CQN

CARTER QUINN NORLIN

STRUCTURAL
ENGINEERING

STRUCTURAL CALCULATIONS

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March 13, 2024

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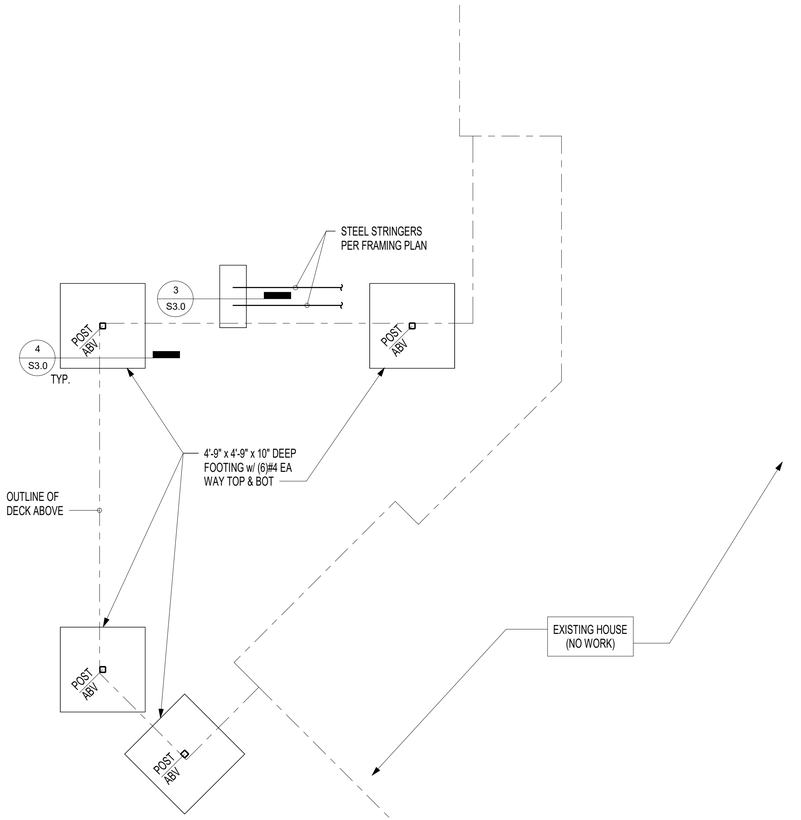
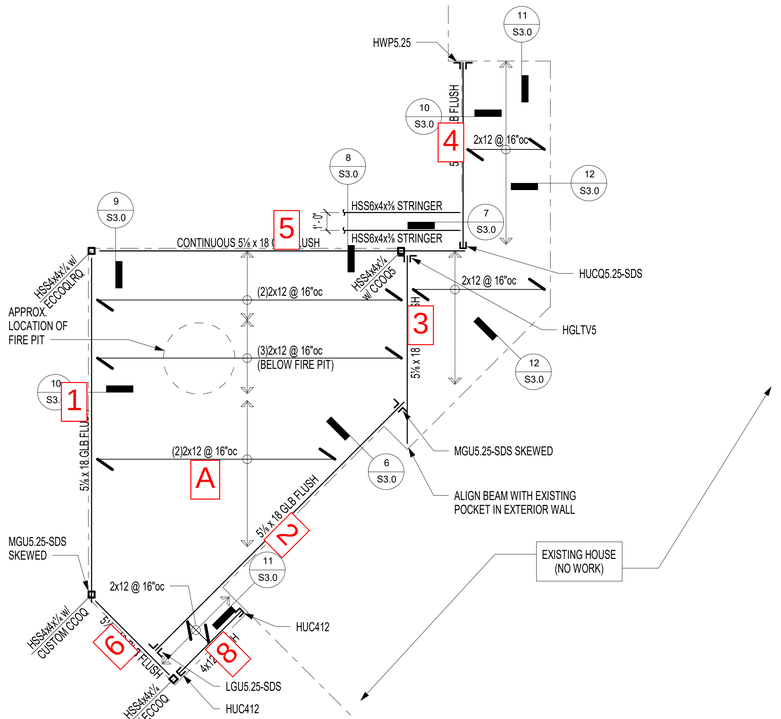
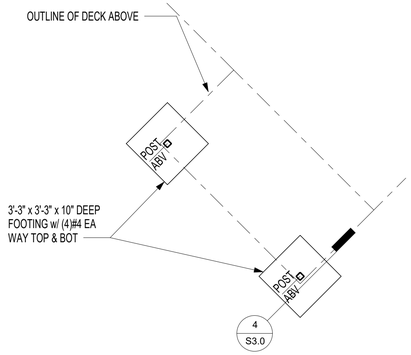
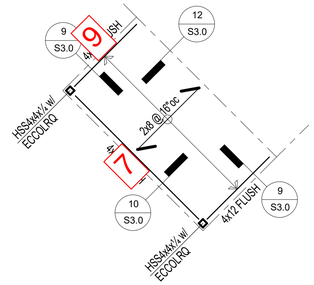


1 FOUNDATION PLAN
1/4" = 1'-0"



2 DECK FRAMING PLAN
1/4" = 1'-0"





LEGEND

- HANGER
- WALL/ COLUMN
- SPAN AND EXTENTS
- INDICATES DETAIL X ON SHEET SX.XX

FRAMING PLAN NOTES

1. DECK SHEATHING SHALL BE 23/32" TONGUE AND GROOVE APA RATED STRUCTURAL PLYWOOD SHEATHING WITH PANEL INDEX 48/24. ATTACH TO FRAMING WITH 10d NAILS AT 6" oc AT FRAMED PANEL EDGES AND WALLS AND 12" oc AT INTERMDIATE FRAMING UNO. PROVIDE BLOCKING AND PANEL EDGE NAILING PER DETAIL 2/S6.04 AT ALL PANEL EDGES UNO.
2. SIMPSON CCOQ SERIES COLUMNS CAPS CALLED OUT ON THE PLANS ARE THE "NO STRAP" VERSION AND SHALL BE BE WELDED TO THE TOP OF HSS COLUMNS WITH 3/16" FILLET WELDS ON ALL SIDES.

CARTER QUINN MOULIN STRUCTURAL ENGINEERING
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PRELIMINARY
NOT FOR
CONSTRUCTION

KIM-UM RESIDENCE

3440 69TH AVE SE MERCER ISLAND, WA 98040

SEAL:

NO.	DESCRIPTION	DATE

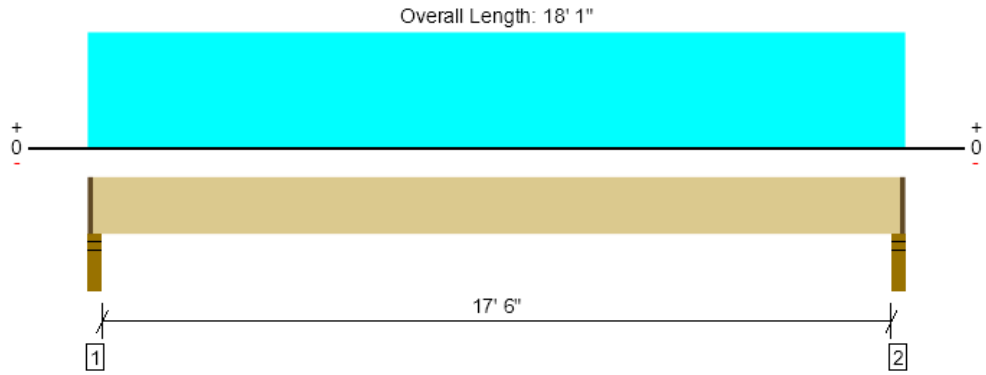
01.09.24

As indicated

S2.0

Deck Framing, Joist A

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



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1073 @ 2 1/2"	2734 (2.25")	Passed (39%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	938 @ 1' 2 3/4"	4050	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4682 @ 9' 1/2"	5458	Passed (86%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.308 @ 9' 1/2"	0.442	Passed (L/689)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.462 @ 9' 1/2"	0.883	Passed (L/459)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) 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 - Stud wall - HF	3.50"	2.25"	1.50"	362	723	1085	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.50"	362	723	1085	1 1/4" Rim Board

• Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 1" o/c	
Bottom Edge (Lu)	17' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 18' 1"	16"	30.0	60.0	Default Load

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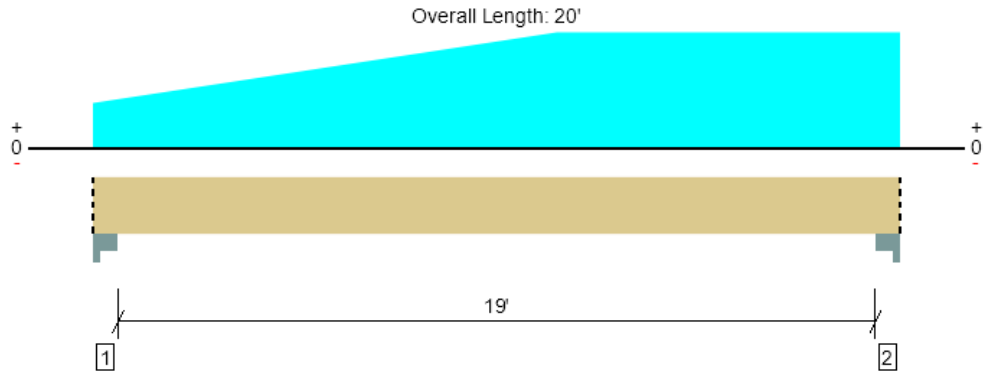
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Deck Framing, Beam 1

1 piece(s) 5 1/8" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	7811 @ 19' 7 1/2"	19988 (6.00")	Passed (39%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	6146 @ 18'	16298	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	33782 @ 10' 7 1/8"	53615	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.321 @ 10' 1 3/4"	0.481	Passed (L/719)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.497 @ 10' 1 11/16"	0.962	Passed (L/464)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
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 0.97 that was calculated using length L = 19' 3".
- 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 - Column Cap - steel	6.00"	6.00"	1.80"	2147	3845	5991	Blocking
2 - Column Cap - steel	6.00"	6.00"	2.34"	2753	5058	7811	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)	20' o/c	
Bottom Edge (Lu)	20' 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 20'	N/A	22.4	--	
1 - Uniform (PSF)	11' 6" to 20' (Front)	9'	30.0	60.0	Default Load
2 - Tapered (PSF)	0 to 11' 6" (Front)	3' 6" to 9'	30.0	60.0	Default Load

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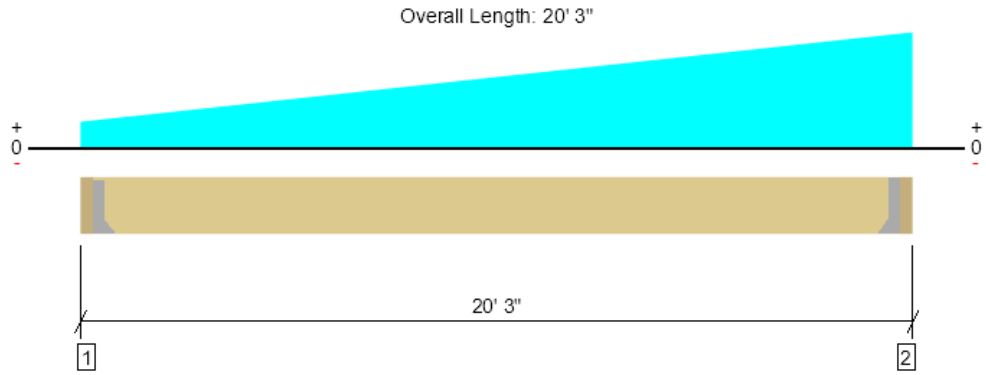
Deck Framing, Beam 2

1 piece(s) 5 1/8" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6023 @ 20'	6023 (1.81")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4842 @ 18' 6"	16298	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	25097 @ 11' 13/16"	53478	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.248 @ 10' 4 1/4"	0.494	Passed (L/954)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.390 @ 10' 4 1/8"	0.988	Passed (L/608)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
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 0.97 that was calculated using length L = 19' 9".
- 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 - Hanger on 18" GLB beam	3.00"	Hanger[1]	1.50"	1512	2581	4092	See note [1]
2 - Hanger on 18" GLB beam	3.00"	Hanger[1]	1.81"	2220	3998	6219	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)	19' 9" o/c	
Bottom Edge (Lu)	19' 9" 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	UA12 W=5.25	2.06"	N/A	18-SDS25300	12-SDS25300	
2 - Face Mount Hanger	UA12 W=5.25	2.06"	N/A	18-SDS25300	12-SDS25300	

- 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 20'	N/A	22.4	--	
1 - Tapered (PSF)	0 to 20' 3" (Front)	2' to 8' 10"	30.0	60.0	Default Load

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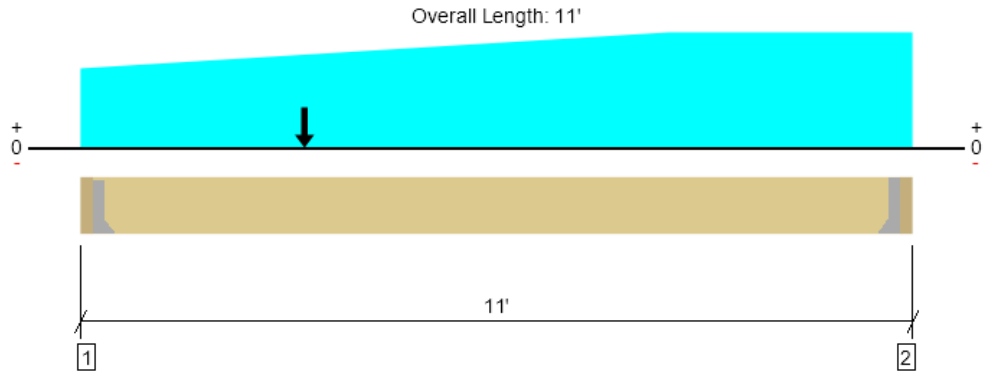
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Steven Nickolas Carter Quinn Norlin (206) 264-7784 ssn@cqn-se.com	

Weyerhaeuser

Deck Framing, Beam 3

1 piece(s) 5 1/8" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9776 @ 3"	9776 (2.93")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	8480 @ 1' 9"	16298	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	24210 @ 4' 1 7/16"	55350	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.069 @ 5' 3 3/4"	0.262	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.106 @ 5' 3 3/4"	0.525	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
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 = 10' 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 - Hanger on 18" GLB beam	3.00"	Hanger[1]	2.93"	3512	6461	9973	See note [1]
2 - Hanger on 18" GLB beam	3.00"	Hanger[1]	2.25"	2713	5075	7788	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)	10' 6" o/c	
Bottom Edge (Lu)	10' 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
1 - Face Mount Hanger	HGU5.25-SDS H=18	5.25"	N/A	36-SDS25212	24-SDS25212	
2 - Face Mount Hanger	UA13.5 W=5.25	2.56"	N/A	20-SDS25300	14-SDS25300	

- 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 10' 9"	N/A	22.4	--	
1 - Uniform (PSF)	7' 9" to 11' (Front)	12' 10"	30.0	60.0	Default Load
2 - Tapered (PSF)	0 to 7' 9" (Front)	8' 10" to 12' 10"	30.0	60.0	Default Load
3 - Point (lb)	3' (Front)	N/A	2220	3998	Linked from: Beam 2, Support 2

ForteWEB Software Operator	Job Notes
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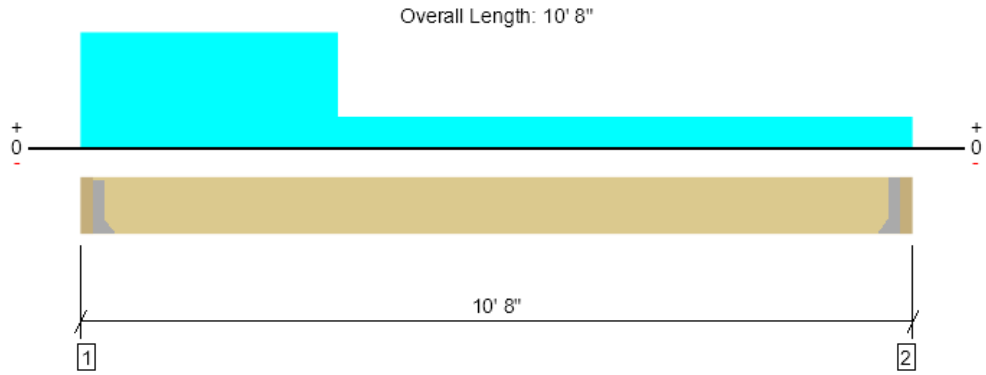
Deck Framing, Beam 4

1 piece(s) 5 1/8" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2847 @ 3"	4997 (1.50")	Passed (57%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1564 @ 1' 9"	16298	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	4804 @ 4' 2 1/4"	55350	Passed (9%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.013 @ 5' 1 7/16"	0.254	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.020 @ 5' 1 9/16"	0.508	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
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 = 10' 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 - Hanger on 18" GLB beam	3.00"	Hanger[1]	1.50"	1094	1961	3055	See note [1]
2 - Hanger on 18" GLB beam	3.00"	Hanger[1]	1.50"	609	989	1598	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)	10' 2" o/c	
Bottom Edge (Lu)	10' 2" 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	HU5.125/13.5	2.50"	N/A	26-16d	12-16d	
2 - Face Mount Hanger	HU314-2	2.50"	N/A	18-10dx1.5	8-10d	

- 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)	3" to 10' 5"	N/A	22.4	--	
1 - Uniform (PSF)	0 to 3' 4" (Front)	9' 3"	30.0	60.0	Default Load
2 - Uniform (PSF)	3' 4" to 10' 8" (Front)	2' 6"	30.0	60.0	Default Load

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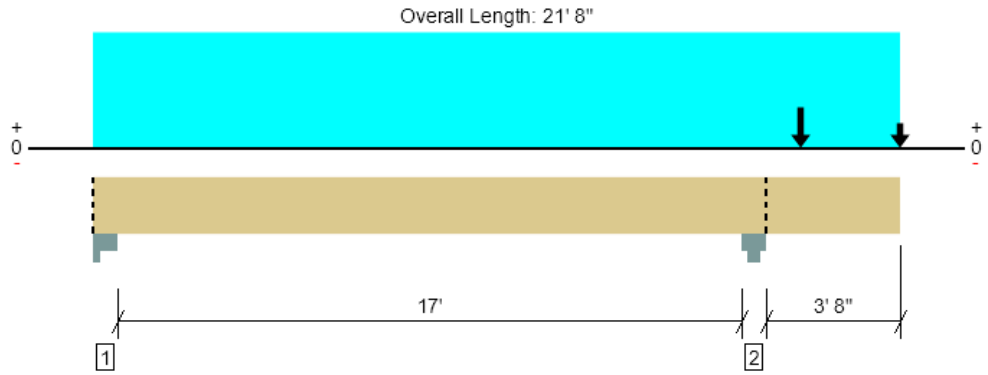
ForteWEB Software Operator	Job Notes
Steven Nickolas Carter Quinn Norlin (206) 264-7784 ssn@cqn-se.com	

Weyerhaeuser

Deck Framing, Beam 5

1 piece(s) 5 1/8" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	13559 @ 17' 9"	19988 (6.00")	Passed (68%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	8491 @ 19' 6"	16298	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	1165 @ 4' 11 1/8"	55350	Passed (2%)	1.00	1.0 D + 1.0 L (Alt Spans)
Neg Moment (Ft-lbs)	-22563 @ 17' 9"	40914	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.148 @ 21' 8"	0.200	Passed (2L/636)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.213 @ 21' 8"	0.392	Passed (2L/442)	--	1.0 D + 1.0 L (Alt Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/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 = 9' 1 1/4".
- Critical negative moment adjusted by a volume/size factor of 0.96 that was calculated using length L = 21' 3 1/2".
- -824 lbs uplift at support located at 4 1/2". Strapping or other restraint may be required.
- 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 - Column Cap - steel	6.00"	6.00"	1.50"	10	544/-834	554/-824	Blocking
2 - Column Cap - steel	6.00"	6.00"	4.07"	4933	8626	13559	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)	21' 8" o/c	
Bottom Edge (Lu)	21' 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 21' 8"	N/A	22.4	--	
1 - Uniform (PSF)	0 to 21' 8" (Front)	1'	30.0	60.0	Default Load
2 - Point (lb)	19' (Front)	N/A	2713	5075	Linked from: Beam 3, Support 2
3 - Point (lb)	21' 8" (Front)	N/A	1094	1961	Linked from: Beam 4, Support 1

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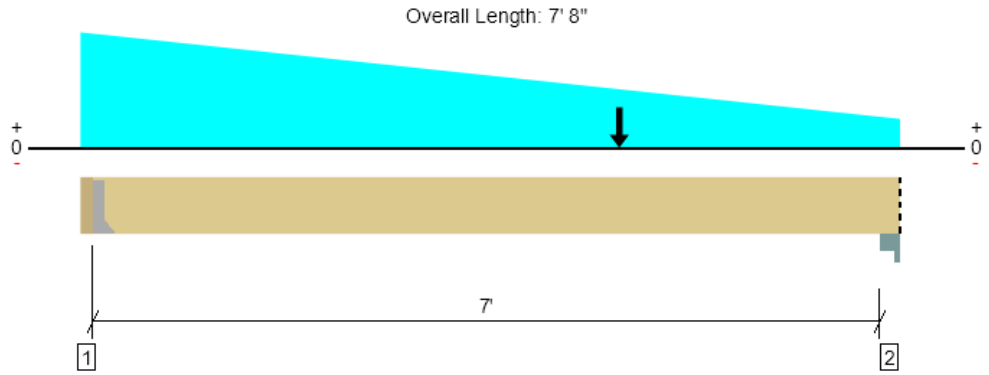
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Steven Nickolas Carter Quinn Norlin (206) 264-7784 ssn@cqn-se.com	

Weyerhaeuser

Deck Framing, Beam 6

1 piece(s) 5 1/8" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2397 @ 3"	4997 (1.50")	Passed (48%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3218 @ 5' 9"	16298	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	7802 @ 5'	55350	Passed (14%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.008 @ 3' 11 7/8"	0.178	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.013 @ 3' 11 7/8"	0.356	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
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 = 7' 1 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 - Hanger on 18" SPF beam	3.00"	Hanger[1]	1.50"	932	1557	2488	See note [1]
2 - Column Cap - steel	5.00"	5.00"	1.50"	1322	2176	3498	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)	7' 5" o/c	
Bottom Edge (Lu)	7' 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	HU5.125/16	2.50"	N/A	26-10d	12-10d	

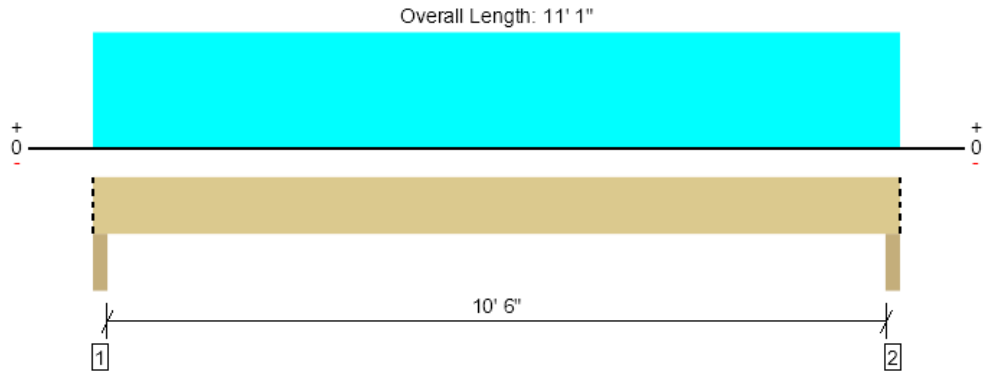
- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3" to 7' 8"	N/A	22.4	--	
1 - Tapered (PSF)	0 to 7' 8" (Front)	4' to 1'	30.0	60.0	Default Load
2 - Point (lb)	5' (Front)	N/A	1512	2581	Linked from: Beam 2, Support 1

ForteWEB Software Operator	Job Notes
Steven Nickolas Carter Quinn Norlin (206) 264-7784 ssn@cqn-se.com	

Weyerhaeuser

Deck Framing, Beam 7
1 piece(s) 4 x 12 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1552 @ 2"	4961 (3.50")	Passed (31%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1207 @ 1' 2 3/4"	3938	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4044 @ 5' 6 1/2"	5752	Passed (70%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.100 @ 5' 6 1/2"	0.269	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.156 @ 5' 6 1/2"	0.538	Passed (L/828)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
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 - Column - HF	3.50"	3.50"	1.50"	554	998	1552	Blocking
2 - Column - HF	3.50"	3.50"	1.50"	554	998	1552	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' 1" o/c	
Bottom Edge (Lu)	11' 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 11' 1"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 11' 1" (Front)	3'	30.0	60.0	Default Load

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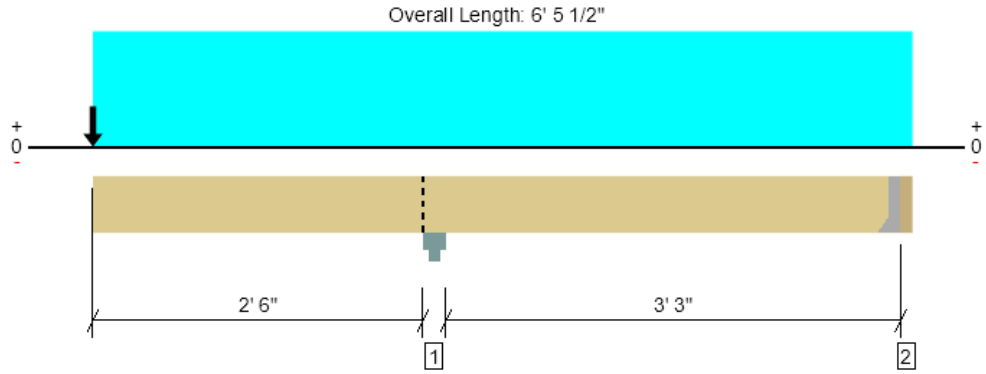
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Steven Nickolas Carter Quinn Norlin (206) 264-7784 ssn@cqn-se.com	

Weyerhaeuser

Deck Framing, Beam 8

1 piece(s) 5 1/8" x 18" 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.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	7363 @ 2' 8 3/4"	18322 (5.50")	Passed (40%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3700 @ 1'	16298	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	0 @ N/A	N/A	Passed (N/A)	--	N/A
Neg Moment (Ft-lbs)	-10300 @ 2' 8 3/4"	42666	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.014 @ 0	0.200	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.022 @ 0	0.273	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 6' 2 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/240).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 6' 2 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 - Column Cap - steel	5.50"	5.50"	2.21"	2816	4548	7363	Blocking
2 - Hanger on 18" HF beam	3.00"	Hanger[1]	1.50"	-967	239/-1805	-2772	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)	6' 3" o/c	
Bottom Edge (Lu)	6' 3" 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	UA12 W=5.25	2.06"	N/A	18-SDS25300	12-SDS25300	

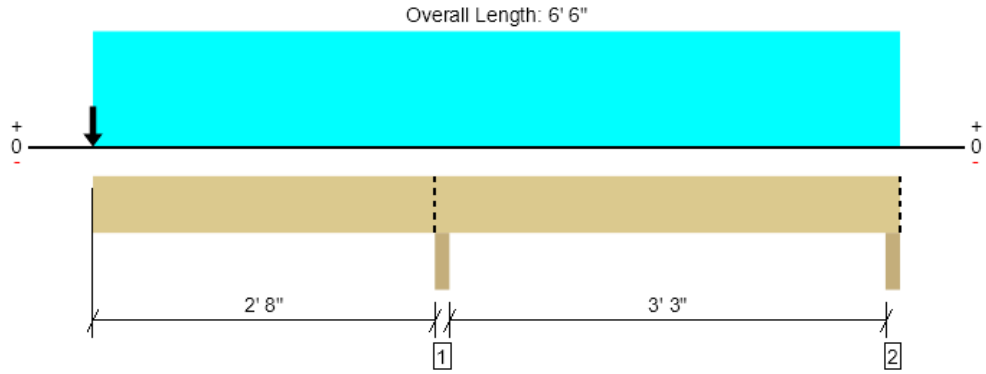
- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 2 1/2"	N/A	22.4	--	
1 - Uniform (PSF)	0 to 6' 5 1/2" (Front)	2'	30.0	60.0	Default Load
2 - Point (lb)	0 (Front)	N/A	1322	2176	Linked from: Beam 6, Support 2

ForteWEB Software Operator	Job Notes
Steven Nickolas Carter Quinn Norlin (206) 264-7784 ssn@cqn-se.com	

Weyerhaeuser

Deck Framing, Beam 9
1 piece(s) 4 x 12 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3361 @ 2' 9 3/4"	4961 (3.50")	Passed (68%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1725 @ 1' 8 3/4"	3938	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-4760 @ 2' 9 3/4"	5752	Passed (83%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.057 @ 0	0.200	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.089 @ 0	0.281	Passed (2L/758)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 6' 6"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/240).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- 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 - Column - HF	3.50"	3.50"	2.37"	1224	2137	3361	Blocking
2 - Column - HF	3.50"	3.50"	1.50"	-410	116/-865	-1275	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)	6' 6" o/c	
Bottom Edge (Lu)	6' 6" 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 6' 6"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 6' 6" (Front)	1'	30.0	60.0	Default Load
2 - Point (lb)	0 (Front)	N/A	554	998	Linked from: Beam 7, Support 1

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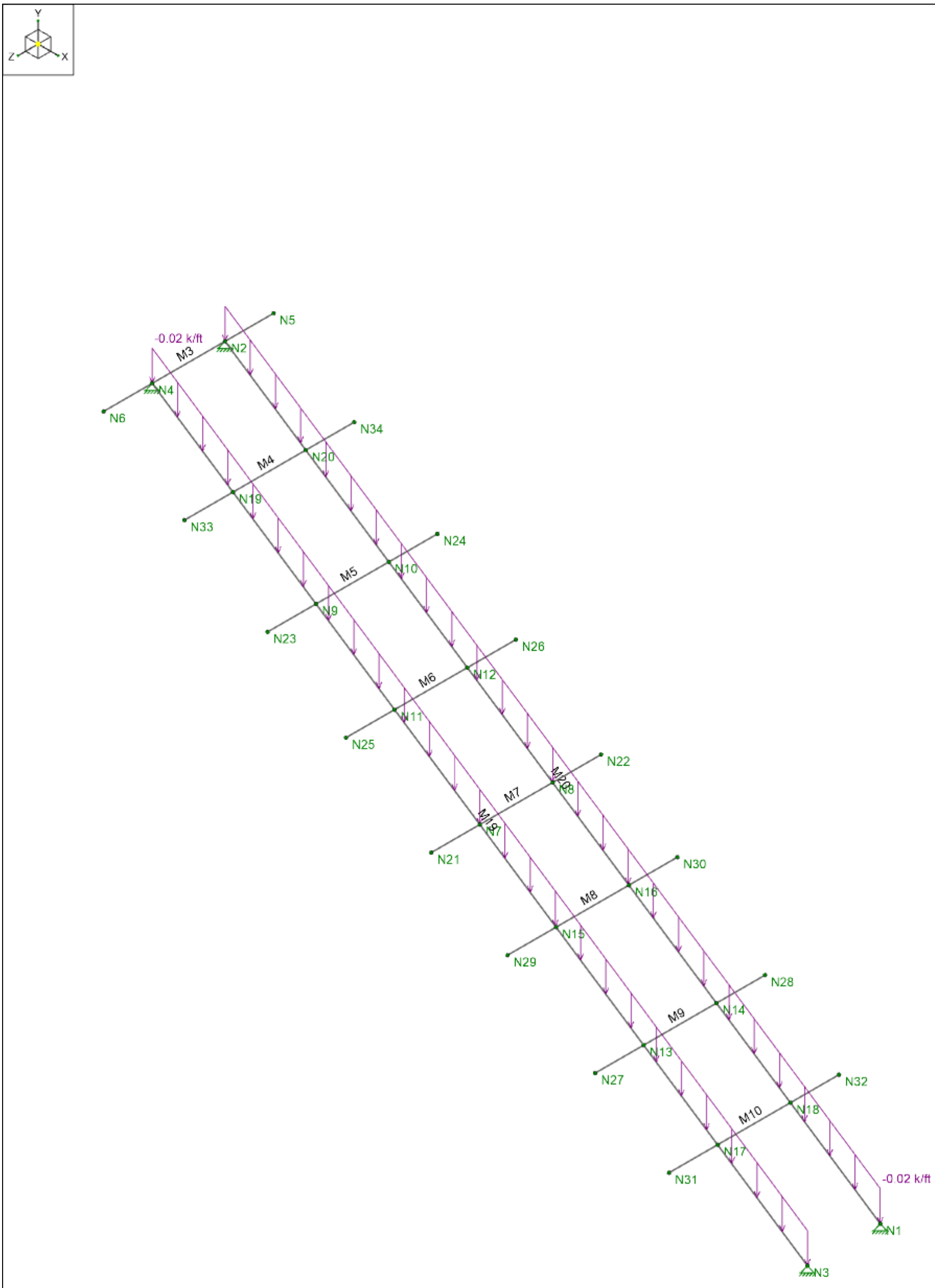


Loads: BLC 1, Dead Load

RISA A NEMETSCHEK COMPANY	BCQ	Kim-Um Deck Stair Stringer	SK-1
	ssn		Jan 30, 2024 at 09:08 AM
			Steel Stringer.r3d

Model Settings

Number of Reported Sections	5
Number of Internal Sections	100
Member Area Load Mesh Size (in^2)	144
Consider Shear Deformation	Yes
Consider Torsional Warping	Yes
Approximate Mesh Size (in)	24
Transfer Forces Between Intersecting Wood Walls	Yes
Increase Wood Wall Nailing Capacity for Wind Loads	Yes
Include P-Delta for Walls	Yes
Optimize Masonry and Wood Walls	Yes
Maximum Number of Iterations	3
Single	No
Multiple (Optimum)	Yes
Maximum	No

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes
Default Global Plane for z-axis	XZ
Plate Local Axis Orientation	Global

Hot Rolled Steel	AISC 15th (360-16): ASD
Stiffness Adjustment	Yes (Iterative)
Notional Annex	None
Connections	AISC 14th (360-10): ASD
Cold Formed Steel	AISI S100-16: ASD
Stiffness Adjustment	Yes (Iterative)
Wood	AWC NDS-18 / SDPWS-15 ASD
Temperature	< 100F
Concrete	ACI 318-14
Masonry	TMS 402-16: ASD
Aluminum	AA ADM1-15: ASD
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	AISC 14th (360-10): ASD
Stiffness Adjustment	Yes (Iterative)

Analysis Methodology	Exact Integration Method
Parme Beta Factor	0.65

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	Yes
Leave room for horizontal rebar splices (2*d bar spacing)	Yes
List forces which were ignored for design in the Detail Report	Yes

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No
Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	4

Code	ASCE 7-16
Risk Category	I or II
Drift Cat	Other
Base Elevation (ft)	
Include the weight of the structure in base shear calcs	Yes
S_1 (g)	1
SD_1 (g)	1
SD_s (g)	1
T_L (sec)	5
T Z (sec)	
T X (sec)	
C_tZ	0.02
C_tX	0.02
C_tExp. Z	0.75
C_tExp. X	0.75
R Z	3
R X	3
$\Omega_0 Z$	1
$\Omega_0 X$	1
$C_d Z$	4
$C_d X$	4
ρ Z	1
ρ X	1

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	13.5	0	-0.75	Yes
2	N2	0	9	-0.75	Yes
3	N3	13.5	0	0.75	Yes
4	N4	0	9	0.75	Yes
5	N5	0	9	-1.75	Yes
6	N6	0	9	1.75	Yes
7	N7	6.75	4.5	0.75	
8	N8	6.75	4.5	-0.75	
9	N9	3.375	6.75	0.75	
10	N10	3.375	6.75	-0.75	
11	N11	4.992302	5.671799	0.75	
12	N12	4.992302	5.671799	-0.75	
13	N13	10.125	2.25	0.75	
14	N14	10.125	2.25	-0.75	
15	N15	8.320503	3.452998	0.75	
16	N16	8.320503	3.452998	-0.75	
17	N17	11.648704	1.234197	0.75	
18	N18	11.648704	1.234197	-0.75	
19	N19	1.664101	7.8906	0.75	
20	N20	1.664101	7.8906	-0.75	
21	N21	6.75	4.5	1.75	
22	N22	6.75	4.5	-1.75	
23	N23	3.375	6.75	1.75	
24	N24	3.375	6.75	-1.75	
25	N25	4.992302	5.671799	1.75	
26	N26	4.992302	5.671799	-1.75	
27	N27	10.125	2.25	1.75	
28	N28	10.125	2.25	-1.75	
29	N29	8.320503	3.452998	1.75	
30	N30	8.320503	3.452998	-1.75	
31	N31	11.648704	1.234197	1.75	
32	N32	11.648704	1.234197	-1.75	
33	N33	1.664101	7.8906	1.75	
34	N34	1.664101	7.8906	-1.75	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]
1	N1	Reaction	Reaction	Reaction
2	N2	Reaction	Reaction	Reaction
3	N3	Reaction	Reaction	Reaction
4	N4	Reaction	Reaction	Reaction

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	0.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	0.3	0.65	0.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	0.3	0.65	0.49	35	1.6	60	1.2
7	A1085	29000	11154	0.3	0.65	0.49	50	1.25	65	1.15
8	A913 Gr.65	29000	11154	0.3	0.65	0.49	65	1.1	80	1.1

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	Steel Stringer	HSS6X4X6	Beam	Tube	A500 Gr.B Rect	Typical	6.18	14.9	28.3	32.8
2	Tread	HSS2X2X4	Beam	Tube	A500 Gr.B Rect	Typical	1.51	0.747	0.747	1.31

Member Primary Data

	Label	I Node	J Node	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rule
1	M19	N4	N3		Steel Stringer	Beam	Tube	A500 Gr.B Rect	Typical
2	M20	N1	N2		Steel Stringer	Beam	Tube	A500 Gr.B Rect	Typical
3	M3	N6	N5	33.69	Tread	Beam	Tube	A500 Gr.B Rect	Typical
4	M4	N33	N34		Tread	Beam	Tube	A500 Gr.B Rect	Typical
5	M5	N23	N24		Tread	Beam	Tube	A500 Gr.B Rect	Typical
6	M6	N25	N26		Tread	Beam	Tube	A500 Gr.B Rect	Typical
7	M7	N21	N22		Tread	Beam	Tube	A500 Gr.B Rect	Typical
8	M8	N29	N30		Tread	Beam	Tube	A500 Gr.B Rect	Typical
9	M9	N27	N28		Tread	Beam	Tube	A500 Gr.B Rect	Typical
10	M10	N31	N32		Tread	Beam	Tube	A500 Gr.B Rect	Typical

Member Advanced Data

	Label	Physical	Deflection Ratio Options	Seismic DR
1	M19	Yes	Default	None
2	M20	Yes	Default	None
3	M3	Yes	Default	None
4	M4	Yes	Default	None
5	M5	Yes	Default	None
6	M6	Yes	Default	None
7	M7	Yes	Default	None
8	M8	Yes	Default	None
9	M9	Yes	Default	None
10	M10	Yes	Default	None

Hot Rolled Steel Design Parameters

	Label	Shape	Length [ft]	Lcomp top [ft]	Channel Conn.	a [ft]	Function
1	M19	Steel Stringer	16.225	Lbyy	N/A	N/A	Lateral
2	M20	Steel Stringer	16.225	Lbyy	N/A	N/A	Lateral
3	M3	Tread	3.5	Lbyy	N/A	N/A	Lateral
4	M4	Tread	3.5	Lbyy	N/A	N/A	Lateral
5	M5	Tread	3.5	Lbyy	N/A	N/A	Lateral
6	M6	Tread	3.5	Lbyy	N/A	N/A	Lateral
7	M7	Tread	3.5	Lbyy	N/A	N/A	Lateral
8	M8	Tread	3.5	Lbyy	N/A	N/A	Lateral
9	M9	Tread	3.5	Lbyy	N/A	N/A	Lateral
10	M10	Tread	3.5	Lbyy	N/A	N/A	Lateral

Basic Load Cases

	BLC Description	Category	Y Gravity	Nodal	Distributed
1	Dead Load	None	-1		2
2	Live Load (PL)	None		8	
3	Live Load (Dist)	None			2

Node Loads and Enforced Displacements (BLC 2 : Live Load (PL))

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	N5	L	Y	-0.35
2	N34	L	Y	-0.35
3	N24	L	Y	-0.35
4	N26	L	Y	-0.35
5	N22	L	Y	-0.35
6	N30	L	Y	-0.35
7	N28	L	Y	-0.35
8	N32	L	Y	-0.35

Member Distributed Loads (BLC 1 : Dead Load)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M19	Y	-0.02	-0.02	0	%100
2	M20	Y	-0.02	-0.02	0	%100

Member Distributed Loads (BLC 3 : Live Load (Dist))

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M19	Y	-0.12	-0.12	0	%100
2	M20	Y	-0.12	-0.12	0	%100

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor
1	D+L (PL)	Yes	Y	1	1	2	1
2	D+L (Dist)	Yes	Y	1	1	3	1

Node Reactions

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N1	0.116	1.73	-0.063	0	0	0
2	1	N2	0.713	3.153	0.122	0	0	0
3	1	N3	-0.118	0.241	-0.029	0	0	0
4	1	N4	-0.711	-0.786	-0.03	0	0	0
5	1	Totals:	0	4.338	0			
6	1	COG (ft):	X: 6.143	Y: 4.904	Z: -1.13			
7	2	N1	-0.001	1.351	0	0	0	0
8	2	N2	0.001	1.365	0.001	0	0	0
9	2	N3	-0.001	1.351	0	0	0	0
10	2	N4	0.001	1.365	-0.001	0	0	0
11	2	Totals:	0	5.432	0			
12	2	COG (ft):	X: 6.725	Y: 4.517	Z: 0			

Node Displacements

	LC	Node Label	X [in]	Y [in]	Z [in]	X Rotation [rad]	Y Rotation [rad]	Z Rotation [rad]
1	1	N1	0	0	0	-4.591e-3	3.162e-3	5.594e-3
2	1	N2	0	0	0	-2.754e-3	1.737e-3	-5.238e-3
3	1	N3	0	0	0	-3.072e-3	2.136e-3	3.038e-3
4	1	N4	0	0	0	-1.205e-3	7.563e-4	-3.385e-3
5	1	N5	-0.021	-0.045	0	-4.216e-3	1.737e-3	-5.238e-3
6	1	N6	0.009	0.014	0	-1.197e-3	7.563e-4	-3.385e-3
7	1	N7	-0.119	-0.179	0.002	-3.388e-3	2.248e-3	1.132e-4
8	1	N8	-0.173	-0.261	0.002	-4.922e-3	3.25e-3	-1.2e-4
9	1	N9	-0.084	-0.126	0.002	-2.496e-3	1.638e-3	-2.52e-3
10	1	N10	-0.124	-0.187	0.002	-4.031e-3	2.639e-3	-3.431e-3
11	1	N11	-0.11	-0.165	0.002	-3.03e-3	2.002e-3	-1.398e-3
12	1	N12	-0.159	-0.239	0.002	-4.564e-3	3.004e-3	-1.91e-3
13	1	N13	-0.079	-0.119	0.002	-3.335e-3	2.243e-3	2.573e-3
14	1	N14	-0.129	-0.194	0.002	-4.869e-3	3.245e-3	3.376e-3
15	1	N15	-0.109	-0.164	0.003	-3.484e-3	2.323e-3	1.445e-3
16	1	N16	-0.165	-0.248	0.003	-5.018e-3	3.325e-3	1.52e-3
17	1	N17	-0.045	-0.067	0.002	-3.089e-3	2.111e-3	2.979e-3
18	1	N18	-0.079	-0.119	0.002	-4.627e-3	3.108e-3	4.788e-3
19	1	N19	-0.044	-0.066	0.001	-1.793e-3	1.154e-3	-3.192e-3
20	1	N20	-0.068	-0.102	0.001	-3.325e-3	2.16e-3	-4.726e-3
21	1	N21	-0.092	-0.138	0.002	-3.38e-3	2.248e-3	1.132e-4
22	1	N22	-0.212	-0.332	0.002	-6.384e-3	3.25e-3	-1.2e-4
23	1	N23	-0.064	-0.096	0.002	-2.488e-3	1.638e-3	-2.52e-3
24	1	N24	-0.156	-0.247	0.002	-5.493e-3	2.639e-3	-3.431e-3
25	1	N25	-0.086	-0.129	0.002	-3.022e-3	2.002e-3	-1.398e-3

Node Displacements (Continued)

	LC	Node Label	X [in]	Y [in]	Z [in]	X Rotation [rad]	Y Rotation [rad]	Z Rotation [rad]
26	1	N26	-0.195	-0.306	0.002	-6.026e-3	3.004e-3	-1.91e-3
27	1	N27	-0.052	-0.079	0.002	-3.327e-3	2.243e-3	2.573e-3
28	1	N28	-0.168	-0.265	0.002	-6.331e-3	3.245e-3	3.376e-3
29	1	N29	-0.081	-0.122	0.003	-3.476e-3	2.323e-3	1.445e-3
30	1	N30	-0.205	-0.32	0.003	-6.48e-3	3.325e-3	1.52e-3
31	1	N31	-0.019	-0.03	0.002	-3.081e-3	2.111e-3	2.979e-3
32	1	N32	-0.117	-0.187	0.002	-6.089e-3	3.108e-3	4.788e-3
33	1	N33	-0.03	-0.045	0.001	-1.786e-3	1.154e-3	-3.192e-3
34	1	N34	-0.094	-0.154	0.001	-4.787e-3	2.16e-3	-4.726e-3
35	2	N1	0	0	0	-7.421e-6	5.012e-6	5.439e-3
36	2	N2	0	0	0	-7.569e-6	4.789e-6	-5.431e-3
37	2	N3	0	0	0	7.421e-6	-5.012e-6	5.439e-3
38	2	N4	0	0	0	7.569e-6	-4.789e-6	-5.431e-3
39	2	N5	0	0	0	-1.522e-5	4.789e-6	-5.431e-3
40	2	N6	0	0	0	1.522e-5	-4.789e-6	-5.431e-3
41	2	N7	-0.184	-0.276	0	7.498e-6	-4.896e-6	-4.035e-6
42	2	N8	-0.184	-0.276	0	-7.498e-6	4.896e-6	-4.035e-6
43	2	N9	-0.131	-0.197	0	7.499e-6	-4.894e-6	-3.737e-3
44	2	N10	-0.131	-0.197	0	-7.499e-6	4.894e-6	-3.737e-3
45	2	N11	-0.169	-0.254	0	7.498e-6	-4.896e-6	-2.078e-3
46	2	N12	-0.169	-0.254	0	-7.498e-6	4.896e-6	-2.078e-3
47	2	N13	-0.131	-0.197	0	7.496e-6	-4.899e-6	3.737e-3
48	2	N14	-0.131	-0.197	0	-7.496e-6	4.899e-6	3.737e-3
49	2	N15	-0.172	-0.259	0	7.498e-6	-4.895e-6	1.86e-3
50	2	N16	-0.172	-0.259	0	-7.498e-6	4.895e-6	1.86e-3
51	2	N17	-0.078	-0.117	0	7.514e-6	-4.871e-6	4.881e-3
52	2	N18	-0.078	-0.117	0	-7.514e-6	4.871e-6	4.881e-3
53	2	N19	-0.07	-0.106	0	7.484e-6	-4.917e-6	-4.978e-3
54	2	N20	-0.07	-0.106	0	-7.484e-6	4.917e-6	-4.978e-3
55	2	N21	-0.184	-0.277	0	1.515e-5	-4.896e-6	-4.035e-6
56	2	N22	-0.184	-0.277	0	-1.515e-5	4.896e-6	-4.035e-6
57	2	N23	-0.131	-0.197	0	1.515e-5	-4.894e-6	-3.737e-3
58	2	N24	-0.131	-0.197	0	-1.515e-5	4.894e-6	-3.737e-3
59	2	N25	-0.169	-0.254	0	1.515e-5	-4.896e-6	-2.078e-3
60	2	N26	-0.169	-0.254	0	-1.515e-5	4.896e-6	-2.078e-3
61	2	N27	-0.131	-0.197	0	1.515e-5	-4.899e-6	3.737e-3
62	2	N28	-0.131	-0.197	0	-1.515e-5	4.899e-6	3.737e-3
63	2	N29	-0.172	-0.259	0	1.515e-5	-4.895e-6	1.86e-3
64	2	N30	-0.172	-0.259	0	-1.515e-5	4.895e-6	1.86e-3
65	2	N31	-0.078	-0.117	0	1.517e-5	-4.871e-6	4.881e-3
66	2	N32	-0.078	-0.117	0	-1.517e-5	4.871e-6	4.881e-3
67	2	N33	-0.071	-0.106	0	1.514e-5	-4.917e-6	-4.978e-3
68	2	N34	-0.071	-0.106	0	-1.514e-5	4.917e-6	-4.978e-3

AISC 15TH (360-16): ASD Member Steel Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Dir	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	1	M19	HSS6X4X6	0.125	8.112	0.065	2.028	y	59.079	170.228	20.521	27.315	1.26	H1-1b
2	1	M20	HSS6X4X6	0.153	6.084	0.069	16.225	y	59.079	170.228	20.521	27.315	1.044	H1-1b
3	1	M3	HSS2X2X4	0.541	2.479	0.202	2.479	y	32.723	41.593	2.213	2.213	3	H1-1b
4	1	M4	HSS2X2X4	0.272	2.479	0.086	2.479	y	32.723	41.593	2.213	2.213	1.981	H1-1b
5	1	M5	HSS2X2X4	0.157	2.516	0.038	1.021	y	32.723	41.593	2.213	2.213	1.895	H1-1b
6	1	M6	HSS2X2X4	0.2	1.021	0.037	1.021	y	32.723	41.593	2.213	2.213	1.895	H1-1b
7	1	M7	HSS2X2X4	0.223	1.021	0.035	2.516	y	32.723	41.593	2.213	2.213	1.895	H1-1b
8	1	M8	HSS2X2X4	0.223	1.021	0.035	2.516	y	32.723	41.593	2.213	2.213	1.895	H1-1b
9	1	M9	HSS2X2X4	0.157	2.516	0.035	2.516	y	32.723	41.593	2.213	2.213	1.895	H1-1b
10	1	M10	HSS2X2X4	0.419	2.479	0.119	2.479	y	32.723	41.593	2.213	2.213	2.446	H1-1b
11	2	M19	HSS6X4X6	0.168	8.282	0.02	16.225	y	59.079	170.228	20.521	27.315	1.136	H1-1b
12	2	M20	HSS6X4X6	0.168	7.943	0.02	0	y	59.079	170.228	20.521	27.315	1.136	H1-1b
13	2	M3	HSS2X2X4	0.002	2.516	0	2.516	y	32.723	41.593	2.213	2.213	1.382	H1-1b
14	2	M4	HSS2X2X4	0.001	2.479	0.001	2.516	y	32.723	41.593	2.213	2.213	1.513	H1-1b
15	2	M5	HSS2X2X4	0.001	2.479	0.001	2.516	y	32.723	41.593	2.213	2.213	1.513	H1-1b
16	2	M6	HSS2X2X4	0.001	2.479	0.001	2.516	y	32.723	41.593	2.213	2.213	1.513	H1-1b
17	2	M7	HSS2X2X4	0.001	2.479	0.001	2.516	y	32.723	41.593	2.213	2.213	1.513	H1-1b
18	2	M8	HSS2X2X4	0.001	2.479	0.001	2.516	y	32.723	41.593	2.213	2.213	1.513	H1-1b
19	2	M9	HSS2X2X4	0.001	2.479	0.001	2.516	y	32.723	41.593	2.213	2.213	1.513	H1-1b
20	2	M10	HSS2X2X4	0.001	2.479	0.001	2.516	y	32.723	41.593	2.213	2.213	1.512	H1-1b

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M19	HSS6X4X6	0.168	8.282	2	0.065	2.028	y	1	59.079	170.228	20.521	27.315	1.136	H1-1b
2	M20	HSS6X4X6	0.168	7.943	2	0.069	16.225	y	1	59.079	170.228	20.521	27.315	1.136	H1-1b
3	M3	HSS2X2X4	0.541	2.479	1	0.202	2.479	y	1	32.723	41.593	2.213	2.213	3	H1-1b
4	M4	HSS2X2X4	0.272	2.479	1	0.086	2.479	y	1	32.723	41.593	2.213	2.213	1.981	H1-1b
5	M5	HSS2X2X4	0.157	2.516	1	0.038	1.021	y	1	32.723	41.593	2.213	2.213	1.895	H1-1b
6	M6	HSS2X2X4	0.2	1.021	1	0.037	1.021	y	1	32.723	41.593	2.213	2.213	1.895	H1-1b
7	M7	HSS2X2X4	0.223	1.021	1	0.035	2.516	y	1	32.723	41.593	2.213	2.213	1.895	H1-1b
8	M8	HSS2X2X4	0.223	1.021	1	0.035	2.516	y	1	32.723	41.593	2.213	2.213	1.895	H1-1b
9	M9	HSS2X2X4	0.157	2.516	1	0.035	2.516	y	1	32.723	41.593	2.213	2.213	1.895	H1-1b
10	M10	HSS2X2X4	0.419	2.479	1	0.119	2.479	y	1	32.723	41.593	2.213	2.213	2.446	H1-1b

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	0.116	1	1.73	1	0	2	0	2	0	2	0	2
2		min	-0.001	2	1.351	2	-0.063	1	0	1	0	1	0	1
3	N2	max	0.713	1	3.153	1	0.122	1	0	2	0	2	0	2
4		min	0.001	2	1.365	2	0.001	2	0	1	0	1	0	1
5	N3	max	-0.001	2	1.351	2	0	2	0	2	0	2	0	2
6		min	-0.118	1	0.241	1	-0.029	1	0	1	0	1	0	1
7	N4	max	0.001	2	1.365	2	-0.001	2	0	2	0	2	0	2
8		min	-0.711	1	-0.786	1	-0.03	1	0	1	0	1	0	1
9	Totals:	max	0	1	5.432	2	0	2						
10		min	0	2	4.338	1	0	1						

Envelope Node Displacements

	Node Label		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
1	N1	max	0	2	0	2	0	1	-7.421e-6	2	3.162e-3	1	5.594e-3	1
2		min	0	1	0	1	0	2	-4.591e-3	1	5.012e-6	2	5.439e-3	2
3	N2	max	0	2	0	2	0	2	-7.569e-6	2	1.737e-3	1	-5.238e-3	1
4		min	0	1	0	1	0	1	-2.754e-3	1	4.789e-6	2	-5.431e-3	2
5	N3	max	0	1	0	1	0	1	7.421e-6	2	2.136e-3	1	5.439e-3	2
6		min	0	2	0	2	0	2	-3.072e-3	1	-5.012e-6	2	3.038e-3	1
7	N4	max	0	1	0	1	0	1	7.569e-6	2	7.563e-4	1	-3.385e-3	1
8		min	0	2	0	2	0	2	-1.205e-3	1	-4.789e-6	2	-5.431e-3	2
9	N5	max	0	2	0	2	0	2	-1.522e-5	2	1.737e-3	1	-5.238e-3	1
10		min	-0.021	1	-0.045	1	0	1	-4.216e-3	1	4.789e-6	2	-5.431e-3	2
11	N6	max	0.009	1	0.014	1	0	1	1.522e-5	2	7.563e-4	1	-3.385e-3	1
12		min	0	2	0	2	0	2	-1.197e-3	1	-4.789e-6	2	-5.431e-3	2
13	N7	max	-0.119	1	-0.179	1	0.002	1	7.498e-6	2	2.248e-3	1	1.132e-4	1
14		min	-0.184	2	-0.276	2	0	2	-3.388e-3	1	-4.896e-6	2	-4.035e-6	2
15	N8	max	-0.173	1	-0.261	1	0.002	1	-7.498e-6	2	3.25e-3	1	-4.035e-6	2
16		min	-0.184	2	-0.276	2	0	2	-4.922e-3	1	4.896e-6	2	-1.2e-4	1
17	N9	max	-0.084	1	-0.126	1	0.002	1	7.499e-6	2	1.638e-3	1	-2.52e-3	1
18		min	-0.131	2	-0.197	2	0	2	-2.496e-3	1	-4.894e-6	2	-3.737e-3	2
19	N10	max	-0.124	1	-0.187	1	0.002	1	-7.499e-6	2	2.639e-3	1	-3.431e-3	1
20		min	-0.131	2	-0.197	2	0	2	-4.031e-3	1	4.894e-6	2	-3.737e-3	2
21	N11	max	-0.11	1	-0.165	1	0.002	1	7.498e-6	2	2.002e-3	1	-1.398e-3	1
22		min	-0.169	2	-0.254	2	0	2	-3.03e-3	1	-4.896e-6	2	-2.078e-3	2
23	N12	max	-0.159	1	-0.239	1	0.002	1	-7.498e-6	2	3.004e-3	1	-1.91e-3	1
24		min	-0.169	2	-0.254	2	0	2	-4.564e-3	1	4.896e-6	2	-2.078e-3	2
25	N13	max	-0.079	1	-0.119	1	0.002	1	7.496e-6	2	2.243e-3	1	3.737e-3	2
26		min	-0.131	2	-0.197	2	0	2	-3.335e-3	1	-4.899e-6	2	2.573e-3	1
27	N14	max	-0.129	1	-0.194	1	0.002	1	-7.496e-6	2	3.245e-3	1	3.737e-3	2
28		min	-0.131	2	-0.197	2	0	2	-4.869e-3	1	4.899e-6	2	3.376e-3	1
29	N15	max	-0.109	1	-0.164	1	0.003	1	7.498e-6	2	2.323e-3	1	1.86e-3	2
30		min	-0.172	2	-0.259	2	0	2	-3.484e-3	1	-4.895e-6	2	1.445e-3	1
31	N16	max	-0.165	1	-0.248	1	0.003	1	-7.498e-6	2	3.325e-3	1	1.86e-3	2
32		min	-0.172	2	-0.259	2	0	2	-5.018e-3	1	4.895e-6	2	1.52e-3	1
33	N17	max	-0.045	1	-0.067	1	0.002	1	7.514e-6	2	2.111e-3	1	4.881e-3	2
34		min	-0.078	2	-0.117	2	0	2	-3.089e-3	1	-4.871e-6	2	2.979e-3	1
35	N18	max	-0.078	2	-0.117	2	0.002	1	-7.514e-6	2	3.108e-3	1	4.881e-3	2
36		min	-0.079	1	-0.119	1	0	2	-4.627e-3	1	4.871e-6	2	4.788e-3	1
37	N19	max	-0.044	1	-0.066	1	0.001	1	7.484e-6	2	1.154e-3	1	-3.192e-3	1
38		min	-0.07	2	-0.106	2	0	2	-1.793e-3	1	-4.917e-6	2	-4.978e-3	2
39	N20	max	-0.068	1	-0.102	1	0.001	1	-7.484e-6	2	2.16e-3	1	-4.726e-3	1
40		min	-0.07	2	-0.106	2	0	2	-3.325e-3	1	4.917e-6	2	-4.978e-3	2
41	N21	max	-0.092	1	-0.138	1	0.002	1	1.515e-5	2	2.248e-3	1	1.132e-4	1
42		min	-0.184	2	-0.277	2	0	2	-3.38e-3	1	-4.896e-6	2	-4.035e-6	2
43	N22	max	-0.184	2	-0.277	2	0.002	1	-1.515e-5	2	3.25e-3	1	-4.035e-6	2
44		min	-0.212	1	-0.332	1	0	2	-6.384e-3	1	4.896e-6	2	-1.2e-4	1
45	N23	max	-0.064	1	-0.096	1	0.002	1	1.515e-5	2	1.638e-3	1	-2.52e-3	1
46		min	-0.131	2	-0.197	2	0	2	-2.488e-3	1	-4.894e-6	2	-3.737e-3	2
47	N24	max	-0.131	2	-0.197	2	0.002	1	-1.515e-5	2	2.639e-3	1	-3.431e-3	1
48		min	-0.156	1	-0.247	1	0	2	-5.493e-3	1	4.894e-6	2	-3.737e-3	2
49	N25	max	-0.086	1	-0.129	1	0.002	1	1.515e-5	2	2.002e-3	1	-1.398e-3	1
50		min	-0.169	2	-0.254	2	0	2	-3.022e-3	1	-4.896e-6	2	-2.078e-3	2
51	N26	max	-0.169	2	-0.254	2	0.002	1	-1.515e-5	2	3.004e-3	1	-1.91e-3	1
52		min	-0.195	1	-0.306	1	0	2	-6.026e-3	1	4.896e-6	2	-2.078e-3	2
53	N27	max	-0.052	1	-0.079	1	0.002	1	1.515e-5	2	2.243e-3	1	3.737e-3	2
54		min	-0.131	2	-0.197	2	0	2	-3.327e-3	1	-4.899e-6	2	2.573e-3	1
55	N28	max	-0.131	2	-0.197	2	0.002	1	-1.515e-5	2	3.245e-3	1	3.737e-3	2
56		min	-0.168	1	-0.265	1	0	2	-6.331e-3	1	4.899e-6	2	3.376e-3	1
57	N29	max	-0.081	1	-0.122	1	0.003	1	1.515e-5	2	2.323e-3	1	1.86e-3	2
58		min	-0.172	2	-0.259	2	0	2	-3.476e-3	1	-4.895e-6	2	1.445e-3	1
59	N30	max	-0.172	2	-0.259	2	0.003	1	-1.515e-5	2	3.325e-3	1	1.86e-3	2
60		min	-0.205	1	-0.32	1	0	2	-6.48e-3	1	4.895e-6	2	1.52e-3	1
61	N31	max	-0.019	1	-0.03	1	0.002	1	1.517e-5	2	2.111e-3	1	4.881e-3	2
62		min	-0.078	2	-0.117	2	0	2	-3.081e-3	1	-4.871e-6	2	2.979e-3	1
63	N32	max	-0.078	2	-0.117	2	0.002	1	-1.517e-5	2	3.108e-3	1	4.881e-3	2
64		min	-0.117	1	-0.187	1	0	2	-6.089e-3	1	4.871e-6	2	4.788e-3	1
65	N33	max	-0.03	1	-0.045	1	0.001	1	1.514e-5	2	1.154e-3	1	-3.192e-3	1
66		min	-0.071	2	-0.106	2	0	2	-1.786e-3	1	-4.917e-6	2	-4.978e-3	2
67	N34	max	-0.071	2	-0.106	2	0.001	1	-1.514e-5	2	2.16e-3	1	-4.726e-3	1
68		min	-0.094	1	-0.154	1	0	2	-4.787e-3	1	4.917e-6	2	-4.978e-3	2

RAILING DESIGN

TOP RAIL

- CHECK AS 2-SPAN CONT. BEAM

$$M_{max} = \frac{13}{64} PL = \frac{13}{64}(200\text{lb})(4\text{ ft}) = 162.5\text{ lb-ft} = 1950\text{ lb-in}$$

A36 STEEL, 1.5" x ½"

$F_y = 36{,}000$ psi

$$Z = bd^2/4 = (1.5)(1/2)^2/4 = 0.094\text{ in}^3$$

$$\frac{M_n}{\Omega} = \frac{F_y Z}{\Omega} = \frac{(36{,}000\text{ psi})(0.094)}{1.67} = 2021\text{ lb-in} \quad \therefore \text{OK}$$

COLUMNS

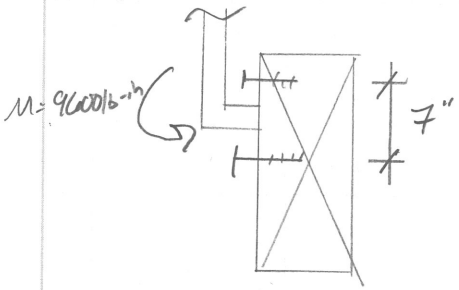
- SPACED @ 4'-0" oc
- A36 STEEL, (2) 1.5" x ½"
- WORST CASE MOMENT W/ 200# AT TOP

$$M = (200\text{lb})(4') = 800\text{ lb-ft} = 9600\text{ lb-in}$$

$$Z = 2\left[\frac{(1/2)(1.5)^2}{4}\right] = 0.56\text{ in}^3$$

$$\frac{M_n}{\Omega} = \frac{(36{,}000)(0.56)}{1.67} = 12{,}126\text{ lb-in} \quad \therefore \text{OK}$$

CONNECTION TO WOOD BEAM:



$M = 9600$ lb-in

$d = 7"$

$T = 9600/7 = 1372$ lb

- CHECK 5/8"ø x 5" LAGS IN WITHDRAWAL

$$Z = (447\text{ lb/in})(0.7)(3.5") = 782\text{ lb}$$

C_m

- (2) LAGS TAKE TENSION

$782 \times 2 = 1564$ lb $\therefore$ OK

Seismic (Main Deck)

Project: Kim-Um Deck (Main Deck)

Seismic Design Parameters		
Site Class	D (default)	
Risk Category	II	*Table 1.5-1*
Importance Factor	1	*Table 1.5-2*
Ss	1.412	*From USGS*
S1	0.491	
Fa	1.200	*Table 11.4-1*
Fv	1.809	*Table 11.4-2*
Sms	1.694	*Eq. 11.4-1*
Sm1	0.888	*Eq. 11.4-2*
Sds	1.130	*Eq. 11.4-3*
Sd1	0.592	*Eq. 11.4-4*
R	1.5	*Table 12.2-1*
C_s	0.753	*Eq. 12.8-2*
T_a	0.112	*12.8-7 - for "All other structural systems"*
k	1	*12.8.3*
Seismic Design Category	D	*Table 11.6-1*

Seismic Weight

Areas (ft^2)	
Deck	471

Loads	
DL-Floor (psf)	10

Seismic Base Shear		
$V_{ultimate}$ (k)	3.5	*Eq. 12.8-1*
$V_{allowable}$ (k)	2.5	

Level	Weight (k)	Height (ft)	$w_x f_x^k$	C_{vx}	F_x (ult.)	F_x (allow.)
Deck	4.71	10	47.1	1.00	3.5	2.5
TOTAL	4.7	-	47.1	1	3.5	2.5

All references are from ASCE 7-16: Minimum Design Loads and Associated Criteria for Buildings and Other Structures

Project: Kim-Um Deck (Primary Suite Deck)

Seismic Design Parameters		
Site Class	D (default)	
Risk Category	II	*Table 1.5-1*
Importance Factor	1	*Table 1.5-2*
Ss	1.412	*From USGS*
S1	0.491	
Fa	1.200	*Table 11.4-1*
Fv	1.809	*Table 11.4-2*
Sms	1.694	*Eq. 11.4-1*
Sm1	0.888	*Eq. 11.4-2*
Sds	1.130	*Eq. 11.4-3*
Sd1	0.592	*Eq. 11.4-4*
R	1.5	*Table 12.2-1*
C_s	0.753	*Eq. 12.8-2*
T_a	0.112	*12.8-7 - for "All other structural systems"*
k	1	*12.8.3*
Seismic Design Category	D	*Table 11.6-1*

Seismic Weight

Areas (ft^2)	
Deck	65

Loads	
DL-Floor (psf)	10

Seismic Base Shear		
$V_{ultimate}$ (k)	0.5	*Eq. 12.8-1*
$V_{allowable}$ (k)	0.3	

Level	Weight (k)	Height (ft)	$w_x f_x^k$	C_{vx}	F_x (ult.)	F_x (allow.)
Deck	0.65	10	6.5	1.00	0.5	0.3
TOTAL	0.7	-	6.5	1	0.5	0.3

All references are from ASCE 7-16: Minimum Design Loads and Associated Criteria for Buildings and Other Structures

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: Kim-Um Deck.ec6

LIC# : KW-06015393, Build:20.23.08.30 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2023

DESCRIPTION: Cantilevered Column

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Steel Section Name : **HSS4x4x1/4**

Analysis Method :	Allowable Strength
Steel Stress Grade	
Fy : Steel Yield	46.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	8 ft
Top & Bottom Fixity	Top Free, Bottom Fixed
Brace condition :	

Unbraced Length for buckling ABOUT X-X Axis = 8 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 8 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 97.680 lbs * Dead Load Factor
BENDING LOADS . . .
Lat. Point Load at 8.0 ft creating Mx-x, E = 0.8750 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.4558** : 1

Load Combination	+D+0.70E	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Pa : Axial	0.09768	k
Pn / Omega : Allowable	70.980	k
Ma-x : Applied	-4.90	k-ft
Mn-x / Omega : Allowable	10.765	k-ft
Ma-y : Applied	0.0	k-ft
Mn-y / Omega : Allowable	10.765	k-ft

PASS Maximum Shear Stress Ratio **0.02409** : 1

Load Combination	+D+0.70E	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Va : Applied	0.6125	k
Vn / Omega : Allowable	25.423	k

Maximum Load Reactions . .

Top along X-X	k
Bottom along X-X	k
Top along Y-Y	k
Bottom along Y-Y	k

Maximum Load Deflections . . .

Along Y-Y in at ft above base
for load combination :

Along X-X in at ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Ry	KyLy/Rx	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	k	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments @ Base k-ft	Mx - End Moments @ Top k-ft	My - End Moments @ Base k-ft	My - End Moments @ Top k-ft

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	k	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments @ Base k-ft	Mx - End Moments @ Top k-ft	My - End Moments @ Base k-ft	My - End Moments @ Top k-ft

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : HSS4x4x1/4

Steel Section Properties : HSS4x4x1/4

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

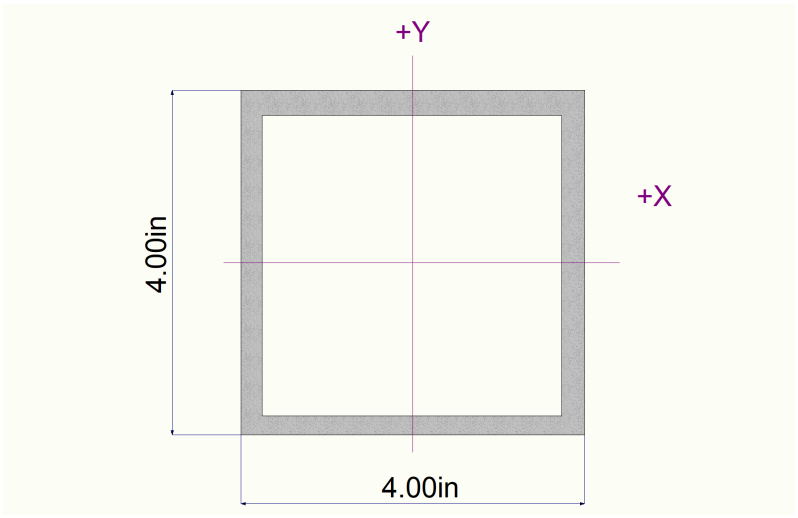
Project File: Kim-Um Deck.ec6

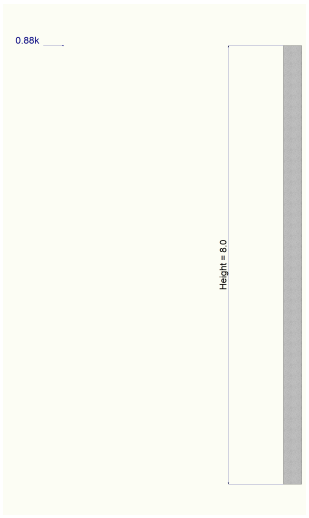
LIC# : KW-06015393, Build:20.23.08.30 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2023

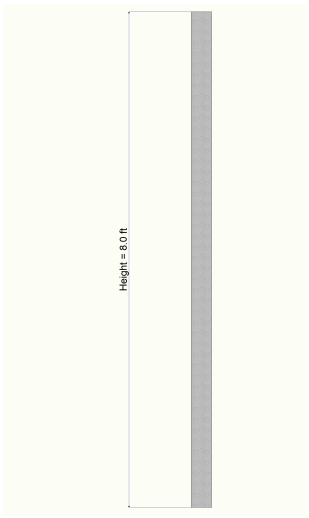
DESCRIPTION: Cantilevered Column

Depth	=	4.000	in	I xx	=	7.80	in^4	J	=	12.800 in^4
Design Thick	=	0.233	in	S xx	=	3.90	in^3			
Width	=	4.000	in	R xx	=	1.520	in			
Wall Thick	=	0.250	in	Zx	=	4.690	in^3			
Area	=	3.370	in^2	I yy	=	7.800	in^4	C	=	6.560 in^3
Weight	=	12.210	plf	S yy	=	3.900	in^3			
				R yy	=	1.520	in			
Ycg	=	0.000	in							

Sketches







Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Kim-Um Deck.ec6

LIC# : KW-06015393, Build:20.23.08.30 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2023

DESCRIPTION: Cantilevered Column Footing (Main Deck)

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	2,850.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	2.0	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	1.50	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

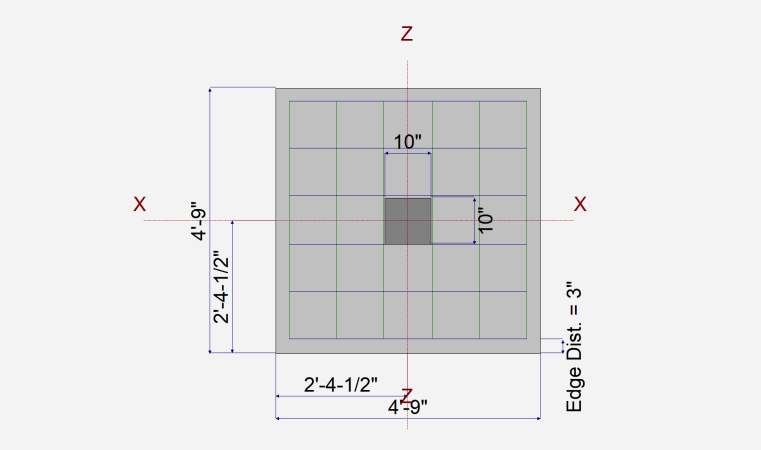
Width parallel to X-X Axis	=	4.750 ft
Length parallel to Z-Z Axis	=	4.750 ft
Footing Thickness	=	10.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	10.0 in
pz : parallel to Z-Z Axis	=	10.0 in
Height	=	18.0 in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in

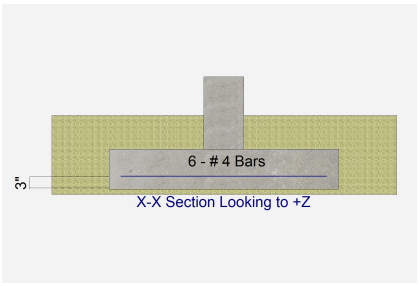


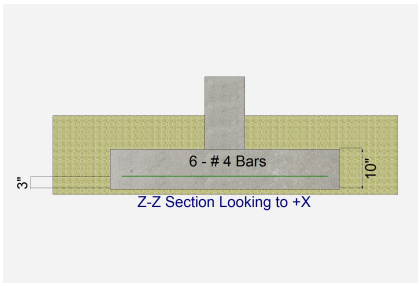
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		6.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		6.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	1.0							k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=						7.0		k-ft
V-x	=						0.8750		k
V-z	=								k

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Kim-Um Deck.ec6

LIC# : KW-06015393, Build:20.23.08.30 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2023

DESCRIPTION: Cantilevered Column Footing (Main Deck)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.5555	Soil Bearing	1.111 ksf	2.0 ksf	+0.60D+0.70E about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	1.20	Overturning - Z-Z	6.329 k-ft	7.595 k-ft	+0.60D+0.70E
PASS	3.317	Sliding - X-X	0.6125 k	2.031 k	+0.60D+0.70E
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1506	Z Flexure (+X)	1.147 k-ft/ft	7.620 k-ft/ft	+0.90D+E
PASS	0.05863	Z Flexure (-X)	0.4467 k-ft/ft	7.620 k-ft/ft	+1.20D+E
PASS	0.01482	X Flexure (+Z)	0.1129 k-ft/ft	7.620 k-ft/ft	+1.40D
PASS	0.01482	X Flexure (-Z)	0.1129 k-ft/ft	7.620 k-ft/ft	+1.40D
PASS	0.1215	1-way Shear (+X)	9.109 psi	75.0 psi	+0.90D+E
PASS	0.05095	1-way Shear (-X)	3.821 psi	75.0 psi	+1.20D+E
PASS	0.01288	1-way Shear (+Z)	0.9657 psi	75.0 psi	+1.40D
PASS	0.01288	1-way Shear (-Z)	0.9657 psi	75.0 psi	+1.40D
PASS	0.01776	2-way Punching	2.663 psi	150.0 psi	+1.20D+E

Top reinforcing mat required (see 'Bending' tab).

Hand check required for anchor pullout.

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.0	n/a	0.0	0.2362	0.2362	n/a	n/a	0.118
X-X, +D+0.70E	2.0	n/a	0.0	0.2362	0.2362	n/a	n/a	0.118
X-X, +D+0.5250E	2.0	n/a	0.0	0.2362	0.2362	n/a	n/a	0.118
X-X, +0.60D	2.0	n/a	0.0	0.1417	0.1417	n/a	n/a	0.071
X-X, +0.60D+0.70E	2.0	n/a	0.0	0.1417	0.1417	n/a	n/a	0.071
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.2362	0.2362	0.118
Z-Z, +D+0.70E	2.0	14.250	n/a	n/a	n/a	0.0	0.6257	0.313
Z-Z, +D+0.5250E	2.0	10.687	n/a	n/a	n/a	0.0	0.5013	0.251
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.1417	0.1417	0.071
Z-Z, +0.60D+0.70E	2.0	23.749	n/a	n/a	n/a	0.0	1.111	0.556

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	0.0 k-ft	Infinity	OK
X-X, +D+0.70E	None	0.0 k-ft	Infinity	OK
X-X, +D+0.5250E	None	0.0 k-ft	Infinity	OK
X-X, +0.60D	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.70E	None	0.0 k-ft	Infinity	OK
Z-Z, D Only	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.70E	6.329 k-ft	12.659 k-ft	2.0	OK
Z-Z, +D+0.5250E	4.747 k-ft	12.659 k-ft	2.667	OK
Z-Z, +0.60D	None	0.0 k-ft	Infinity	OK
Z-Z, +0.60D+0.70E	6.329 k-ft	7.595 k-ft	1.20	OK

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, D Only	0.0 k	2.671 k	No Sliding	OK
X-X, +D+0.70E	0.6125 k	2.671 k	4.361	OK
X-X, +D+0.5250E	0.4594 k	2.671 k	5.815	OK
X-X, +0.60D	0.0 k	2.031 k	No Sliding	OK
X-X, +0.60D+0.70E	0.6125 k	2.031 k	3.317	OK
Z-Z, D Only	0.0 k	2.671 k	No Sliding	OK
Z-Z, +D+0.70E	0.0 k	2.671 k	No Sliding	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Kim-Um Deck.ec6

LIC# : KW-06015393, Build:20.23.08.30 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2023

DESCRIPTION: Cantilevered Column Footing (Main Deck)

All units k

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Z-Z, +D+0.5250E	0.0 k	2.671 k	No Sliding	OK
Z-Z, +0.60D	0.0 k	2.031 k	No Sliding	OK
Z-Z, +0.60D+0.70E	0.0 k	2.031 k	No Sliding	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.1129	+Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +1.40D	0.1129	-Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +1.20D	0.09679	+Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +1.20D	0.09679	-Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +1.20D+E	0.09679	+Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +1.20D+E	0.09679	-Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +0.90D	0.07259	+Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +0.90D	0.07259	-Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +0.90D+E	0.07259	+Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
X-X, +0.90D+E	0.07259	-Z	Bottom	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +1.40D	0.1129	-X	Bottom	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +1.40D	0.1129	+X	Bottom	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +1.20D	0.09679	-X	Bottom	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +1.20D	0.09679	+X	Bottom	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +1.20D+E	0.4467	-X	Top	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +1.20D+E	0.9384	+X	Bottom	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +0.90D	0.07259	-X	Bottom	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +0.90D	0.07259	+X	Bottom	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +0.90D+E	0.3351	-X	Top	0.2160	AsMin	0.2526	7.620	OK
Z-Z, +0.90D+E	1.147	+X	Bottom	0.2160	AsMin	0.2526	7.620	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.97 psi	0.97 psi	0.97 psi	0.97 psi	0.97 psi	75.00 psi	0.01	OK
+1.20D	0.83 psi	0.83 psi	0.83 psi	0.83 psi	0.83 psi	75.00 psi	0.01	OK
+1.20D+E	3.82 psi	7.84 psi	0.83 psi	0.83 psi	7.84 psi	75.00 psi	0.10	OK
+0.90D	0.62 psi	0.62 psi	0.62 psi	0.62 psi	0.62 psi	75.00 psi	0.01	OK
+0.90D+E	2.87 psi	9.11 psi	0.62 psi	0.62 psi	9.11 psi	75.00 psi	0.12	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	2.54 psi	150.00 psi	0.01693	OK
+1.20D	2.18 psi	150.00 psi	0.01452	OK
+1.20D+E	2.66 psi	150.00 psi	0.01776	OK
+0.90D	1.63 psi	150.00 psi	0.01089	OK
+0.90D+E	2.54 psi	150.00 psi	0.01693	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Kim-Um Deck.ec6

LIC# : KW-06015393, Build:20.23.08.30 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2023

DESCRIPTION: Cantilevered Column Footing (Primary Suite Deck)

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	2,850.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	2.0	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	1.50	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

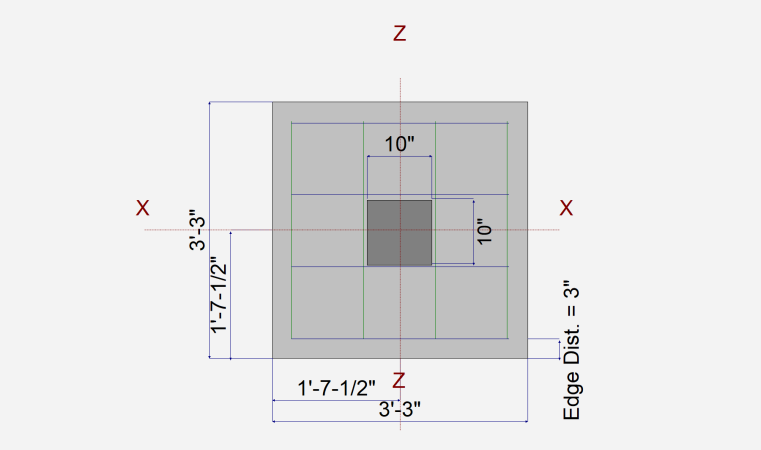
Width parallel to X-X Axis	=	3.250 ft
Length parallel to Z-Z Axis	=	3.250 ft
Footing Thickness	=	10.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	10.0 in
pz : parallel to Z-Z Axis	=	10.0 in
Height	=	18.0 in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in

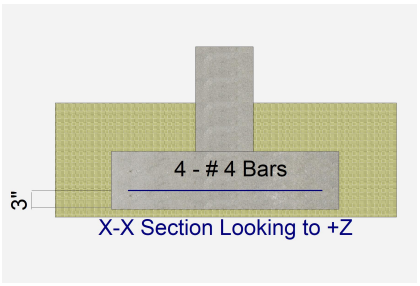


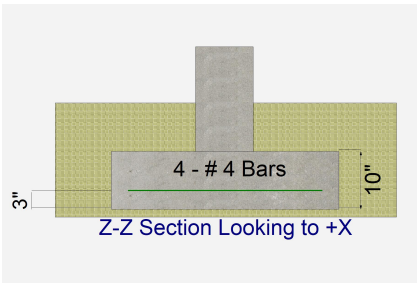
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		4
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		4
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	0.50							k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=						2.0		k-ft
V-x	=						0.250		k
V-z	=								k

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Kim-Um Deck.ec6

LIC# : KW-06015393, Build:20.23.08.30 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2023

DESCRIPTION: Cantilevered Column Footing (Primary Suite Deck)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.3621	Soil Bearing	0.7241 ksf	2.0 ksf	+0.60D+0.70E about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	1.348	Overturning - Z-Z	1.808 k-ft	2.437 k-ft	+0.60D+0.70E
PASS	6.763	Sliding - X-X	0.1750 k	1.184 k	+0.60D+0.70E
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.05112	Z Flexure (+X)	0.380 k-ft/ft	7.433 k-ft/ft	+0.90D+E
PASS	0.02276	Z Flexure (-X)	0.1692 k-ft/ft	7.433 k-ft/ft	+1.20D+E
PASS	0.005846	X Flexure (+Z)	0.04345 k-ft/ft	7.433 k-ft/ft	+1.40D
PASS	0.005846	X Flexure (-Z)	0.04345 k-ft/ft	7.433 k-ft/ft	+1.40D
PASS	0.05727	1-way Shear (+X)	4.295 psi	75.0 psi	+0.90D+E
PASS	0.02284	1-way Shear (-X)	1.713 psi	75.0 psi	+1.20D+E
PASS	0.005834	1-way Shear (+Z)	0.4376 psi	75.0 psi	+1.40D
PASS	0.005834	1-way Shear (-Z)	0.4376 psi	75.0 psi	+1.40D
PASS	0.008830	2-way Punching	1.324 psi	150.0 psi	+0.90D+E

Top reinforcing mat required (see 'Bending' tab).

Hand check required for anchor pullout.

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.0	n/a	0.0	0.2367	0.2367	n/a	n/a	0.118
X-X, +D+0.70E	2.0	n/a	0.0	0.2367	0.2367	n/a	n/a	0.118
X-X, +D+0.5250E	2.0	n/a	0.0	0.2367	0.2367	n/a	n/a	0.118
X-X, +0.60D	2.0	n/a	0.0	0.1420	0.1420	n/a	n/a	0.071
X-X, +0.60D+0.70E	2.0	n/a	0.0	0.1420	0.1420	n/a	n/a	0.071
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.2367	0.2367	0.118
Z-Z, +D+0.70E	2.0	8.680	n/a	n/a	n/a	0.0	0.5653	0.283
Z-Z, +D+0.5250E	2.0	6.510	n/a	n/a	n/a	0.002002	0.4714	0.236
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.1420	0.1420	0.071
Z-Z, +0.60D+0.70E	2.0	14.467	n/a	n/a	n/a	0.0	0.7241	0.362

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	0.0 k-ft	Infinity	OK
X-X, +D+0.70E	None	0.0 k-ft	Infinity	OK
X-X, +D+0.5250E	None	0.0 k-ft	Infinity	OK
X-X, +0.60D	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.70E	None	0.0 k-ft	Infinity	OK
Z-Z, D Only	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.70E	1.808 k-ft	4.062 k-ft	2.247	OK
Z-Z, +D+0.5250E	1.356 k-ft	4.062 k-ft	2.995	OK
Z-Z, +0.60D	None	0.0 k-ft	Infinity	OK
Z-Z, +0.60D+0.70E	1.808 k-ft	2.437 k-ft	1.348	OK

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, D Only	0.0 k	1.483 k	No Sliding	OK
X-X, +D+0.70E	0.1750 k	1.483 k	8.477	OK
X-X, +D+0.5250E	0.1313 k	1.483 k	11.303	OK
X-X, +0.60D	0.0 k	1.184 k	No Sliding	OK
X-X, +0.60D+0.70E	0.1750 k	1.184 k	6.763	OK
Z-Z, D Only	0.0 k	1.483 k	No Sliding	OK
Z-Z, +D+0.70E	0.0 k	1.483 k	No Sliding	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Kim-Um Deck.ec6

LIC# : KW-06015393, Build:20.23.08.30 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2023

DESCRIPTION: Cantilevered Column Footing (Primary Suite Deck)

All units k

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Z-Z, +D+0.5250E	0.0 k	1.483 k	No Sliding	OK
Z-Z, +0.60D	0.0 k	1.184 k	No Sliding	OK
Z-Z, +0.60D+0.70E	0.0 k	1.184 k	No Sliding	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.04345	+Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +1.40D	0.04345	-Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +1.20D	0.03725	+Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +1.20D	0.03725	-Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +1.20D+E	0.03725	+Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +1.20D+E	0.03725	-Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +0.90D	0.02793	+Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +0.90D	0.02793	-Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +0.90D+E	0.02793	+Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
X-X, +0.90D+E	0.02793	-Z	Bottom	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +1.40D	0.04345	-X	Bottom	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +1.40D	0.04345	+X	Bottom	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +1.20D	0.03725	-X	Bottom	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +1.20D	0.03725	+X	Bottom	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +1.20D+E	0.1692	-X	Top	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +1.20D+E	0.3146	+X	Bottom	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +0.90D	0.02793	-X	Bottom	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +0.90D	0.02793	+X	Bottom	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +0.90D+E	0.1276	-X	Top	0.2160	AsMin	0.2462	7.433	OK
Z-Z, +0.90D+E	0.380	+X	Bottom	0.2160	AsMin	0.2462	7.433	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.44 psi	0.44 psi	0.44 psi	0.44 psi	0.44 psi	75.00 psi	0.01	OK
+1.20D	0.38 psi	0.38 psi	0.38 psi	0.38 psi	0.38 psi	75.00 psi	0.01	OK
+1.20D+E	1.71 psi	3.41 psi	0.38 psi	0.38 psi	3.41 psi	75.00 psi	0.05	OK
+0.90D	0.28 psi	0.28 psi	0.28 psi	0.28 psi	0.28 psi	75.00 psi	0.00	OK
+0.90D+E	1.29 psi	4.30 psi	0.28 psi	0.28 psi	4.30 psi	75.00 psi	0.06	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	1.07 psi	150.00 psi	0.007101	OK
+1.20D	0.91 psi	150.00 psi	0.006086	OK
+1.20D+E	1.13 psi	150.00 psi	0.0075	OK
+0.90D	0.68 psi	150.00 psi	0.004565	OK
+0.90D+E	1.32 psi	150.00 psi	0.00883	OK