Mz-stress* = 132.5 + 0.0 + 0.0 = 132.5 psi < 150.0 psi OK

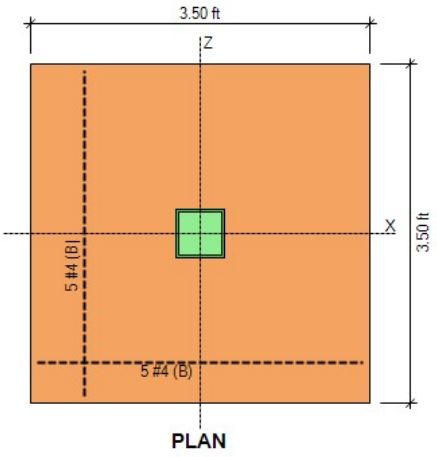


DESIGN CODES

Concrete Design	ACI 318-14
Load Combinations	ASCE 7-10/16



ELEVATION



PLAN

ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*

GEOMETRY

Footing Length (X-dir)	3.50	ft	
Footing Width (Z-dir)	3.50	ft	
Footing Thickness	8.0	in	OK
Soil Cover	0.00	ft	
Column Length (X-dir)	6.0	in	
Column Width (Z-dir)	6.0	in	
Offset (X-dir)	0.00	in	OK
Offset (Z-dir)	0.00	in	OK
Base Plate (L x W)	6.0 x 6.0	in	

SOIL PRESSURES (D+L)

Gross Allow. Soil Pressure	2.0	ksf	
Soil Pressure at Corner 1	1.8	ksf	
Soil Pressure at Corner 2	1.8	ksf	
Soil Pressure at Corner 3	1.8	ksf	
Soil Pressure at Corner 4	1.8	ksf	
Bearing Pressure Ratio	0.90		OK
Ftg. Area in Contact with Soil	100.0	%	
X-eccentricity / Ftg. Length	0.00		OK
Z-eccentricity / Ftg. Width	0.00		OK

APPLIED LOADS

	Dead	Live	RLive	Snow	Wind	Seismic	
Axial Force P	6.0	15.3	0.0	0.0	0.0	0.0	kip
Moment about X Mx ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Moment about Z Mz ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Shear Force Vx	0.0	0.0	0.0	0.0	0.0	0.0	kip
Shear Force Vz	0.0	0.0	0.0	0.0	0.0	0.0	kip

OVERTURNING CALCULATIONS (Comb: 0.6D+0.6W)

- Overturning about X-X
- Moment Mx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft
- Shear Force Vz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

  Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft
- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft
- Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

- Resisting about X-X
- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 3.50 * 3.50 * 8.0 / 12 * 0.15 = 0.7 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.7 * 1.75 = 1.3 k-ft
- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

  Arm = *W / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft
- Soil cover = *0.6 * W * L * SC * Density* 0=6 * (3.50 * 3.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft
- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 3.50 * 3.50 * 62 * (0.67) = -0.3 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.3 * 1.75 = -0.5 k-ft
- Axial force P = 0.6 * 6.0 + 0.6 * 0.0 = 3.6 kip

  Arm = *W / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 3.6 * 1.75 = 6.3 k-ft
- Resisting moment X-X = 1.3 + 0.0 + 0.0 + 6.3 + -0.5 = 7.1 k-ft
- Overturning safety factor X-X = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{7.1}{0.0}$ = 70.51 > 1.50 OK

- Overturning about Z-Z

- Moment Mz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft

- Shear Force Vx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft

- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft

- Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

- Resisting about Z-Z

- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 3.50 * 3.50 * 8.0 / 12 * 0.15 = 0.7 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.7 * 1.75 = 1.3 k-ft

- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

Arm = *L / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft

- Soil cover = *0.6 * W * L * SC * Density* = 0.6 * (3.50 * 3.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft

- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 3.50 * 3.50 * 62 * (0.67) = -0.3 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.3 * 1.75 = -0.5 k-ft

- Axial force P = 0.6 * 6.0 + 0.6 * 0.0 = 3.6 kip

Arm = *L / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 3.6 * 1.75 = 6.3 k-ft

- Resisting moment Z-Z = 1.3 + 0.0 + 0.0 + 6.3 + -0.5 = 7.1 k-ft

- Overturning safety factor Z-Z = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{7.1}{0.0}$ = 70.51 > 1.50 OK

SOIL BEARING PRESSURES (Comb: D+L)

Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

Resisting moment X-X = 2.1 + 0.0 + 0.0 + -0.9 + 37.3 = 38.5 k-ft

Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

Resisting moment Z-Z = 2.1 + 0.0 + 0.0 + -0.9 + 37.3 = 38.5 k-ft

Resisting force = *Footing + Pedestal + Soil - Buoyancy + P* = 1.2 + 0.0 + 0.0 - 0.5 + 21.3 = 22.0 kip

X-coordinate of resultant from maximum bearing corner:

$$Xp = \frac{\textit{Z-Resisting moment - Z-Overturning moment}}{\textit{Resisting force}} = \frac{38.5 - 0.0}{22.0} = 1.75 \text{ ft}$$

Z-coordinate of resultant from maximum bearing corner:

$$Zp = \frac{\textit{X-Resisting moment - X-Overturning moment}}{\textit{Resisting force}} = \frac{38.5 - 0.0}{22.0} = 1.75 \text{ ft}$$

X-ecc = *Length / 2 - Xp* =3.50 / 2 - 1.75 = 0.00 ft

Z-ecc = *Width / 2 - Zp* = 3.50 / 2 - 1.75 = 0.00 ft

Area = *Width * Length* = 3.50 * 3.50 = 12.3 ft²

Sx = *Length * Width² / 6* = 3.50 * 3.50² / 6 = 7.1 ft³

Sz = *Width * Length² / 6* = 3.50 * 3.50² / 6 = 7.1 ft³

- Footing is in full bearing. Soil pressures are as follows:

P1 = *P * (1/ A + Z-ecc / Sx + X-ecc / Sz)* = 22.0 * (1 / 12.3 + 0.00 / 7.1 + 0.00 / 7.1) = 1.80 ksf

P2 = *P * (1/ A - Z-ecc / Sx + X-ecc / Sz)* = 22.0 * (1 / 12.3 - 0.00 / 7.1 + 0.00 / 7.1) = 1.80 ksf

P3 = *P * (1/ A - Z-ecc / Sx - X-ecc / Sz)* = 22.0 * (1 / 12.3 - 0.00 / 7.1 - 0.00 / 7.1) = 1.80 ksf

P4 = *P * (1/ A + Z-ecc / Sx - X-ecc / Sz)* = 22.0 * (1 / 12.3 + 0.00 / 7.1 - 0.00 / 7.1) = 1.80 ksf

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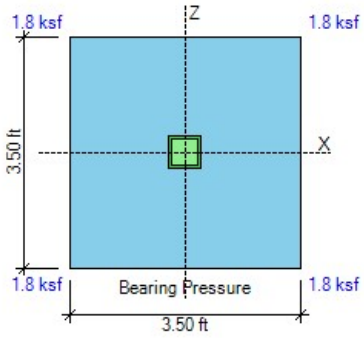
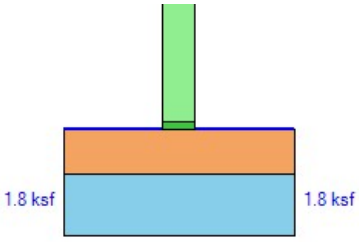




SLIDING CALCULATIONS (Comb: 0.6D+0.6W)

Internal friction angle = 28.0 deg

Passive coefficient *kp = 4.33 (per Coulomb)*

Pressure at mid-depth = *kp * Density * (Cover + Thick / 2)* = 4.33 * 110 * (0.00 + 8.0 / 12 / 2) = 0.16 ksf

X-Passive force = *Pressure * Thick * Width* = 0.16 * 8.0 / 12 * 3.50 = 0.4 kip

Z-Passive force = *Pressure * Thick * Length* = 0.16 * 8.0 / 12 * 3.50 = 0.4 kip

Friction force = *Resisting force * Friction coeff.* = Max (0, 4.0 * 0.35) = 1.4 kip

Use 100% of Passive + 100% of Friction for sliding resistance

- Sliding safety factor X-X = $\frac{\textit{X-Passive force + Friction}}{\textit{X-Horizontal load}} = \frac{1.00 * 0.4 + 1.00 * 1.4}{0.0}$ = 17.80 > 1.50 OK

- Sliding safety factor Z-Z = $\frac{\textit{Z-Passive force + Friction}}{\textit{Z-Horizontal load}} = \frac{1.00 * 0.4 + 1.00 * 1.4}{0.0}$ = 17.80 > 1.50 OK

UPLIFT CALCULATIONS (Comb: 0.6D+0.6W)

- Uplift safety factor = $\frac{\textit{Pedestal + Footing + Cover - Buoyancy}}{\textit{Uplift load}} = \frac{0.0 + 0.7 + 0.0 - 0.3}{0.0}$ = 99.99 > 1.00 OK

ONE-WAY SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Concrete f'c = 2.5 ksi Steel fy = 40.0 ksi Soil density = 110 pcf

d Top X-dir = *Thick - Cover - X-diameter / 2* = 8.0 - 2.0 - 0.8 / 2 = 5.6 in

d Top Z-dir = *Thick - Cover - X-diameter - Z-diameter / 2* = 8.0 - 2.0 - 0.8 - 0.8 / 2 = 4.9 in

d Bot X-dir = *Thick - Cover - X-diameter / 2* = 8.0 - 3.0 - 0.5 / 2 = 4.8 in

d Bot Z-dir = *Thick - Cover - X-diameter - Z-diameter / 2* = 8.0 - 3.0 - 0.5 - 0.5 / 2 = 4.3 in

$\phi Vcx = 2 * \phi * \sqrt{f'c} * Width * d / 1000$ = 2 * 0.75 * √(2500) * 3.5 * 12 * 4.8 / 1000 = 15.0 kip ACI Eq. (22.5.5.1)

$\phi Vcz = 2 * \phi * \sqrt{f'c} * Length * d / 1000$ = 2 * 0.75 * √(2500) * 3.5 * 12 * 4.3 / 1000 = 13.4 kip

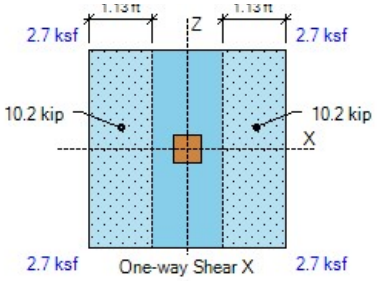
- Shear forces calculated as the volume of the bearing pressures under the effective areas:

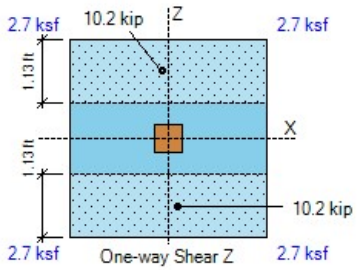
One-way shear Vux (- Side) = 10.2 kip < 15.0 kip OK

One-way shear Vux (+ Side) = 10.2 kip < 15.0 kip OK

One-way shear Vuz (- Side) = 10.2 kip < 13.4 kip OK

One-way shear Vuz (+ Side) = 10.2 kip < 13.4 kip OK





FLEXURE CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Plain ϕMnx = *5 * ϕ * √(f'c) * L * Thick² / 6* = 5 * 0.60 * √(2500) * 3.50 * 8.0² / 6 / 1000 = 1.5 k-ft ACI Eq. (14.5.2.1a)

Plain ϕMnz = *5 * ϕ * √(f'c) * W * Thick² / 6* = 5 * 0.60 * √(2500) * 3.50 * 8.0² / 6 / 1000 = 1.5 k-ft

- Top Bars

No Top Reinforcement Provided at the Footing

Use Plain Concrete Flexural Strength at Top

- Top moments calculated as the overburden minus the bearing pressures times the lever arm:

Top moment -Mux (- Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Mux (+ Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Muz (- Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Muz (+ Side) = 0.0 k-ft < 5.6 k-ft OK

- Bottom Bars

Use 5 #4 Z-Bars *ρ = As / b d* = 1.0 / (3.50 * 12 * 4.3) = 0.0056 q = 0.0056 * 40 / 2.5 = 0.090

Use 5 #4 X-Bars *ρ = As / b d* = 1.0 / (3.50 * 12 * 4.8) = 0.0050 q = 0.0050 * 40 / 2.5 = 0.080

β = L / W = 3.50 / 3.50 = 1.00 *γs = 2 * β / (β + 1)* = 2 * 1.00 / (1.00 + 1) = 1.00 ACI 13.3.3.3

Bending strength *ϕMn = ϕ * b * d² * f'c * q * (1 - 0.59 * q)* ACI 22.2.2

ϕMnx = 0.90 * 3.50 * 12 * 4.3² * 2.5 * 0.090 * (1 - 0.59 * 0.090) = 12.1 k-ft

ϕMnz = 0.90 * 3.50 * 12 * 4.8² * 2.5 * 0.080 / 1.00 * (1 - 0.59 * 0.080 / 1.00) = 13.6 k-ft

- Bottom moments calculated as the bearing minus the overburden pressures times the lever arm:

Bottom moment Mux (- Side) = 10.2 k-ft < 12.1 k-ft OK ratio = 0.84

Bottom moment Mux (+ Side) = 10.2 k-ft < 12.1 k-ft OK ratio = 0.85

Bottom moment Muz (- Side) = 10.2 k-ft < 13.6 k-ft OK ratio = 0.75

Bottom moment Muz (+ Side) = 10.2 k-ft < 13.6 k-ft OK ratio = 0.75

X-As min = *0.0018 * Width * Thick* = 0.0018 * 3.50 * 12 * 8.0 = 0.6 in² < 1.0 in² OK ACI 8.6.1.1

Z-As min = *0.0018 * Length * Thick* = 0.0018 * 3.50 * 12 * 8.0 = 0.6 in² < 1.0 in² OK ACI 8.6.1.1

X-As max for 0.005 tension strain = 3.20 in² > 1.00 in² OK ACI 21.2.2

Z-As max for 0.005 tension strain = 3.20 in² > 1.00 in² OK ACI 21.2.2

X-Cover factor = *Min (2.5, (Cover + db /2, Spacing / 2) / db)* = Min (2.5, (3.0 + 0.50 / 2, 9.0 / 2) / 0.50) = 2.5

Straight *X-Ld = Max (12.0, 3 / 40 * fy / (f'c)½ * Grade * Size * Casting / Cover * db * ratio)* ACI Eq. (25.4.2.3a)

X-Ld = Max (12.0, 3 / 40 * 40.0 * 1000 / (2500)½ * 1.0 * 0.8 * 1.0 / 2.5 * 0.50 * 0.75) = 12.0 in

Hooked *X-Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* = ACI 25.4.3

X-Ldh = Max (8 db, 6, 0.02 * 40.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.50 * 0.75) = 6.0 in

-X Ld provided = *(Length - Col) / 2 + Offset - Cover* = 3.50 * 12 / 2 + 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

+X Ld provided = *(Length - Col) / 2 - Offset - Cover* = 3.50 * 12 / 2 - 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

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Z-Cover factor = *Min (2.5, (Cover + db /2, Spacing / 2) / db)* = Min (2.5, (3.0 + 0.50 / 2, 9.0 / 2) / 0.50) = 2.5

Straight *Z-Ld = Max (12.0, 3 / 40 * fy / (f'c)½ * Grade * Size * Casting / Cover * db * ratio)* ACI Eq. (25.4.2.3a)

Z-Ld = Max (12.0, 3 / 40 * 40.0 * 1000 / (2500)½ * 1.0 * 0.8 * 1.0 / 2.5 * 0.50 * 0.75) = 12.0 in

Hooked *Z-Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* = ACI 25.4.3

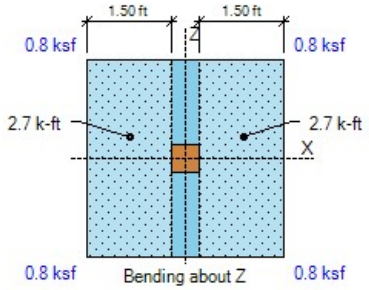
Z-Ldh = Max (8 db, 6, 0.02 * 40.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.50 * 0.85) = 6.0 in

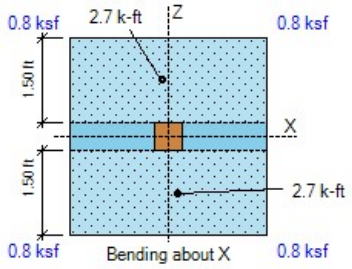
-Z Ld provided = *(Width - Col) / 2 + Offset - Cover* = 3.50 * 12 / 2 + 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

+Z Ld provided = *(Width - Col) / 2 - Offset - Cover* = 3.50 * 12 / 2 - 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

X-bar spacing = 9.0 in < Min (3 * t, 18.0) = 18.0 in OK ACI 7.7.2.3

Z-bar spacing = 9.0 in < Min (3 * t, 18.0) = 18.0 in OK





LOAD TRANSFER CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Area *A1 = col L * col W* = 6.0 * 6.0 = 36.0 in²

Sx = *col W * col L² / 6* = 6.0 * 6.0² / 6 = 36.0 in³

Sz = *col L * col W² / 6* = 6.0 * 6.0² / 6 = 36.0 in³

Bearing *Pbu = P / A1 + Mz / Sx + Mx / Sz* = 31.7 / 36.0 + 0.0 * 12 / 36.0 + 0.0 * 12 / 36.0 = 0.9 ksi

Min edge = *Min (L / 2 - X-offset - col L / 2, W / 2 - Z-offset - col W / 2)*

Min edge = Min (3.50 * 12 / 2 - 0.0 - 6.0 / 2, 3.50 * 12 / 2 - 0.0 - 6.0 / 2 = 18.0 in

Area *A2 = Min [L * W, (col L + 2 * Min edge) * (col W + 2 * Min edge)]* ACI R22.8.3.2

A2 = Min [3.50 * 12 * 3.5 * 12, (6.0 + 2 * 18.0) * (6.0 + 2 * 18.0)] = 1764.0 in²

Footing *ϕPnc = ϕ * 0.85 * f'c * Min [2, √(A2 / A1)]* = 0.65 * 0.85 * 2.5 * Min [2, √(1764.0 / 36.0)] = 2.8 ksi

Footing *ϕPns = ϕ * As * Fy / A1* = 0.0 ksi ACI 22.8.3.2

Footing bearing *ϕPn = ϕPnc + ϕPns* = 2.8 + 0.0 = 2.8 ksi > 0.9 psi OK

Hooked *Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* ACI 25.4.3

Ldh = Max (8 db, 6, 0.02 * 60.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.75 * 0.15) = 6.0 in

Ld provided = *Dowel length* = 3.00 * 12 = 36.0 in > 27.4 in OK

Ldh provided = *Footing thickness - Cover* = 8.00 - 3.0 = 5.0 in < 6.0 in NG

PUNCHING SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

X-Edge = *d /2* = 4.5 / 2 = 2.3 in αsx = 20

Z-Edge = *d /2* = 4.5 / 2 = 2.3 in αsz = 20

αs = *αsx + αsz* = 20 + 20 = 40 Col type = Interior β = *L / W* = 6.0 / 6.0 = 1.00 ACI 22.6.5.2

Perimeter *bo = αsz / 10 * (L + d / 2 + X-Edge) + αsx / 10 * (W + d / 2 + Z-Edge)* ACI 22.6.4.2

bo = 20 / 10 * (6.0 + 4.5 / 2 + 2.3) + 20 / 10 * (6.0 + 4.5 / 2 + 2.3) = 42.0 in

Area *Abo = (L + d / 2 + X-Edge) * (W + d / 2 + Z-Edge)* = (6.0 + 4.5 / 2 + 2.3) * (6.0 + 4.5 / 2 + 2.3) = 110.3 in²

ϕVc = *ϕ * Min (2 + 4 / β, αs * d / bo + 2, 4) * √(f'c)* ACI 22.6.5.2

ϕVc = 0.75 * Min (2 + 4 / 1.00, 40 * 4.5 / 42.0 + 2, 4) * √(2500) = 150.0 psi

Punching force *F = P + Overburden * Abo - Bearing*

F = 31.7 + 0.07 * 110.3 / 144 - 2.0 = 29.7 kip

b1 = *L + d / 2 + X-Edge* = 6.0 + 4.5 / 2 + 2.3 = 10.5 in b2 = *W + d / 2 + Z-Edge* = 6.0 + 4.5 / 2 + 2.3 = 10.5 in

γvx factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b2 / b1)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(10.5 / 10.5)}} = 0.40$ ACI Eq. (8.4.4.2.2)

γvz factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b1 / b2)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(10.5 / 10.5)}} = 0.40$ ACI Eq. (8.4.2.3.2)

X2z = *b1 / 2* = 10.5 / 2 = 5.3 in X2x = *b2 / 2* = 10.5 / 2 = 5.3 in

Jcz = *b1 * d³ / 6 + b1³ * d / 6 + b1² * b2 * d / 2* ACI R8.4.4.2.3

Jcz = 10.5 * 4.5³ / 6 + 10.5³ * 4.5 / 6 + 10.5² * 10.5 * 4.5 / 2 = 3632 in⁴

Jcx = *b2 * d³ / 6 + b2³ * d / 6 + b2² * b1 * d / 2* ACI R8.4.4.2.3

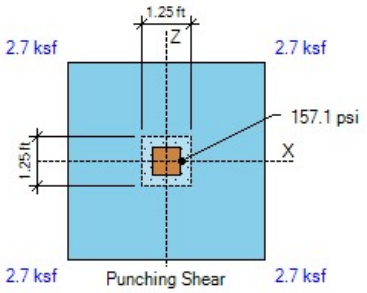
Jcx = 10.5 * 4.5³ / 6 + 10.5³ * 4.5 / 6 + 10.5² * 10.5 * 4.5 / 2 = 3632 in⁴

Stress due to P = *F / (bo * d) * 1000* = 29.7 / (42.0 * 4.5) * 1000 = 157.1 psi

Stress due to Mx = *γvx * X-OTM * X2x / Jcx* = 0.40 * 0.0 * 12 * 5.3 / 3632 * 1000 = 0.0 psi

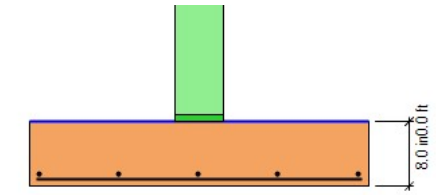
Stress due to Mz = *γvz * Z-OTM * X2z / Jcz* = 0.40 * 0.0 * 12 * 5.3 / 3632 * 1000 = 0.0 psi

Punching stress = *P-stress + Mx-stress + Mz-stress* = 157.1 + 0.0 + 0.0 = 157.1 psi > 150.0 psi NG

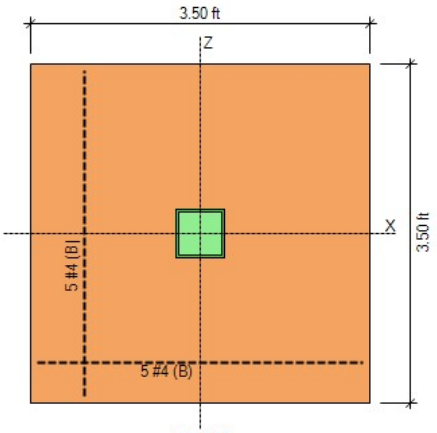


DESIGN CODES

Concrete Design	ACI 318-14
Load Combinations	ASCE 7-10/16



ELEVATION



PLAN

Project: Page # ___
Engineer: 2/27/2024
Descrip: Grid 9D Footing

ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*

GEOMETRY

Footing Length (X-dir)	3.50	ft	
Footing Width (Z-dir)	3.50	ft	
Footing Thickness	8.0	in	OK
Soil Cover	0.00	ft	
Column Length (X-dir)	6.0	in	
Column Width (Z-dir)	6.0	in	
Offset (X-dir)	0.00	in	OK
Offset (Z-dir)	0.00	in	OK
Base Plate (L x W)	6.0 x 6.0	in	

SOIL PRESSURES (D+L)

Gross Allow. Soil Pressure	2.0	ksf	
Soil Pressure at Corner 1	1.8	ksf	
Soil Pressure at Corner 2	1.8	ksf	
Soil Pressure at Corner 3	1.8	ksf	
Soil Pressure at Corner 4	1.8	ksf	
Bearing Pressure Ratio	0.90		OK
Ftg. Area in Contact with Soil	100.0	%	
X-eccentricity / Ftg. Length	0.00		OK
Z-eccentricity / Ftg. Width	0.00		OK

APPLIED LOADS

	Dead	Live	RLive	Snow	Wind	Seismic	
Axial Force P	6.0	15.3	0.0	0.0	0.0	0.0	kip
Moment about X Mx ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Moment about Z Mz ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Shear Force Vx	0.0	0.0	0.0	0.0	0.0	0.0	kip
Shear Force Vz	0.0	0.0	0.0	0.0	0.0	0.0	kip

OVERTURNING CALCULATIONS (Comb: 0.6D+0.6W)

- Overturning about X-X
- Moment Mx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft
- Shear Force Vz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

  Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft
- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft
- Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

- Resisting about X-X
- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 3.50 * 3.50 * 8.0 / 12 * 0.15 = 0.7 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.7 * 1.75 = 1.3 k-ft
- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

  Arm = *W / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft
- Soil cover = *0.6 * W * L * SC * Density* 0=6 * (3.50 * 3.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft
- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 3.50 * 3.50 * 62 * (0.67) = -0.3 kip

  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.3 * 1.75 = -0.5 k-ft
- Axial force P = 0.6 * 6.0 + 0.6 * 0.0 = 3.6 kip

  Arm = *W / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 3.6 * 1.75 = 6.3 k-ft
- Resisting moment X-X = 1.3 + 0.0 + 0.0 + 6.3 + -0.5 = 7.1 k-ft
- Overturning safety factor X-X = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{7.1}{0.0}$ = 70.51 > 1.50 OK

- Overturning about Z-Z

- Moment Mz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft

- Shear Force Vx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft

- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft

- Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

- Resisting about Z-Z

- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 3.50 * 3.50 * 8.0 / 12 * 0.15 = 0.7 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.7 * 1.75 = 1.3 k-ft

- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

Arm = *L / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft

- Soil cover = *0.6 * W * L * SC * Density* = 0.6 * (3.50 * 3.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft

- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 3.50 * 3.50 * 62 * (0.67) = -0.3 kip

Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.3 * 1.75 = -0.5 k-ft

- Axial force P = 0.6 * 6.0 + 0.6 * 0.0 = 3.6 kip

Arm = *L / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 3.6 * 1.75 = 6.3 k-ft

- Resisting moment Z-Z = 1.3 + 0.0 + 0.0 + 6.3 + -0.5 = 7.1 k-ft

- Overturning safety factor Z-Z = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{7.1}{0.0}$ = 70.51 > 1.50 OK

SOIL BEARING PRESSURES (Comb: D+L)

Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

Resisting moment X-X = 2.1 + 0.0 + 0.0 + -0.9 + 37.3 = 38.5 k-ft

Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

Resisting moment Z-Z = 2.1 + 0.0 + 0.0 + -0.9 + 37.3 = 38.5 k-ft

Resisting force = *Footing + Pedestal + Soil - Buoyancy + P* = 1.2 + 0.0 + 0.0 - 0.5 + 21.3 = 22.0 kip

X-coordinate of resultant from maximum bearing corner:

$$Xp = \frac{\textit{Z-Resisting moment - Z-Overturning moment}}{\textit{Resisting force}} = \frac{38.5 - 0.0}{22.0} = 1.75 \text{ ft}$$

Z-coordinate of resultant from maximum bearing corner:

$$Zp = \frac{\textit{X-Resisting moment - X-Overturning moment}}{\textit{Resisting force}} = \frac{38.5 - 0.0}{22.0} = 1.75 \text{ ft}$$

X-ecc = *Length / 2 - Xp* =3.50 / 2 - 1.75 = 0.00 ft

Z-ecc = *Width / 2 - Zp* = 3.50 / 2 - 1.75 = 0.00 ft

Area = *Width * Length* = 3.50 * 3.50 = 12.3 ft²

Sx = *Length * Width² / 6* = 3.50 * 3.50² / 6 = 7.1 ft³

Sz = *Width * Length² / 6* = 3.50 * 3.50² / 6 = 7.1 ft³

- Footing is in full bearing. Soil pressures are as follows:

P1 = *P * (1/ A + Z-ecc / Sx + X-ecc / Sz)* = 22.0 * (1 / 12.3 + 0.00 / 7.1 + 0.00 / 7.1) = 1.80 ksf

P2 = *P * (1/ A - Z-ecc / Sx + X-ecc / Sz)* = 22.0 * (1 / 12.3 - 0.00 / 7.1 + 0.00 / 7.1) = 1.80 ksf

P3 = *P * (1/ A - Z-ecc / Sx - X-ecc / Sz)* = 22.0 * (1 / 12.3 - 0.00 / 7.1 - 0.00 / 7.1) = 1.80 ksf

P4 = *P * (1/ A + Z-ecc / Sx - X-ecc / Sz)* = 22.0 * (1 / 12.3 + 0.00 / 7.1 - 0.00 / 7.1) = 1.80 ksf

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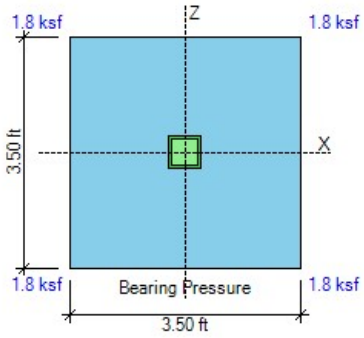
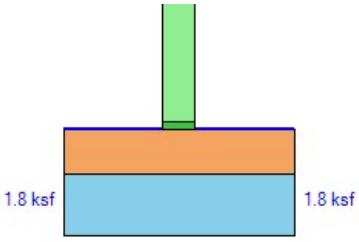




SLIDING CALCULATIONS (Comb: 0.6D+0.6W)

Internal friction angle = 28.0 deg

Passive coefficient *kp = 4.33 (per Coulomb)*

Pressure at mid-depth = *kp * Density * (Cover + Thick / 2)* = 4.33 * 110 * (0.00 + 8.0 / 12 / 2) = 0.16 ksf

X-Passive force = *Pressure * Thick * Width* = 0.16 * 8.0 / 12 * 3.50 = 0.4 kip

Z-Passive force = *Pressure * Thick * Length* = 0.16 * 8.0 / 12 * 3.50 = 0.4 kip

Friction force = *Resisting force * Friction coeff.* = Max (0, 4.0 * 0.35) = 1.4 kip

Use 100% of Passive + 100% of Friction for sliding resistance

- Sliding safety factor X-X = $\frac{\textit{X-Passive force + Friction}}{\textit{X-Horizontal load}} = \frac{1.00 * 0.4 + 1.00 * 1.4}{0.0}$ = 17.80 > 1.50 OK

- Sliding safety factor Z-Z = $\frac{\textit{Z-Passive force + Friction}}{\textit{Z-Horizontal load}} = \frac{1.00 * 0.4 + 1.00 * 1.4}{0.0}$ = 17.80 > 1.50 OK

UPLIFT CALCULATIONS (Comb: 0.6D+0.6W)

- Uplift safety factor = $\frac{\textit{Pedestal + Footing + Cover - Buoyancy}}{\textit{Uplift load}} = \frac{0.0 + 0.7 + 0.0 - 0.3}{0.0}$ = 99.99 > 1.00 OK

ONE-WAY SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Concrete f'c = 2.5 ksi Steel fy = 40.0 ksi Soil density = 110 pcf

d Top X-dir = *Thick - Cover - X-diameter / 2* = 8.0 - 2.0 - 0.8 / 2 = 5.6 in

d Top Z-dir = *Thick - Cover - X-diameter - Z-diameter / 2* = 8.0 - 2.0 - 0.8 - 0.8 / 2 = 4.9 in

d Bot X-dir = *Thick - Cover - X-diameter / 2* = 8.0 - 3.0 - 0.5 / 2 = 4.8 in

d Bot Z-dir = *Thick - Cover - X-diameter - Z-diameter / 2* = 8.0 - 3.0 - 0.5 - 0.5 / 2 = 4.3 in

$\phi Vcx = 2 * \phi * \sqrt{f'c} * Width * d / 1000$ = 2 * 0.75 * √(2500) * 3.5 * 12 * 4.8 / 1000 = 15.0 kip ACI Eq. (22.5.5.1)

$\phi Vcz = 2 * \phi * \sqrt{f'c} * Length * d / 1000$ = 2 * 0.75 * √(2500) * 3.5 * 12 * 4.3 / 1000 = 13.4 kip

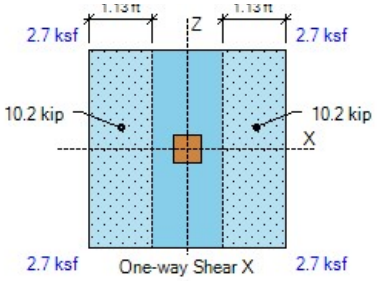
- Shear forces calculated as the volume of the bearing pressures under the effective areas:

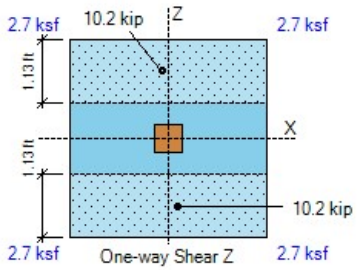
One-way shear Vux (- Side) = 10.2 kip < 15.0 kip OK

One-way shear Vux (+ Side) = 10.2 kip < 15.0 kip OK

One-way shear Vuz (- Side) = 10.2 kip < 13.4 kip OK

One-way shear Vuz (+ Side) = 10.2 kip < 13.4 kip OK





FLEXURE CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Plain ϕMnx = *5 * ϕ * √(f'c) * L * Thick² / 6* = 5 * 0.60 * √(2500) * 3.50 * 8.0² / 6 / 1000 = 1.5 k-ft ACI Eq. (14.5.2.1a)

Plain ϕMnz = *5 * ϕ * √(f'c) * W * Thick² / 6* = 5 * 0.60 * √(2500) * 3.50 * 8.0² / 6 / 1000 = 1.5 k-ft

- Top Bars

No Top Reinforcement Provided at the Footing

Use Plain Concrete Flexural Strength at Top

- Top moments calculated as the overburden minus the bearing pressures times the lever arm:

Top moment -Mux (- Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Mux (+ Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Muz (- Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Muz (+ Side) = 0.0 k-ft < 5.6 k-ft OK

- Bottom Bars

Use 5 #4 Z-Bars *ρ = As / b d* = 1.0 / (3.50 * 12 * 4.3) = 0.0056 q = 0.0056 * 40 / 2.5 = 0.090

Use 5 #4 X-Bars *ρ = As / b d* = 1.0 / (3.50 * 12 * 4.8) = 0.0050 q = 0.0050 * 40 / 2.5 = 0.080

β = L / W = 3.50 / 3.50 = 1.00 *γs = 2 * β / (β + 1)* = 2 * 1.00 / (1.00 + 1) = 1.00 ACI 13.3.3.3

Bending strength *ϕMn = ϕ * b * d² * f'c * q * (1 - 0.59 * q)* ACI 22.2.2

ϕMnx = 0.90 * 3.50 * 12 * 4.3² * 2.5 * 0.090 * (1 - 0.59 * 0.090) = 12.1 k-ft

ϕMnz = 0.90 * 3.50 * 12 * 4.8² * 2.5 * 0.080 / 1.00 * (1 - 0.59 * 0.080 / 1.00) = 13.6 k-ft

- Bottom moments calculated as the bearing minus the overburden pressures times the lever arm:

Bottom moment Mux (- Side) = 10.2 k-ft < 12.1 k-ft OK ratio = 0.84

Bottom moment Mux (+ Side) = 10.2 k-ft < 12.1 k-ft OK ratio = 0.85

Bottom moment Muz (- Side) = 10.2 k-ft < 13.6 k-ft OK ratio = 0.75

Bottom moment Muz (+ Side) = 10.2 k-ft < 13.6 k-ft OK ratio = 0.75

X-As min = *0.0018 * Width * Thick* = 0.0018 * 3.50 * 12 * 8.0 = 0.6 in² < 1.0 in² OK ACI 8.6.1.1

Z-As min = *0.0018 * Length * Thick* = 0.0018 * 3.50 * 12 * 8.0 = 0.6 in² < 1.0 in² OK ACI 8.6.1.1

X-As max for 0.005 tension strain = 3.20 in² > 1.00 in² OK ACI 21.2.2

Z-As max for 0.005 tension strain = 3.20 in² > 1.00 in² OK ACI 21.2.2

X-Cover factor = *Min (2.5, (Cover + db /2, Spacing / 2) / db)* = Min (2.5, (3.0 + 0.50 / 2, 9.0 / 2) / 0.50) = 2.5

Straight *X-Ld = Max (12.0, 3 / 40 * fy / (f'c)½ * Grade * Size * Casting / Cover * db * ratio)* ACI Eq. (25.4.2.3a)

X-Ld = Max (12.0, 3 / 40 * 40.0 * 1000 / (2500)½ * 1.0 * 0.8 * 1.0 / 2.5 * 0.50 * 0.75) = 12.0 in

Hooked *X-Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* = ACI 25.4.3

X-Ldh = Max (8 db, 6, 0.02 * 40.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.50 * 0.75) = 6.0 in

-X Ld provided = *(Length - Col) / 2 + Offset - Cover* = 3.50 * 12 / 2 + 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

+X Ld provided = *(Length - Col) / 2 - Offset - Cover* = 3.50 * 12 / 2 - 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

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Z-Cover factor = *Min (2.5, (Cover + db /2, Spacing / 2) / db)* = Min (2.5, (3.0 + 0.50 / 2, 9.0 / 2) / 0.50) = 2.5

Straight *Z-Ld = Max (12.0, 3 / 40 * fy / (f'c)½ * Grade * Size * Casting / Cover * db * ratio)* ACI Eq. (25.4.2.3a)

Z-Ld = Max (12.0, 3 / 40 * 40.0 * 1000 / (2500)½ * 1.0 * 0.8 * 1.0 / 2.5 * 0.50 * 0.75) = 12.0 in

Hooked *Z-Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* = ACI 25.4.3

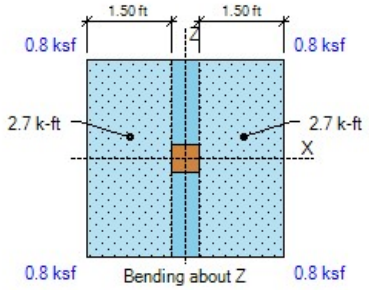
Z-Ldh = Max (8 db, 6, 0.02 * 40.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.50 * 0.85) = 6.0 in

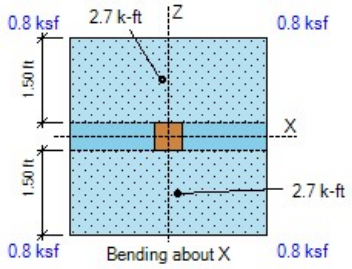
-Z Ld provided = *(Width - Col) / 2 + Offset - Cover* = 3.50 * 12 / 2 + 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

+Z Ld provided = *(Width - Col) / 2 - Offset - Cover* = 3.50 * 12 / 2 - 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

X-bar spacing = 9.0 in < Min (3 * t, 18.0) = 18.0 in OK ACI 7.7.2.3

Z-bar spacing = 9.0 in < Min (3 * t, 18.0) = 18.0 in OK





LOAD TRANSFER CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Area *A1 = col L * col W* = 6.0 * 6.0 = 36.0 in²

Sx = *col W * col L² / 6* = 6.0 * 6.0² / 6 = 36.0 in³

Sz = *col L * col W² / 6* = 6.0 * 6.0² / 6 = 36.0 in³

Bearing *Pbu = P / A1 + Mz / Sx + Mx / Sz* = 31.7 / 36.0 + 0.0 * 12 / 36.0 + 0.0 * 12 / 36.0 = 0.9 ksi

Min edge = *Min (L / 2 - X-offset - col L / 2, W / 2 - Z-offset - col W / 2)*

Min edge = Min (3.50 * 12 / 2 - 0.0 - 6.0 / 2, 3.50 * 12 / 2 - 0.0 - 6.0 / 2 = 18.0 in

Area *A2 = Min [L * W, (col L + 2 * Min edge) * (col W + 2 * Min edge)]* ACI R22.8.3.2

A2 = Min [3.50 * 12 * 3.5 * 12, (6.0 + 2 * 18.0) * (6.0 + 2 * 18.0)] = 1764.0 in²

Footing *ϕPnc = ϕ * 0.85 * f'c * Min [2, √(A2 / A1)]* = 0.65 * 0.85 * 2.5 * Min [2, √(1764.0 / 36.0)] = 2.8 ksi

Footing *ϕPns = ϕ * As * Fy / A1* = 0.0 ksi ACI 22.8.3.2

Footing bearing *ϕPn = ϕPnc + ϕPns* = 2.8 + 0.0 = 2.8 ksi > 0.9 psi OK

Hooked *Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* ACI 25.4.3

Ldh = Max (8 db, 6, 0.02 * 60.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.75 * 0.15) = 6.0 in

Ld provided = *Dowel length* = 3.00 * 12 = 36.0 in > 27.4 in OK

Ldh provided = *Footing thickness - Cover* = 8.00 - 3.0 = 5.0 in < 6.0 in NG

PUNCHING SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

X-Edge = *d /2* = 4.5 / 2 = 2.3 in αsx = 20

Z-Edge = *d /2* = 4.5 / 2 = 2.3 in αsz = 20

αs = *αsx + αsz* = 20 + 20 = 40 Col type = Interior β = *L / W* = 6.0 / 6.0 = 1.00 ACI 22.6.5.2

Perimeter *bo = αsz / 10 * (L + d / 2 + X-Edge) + αsx / 10 * (W + d / 2 + Z-Edge)* ACI 22.6.4.2

bo = 20 / 10 * (6.0 + 4.5 / 2 + 2.3) + 20 / 10 * (6.0 + 4.5 / 2 + 2.3) = 42.0 in

Area *Abo = (L + d / 2 + X-Edge) * (W + d / 2 + Z-Edge)* = (6.0 + 4.5 / 2 + 2.3) * (6.0 + 4.5 / 2 + 2.3) = 110.3 in²

ϕVc = *ϕ * Min (2 + 4 / β, αs * d / bo + 2, 4) * √(f'c)* ACI 22.6.5.2

ϕVc = 0.75 * Min (2 + 4 / 1.00, 40 * 4.5 / 42.0 + 2, 4) * √(2500) = 150.0 psi

Punching force *F = P + Overburden * Abo - Bearing*

F = 31.7 + 0.07 * 110.3 / 144 - 2.0 = 29.7 kip

b1 = *L + d / 2 + X-Edge* = 6.0 + 4.5 / 2 + 2.3 = 10.5 in b2 = *W + d / 2 + Z-Edge* = 6.0 + 4.5 / 2 + 2.3 = 10.5 in

γvx factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b2 / b1)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(10.5 / 10.5)}} = 0.40$ ACI Eq. (8.4.4.2.2)

γvz factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b1 / b2)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(10.5 / 10.5)}} = 0.40$ ACI Eq. (8.4.2.3.2)

X2z = *b1 / 2* = 10.5 / 2 = 5.3 in X2x = *b2 / 2* = 10.5 / 2 = 5.3 in

Jcz = *b1 * d³ / 6 + b1³ * d / 6 + b1² * b2 * d / 2* ACI R8.4.4.2.3

Jcz = 10.5 * 4.5³ / 6 + 10.5³ * 4.5 / 6 + 10.5² * 10.5 * 4.5 / 2 = 3632 in⁴

Jcx = *b2 * d³ / 6 + b2³ * d / 6 + b2² * b1 * d / 2* ACI R8.4.4.2.3

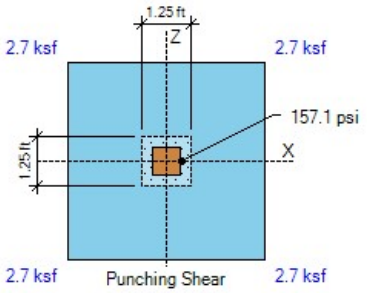
Jcx = 10.5 * 4.5³ / 6 + 10.5³ * 4.5 / 6 + 10.5² * 10.5 * 4.5 / 2 = 3632 in⁴

Stress due to P = *F / (bo * d) * 1000* = 29.7 / (42.0 * 4.5) * 1000 = 157.1 psi

Stress due to Mx = *γvx * X-OTM * X2x / Jcx* = 0.40 * 0.0 * 12 * 5.3 / 3632 * 1000 = 0.0 psi

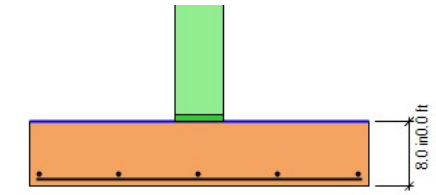
Stress due to Mz = *γvz * Z-OTM * X2z / Jcz* = 0.40 * 0.0 * 12 * 5.3 / 3632 * 1000 = 0.0 psi

Punching stress = *P-stress + Mx-stress + Mz-stress* = 157.1 + 0.0 + 0.0 = 157.1 psi > 150.0 psi NG

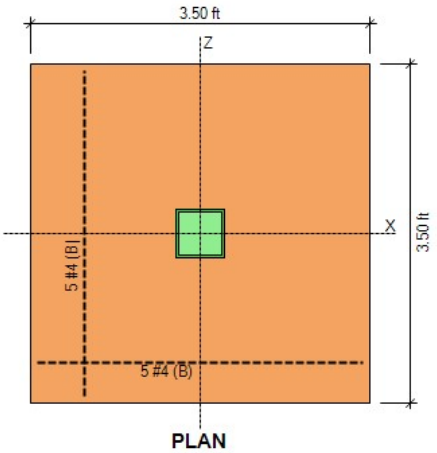


DESIGN CODES

Concrete Design	ACI 318-14
Load Combinations	ASCE 7-10/16



ELEVATION



PLAN

ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*

GEOMETRY

Footing Length (X-dir)	3.50	ft	
Footing Width (Z-dir)	3.50	ft	
Footing Thickness	8.0	in	OK
Soil Cover	0.00	ft	
Column Length (X-dir)	6.0	in	
Column Width (Z-dir)	6.0	in	
Offset (X-dir)	0.00	in	OK
Offset (Z-dir)	0.00	in	OK
Base Plate (L x W)	6.0 x 6.0	in	

SOIL PRESSURES (D+L)

Gross Allow. Soil Pressure	2.0	ksf	
Soil Pressure at Corner 1	1.5	ksf	
Soil Pressure at Corner 2	1.5	ksf	
Soil Pressure at Corner 3	1.5	ksf	
Soil Pressure at Corner 4	1.5	ksf	
Bearing Pressure Ratio	0.76		OK
Ftg. Area in Contact with Soil	100.0	%	
X-eccentricity / Ftg. Length	0.00		OK
Z-eccentricity / Ftg. Width	0.00		OK

APPLIED LOADS

	Dead	Live	RLive	Snow	Wind	Seismic	
Axial Force P	5.2	12.8	0.0	0.0	0.0	0.0	kip
Moment about X Mx ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Moment about Z Mz ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Shear Force Vx	0.0	0.0	0.0	0.0	0.0	0.0	kip
Shear Force Vz	0.0	0.0	0.0	0.0	0.0	0.0	kip

OVERTURNING CALCULATIONS (Comb: 0.6D+0.6W)

- Overturning about X-X
- Moment Mx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft
- Shear Force Vz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip
  Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft
- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft
- Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

- Resisting about X-X
- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 3.50 * 3.50 * 8.0 / 12 * 0.15 = 0.7 kip
  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.7 * 1.75 = 1.3 k-ft
- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip
  Arm = *W / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft
- Soil cover = *0.6 * W * L * SC * Density* 0=6 * (3.50 * 3.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip
  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft
- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 3.50 * 3.50 * 62 * (0.67) = -0.3 kip
  Arm = *W / 2* = 3.50 / 2 = 1.75 ft Moment = 0.3 * 1.75 = -0.5 k-ft
- Axial force P = 0.6 * 5.2 + 0.6 * 0.0 = 3.1 kip
  Arm = *W / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 3.1 * 1.75 = 5.5 k-ft
- Resisting moment X-X = 1.3 + 0.0 + 0.0 + 5.5 + -0.5 = 6.2 k-ft
- Overturning safety factor X-X = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{6.2}{0.0}$ = 62.11 > 1.50 OK

- Overturning about Z-Z

- Moment Mz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft

- Shear Force Vx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

  Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft

- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft

- Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

- Resisting about Z-Z

- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 3.50 * 3.50 * 8.0 / 12 * 0.15 = 0.7 kip

  Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.7 * 1.75 = 1.3 k-ft

- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

  Arm = *L / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft

- Soil cover = *0.6 * W * L * SC * Density* = 0.6 * (3.50 * 3.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

  Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.0 * 1.75 = 0.0 k-ft

- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 3.50 * 3.50 * 62 * (0.67) = -0.3 kip

  Arm = *L / 2* = 3.50 / 2 = 1.75 ft Moment = 0.3 * 1.75 = -0.5 k-ft

- Axial force P = 0.6 * 5.2 + 0.6 * 0.0 = 3.1 kip

  Arm = *L / 2 - Offset* = 3.50 / 2 - 0.0 / 12 = 1.75 ft Moment = 3.1 * 1.75 = 5.5 k-ft

- Resisting moment Z-Z = 1.3 + 0.0 + 0.0 + 5.5 + -0.5 = 6.2 k-ft

- Overturning safety factor Z-Z = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{6.2}{0.0}$ = 62.11 > 1.50 OK

SOIL BEARING PRESSURES (Comb: D+L)

Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

Resisting moment X-X = 2.1 + 0.0 + 0.0 + -0.9 + 31.5 = 32.8 k-ft

Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

Resisting moment Z-Z = 2.1 + 0.0 + 0.0 + -0.9 + 31.5 = 32.8 k-ft

Resisting force = *Footing + Pedestal + Soil - Buoyancy + P* = 1.2 + 0.0 + 0.0 - 0.5 + 18.0 = 18.7 kip

X-coordinate of resultant from maximum bearing corner:

$$Xp = \frac{\textit{Z-Resisting moment - Z-Overturning moment}}{\textit{Resisting force}} = \frac{32.8 - 0.0}{18.7} = 1.75 \text{ ft}$$

Z-coordinate of resultant from maximum bearing corner:

$$Zp = \frac{\textit{X-Resisting moment - X-Overturning moment}}{\textit{Resisting force}} = \frac{32.8 - 0.0}{18.7} = 1.75 \text{ ft}$$

X-ecc = *Length / 2 - Xp* =3.50 / 2 - 1.75 = 0.00 ft

Z-ecc = *Width / 2 - Zp* = 3.50 / 2 - 1.75 = 0.00 ft

Area = *Width * Length* = 3.50 * 3.50 = 12.3 ft²

Sx = *Length * Width² / 6* = 3.50 * 3.50² / 6 = 7.1 ft³

Sz = *Width * Length² / 6* = 3.50 * 3.50² / 6 = 7.1 ft³

- Footing is in full bearing. Soil pressures are as follows:

P1 = *P * (1/ A + Z-ecc / Sx + X-ecc / Sz)* = 18.7 * (1 / 12.3 + 0.00 / 7.1 + 0.00 / 7.1) = 1.53 ksf

P2 = *P * (1/ A - Z-ecc / Sx + X-ecc / Sz)* = 18.7 * (1 / 12.3 - 0.00 / 7.1 + 0.00 / 7.1) = 1.53 ksf

P3 = *P * (1/ A - Z-ecc / Sx - X-ecc / Sz)* = 18.7 * (1 / 12.3 - 0.00 / 7.1 - 0.00 / 7.1) = 1.53 ksf

P4 = *P * (1/ A + Z-ecc / Sx - X-ecc / Sz)* = 18.7 * (1 / 12.3 + 0.00 / 7.1 - 0.00 / 7.1) = 1.53 ksf

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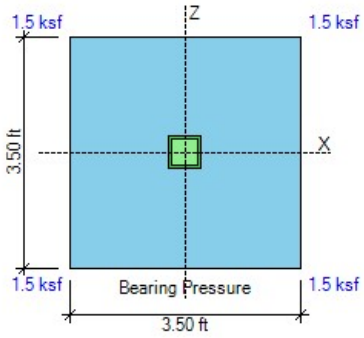
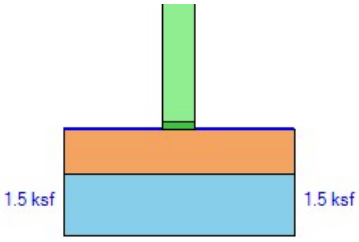




SLIDING CALCULATIONS (Comb: 0.6D+0.6W)

Internal friction angle = 28.0 deg

Passive coefficient *kp = 4.33 (per Coulomb)*

Pressure at mid-depth = *kp * Density * (Cover + Thick / 2)* = 4.33 * 110 * (0.00 + 8.0 / 12 / 2) = 0.16 ksf

X-Passive force = *Pressure * Thick * Width* = 0.16 * 8.0 / 12 * 3.50 = 0.4 kip

Z-Passive force = *Pressure * Thick * Length* = 0.16 * 8.0 / 12 * 3.50 = 0.4 kip

Friction force = *Resisting force * Friction coeff.* = Max (0, 3.5 * 0.35) = 1.2 kip

Use 100% of Passive + 100% of Friction for sliding resistance

- Sliding safety factor X-X = $\frac{\textit{X-Passive force + Friction}}{\textit{X-Horizontal load}} = \frac{1.00 * 0.4 + 1.00 * 1.2}{0.0}$ = 16.12 > 1.50 OK

- Sliding safety factor Z-Z = $\frac{\textit{Z-Passive force + Friction}}{\textit{Z-Horizontal load}} = \frac{1.00 * 0.4 + 1.00 * 1.2}{0.0}$ = 16.12 > 1.50 OK

UPLIFT CALCULATIONS (Comb: 0.6D+0.6W)

- Uplift safety factor = $\frac{\textit{Pedestal + Footing + Cover - Buoyancy}}{\textit{Uplift load}} = \frac{0.0 + 0.7 + 0.0 - 0.3}{0.0}$ = 99.99 > 1.00 OK

ONE-WAY SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Concrete f'c = 2.5 ksi Steel fy = 40.0 ksi Soil density = 110 pcf

d Top X-dir = *Thick - Cover - X-diameter / 2* = 8.0 - 2.0 - 0.8 / 2 = 5.6 in

d Top Z-dir = *Thick - Cover - X-diameter - Z-diameter / 2* = 8.0 - 2.0 - 0.8 - 0.8 / 2 = 4.9 in

d Bot X-dir = *Thick - Cover - X-diameter / 2* = 8.0 - 3.0 - 0.5 / 2 = 4.8 in

d Bot Z-dir = *Thick - Cover - X-diameter - Z-diameter / 2* = 8.0 - 3.0 - 0.5 - 0.5 / 2 = 4.3 in

$\phi Vcx = 2 * \phi * \sqrt{f'c} * Width * d / 1000$ = 2 * 0.75 * √(2500) * 3.5 * 12 * 4.8 / 1000 = 15.0 kip ACI Eq. (22.5.5.1)

$\phi Vcz = 2 * \phi * \sqrt{f'c} * Length * d / 1000$ = 2 * 0.75 * √(2500) * 3.5 * 12 * 4.3 / 1000 = 13.4 kip

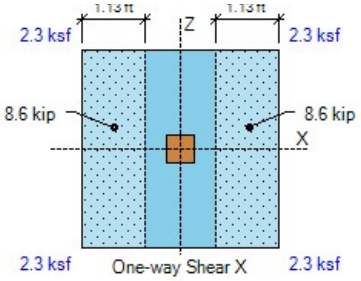
- Shear forces calculated as the volume of the bearing pressures under the effective areas:

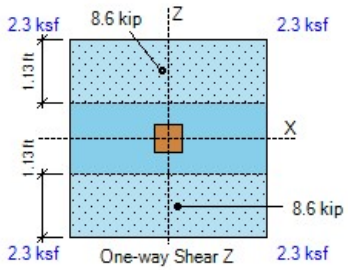
One-way shear Vux (- Side) = 8.6 kip < 15.0 kip OK

One-way shear Vux (+ Side) = 8.6 kip < 15.0 kip OK

One-way shear Vuz (- Side) = 8.6 kip < 13.4 kip OK

One-way shear Vuz (+ Side) = 8.6 kip < 13.4 kip OK





FLEXURE CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Plain ϕMnx = *5 * ϕ * √(f'c) * L * Thick² / 6* = 5 * 0.60 * √(2500) * 3.50 * 8.0² / 6 / 1000 = 1.5 k-ft ACI Eq. (14.5.2.1a)

Plain ϕMnz = *5 * ϕ * √(f'c) * W * Thick² / 6* = 5 * 0.60 * √(2500) * 3.50 * 8.0² / 6 / 1000 = 1.5 k-ft

- Top Bars

No Top Reinforcement Provided at the Footing

Use Plain Concrete Flexural Strength at Top

- Top moments calculated as the overburden minus the bearing pressures times the lever arm:

Top moment -Mux (- Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Mux (+ Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Muz (- Side) = 0.0 k-ft < 5.6 k-ft OK

Top moment -Muz (+ Side) = 0.0 k-ft < 5.6 k-ft OK

- Bottom Bars

Use 5 #4 Z-Bars *ρ = As / b d* = 1.0 / (3.50 * 12 * 4.3) = 0.0056 q = 0.0056 * 40 / 2.5 = 0.090

Use 5 #4 X-Bars *ρ = As / b d* = 1.0 / (3.50 * 12 * 4.8) = 0.0050 q = 0.0050 * 40 / 2.5 = 0.080

β = L / W = 3.50 / 3.50 = 1.00 *γs = 2 * β / (β + 1)* = 2 * 1.00 / (1.00 + 1) = 1.00 ACI 13.3.3.3

Bending strength *ϕMn = ϕ * b * d² * f'c * q * (1 - 0.59 * q)* ACI 22.2.2

ϕMnx = 0.90 * 3.50 * 12 * 4.3² * 2.5 * 0.090 * (1 - 0.59 * 0.090) = 12.1 k-ft

ϕMnz = 0.90 * 3.50 * 12 * 4.8² * 2.5 * 0.080 / 1.00 * (1 - 0.59 * 0.080 / 1.00) = 13.6 k-ft

- Bottom moments calculated as the bearing minus the overburden pressures times the lever arm:

Bottom moment Mux (- Side) = 8.6 k-ft < 12.1 k-ft OK ratio = 0.71

Bottom moment Mux (+ Side) = 8.6 k-ft < 12.1 k-ft OK ratio = 0.71

Bottom moment Muz (- Side) = 8.6 k-ft < 13.6 k-ft OK ratio = 0.63

Bottom moment Muz (+ Side) = 8.6 k-ft < 13.6 k-ft OK ratio = 0.63

X-As min = *0.0018 * Width * Thick* = 0.0018 * 3.50 * 12 * 8.0 = 0.6 in² < 1.0 in² OK ACI 8.6.1.1

Z-As min = *0.0018 * Length * Thick* = 0.0018 * 3.50 * 12 * 8.0 = 0.6 in² < 1.0 in² OK ACI 8.6.1.1

X-As max for 0.005 tension strain = 3.20 in² > 1.00 in² OK ACI 21.2.2

Z-As max for 0.005 tension strain = 3.20 in² > 1.00 in² OK ACI 21.2.2

X-Cover factor = *Min (2.5, (Cover + db /2, Spacing / 2) / db)* = Min (2.5, (3.0 + 0.50 / 2, 9.0 / 2) / 0.50) = 2.5

Straight *X-Ld = Max (12.0, 3 / 40 * fy / (f'c)½ * Grade * Size * Casting / Cover * db * ratio)* ACI Eq. (25.4.2.3a)

X-Ld = Max (12.0, 3 / 40 * 40.0 * 1000 / (2500)½ * 1.0 * 0.8 * 1.0 / 2.5 * 0.50 * 0.63) = 12.0 in

Hooked *X-Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* = ACI 25.4.3

X-Ldh = Max (8 db, 6, 0.02 * 40.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.50 * 0.63) = 6.0 in

-X Ld provided = *(Length - Col) / 2 + Offset - Cover* = 3.50 * 12 / 2 + 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

+X Ld provided = *(Length - Col) / 2 - Offset - Cover* = 3.50 * 12 / 2 - 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

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Z-Cover factor = *Min (2.5, (Cover + db /2, Spacing / 2) / db)* = Min (2.5, (3.0 + 0.50 / 2, 9.0 / 2) / 0.50) = 2.5

Straight *Z-Ld = Max (12.0, 3 / 40 * fy / (f'c)½ * Grade * Size * Casting / Cover * db * ratio)* ACI Eq. (25.4.2.3a)

Z-Ld = Max (12.0, 3 / 40 * 40.0 * 1000 / (2500)½ * 1.0 * 0.8 * 1.0 / 2.5 * 0.50 * 0.63) = 12.0 in

Hooked *Z-Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* = ACI 25.4.3

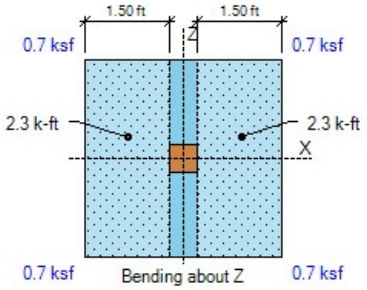
Z-Ldh = Max (8 db, 6, 0.02 * 40.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.50 * 0.71) = 6.0 in

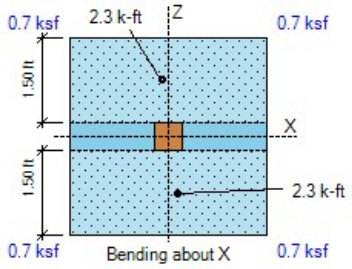
-Z Ld provided = *(Width - Col) / 2 + Offset - Cover* = 3.50 * 12 / 2 + 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

+Z Ld provided = *(Width - Col) / 2 - Offset - Cover* = 3.50 * 12 / 2 - 0.0 - 6.0 / 2 - 2.5 = 15.5 in > 12.0 in OK

X-bar spacing = 9.0 in < Min (3 * t, 18.0) = 18.0 in OK ACI 7.7.2.3

Z-bar spacing = 9.0 in < Min (3 * t, 18.0) = 18.0 in OK





LOAD TRANSFER CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Area *A1 = col L * col W* = 6.0 * 6.0 = 36.0 in²

Sx = *col W * col L² / 6* = 6.0 * 6.0² / 6 = 36.0 in³

Sz = *col L * col W² / 6* = 6.0 * 6.0² / 6 = 36.0 in³

Bearing *Pbu = P / A1 + Mz / Sx + Mx / Sz* = 26.7 / 36.0 + 0.0 * 12 / 36.0 + 0.0 * 12 / 36.0 = 0.7 ksi

Min edge = *Min (L / 2 - X-offset - col L / 2, W / 2 - Z-offset - col W / 2)*

Min edge = Min (3.50 * 12 / 2 - 0.0 - 6.0 / 2, 3.50 * 12 / 2 - 0.0 - 6.0 / 2 = 18.0 in

Area *A2 = Min [L * W, (col L + 2 * Min edge) * (col W + 2 * Min edge)]* ACI R22.8.3.2

A2 = Min [3.50 * 12 * 3.5 * 12, (6.0 + 2 * 18.0) * (6.0 + 2 * 18.0)] = 1764.0 in²

Footing *ϕPnc = ϕ * 0.85 * f'c * Min [2, √(A2 / A1)]* = 0.65 * 0.85 * 2.5 * Min [2, √(1764.0 / 36.0)] = 2.8 ksi

Footing *ϕPns = ϕ * As * Fy / A1* = 0.0 ksi ACI 22.8.3.2

Footing bearing *ϕPn = ϕPnc + ϕPns* = 2.8 + 0.0 = 2.8 ksi > 0.7 psi OK

Hooked *Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* ACI 25.4.3

Ldh = Max (8 db, 6, 0.02 * 60.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.75 * 0.13) = 6.0 in

Ld provided = *Dowel length* = 3.00 * 12 = 36.0 in > 23.1 in OK

Ldh provided = *Footing thickness - Cover* = 8.00 - 3.0 = 5.0 in < 6.0 in NG

PUNCHING SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

X-Edge = *d /2* = 4.5 / 2 = 2.3 in αsx = 20

Z-Edge = *d /2* = 4.5 / 2 = 2.3 in αsz = 20

αs = *αsx + αsz* = 20 + 20 = 40 Col type = Interior β = *L / W* = 6.0 / 6.0 = 1.00 ACI 22.6.5.2

Perimeter *bo = αsz / 10 * (L + d / 2 + X-Edge) + αsx / 10 * (W + d / 2 + Z-Edge)* ACI 22.6.4.2

bo = 20 / 10 * (6.0 + 4.5 / 2 + 2.3) + 20 / 10 * (6.0 + 4.5 / 2 + 2.3) = 42.0 in

Area *Abo = (L + d / 2 + X-Edge) * (W + d / 2 + Z-Edge)* = (6.0 + 4.5 / 2 + 2.3) * (6.0 + 4.5 / 2 + 2.3) = 110.3 in²

ϕVc = *ϕ * Min (2 + 4 / β, αs * d / bo + 2, 4) * √(f'c)* ACI 22.6.5.2

ϕVc = 0.75 * Min (2 + 4 / 1.00, 40 * 4.5 / 42.0 + 2, 4) * √(2500) = 150.0 psi

Punching force *F = P + Overburden * Abo - Bearing*

F = 26.7 + 0.07 * 110.3 / 144 - 1.7 = 25.1 kip

b1 = *L + d / 2 + X-Edge* = 6.0 + 4.5 / 2 + 2.3 = 10.5 in b2 = *W + d / 2 + Z-Edge* = 6.0 + 4.5 / 2 + 2.3 = 10.5 in

γvx factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b2 / b1)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(10.5 / 10.5)}} = 0.40$ ACI Eq. (8.4.4.2.2)

γvz factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b1 / b2)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(10.5 / 10.5)}} = 0.40$ ACI Eq. (8.4.2.3.2)

X2z = *b1 / 2* = 10.5 / 2 = 5.3 in X2x = *b2 / 2* = 10.5 / 2 = 5.3 in

Jcz = *b1 * d³ / 6 + b1³ * d / 6 + b1² * b2 * d / 2* ACI R8.4.4.2.3

Jcz = 10.5 * 4.5³ / 6 + 10.5³ * 4.5 / 6 + 10.5² * 10.5 * 4.5 / 2 = 3632 in⁴

Jcx = *b2 * d³ / 6 + b2³ * d / 6 + b2² * b1 * d / 2* ACI R8.4.4.2.3

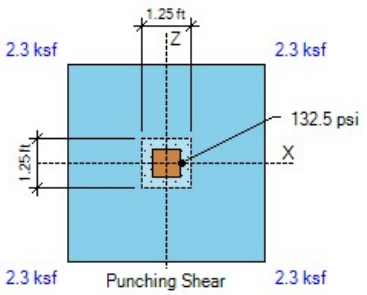
Jcx = 10.5 * 4.5³ / 6 + 10.5³ * 4.5 / 6 + 10.5² * 10.5 * 4.5 / 2 = 3632 in⁴

Stress due to P = *F / (bo * d) * 1000* = 25.1 / (42.0 * 4.5) * 1000 = 132.5 psi

Stress due to Mx = *γvx * X-OTM * X2x / Jcx* = 0.40 * 0.0 * 12 * 5.3 / 3632 * 1000 = 0.0 psi

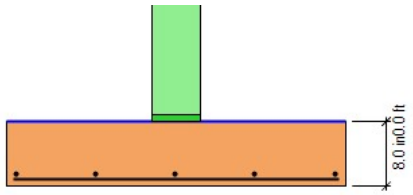
Stress due to Mz = *γvz * Z-OTM * X2z / Jcz* = 0.40 * 0.0 * 12 * 5.3 / 3632 * 1000 = 0.0 psi

Punching stress = *P-stress + Mx-stress + Mz-stress* = 132.5 + 0.0 + 0.0 = 132.5 psi < 150.0 psi OK

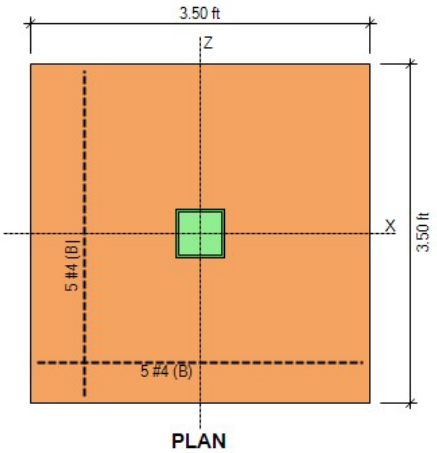


DESIGN CODES

Concrete Design	ACI 318-14
Load Combinations	ASCE 7-10/16



ELEVATION



PLAN

Project: Page # ___
Engineer: 2/27/2024
Descrip: Typical exterior Footing 6,000# point load

ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*

GEOMETRY

Footing Length (X-dir)	2.00	ft	
Footing Width (Z-dir)	2.60	ft	
Footing Thickness	8.0	in	OK
Soil Cover	0.00	ft	
Column Length (X-dir)	6.0	in	
Column Width (Z-dir)	6.0	in	
Offset (X-dir)	0.00	in	OK
Offset (Z-dir)	0.00	in	OK
Base Plate (L x W)	6.0 x 6.0	in	

SOIL PRESSURES (D+L)

Gross Allow. Soil Pressure	2.0	ksf	
Soil Pressure at Corner 1	2.0	ksf	
Soil Pressure at Corner 2	2.0	ksf	
Soil Pressure at Corner 3	2.0	ksf	
Soil Pressure at Corner 4	2.0	ksf	
Bearing Pressure Ratio	0.99		OK
Ftg. Area in Contact with Soil	100.0	%	
X-eccentricity / Ftg. Length	0.00		OK
Z-eccentricity / Ftg. Width	0.00		OK

APPLIED LOADS

	Dead	Live	RLive	Snow	Wind	Seismic	
Axial Force P	4.5	5.5	0.0	0.0	0.0	0.0	kip
Moment about X Mx ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Moment about Z Mz ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Shear Force Vx	0.0	0.0	0.0	0.0	0.0	0.0	kip
Shear Force Vz	0.0	0.0	0.0	0.0	0.0	0.0	kip

OVERTURNING CALCULATIONS (Comb: 0.6D+0.6W)

- Overturning about X-X
- Moment Mx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft
- Shear Force Vz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip
  Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft
- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft
- Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

- Resisting about X-X
- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 2.60 * 2.00 * 8.0 / 12 * 0.15 = 0.3 kip
  Arm = *W / 2* = 2.60 / 2 = 1.30 ft Moment = 0.3 * 1.30 = 0.4 k-ft
- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip
  Arm = *W / 2 - Offset* = 2.60 / 2 - 0.0 / 12 = 1.30 ft Moment = 0.0 * 1.30 = 0.0 k-ft
- Soil cover = *0.6 * W * L * SC * Density* 0=6 * (2.60 * 2.00 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip
  Arm = *W / 2* = 2.60 / 2 = 1.30 ft Moment = 0.0 * 1.30 = 0.0 k-ft
- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 2.60 * 2.00 * 62 * (0.67) = -0.1 kip
  Arm = *W / 2* = 2.60 / 2 = 1.30 ft Moment = 0.1 * 1.30 = -0.2 k-ft
- Axial force P = 0.6 * 4.5 + 0.6 * 0.0 = 2.7 kip
  Arm = *W / 2 - Offset* = 2.60 / 2 - 0.0 / 12 = 1.30 ft Moment = 2.7 * 1.30 = 3.5 k-ft
- Resisting moment X-X = 0.4 + 0.0 + 0.0 + 3.5 + -0.2 = 3.7 k-ft
- Overturning safety factor X-X = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{3.7}{0.0}$ = 37.47 > 1.50 OK

- Overturning about Z-Z

- Moment Mz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft

- Shear Force Vx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft

- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft

- Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

- Resisting about Z-Z

- Footing weight = *0.6 * W * L * Thick * Density =* 0.6 * 2.60 * 2.00 * 8.0 / 12 * 0.15 = 0.3 kip

Arm = *L / 2 =* 2.00 / 2 = 1.00 ft Moment = 0.3 * 1.00 = 0.3 k-ft

- Pedestal weight = *0.6 * W * L * H * Density =* 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

Arm = *L / 2 - Offset =* 2.00 / 2 - 0.0 / 12 = 1.00 ft Moment = 0.0 * 1.00 = 0.0 k-ft

- Soil cover = *0.6 * W * L * SC * Density =* 0.6 * (2.60 * 2.00 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

Arm = *L / 2 =* 2.00 / 2 = 1.00 ft Moment = 0.0 * 1.00 = 0.0 k-ft

- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT) =* 0.6 * 2.60 * 2.00 * 62 * (0.67) = -0.1 kip

Arm = *L / 2 =* 2.00 / 2 = 1.00 ft Moment = 0.1 * 1.00 = -0.1 k-ft

- Axial force P = 0.6 * 4.5 + 0.6 * 0.0 = 2.7 kip

Arm = *L / 2 - Offset =* 2.00 / 2 - 0.0 / 12 = 1.00 ft Moment = 2.7 * 1.00 = 2.7 k-ft

- Resisting moment Z-Z = 0.3 + 0.0 + 0.0 + 2.7 + -0.1 = 2.9 k-ft

- Overturning safety factor Z-Z = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{2.9}{0.0}$ = 28.82 > 1.50 OK

SOIL BEARING PRESSURES (Comb: D+L)

Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

Resisting moment X-X = 0.7 + 0.0 + 0.0 + -0.3 + 13.0 = 13.4 k-ft

Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

Resisting moment Z-Z = 0.5 + 0.0 + 0.0 + -0.2 + 10.0 = 10.3 k-ft

Resisting force = *Footing + Pedestal + Soil - Buoyancy + P =* 0.5 + 0.0 + 0.0 - 0.2 + 10.0 = 10.3 kip

X-coordinate of resultant from maximum bearing corner:

$$Xp = \frac{\textit{Z-Resisting moment - Z-Overturning moment}}{\textit{Resisting force}} = \frac{10.3 - 0.0}{10.3} = 1.00 \text{ ft}$$

Z-coordinate of resultant from maximum bearing corner:

$$Zp = \frac{\textit{X-Resisting moment - X-Overturning moment}}{\textit{Resisting force}} = \frac{13.4 - 0.0}{10.3} = 1.30 \text{ ft}$$

X-ecc = *Length / 2 - Xp* =2.00 / 2 - 1.00 = 0.00 ft

Z-ecc = *Width / 2 - Zp =* 2.60 / 2 - 1.30 = 0.00 ft

Area = *Width * Length =* 2.60 * 2.00 = 5.2 ft²

Sx = *Length * Width² / 6 =* 2.00 * 2.60² / 6 = 2.3 ft³

Sz = *Width * Length² / 6 =* 2.60 * 2.00² / 6 = 1.7 ft³

- Footing is in full bearing. Soil pressures are as follows:

P1 = *P * (1/ A + Z-ecc / Sx + X-ecc / Sz) =* 10.3 * (1 / 5.2 + 0.00 / 2.3 + 0.00 / 1.7) = 1.98 ksf

P2 = *P * (1/ A - Z-ecc / Sx + X-ecc / Sz) =* 10.3 * (1 / 5.2 - 0.00 / 2.3 + 0.00 / 1.7) = 1.98 ksf

P3 = *P * (1/ A - Z-ecc / Sx - X-ecc / Sz) =* 10.3 * (1 / 5.2 - 0.00 / 2.3 - 0.00 / 1.7) = 1.98 ksf

P4 = *P * (1/ A + Z-ecc / Sx - X-ecc / Sz) =* 10.3 * (1 / 5.2 + 0.00 / 2.3 - 0.00 / 1.7) = 1.98 ksf

Project: Page # ___
Engineer: 2/27/2024
Descrip: Typical exterior Footing 6,000# point load

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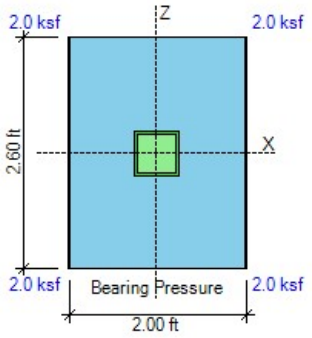
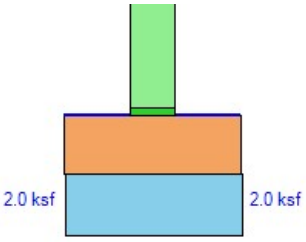




SLIDING CALCULATIONS (Comb: 0.6D+0.6W)

Internal friction angle = 28.0 deg

Passive coefficient *kp = 4.33 (per Coulomb)*

Pressure at mid-depth = *kp * Density * (Cover + Thick / 2)* = 4.33 * 110 * (0.00 + 8.0 / 12 / 2) = 0.16 ksf

X-Passive force = *Pressure * Thick * Width* = 0.16 * 8.0 / 12 * 2.60 = 0.3 kip

Z-Passive force = *Pressure * Thick * Length* = 0.16 * 8.0 / 12 * 2.00 = 0.2 kip

Friction force = *Resisting force * Friction coeff.* = Max (0, 2.9 * 0.35) = 1.0 kip

Use 100% of Passive + 100% of Friction for sliding resistance

- Sliding safety factor X-X = $\frac{\textit{X-Passive force + Friction}}{\textit{X-Horizontal load}} = \frac{1.00 * 0.3 + 1.00 * 1.0}{0.0}$ = 12.84 > 1.50 OK

- Sliding safety factor Z-Z = $\frac{\textit{Z-Passive force + Friction}}{\textit{Z-Horizontal load}} = \frac{1.00 * 0.2 + 1.00 * 1.0}{0.0}$ = 12.20 > 1.50 OK

UPLIFT CALCULATIONS (Comb: 0.6D+0.6W)

- Uplift safety factor = $\frac{\textit{Pedestal + Footing + Cover - Buoyancy}}{\textit{Uplift load}} = \frac{0.0 + 0.3 + 0.0 - 0.1}{0.0}$ = 99.99 > 1.00 OK

ONE-WAY SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Concrete f'c = 2.5 ksi Steel fy = 40.0 ksi Soil density = 110 pcf

Use Plain Concrete Shear Strength

ϕVcx = *4/3 * ϕ * √(f'c) * Width * t / 1000* = 4/3 * 0.60 * √(2500) * 2.6 * 12 * 8.0 / 1000 = 10.0 kip ACI 14.5.5.1

ϕVcz = *4/3 * ϕ * √(f'c) * Length * t / 1000* = 4/3 * 0.60 * √(2500) * 2.0 * 12 * 8.0 / 1000 = 7.7 kip

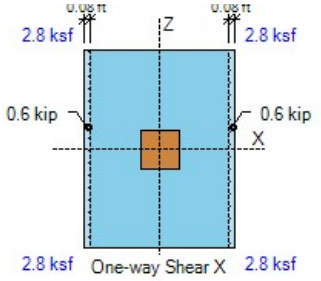
- Shear forces calculated as the volume of the bearing pressures under the effective areas:

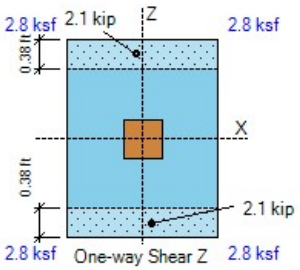
One-way shear Vux (- Side) = 0.6 kip < 10.0 kip OK

One-way shear Vux (+ Side) = 0.6 kip < 10.0 kip OK

One-way shear Vuz (- Side) = 2.1 kip < 7.7 kip OK

One-way shear Vuz (+ Side) = 2.1 kip < 7.7 kip OK





FLEXURE CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Plain ϕMnx = *5 * ϕ * √(f'c) * L * Thick² / 6* = 5 * 0.60 * √(2500) * 2.00 * 8.0² / 6 / 1000 = 0.9 k-ft ACI Eq. (14.5.2.1a)

Plain ϕMnz = *5 * ϕ * √(f'c) * W * Thick² / 6* = 5 * 0.60 * √(2500) * 2.60 * 8.0² / 6 / 1000 = 1.1 k-ft

- Top Bars

No Top Reinforcement Provided at the Footing

Use Plain Concrete Flexural Strength at Top

- Top moments calculated as the overburden minus the bearing pressures times the lever arm:

Top moment -Mux (- Side) = 0.0 k-ft < 3.2 k-ft OK

Top moment -Mux (+ Side) = 0.0 k-ft < 3.2 k-ft OK

Top moment -Muz (- Side) = 0.0 k-ft < 4.2 k-ft OK

Top moment -Muz (+ Side) = 0.0 k-ft < 4.2 k-ft OK

- Bottom Bars

No Bottom Reinforcement Provided at the Footing

Use Plain Concrete Flexural Strength at Bottom

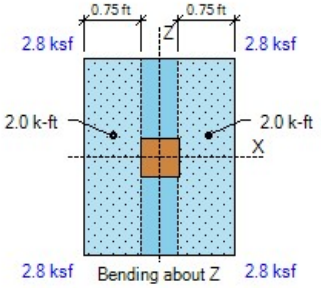
- Bottom moments calculated as the bearing minus the overburden pressures times the lever arm:

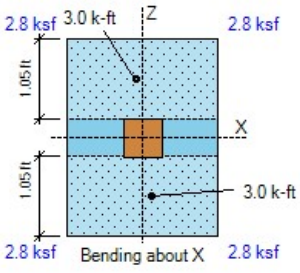
Bottom moment Mux (- Side) = 3.0 k-ft < 3.2 k-ft OK ratio = 0.94

Bottom moment Mux (+ Side) = 3.0 k-ft < 3.2 k-ft OK ratio = 0.94

Bottom moment Muz (- Side) = 2.0 k-ft < 4.2 k-ft OK ratio = 0.48

Bottom moment Muz (+ Side) = 2.0 k-ft < 4.2 k-ft OK ratio = 0.48





ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*

LOAD TRANSFER CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Area $A1 = col\ L * col\ W =$ 6.0 * 6.0 = 36.0 in²

Sx = $col\ W * col\ L^2 / 6 =$ 6.0 * 6.0² / 6 = 36.0 in³

Sz = $col\ L * col\ W^2 / 6 =$ 6.0 * 6.0² / 6 = 36.0 in³

Bearing $Pbu = P / A1 + Mz / Sx + Mx / Sz =$ 14.2 / 36.0 + 0.0 * 12 / 36.0 + 0.0 * 12 / 36.0 = 0.4 ksi

Min edge = *Min (L / 2 - X-offset - col L / 2, W / 2 - Z-offset - col W / 2)*

Min edge = Min (2.00 * 12 / 2 - 0.0 - 6.0 / 2, 2.60 * 12 / 2 - 0.0 - 6.0 / 2 = 9.0 in

Area $A2 = Min [L * W, (col\ L + 2 * Min\ edge) * (col\ W + 2 * Min\ edge)]$ ACI R22.8.3.2

A2 = Min [2.00 * 12 * 2.6 * 12, (6.0 + 2 * 9.0) * (6.0 + 2 * 9.0)] = 576.0 in²

Footing $\phi Pnc = \phi * 0.85 * f'c * Min [2, \sqrt{(A2 / A1)}] =$ 0.65 * 0.85 * 2.5 * Min [2, √(576.0 / 36.0)] = 2.8 ksi

Footing $\phi Pns = \phi * As * Fy / A1 =$ 0.0 ksi ACI 22.8.3.2

Footing bearing $\phi Pn = \phi Pnc + \phi Pns =$ 2.8 + 0.0 = 2.8 ksi > 0.4 psi OK

Hooked *Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* ACI 25.4.3

Ldh = Max (8 db, 6, 0.02 * 60.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.75 * 0.07) = 6.0 in

Ld provided = *Dowel length* = 3.00 * 12 = 36.0 in > 12.3 in OK

Ldh provided = *Footing thickness - Cover* = 8.00 - 3.0 = 5.0 in < 6.0 in NG

PUNCHING SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

X-Edge = *Length / 2 - Offset - Col / 2* = 2.00 * 12 / 2 - 0.0 - 6.0 / 2 = 9.0 in αsx = 10

Z-Edge = *Width / 2 - Offset - Col / 2* = 2.60 * 12 / 2 - 0.0 - 6.0 / 2 = 12.6 in αsz = 10

αs = *αsx + αsz* = 10 + 10 = 20 Col type = Corner β = *L / W* = 6.0 / 6.0 = 1.00 ACI 22.6.5.2

Perimeter *bo = αsz / 10 * (L + d / 2 + X-Edge) + αsx / 10 * (W + d / 2 + Z-Edge)* ACI 22.6.4.2

bo = 10 / 10 * (6.0 + 8.0 / 2 + 9.0) + 10 / 10 * (6.0 + 8.0 / 2 + 12.6) = 41.6 in

Area *Abo = (L + d / 2 + X-Edge) * (W + d / 2 + Z-Edge)* = (6.0 + 8.0 / 2 + 9.0) * (6.0 + 8.0 / 2 + 12.6) = 429.4 in²

Use Plain Concrete Shear Strength

ϕVc = *ϕ * Min (1 + 2 / β, 2) * 4/3 * √(f'c)* ACI 14.5.5.1

ϕVc = 0.60 * Min (1 + 2 / 1.00, 2) * 4/3 √(2500) = 80.0 psi

Punching force *F = P + Overburden * Abo - Bearing*

F = 14.2 + 0.07 * 429.4 / 144 - 3.8 = 10.6 kip

b1 = *L + d / 2 + X-Edge* = 6.0 + 8.0 / 2 + 9.0 = 19.0 in b2 = *W + d / 2 + Z-Edge* = 6.0 + 8.0 / 2 + 12.6 = 22.6 in

$$\gamma vx \text{ factor} = 1 - \frac{1}{1 + (2/3)\sqrt{(b2 / b1)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(22.6 / 19.0)}} = 0.42$$ ACI Eq. (8.4.4.2.2)

$$\gamma vz \text{ factor} = 1 - \frac{1}{1 + (2/3)\sqrt{(b1 / b2)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(19.0 / 22.6)}} = 0.38$$ ACI Eq. (8.4.2.3.2)

X2z = $b1^2 / 2 / (b1 + b2)$ = 19.0² / 2 / (19.0 + 22.6) = 4.3 in X2x = $b2^2 / 2 / (b2 + b1)$ = 6.1 in

Jcz = $b1 * d^3 / 12 + b1^3 * d / 12 + b1 * d * (b1 / 2 - X2z)^2 + b2 * d * X2z^2$ ACI R8.4.4.2.3

Jcz = 19.0 * 8.0³ / 12 + 19.0³ * 8.0 / 12 + 19.0 * 8.0 * (19.0 / 2 * 4.3)² + 22.6 * 8.0 * 4.3² = 12836 in⁴

Jcx = $b2 * d^3 / 12 + b2^3 * d / 12 + b2 * d * (b2 / 2 - X2x)^2 + b1 * d * X2x^2$ ACI R8.4.4.2.3

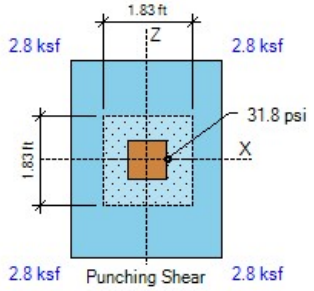
Jcz = 22.6 * 8.0³ / 12 + 22.6³ * 8.0 / 12 + 22.6 * 8.0 * (22.6 / 2 * 6.1)² + 19.0 * 8.0 * 6.1² = 19204 in⁴

Stress due to P = *F / (bo * d) * 1000* = 10.6 / (41.6 * 8.0) * 1000 = 31.8 psi

Stress due to Mx = *γvx * X-OTM * X2x / Jcx* = 0.42 * 0.0 * 12 * 6.1 / 19204 * 1000 = 0.0 psi

Stress due to Mz = *γvz * Z-OTM * X2z / Jcz* = 0.42 * 0.0 * 12 * 4.3 / 12836 * 1000 = 0.0 psi

Punching stress = *P-stress + Mx-stress + Mz-stress* = 31.8 + 0.0 + 0.0 = 31.8 psi < 80.0 psi OK

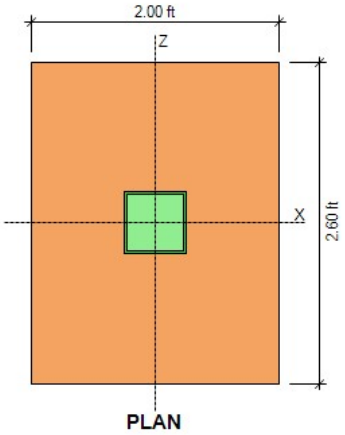


ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*

DESIGN CODES

Concrete Design	ACI 318-14
Load Combinations	ASCE 7-10/16

ELEVATION



PLAN

Project: Page # ___
Engineer: 2/27/2024
Descrip: Typical Interior Footing 6,500# point load

ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*

GEOMETRY

Footing Length (X-dir)	1.50	ft	
Footing Width (Z-dir)	2.60	ft	
Footing Thickness	8.0	in	OK
Soil Cover	0.00	ft	
Column Length (X-dir)	6.0	in	
Column Width (Z-dir)	6.0	in	
Offset (X-dir)	0.00	in	OK
Offset (Z-dir)	0.00	in	OK
Base Plate (L x W)	6.0 x 6.0	in	

SOIL PRESSURES (D+L)

Gross Allow. Soil Pressure	2.0	ksf	
Soil Pressure at Corner 1	2.0	ksf	
Soil Pressure at Corner 2	2.0	ksf	
Soil Pressure at Corner 3	2.0	ksf	
Soil Pressure at Corner 4	2.0	ksf	
Bearing Pressure Ratio	0.99		OK
Ftg. Area in Contact with Soil	100.0	%	
X-eccentricity / Ftg. Length	0.00		OK
Z-eccentricity / Ftg. Width	0.00		OK

APPLIED LOADS

	Dead	Live	RLive	Snow	Wind	Seismic	
Axial Force P	3.0	4.5	0.0	0.0	0.0	0.0	kip
Moment about X Mx ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Moment about Z Mz ..	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
Shear Force Vx	0.0	0.0	0.0	0.0	0.0	0.0	kip
Shear Force Vz	0.0	0.0	0.0	0.0	0.0	0.0	kip

OVERTURNING CALCULATIONS (Comb: 0.6D+0.6W)

- Overturning about X-X
- Moment Mx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft
- Shear Force Vz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

  Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft
- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft
- Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

- Resisting about X-X
- Footing weight = *0.6 * W * L * Thick * Density* = 0.6 * 2.60 * 1.50 * 8.0 / 12 * 0.15 = 0.2 kip

  Arm = *W / 2* = 2.60 / 2 = 1.30 ft Moment = 0.2 * 1.30 = 0.3 k-ft
- Pedestal weight = *0.6 * W * L * H * Density* = 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

  Arm = *W / 2 - Offset* = 2.60 / 2 - 0.0 / 12 = 1.30 ft Moment = 0.0 * 1.30 = 0.0 k-ft
- Soil cover = *0.6 * W * L * SC * Density* 0=6 * (2.60 * 1.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

  Arm = *W / 2* = 2.60 / 2 = 1.30 ft Moment = 0.0 * 1.30 = 0.0 k-ft
- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT)* = 0.6 * 2.60 * 1.50 * 62 * (0.67) = -0.1 kip

  Arm = *W / 2* = 2.60 / 2 = 1.30 ft Moment = 0.1 * 1.30 = -0.1 k-ft
- Axial force P = 0.6 * 3.0 + 0.6 * 0.0 = 1.8 kip

  Arm = *W / 2 - Offset* = 2.60 / 2 - 0.0 / 12 = 1.30 ft Moment = 1.8 * 1.30 = 2.3 k-ft
- Resisting moment X-X = 0.3 + 0.0 + 0.0 + 2.3 + -0.1 = 2.5 k-ft
- Overturning safety factor X-X = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{2.5}{0.0}$ = 25.18 > 1.50 OK

- Overturning about Z-Z

- Moment Mz = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 k-ft

- Shear Force Vx = 0.6 * 0.0 + 0.6 * 0.0 = 0.0 kip

  Arm = 0.00 + 8.0 / 12 = 0.67 ft Moment = 0.0 * 0.67 = 0.0 k-ft

- Passive Force = 0.0 kip Arm = 0.27 ft Moment = 0.0 k-ft

- Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

- Resisting about Z-Z

- Footing weight = *0.6 * W * L * Thick * Density =* 0.6 * 2.60 * 1.50 * 8.0 / 12 * 0.15 = 0.2 kip

  Arm = *L / 2 =* 1.50 / 2 = 0.75 ft Moment = 0.2 * 0.75 = 0.2 k-ft

- Pedestal weight = *0.6 * W * L * H * Density =* 0.6 * 6.0 / 12 * 6.0 / 12 * 0.0 * 0.15 = 0.0 kip

  Arm = *L / 2 - Offset =* 1.50 / 2 - 0.0 / 12 = 0.75 ft Moment = 0.0 * 0.75 = 0.0 k-ft

- Soil cover = *0.6 * W * L * SC * Density =* 0.6 * (2.60 * 1.50 - 6.0 / 12 * 6.0 / 12) * 0.0 * 110 = 0.0 kip

  Arm = *L / 2 =* 1.50 / 2 = 0.75 ft Moment = 0.0 * 0.75 = 0.0 k-ft

- Buoyancy = *0.6 * W * L * γ * (SC + Thick - WT) =* 0.6 * 2.60 * 1.50 * 62 * (0.67) = -0.1 kip

  Arm = *L / 2 =* 1.50 / 2 = 0.75 ft Moment = 0.1 * 0.75 = -0.1 k-ft

- Axial force P = 0.6 * 3.0 + 0.6 * 0.0 = 1.8 kip

  Arm = *L / 2 - Offset =* 1.50 / 2 - 0.0 / 12 = 0.75 ft Moment = 1.8 * 0.75 = 1.4 k-ft

- Resisting moment Z-Z = 0.2 + 0.0 + 0.0 + 1.4 + -0.1 = 1.5 k-ft

- Overturning safety factor Z-Z = $\frac{\textit{Resisting moment}}{\textit{Overturning moment}} = \frac{1.5}{0.0}$ = 14.52 > 1.50 OK

SOIL BEARING PRESSURES (Comb: D+L)

Overturning moment X-X = 0.0 + 0.0 = 0.0 k-ft

Resisting moment X-X = 0.5 + 0.0 + 0.0 + -0.2 + 9.8 = 10.0 k-ft

Overturning moment Z-Z = 0.0 + 0.0 = 0.0 k-ft

Resisting moment Z-Z = 0.3 + 0.0 + 0.0 + -0.1 + 5.6 = 5.8 k-ft

Resisting force = *Footing + Pedestal + Soil - Buoyancy + P =* 0.4 + 0.0 + 0.0 - 0.2 + 7.5 = 7.7 kip

X-coordinate of resultant from maximum bearing corner:

$$Xp = \frac{\textit{Z-Resisting moment - Z-Overturning moment}}{\textit{Resisting force}} = \frac{5.8 - 0.0}{7.7} = 0.75 \text{ ft}$$

Z-coordinate of resultant from maximum bearing corner:

$$Zp = \frac{\textit{X-Resisting moment - X-Overturning moment}}{\textit{Resisting force}} = \frac{10.0 - 0.0}{7.7} = 1.30 \text{ ft}$$

X-ecc = *Length / 2 - Xp* =1.50 / 2 - 0.75 = 0.00 ft

Z-ecc = *Width / 2 - Zp =* 2.60 / 2 - 1.30 = 0.00 ft

Area = *Width * Length =* 2.60 * 1.50 = 3.9 ft²

Sx = *Length * Width² / 6 =* 1.50 * 2.60² / 6 = 1.7 ft³

Sz = *Width * Length² / 6 =* 2.60 * 1.50² / 6 = 1.0 ft³

- Footing is in full bearing. Soil pressures are as follows:

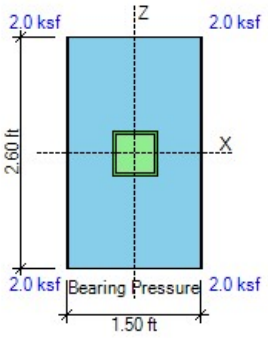
P1 = *P * (1/ A + Z-ecc / Sx + X-ecc / Sz) =* 7.7 * (1 / 3.9 + 0.00 / 1.7 + 0.00 / 1.0) = 1.98 ksf

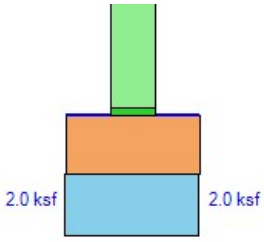
P2 = *P * (1/ A - Z-ecc / Sx + X-ecc / Sz) =* 7.7 * (1 / 3.9 - 0.00 / 1.7 + 0.00 / 1.0) = 1.98 ksf

P3 = *P * (1/ A - Z-ecc / Sx - X-ecc / Sz) =* 7.7 * (1 / 3.9 - 0.00 / 1.7 - 0.00 / 1.0) = 1.98 ksf

P4 = *P * (1/ A + Z-ecc / Sx - X-ecc / Sz) =* 7.7 * (1 / 3.9 + 0.00 / 1.7 - 0.00 / 1.0) = 1.98 ksf

ASDIP Foundation 4.8.2.7 **SPREAD FOOTING DESIGN** *www.asdipsoft.com*





SLIDING CALCULATIONS (Comb: 0.6D+0.6W)

Internal friction angle = 28.0 deg

Passive coefficient *kp = 4.33 (per Coulomb)*

Pressure at mid-depth = *kp * Density * (Cover + Thick / 2)* = 4.33 * 110 * (0.00 + 8.0 / 12 / 2) = 0.16 ksf

X-Passive force = *Pressure * Thick * Width* = 0.16 * 8.0 / 12 * 2.60 = 0.3 kip

Z-Passive force = *Pressure * Thick * Length* = 0.16 * 8.0 / 12 * 1.50 = 0.2 kip

Friction force = *Resisting force * Friction coeff.* = Max (0, 1.9 * 0.35) = 0.7 kip

Use 100% of Passive + 100% of Friction for sliding resistance

- Sliding safety factor X-X = $\frac{\textit{X-Passive force + Friction}}{\textit{X-Horizontal load}} = \frac{1.00 * 0.3 + 1.00 * 0.7}{0.0}$ = 9.53 > 1.50 OK

- Sliding safety factor Z-Z = $\frac{\textit{Z-Passive force + Friction}}{\textit{Z-Horizontal load}} = \frac{1.00 * 0.2 + 1.00 * 0.7}{0.0}$ = 8.36 > 1.50 OK

UPLIFT CALCULATIONS (Comb: 0.6D+0.6W)

- Uplift safety factor = $\frac{\textit{Pedestal + Footing + Cover - Buoyancy}}{\textit{Uplift load}} = \frac{0.0 + 0.2 + 0.0 - 0.1}{0.0}$ = 99.99 > 1.00 OK

ONE-WAY SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Concrete f'c = 2.5 ksi Steel fy = 40.0 ksi Soil density = 110 pcf

Use Plain Concrete Shear Strength

ϕVcx = *4/3 * ϕ * √(f'c) * Width * t / 1000* = 4/3 * 0.60 * √(2500) * 2.6 * 12 * 8.0 / 1000 = 10.0 kip ACI 14.5.5.1

ϕVcz = *4/3 * ϕ * √(f'c) * Length * t / 1000* = 4/3 * 0.60 * √(2500) * 1.5 * 12 * 8.0 / 1000 = 5.8 kip

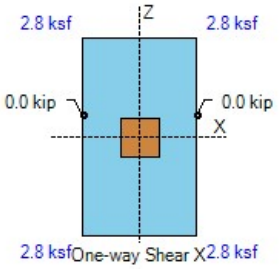
- Shear forces calculated as the volume of the bearing pressures under the effective areas:

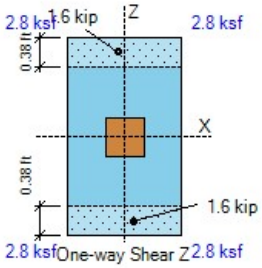
One-way shear Vux (- Side) = 0.0 kip < 10.0 kip OK

One-way shear Vux (+ Side) = 0.0 kip < 10.0 kip OK

One-way shear Vuz (- Side) = 1.6 kip < 5.8 kip OK

One-way shear Vuz (+ Side) = 1.6 kip < 5.8 kip OK





FLEXURE CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Plain ϕMnx = *5 * ϕ * √(f'c) * L * Thick² / 6* = 5 * 0.60 * √(2500) * 1.50 * 8.0² / 6 / 1000 = 0.6 k-ft ACI Eq. (14.5.2.1a)

Plain ϕMnz = *5 * ϕ * √(f'c) * W * Thick² / 6* = 5 * 0.60 * √(2500) * 2.60 * 8.0² / 6 / 1000 = 1.1 k-ft

- Top Bars

No Top Reinforcement Provided at the Footing

Use Plain Concrete Flexural Strength at Top

- Top moments calculated as the overburden minus the bearing pressures times the lever arm:

Top moment -Mux (- Side) = 0.0 k-ft < 2.4 k-ft OK

Top moment -Mux (+ Side) = 0.0 k-ft < 2.4 k-ft OK

Top moment -Muz (- Side) = 0.0 k-ft < 4.2 k-ft OK

Top moment -Muz (+ Side) = 0.0 k-ft < 4.2 k-ft OK

- Bottom Bars

No Bottom Reinforcement Provided at the Footing

Use Plain Concrete Flexural Strength at Bottom

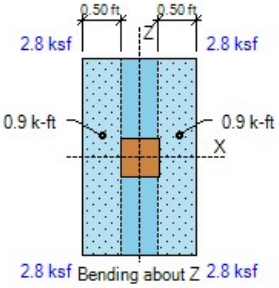
- Bottom moments calculated as the bearing minus the overburden pressures times the lever arm:

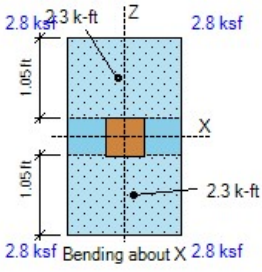
Bottom moment Mux (- Side) = 2.3 k-ft < 2.4 k-ft OK ratio = 0.96

Bottom moment Mux (+ Side) = 2.3 k-ft < 2.4 k-ft OK ratio = 0.96

Bottom moment Muz (- Side) = 0.9 k-ft < 4.2 k-ft OK ratio = 0.22

Bottom moment Muz (+ Side) = 0.9 k-ft < 4.2 k-ft OK ratio = 0.22





LOAD TRANSFER CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

Area $A1 = col\ L * col\ W =$ 6.0 * 6.0 = 36.0 in²

Sx = $col\ W * col\ L^2 / 6 =$ 6.0 * 6.0² / 6 = 36.0 in³

Sz = $col\ L * col\ W^2 / 6 =$ 6.0 * 6.0² / 6 = 36.0 in³

Bearing $Pbu = P / A1 + Mz / Sx + Mx / Sz =$ 10.8 / 36.0 + 0.0 * 12 / 36.0 + 0.0 * 12 / 36.0 = 0.3 ksi

Min edge = *Min (L / 2 - X-offset - col L / 2, W / 2 - Z-offset - col W / 2)*

Min edge = Min (1.50 * 12 / 2 - 0.0 - 6.0 / 2, 2.60 * 12 / 2 - 0.0 - 6.0 / 2 = 6.0 in

Area $A2 = Min [L * W, (col\ L + 2 * Min\ edge) * (col\ W + 2 * Min\ edge)]$ ACI R22.8.3.2

A2 = Min [1.50 * 12 * 2.6 * 12, (6.0 + 2 * 6.0) * (6.0 + 2 * 6.0)] = 324.0 in²

Footing $\phi Pnc = \phi * 0.85 * f'c * Min [2, \sqrt{(A2 / A1)}] =$ 0.65 * 0.85 * 2.5 * Min [2, √(324.0 / 36.0)] = 2.8 ksi

Footing $\phi Pns = \phi * As * Fy / A1 =$ 0.0 ksi ACI 22.8.3.2

Footing bearing $\phi Pn = \phi Pnc + \phi Pns =$ 2.8 + 0.0 = 2.8 ksi > 0.3 psi OK

Hooked *Ldh = Max (8 db, 6, 0.02 * fy / (f'c)½ * Confining * Location * Concrete * db * ratio)* ACI 25.4.3

Ldh = Max (8 db, 6, 0.02 * 60.0 * 1000 / (2500)½ * 1.0 * 0.7 * 0.0 * 0.75 * 0.05) = 6.0 in

Ld provided = *Dowel length* = 3.00 * 12 = 36.0 in > 12.0 in OK

Ldh provided = *Footing thickness - Cover* = 8.00 - 3.0 = 5.0 in < 6.0 in NG

PUNCHING SHEAR CALCULATIONS (Comb: 1.2D+1.6L+0.5Lr)

X-Edge = *Length / 2 - Offset - Col / 2* = 1.50 * 12 / 2 - 0.0 - 6.0 / 2 = 6.0 in αsx = 10

Z-Edge = *Width / 2 - Offset - Col / 2* = 2.60 * 12 / 2 - 0.0 - 6.0 / 2 = 12.6 in αsz = 10

αs = *αsx + αsz* = 10 + 10 = 20 Col type = Corner β = *L / W* = 6.0 / 6.0 = 1.00 ACI 22.6.5.2

Perimeter *bo = αsz / 10 * (L + d / 2 + X-Edge) + αsx / 10 * (W + d / 2 + Z-Edge)* ACI 22.6.4.2

bo = 10 / 10 * (6.0 + 8.0 / 2 + 6.0) + 10 / 10 * (6.0 + 8.0 / 2 + 12.6) = 38.6 in

Area *Abo = (L + d / 2 + X-Edge) * (W + d / 2 + Z-Edge)* = (6.0 + 8.0 / 2 + 6.0) * (6.0 + 8.0 / 2 + 12.6) = 361.6 in²

Use Plain Concrete Shear Strength

ϕVc = *ϕ * Min (1 + 2 / β, 2) * 4/3 * √(f'c)* ACI 14.5.5.1

ϕVc = 0.60 * Min (1 + 2 / 1.00, 2) * 4/3 √(2500) = 80.0 psi

Punching force *F = P + Overburden * Abo - Bearing*

F = 10.8 + 0.07 * 361.6 / 144 - 3.9 = 7.1 kip

b1 = *L + d / 2 + X-Edge* = 6.0 + 8.0 / 2 + 6.0 = 16.0 in b2 = *W + d / 2 + Z-Edge* = 6.0 + 8.0 / 2 + 12.6 = 22.6 in

γvx factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b2 / b1)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(22.6 / 16.0)}} = 0.44$ ACI Eq. (8.4.4.2.2)

γvz factor = $1 - \frac{1}{1 + (2/3)\sqrt{(b1 / b2)}} = 1 - \frac{1}{1 + (2/3)\sqrt{(16.0 / 22.6)}} = 0.36$ ACI Eq. (8.4.2.3.2)

X2z = *b1² / 2 / (b1 + b2)* = 16.0² / 2 / (16.0 + 22.6) = 3.3 in X2x = *b2² / 2 / (b2 + b1)* = 6.6 in

Jcz = *b1 * d³ / 12 + b1³ * d / 12 + b1 * d * (b1 / 2 - X2z)² + b2 * d * X2z²* ACI R8.4.4.2.3

Jcz = 16.0 * 8.0³ / 12 + 16.0³ * 8.0 / 12 + 16.0 * 8.0 * (16.0 / 2 * 3.3)² + 22.6 * 8.0 * 3.3² = 8210 in⁴

Jcx = *b2 * d³ / 12 + b2³ * d / 12 + b2 * d * (b2 / 2 - X2x)² + b1 * d * X2x²* ACI R8.4.4.2.3

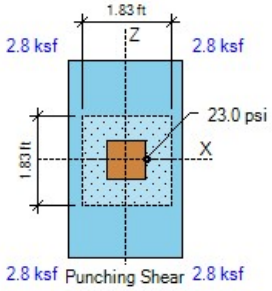
Jcz = 22.6 * 8.0³ / 12 + 22.6³ * 8.0 / 12 + 22.6 * 8.0 * (22.6 / 2 * 6.6)² + 16.0 * 8.0 * 6.6² = 18229 in⁴

Stress due to P = *F / (bo * d) * 1000* = 7.1 / (38.6 * 8.0) * 1000 = 23.0 psi

Stress due to Mx = *γvx * X-OTM * X2x / Jcx* = 0.44 * 0.0 * 12 * 6.6 / 18229 * 1000 = 0.0 psi

Stress due to Mz = *γvz * Z-OTM * X2z / Jcz* = 0.44 * 0.0 * 12 * 3.3 / 8210 * 1000 = 0.0 psi

Punching stress = *P-stress + Mx-stress + Mz-stress* = 23.0 + 0.0 + 0.0 = 23.0 psi < 80.0 psi OK



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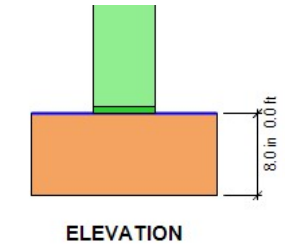
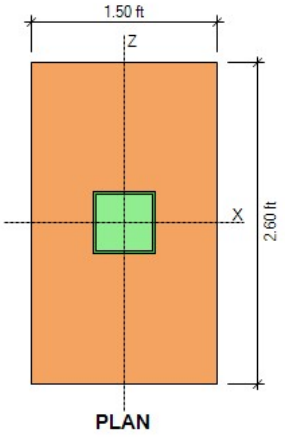
DESIGN CODES

Concrete Design	ACI 318-14
Load Combinations	ASCE 7-10/16



ELEVATION



PLAN

WIND V_{ASD} = 85 MPH // V_{ULT} = 110 MPH EXP. B K_{zt} = 1.0 SLOPE = 0'-3" 0
h = 36' λ = 1.06

ZONE A = 12.9 PSF × 1.06 = 13.7 PSF 16.0 PSF MIN

ZONE B = 8.3 PSF × 1.06 = 9.3 PSF

ZONE C = 10.2 PSF × 1.06 = 10.8 PSF 16.0 PSF MIN

ZONE D = 7.0 PSF × 1.06 = 7.4 PSF 8.0 PSF MIN

SEISMIC S_{DS} = 0.831 R = 6.5 I_E = 1.0

$C_S = (0.831 / (6.5/1.0)) / 1.4 = 0.091$

$W_{ROOF} = (35\,PSF \times 8{,}967\,SF) = 296{,}345^{\#}$ h_2 = 9' h_R = 29'
$W_{LEVEL3} = (40\,PSF \times 7{,}465\,SF) = 298{,}600^{\#}$ h_2 = 9' h_3 = 20'
$W_{LEVEL2} = (40\,PSF \times 7{,}742\,SF) = 309{,}680^{\#}$ h_2 = 9' h_2 = 10'
$W_{TOTAL} = 904{,}625^{\#}$

$V_S = 904{,}625^{\#} \times 0.091 = 82{,}321^{\#}$

17,662,905

$$F_{ROOF} = \left[\frac{(296{,}345^{\#} \times 29')}{(296{,}345^{\#} \times 29') + (298{,}600^{\#} \times 20') + (309{,}680^{\#} \times 10')}\right] \times 82{,}321^{\#} = 40{,}054^{\#}$$

$$F_{LEVEL3} = \left[\frac{(298{,}600^{\#} \times 20')}{(296{,}345^{\#} \times 29') + (298{,}600^{\#} \times 20') + (309{,}680^{\#} \times 10')}\right] \times 82{,}321^{\#} = 27{,}934^{\#}$$

$$F_{LEVEL2} = \left[\frac{(309{,}680^{\#} \times 10')}{(296{,}345^{\#} \times 29') + (298{,}600^{\#} \times 20') + (309{,}680^{\#} \times 10')}\right] \times 82{,}321^{\#} = 14{,}433^{\#}$$

GRID 1 & 13

$F_{3W} = (16.0 PSF \times 153 SF) + (9.3 PSF \times 84 SF) + (8.0 PSF \times 34 SF)$ = 3,501#

$F_{3E} = 40,054\# \times (1,180 SF / 8,467 SF)$ = 5,582#

$F_{2W} = 3,501\# + (16.0 PSF \times 172 SF)$ = 6,253#

$F_{2E} = 5,582\# + 27,934\# \times (1,053 SF / 7,465 SF)$ = 9,508#

$F_{1W} = 6,253\# + (16.0 PSF \times 172 SF)$ = 9,005#

$F_{1E} = 9,508\# + 14,433\# \times (1,053 SF / 7,742 SF)$ = 11,471#

GRID 4/5 & 9/10

$F_{3W} = (16.0 PSF \times 297 SF)$ = 4,752#

$F_{3E} = 40,054\# \times (2,057 SF / 8,467 SF)$ = 9,731#

$F_{2W} = 4,752\# + (16.0 PSF \times 327 SF)$ = 9,984#

$F_{2E} = 9,731\# + 27,834\# \times (1,732 SF / 7,465 SF)$ = 16,189#

$F_{1W} = 9,984\# + (16.0 PSF \times 328 SF)$ = 15,232#

$F_{1E} = 16,189\# + 14,433\# \times (1,871 SF / 7,742 SF)$ = 19,877#

GRID 7

$F_{3W} = (16.0 PSF \times 339 SF)$ = 5,424#

$F_{3E} = 40,054\# \times (1,993 SF / 8,467 SF)$ = 9,428#

$F_{2W} = 5,424\# + (16.0 PSF \times 300 SF)$ = 10,224#

$F_{2E} = 9,428\# + 27,834\# \times (1,995 SF / 7,465 SF)$ = 16,494#

$F_{1W} = 10,224\# + (16.0 PSF \times 301 SF)$ = 15,040#

$F_{1E} = 16,494\# + 14,433\# \times (1,894 SF / 7,742 SF)$ = 20,025#

GRID A-B

$F_{3W} = (16.0 PSF \times 122 SF) + (9.3 PSF \times 106 SF) + (8.0 PSF \times 33 SF)$ $= 3,202\#$

$F_{3E} = 40,054\# \times (2051 SF / 8,467 SF)$ $= 9,702\#$

$F_{2W} = 3,202\# + (16.0 PSF \times 155 SF)$ $= 5,682\#$

$F_{2E} = 9,702\# + 27,834\# \times (1,825 SF / 7,465 SF)$ $= 16,507\#$

$F_{1W} = 5,682\# + (16.0 PSF \times 156 SF)$ $= 8,178\#$

$F_{1E} = 16,507\# + 14,438\# \times (1824 SF / 7,742 SF)$ $= 19,908\#$

GRID C

$F_{3W} = (16.0 PSF \times 270 SF) + (8.0 PSF \times 42 SF)$ $= 4,656\#$

$F_{3E} = 40,054\# \times (4,027 SF / 8,467 SF)$ $= 19,026\#$

$F_{2W} = 4,656\# + (16.0 PSF \times 324 SF)$ $= 9,840\#$

$F_{2E} = 19,026\# + 27,834\# \times (3,774 SF / 7,465 SF)$ $= 33,098\#$

$F_{1W} = 9,840\# + (16.0 PSF \times 325 SF)$ $= 15,040\#$

$F_{1E} = 33,098\# + 14,438\# \times (3,973 SF / 7,742 SF)$ $= 40,505\#$

GRIDS G-H

$F_{3W} = (16.0 PSF \times 242 SF) + (9.3 PSF \times 32 SF)$ $= 4,170\#$

$F_{3E} = 40,054\# \times (2,394 SF / 8,467 SF)$ $= 11,325\#$

$F_{2W} = 4,170\# + (16.0 PSF \times 194 SF)$ $= 7,274\#$

$F_{2E} = 11,325\# + 27,834\# \times (1,866 SF / 7,465 SF)$ $= 18,283\#$

$F_{1W} = 7,274\# + (16.0 PSF \times 196 SF)$ $= 10,410\#$

$F_{1E} = 18,283\# + 14,433\# \times (1945 SF / 7,742 SF)$ $= 21,909\#$

GRIDS 1E - (LEVEL 3) FE=5,582# 7 SEGMENTS L=6'-0" h=9'
L=6'-0"
L=7'-11"
L=4'-3"
L=4'-7"
L=3'-2"
L_T=31'-11"

V_E = 5,582#/31.92' = 175 PLF

USE W1 V_{EALLOW} = 242PLF x (1.25-0.125x9'/3.16') = 216 PLF

HOLD DOWNS

T_E = 175 PLF x 9' x 1.25 - 1/2(25PSF x 1' x 1.58') - 1/2(12PSF x 4.5' x 1.58') = 1,905#

USE MST48 w/ 2 STUDS T_{EALLOW} = 3,425# x 1.4/1.6 = 2,997#

GRID 1 - (LEVEL 2) FE = 9,508# 7 SEGMENTS L=34'-11" h=9'

V_E = 9,509#/31.92' = 298 PLF

USE W2 V_{EALLOW} = 358PLF x (1.25-0.125x9'/3.16') = 316 PLF

HOLD DOWNS

T_E = 298 PLF x 9' x 1.25 + 1,905# - 1/2(30PSF x 7' x 1.58') - 1/2(12PSF x 9' x 1.58') = 5,006#

USE MST72 w/ 2 STUDS T_{EALLOW} = 6,475# x 1.4/1.6 = 5,666#

GRID 1 - (LEVEL 1) FE = 11,471# 7 SEGMENTS L=31'-11" h=9'

V_E = 11,471#/31.92' = 359 PLF

USE W3 V_{EALLOW} = 456PLF x (1.25-0.125x9'/3.16') = 408 PLF

HOLD DOWNS

T_E = 359 PLF x 9' x 1.25 + 5,006# - 1/2(30PSF x 7' x 1.58') - 1/2(12PLF x 9' x 1.58') = 8,798#

USE HDU14-SDS2.5 w/ 4 STUDS T_{EALLOW} = 12,425# x 1.4/1.6 = 10,872#

GRIDS 13 (LEVEL 3) FE=5,582# 7 SEGMENTS L=6'-0" h=9'
L=6'-0"
L=7'-5"
L=4'-3"
L=4'-10"
L=2'-10"
L=2'-10"
L=34'-2"

$V_E = 5{,}582\#/34.16' = 163$ plf

USE W1 $V_{EALLOW} = 2470\text{plf} \times (1.25 - 0.125 \times 9'/2.83') = 206$ plf

HOLD DOWNS

$T_E = 163\text{plf} \times 9' \times 1.25 - 1/2(75\text{psf} \times 1' \times 1.42') - 1/2(12\text{psf} \times 4.5' \times 1.42') = 1{,}778\#$

USE MST37 w/ 2 STUDS $T_{EALLOW} = 2{,}140\# \times 1.4/1.6 = 1{,}874\#$

GRID 13 (LEVEL 2) FE = 9,508# 7 SEGMENTS L=34'-2" h=9'

$V_E = 9{,}509\#/34.16' = 278$ plf

USE W2 $V_{EALLOW} = 358\text{plf} \times (1.25 - 0.125 \times 9'/2.83') = 301$ plf

HOLD DOWNS

$T_E = 278\text{plf} \times 9' \times 1.25 + 1{,}778\# - 1/2(30\text{psf} \times 7' \times 1.42') - 1/2(12\text{psf} \times 9' \times 1.42') = 4{,}680\#$

USE MST60 w/ 2 STUDS $T_{EALLOW} = 5{,}405\# \times 1.4/1.6 = 4{,}729\#$

GRID 13 (LEVEL 1) FE = 11,471# 7 SEGMENTS L=34'-2" h=9'

$V_E = 11{,}471\#/34.16' = 336$ plf

USE W3 $V_{EALLOW} = 456\text{plf} \times (1.25 - 0.125 \times 9'/2.83') = 388$ plf

HOLD DOWNS

$T_E = 336\text{plf} \times 9' \times 1.25 + 4{,}680\# - 1/2(30\text{psf} \times 7' \times 1.42') - 1/2(12\text{psf} \times 9' \times 1.42') = 8{,}234\#$

USE HDU14-SDS2.5 w/ 4 STUDS $T_{EALLOW} = 12{,}425\# \times 1.4/1.6 = 10{,}872\#$

GRID 4/5 & 9/10 (LEVEL 3) FE = 9,731# 2 SEGMENTS L=29'-4" h=9'
L=29'-4"
LT=58'-9"

VE = 9,731# / 58.67' = 166 PLF

USE W1 VEALLOW = 240 PLF

HOLD DOWNS

TE = 166 PLF x 9' x 1.25 - ½(25 PSF x 2' x 14.67') - ½(12 PSF x 9' x 14.67') = 1,103#

USE MST37 W/ 12 STUDS TEALLOW = 2,140# x 1.4/1.6 = 1,874#

GRID 4/5 & 9/10 (LEVEL 2) FE = 16,189# 2 SEGMENTS L=58'-9" h=9'

VE = 16,189# / 58.67' = 276 PLF

USE W2 VEALLOW = 353 PLF

HOLD DOWNS

TE = 276 PLF x 9' x 1.25 + 1,103# - ½(30 PSF x 4' x 14.67') - ½(12 PSF x 9' x 14.67') = 2,535#

USE MST 48 W/ 12 STUDS TEALLOW = 3,425# x 1.4/1.6 = 2,997#

GRID 4/5 & 9/10 (LEVEL 1) FE = 19,677# 2 SEGMENTS L=58'-9" h=9'

VE = 19,677# / 58.67' = 335 PLF

USE W2 VEALLOW = 353 PLF

HOLD DOWNS

TE = 335 PLF x 9' x 1.25 + 2,535# - ½(30 PSF x 4' x 19.67') - ½(12 PSF x 9' x 14.67') = 4,636#

USE HDU8-SDS2.5 W/ 2 STUDS TEALLOW = 5,820# x 1.4/1.6 = 5,093#

GRID 7 (LEVEL 3) $F_E = 9{,}429^{\#}$ 2 SEGMENTS L=28'-0" h=9'
L=28'-1"
$L_T = 56'-1"$

$V_E = 9{,}429^{\#} / 56.16' = 168 plf$

USE W1 $V_{E\,allow} = 242 plf$

HOLD DOWNS

$T_E = 168 plf \times 9' \times 1.25 - \frac{1}{2}(25 psf \times 1' \times 13.5') - \frac{1}{2}(8 psf \times 4.5' \times 13.5') = 1{,}234^{\#}$

USE (2) HDU2-SDS2.5 w/ 2 STUDS $T_{E\,allow} = 2{,}215^{\#} \times 1.4/1.6 = 1{,}938^{\#}$

GRID 7 (LEVEL 2) $F_E = 16{,}494^{\#}$ 2 SEGMENTS L=28'-0" h=9'
L=28'-1"
$L_T = 56'-2"$

$V_E = 16{,}494^{\#} / 56.16' = 294 plf$

USE W2 $V_{E\,allow} = 353 plf$

HOLD DOWNS

$T_E = 294 plf \times 9' \times 1.25 + 1{,}234^{\#} - \frac{1}{2}(30 psf \times 6.33' \times 13.5') - \frac{1}{2}(8 psf \times 9' \times 13.5') = 2{,}770^{\#}$

USE (2) HDU5-SDS2.5 w/ 2 STUDS $T_{E\,allow} = 4{,}340^{\#} \times 1.4/1.6 = 2{,}997^{\#}$

GRID 7 (LEVEL 1) $F_E = 20{,}025^{\#}$ 2 SEGMENTS L=28'-1" h=9'
L=28'-1"
$L_T = 56'-2"$

$V_E = 20{,}025^{\#} / 56.08' = 357 plf$

USE W3 $V_{E\,allow} = 456 plf$

HOLD DOWNS

$T_E = 357 plf \times 9' \times 1.25 + 2{,}770^{\#} - \frac{1}{2}(30 psf \times 6.33' \times 13.5') - \frac{1}{2}(8 psf \times 9' \times 13.5') = 5{,}013^{\#}$

USE HDU8-SDS2.5 w/ 3 STUDS $T_{E\,allow} = 6{,}590^{\#} \times 1.4/1.6 = 5{,}758^{\#}$

GRID A-B (LEVEL 3) FE = 9,702# 11 SEGMENTS L=2'-10" L=4'-9" L=9'
L=2'-10" L=3'-6"
L=3'-6" L=1'-10"
L=4'-9" L=2'-10"
L=4'-9" L=3'-4"
L=3'-4"
L_T = 39'-1"

V_E = 9,702#/39.08' = 248 PLF

USE W7 V_{EALLOW} = 353 PLF x (1.25 - 0.125 x 9'/2.33') = 301 PLF

HOLD DOWNS

T_E = 248 PLF x 9' x 1.25 - ½(25 PSF x 11' x 1.42') - ½(12 PSF x 4.5' x 1.42') = 2,559#

USE PAST48 w/ 2 STUDS T_{EALLOW} = 3,425# x 1.4/1.6 = 2,997#

GRID A-B (LEVEL 2) FE 16,507# 11 SEGMENTS L = 39'-1" h = 9'

V_E = 16,507#/39.08' = 422 PLF

USE W4 V_{EALLOW} = 595 PLF x (1.25 - 0.125 x 9'/2.83') = 507 PLF

HOLD DOWNS

T_E = 422 PLF x 9' x 1.25 + 2,559# - ½(30 PSF x 1' x 1.42') - ½(12 PSF x 9' x 1.42') = 7,208#

USE PAST12 w/ 2 STUDS T_{EALLOW} = 9,215# x 1.4/1.6 = 8,063#

GRID A-B (LEVEL 1) FE = 19,909# 15 SEGMENTS L = 39'-1" h = 9'
4 x 3'-2"
L_T = 51'-9"

V_E = 19,909#/51.75' = 385 PLF

USE W4 V_{EALLOW} = 595 PLF x (1.25 - 0.125 x 9'/2.83') = 507 PLF

HOLD DOWNS

STACKED T_E = 385 PLF x 9' x 1.25 + 7,208# - ½(30 PSF x 1' x 1.42') - ½(12 PSF x 9' x 1.42') = 11,438#

USE HDU14-SDS2.5 w/ 4 OF #2 STUDS T_{EALLOW} = 14,445# x 1.4/1.6 = 12,639#

UNSTACKED T_E = 385 PLF x 9' x 1.25 - ½(12 PSF x 22.5' x 1.58') - ½(30 PSF x 3' x 1.58') = 4,046#

USE HDU5-SDS2.5 w/ 2 STUDS T_{EALLOW} = 4,340#

GRID C (LEVEL 3) FE = 19,026# 4 SEGMENTS L = 18'-7" h=9'
L = 15'-10"
L = 15'-10"
L = 18'-7"
63'-10"

VE = 19,026#/63.83' = 276 plf

USE W2 VEallow = 353 plf

HOLD DOWNS

18'-7" TE = 276 plf x 9' x 1.25 - 1/2(75 psf x 18.67' x 9.3') - 1/2(8 psf x 4.5' x 9.3') = 767#
15'-10" TE = 276 plf x 9' x 1.25 - 1/2(75 psf x 28' x 7.92') - 1/2(12 psf x 4.5' x 7.92') = 123#

18'-7" / 15'-10" USE (2) HDU2-SDS2.5 w/ 2 STUDS OR MST37 w/ 2 STUDS

TEallow = 2,215# x 1.4/1.6 = 1,938#
TEallow = 2,140# x 1.4/1.0 = 1,874#

GRID C (LEVEL 2) FE = 33,098# 4 SEGMENTS L = 68'-10" h=9'

VE = 33,098#/68.83' = 481 plf

USE W4 VEallow = 595 plf

HOLD DOWNS

18'-7" TE = 481 plf x 9' x 1.25 + 767# - 1/2(8 psf x 9' x 9.3') = 5,893#
15'-10" TE = 481 plf x 9' x 1.25 + 123# - 1/2(30 psf x 5' x 7.92') - 1/2(12 psf x 9' x 7.92') = 4,513#

18'-7" / 15'-10" USE (2) HDU11-SDS2.5 w/ 4 STUDS OR MST60 w/ 2 STUDS

TEallow = 8,030# x 1.4/1.6 = 7,026#
TEallow = 5,405# x 1.4/1.6 = 4,729#

GRID C (LEVEL 1) FE = 40,505# 6 SEGMENTS L = 18'-7" h=9'
L = 15'-10"
L = 13'-10"
L = 13'-10"
L = 15'-10"
L = 18'-7"
L = 96'-6"

VE = 40,505#/96.5' = 420 plf

USE W4 VEallow = 595 plf

HOLD DOWNS

18'-7" TE = 420 plf x 9' x 1.25 + 5,893# - 1/2(8 psf x 9' x 9.3') = 10,217#
15'-10" TE = 420 plf x 9' x 1.25 + 4,513# - 1/2(30 psf x 5' x 7.92') - 1/2(12 psf x 9' x 7.92') = 8,216#
13'-4" TE = 420 plf x 9' x 1.25 - 1/2(25 psf x 25.33' x 6.67') - 1/2(8 psf x 22.5' x 6.67') = 3,801#

18'-7" / 15'-10" / 13'-4" USE HDU14-SDS2.5 w/ 6 STUDS OR HDU11-SDS2.5 w/ 4 STUDS OR HDU8-SDS2.5 w/ 2 STUDS

TEallow = 12,475# x 1.4/1.6 = 10,871#
TEallow = 9,610# x 1.4/1.6 = 8,409#
TEallow = 5,820# x 1.4/1.6 = 5,093#

0.894

GRIDS G-H (LEVEL 3) FE = 11,325# 13 SEGMENTS

L = 4'-6" L = 3'-2" h = 9'
L = 3'-10" L = 3'-2"
L = 4'-11" L = 4'-11"
L = 4'-11" L = 4'-11"
L = 3'-2" L = 3'-10"
L = 3'-2" L = 4'-6"
L = 6'-9"
L_T = 55'-9"

VE = 11,325#/55.75' = 203 PLF

USE W1 V_{ALLOW} = 242 PLF x (1.25 - 0.125 x 9'/3.16') = 216 PLF

HOLD DOWNS

TE = 203 PLF x 9' x 1.75 - 1/2(25 PSF x 20.58' x 1.58') - 1/2(12 PSF x 4.5' x 1.58') = 1,982#

USE MST48 w/ 2 STUDS T_{ALLOW} = 3,425# x 1.4/1.6 = 2997#

GRIDS G-H (LEVEL 2) FE = 18,283# 13 SEGMENTS L_T = 50'-8" h = 9'

VE = 18,283#/55.75' = 328 PLF

USE W3 V_{ALLOW} = 456 PLF x (1.25 - 0.125 x 9'/3.16') = 408 PLF

HOLD DOWNS

TE = 328 PLF x 9' x 1.25 + 1,982# - 1/2(12 PSF x 9' x 1.58') = 5,587#

USE CMST12 w/ 2 STUDS T_{ALLOW} = 9,215# x 1.4/1.6 = 8,063#

GRIDS G-H (LEVEL 1) FE = 21,909# 13 SEGMENTS L_T = 50'-8" h = 9'

VE = 21,909#/55.75' = 393 PLF

USE W3 V_{ALLOW} = 456 PLF x (1.25 - 0.125 x 9'/3.16') = 408 PLF

HOLD DOWNS

TE = 393 PLF x 9' x 1.25 + 5,587# - 1/2(12 PSF x 9' x 1.58') = 9,923#

USE HDU14-SDS2.5 w/ 4 STUDS T_{ALLOW} = 12,425# x 1.4/1.6 = 10,872#