Iridium AE
P: (801) 974-5101
F: (801) 974-5102
A: 635 W 5300 S STE 203
MURRAY, UT 84123

IRIDIUM REP: ALG
DATE: 8/2/2017
PROJECT #: 17-244
CLIENT: UPWALL DESIGN ARCH

PROJECT NAME: HOLLIS RESIDENCE
PROJECT LOCATION: 8452 E SPRING PARK
WEBER COUNTY, UT

DESIGN CRITERIA

1 GOVERNING CODE: 2015 IBC

2 ROOF LOADING

2.1	ROOF DEAD LOAD W/ HEAVY TILE	27	PSF
2.2	ROOF LIVE LOAD	20	PSF
2.3	ROOF SNOW LOAD		
	GROUND SNOW LOAD, P_g	243	PSF
	FLAT ROOF SNOW LOAD, P_f	170	PSF
	SNOW EXPOSURE FACTOR, C_s	1.0	
	THERMAL FACTOR, C_t	1.0	
	IMPORTANCE FACTOR, I	1.0	

UTAH SNOW LOAD CALCULATION
COUNTY: WEBER
A = 8.6
P_o = 43
S = 63
A_o = 4.5

3 FLOOR LOADING

3.1	FLOOR DEAD LOAD W/ 1-1/2" L.W. CON	24	PSF
3.2	FLOOR LIVE LOAD	40	PSF

4 DECK LOADING

4.1	DECK DEAD W/ 4" L.W. CONC	42	PSF
4.2	DECK LIVE LOAD	60	PSF

5 WALL WEIGHTS

5.1	EXTERIOR WALL DEAD LOAD	17	PSF

6 SEISMIC PARAMETERS

6.1	SEISMIC RISK CATEGORY	II	
6.2	SEISMIC DESIGN CATEGORY	D0	
6.3	IMPORTANCE FACTOR, I	1.0	
6.4	SNOW USED AS SEISMIC WT., W_S	34.0	PSF
6.5	ANALYSIS PROCEDURE USED	EQUIV. LATERAL FORCE	
6.6	SPECTRAL RESPONSE ACCELERATIONS		
	SHORT PERIOD, S_s	0.863	
	ONE-SEC PERIOD, S_1	0.288	
	SHORT PERIOD SITE COEF., F_a	1.00	
	LONG PERIOD SITE COEF., F_v	1.50	
	SHORT PERIOD ACCEL., S_{DS}	0.664	
	ONE SEC PERIOD ACCEL., S_{D1}	0.351	
6.7	SEISMIC FORCE RESISTING SYSTEM	LIGHT-FRAME (WOOD)	
	RESPONSE MOD. COEF., R	6.5	
	DEFLECTION AMP. FACTOR, C_d	4.0	
	OVERSTRENGTH FACTOR, Ω_0	3.0	
	DESIGN BASE SHEAR, V	0.102	*W (FROM ASCE 12.8-2)

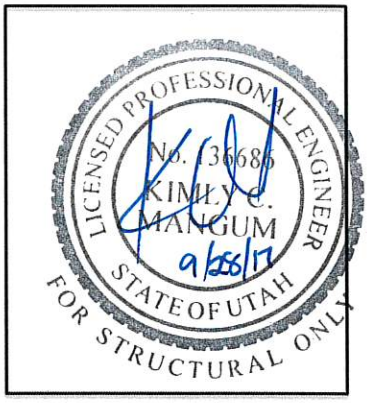
7 WIND PARAMETERS

7.1	ULTIMATE DESIGN WIND SPEED, V_{ult}	115	MPH
7.2	WIND RISK CATEGORY	II	
7.3	WIND EXPOSURE	C	
7.4	INTERNAL PRESSURE COEFFICIENT	0.18	
7.5	COMPONENTS & CLADDING PRESSUR	16	PSF

8 SOILS CRITERIA

8.1	SOIL BEARING PRESSURE	2,500	PSF
8.2	SOIL SITE CLASS	D	
8.3	FROST DEPTH	40	INCHES
8.4	GEOTECH STUDY USED	YES	IGES Project No. 02347-001

THIS SHEET MUST BE WET STAMPED, INITIALED AND DATED TO BE VALID FOR OBTAINING A BUILDING PERMIT. REGISTERING (REUSE) OF THESE CALCULATIONS, DESIGN OR ASSOCIATED PLANS IS PROHIBITED.



THIS ENGINEERING CALCULATION PACKET AND STAMP VALID FOR 180 DAYS FROM THE DATE ON THE STAMP. AFTER THIS 180 DAY PERIOD, ADDITIONAL REVIEW AND NEWLY SIGNED WET STAMP WILL BE REQUIRED.

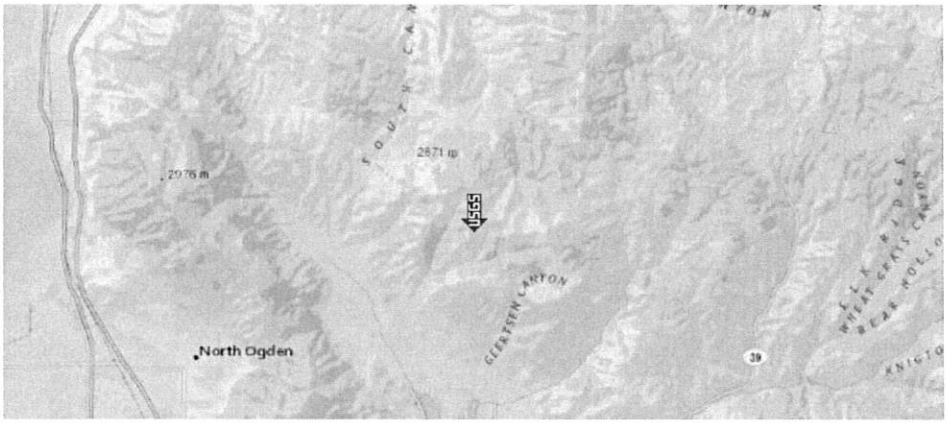
PROJECT NUMBER
17-244

USGS Design Maps Summary Report

View Detailed Report Print

User-Specified Input

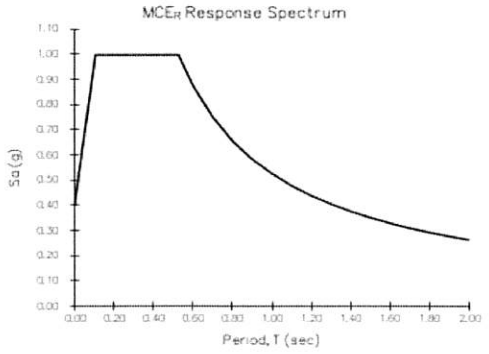
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	41.38°N, 111.79°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

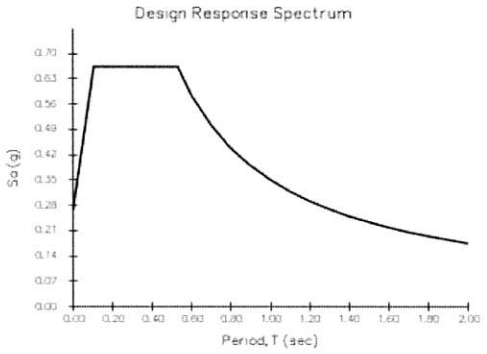


USGS-Provided Output

S_S =	0.863 g	S_{MS} =	0.997 g	S_{DS} =	0.664 g
S_1 =	0.288 g	S_{M1} =	0.526 g	S_{D1} =	0.351 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





STRUCTURAL MEMBERS DESIGN VALUES

	F_b (PSI)	F_v (PSI)	$F_{c\perp}$ (PSI)	E (PSI)
SELECT STRUCTURAL	1,350	180	625	1.90E+06
SPF#1	900	125	425	1.30E+06
DF#1 & BTR	1,150	180	625	1.80E+06
DF#2	850	180	625	1.60E+06
DF#2 ROUND	850	180	625	1.60E+06
LVL (1.9E)	2,600	285	750	1.90E+06
PSL (2.0E)	2,900	290	750	2.00E+06
GLB	2,400	265	650	1.80E+06
ASTM A-992 STEEL	33,000	20,000	N/A	2.90E+07

DEAD LOADS

REVISED 2017-09-26 BY GEJ

ROOF		
SHINGLES	6.00	PSF
SHEATHING (7/16")	1.70	PSF
INSULATION (.1 X 12)	1.20	PSF
JOISTS, TRUSSES & BEAMS	3.00	PSF
SHT ROCK (5/8")	2.75	PSF
BALLAST	12.00	PSF
TOTAL	26.65	PSF
USE	**27**	**PSF**

FLOOR		
HARDWOOD/CARPET	4.00	PSF
SHEATHING (3/4")	2.20	PSF
JOISTS & BEAMS	3.00	PSF
SHT ROCK (5/8")	2.75	PSF
1-1/2" L.W. CONC	12.00	PSF
TOTAL	23.95	PSF
USE	**24**	**PSF**

DECK		
1-1/2" SOFTWOOD DECKING	4.60	PSF
JOISTS & BEAMS	5.00	PSF
4" L.W. CONC	32.00	PSF
TOTAL	41.60	PSF
USE	**42**	**PSF**

EXTERIOR WALLS		
SHT ROCK (5/8")	2.75	PSF
INSULATION (.1 X 5.5)	0.55	PSF
STUDS	1.70	PSF
SHEATHING (7/16")	1.40	PSF
SIDING OR STUCCO	10.00	PSF
TOTAL	16.40	PSF
USE	**17**	**PSF**

FLOOR BEAMS

BEAM WITH POINT LOAD

LOCATION: GARAGE MAN DOOR

FB - 21

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 4.5

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	26.0	0.0	832	520
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**832**	**520**

POINT LOAD

FROM FB12

TL = 20663 LBS

LL = 17616 LBS

LOCATION (a) = 2.8 FT

b = L-a = 1.7 FT (a > b)

EQUIV. UNIFORM TL = 8635 PLF

EQUIV. UNIFORM LL = 7361 PLF

REACTIONS

LIGHT SIDE (TL) =	9678	LBS
(LL) =	7825	LBS
(DL) =	1853	LBS
HEAVY SIDE (TL) =	14729	LBS
(LL) =	12131	LBS
(DL) =	2598	LBS
Rrt/wTL =	11.6	FT
x' =	2.8	FT

MAXIMUM MOMENT

M_{MAX} = 23.838 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE: 4X4X1/4 HSS COL

HEIGHT (FT): 9

SPOT FOOTING: Y 1.98 FT. SQR

HEAVY SIDE: 4X4X1/4 HSS COL

HEIGHT (FT): 9

SPOT FOOTING: Y 2.44 FT. SQR

MAX SUPPORT LOAD

59400 LBS

59400 LBS

STEEL BEAM - W/POINT LOAD

DEPTH = 8.11 IN.

WIDTH = 4.01 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 4.44 IN(2)

S = 11.80 IN(3)

I = 48.00 IN(4)

δ_{MAX} @ 2.4 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.01 IN. L 7817

LL δ_{MAX} = 0.00 IN. L 12912

$A_{REQ.}$ = 1.10 IN(2)

$S_{REQ.}$ = 8.67 IN(3)

I_{REQ}(TL) = 10.77 IN(4)

I_{REQ}(LL) = 13.37 IN(4)

RE

-21 **USE** W8X15

SAFETY FACTOR = 1.36

SIMPLE SPAN BEAM

LOCATION: DECK

FB - 20

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 14.5

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	15.0	0.0	765	450
OTHER	0.0	0.0	0	0
		TOTAL	**765**	**450**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 7.3 FT

b = L-a = 7.3 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 5546 LBS

(LL) = 3263 LBS

(DL) = 2284 LBS

HEAVY SIDE (TL) = 5546 LBS

(LL) = 3263 LBS

(DL) = 2284 LBS

Rrt/wTL = 7.3 FT

x' = 7.3 FT

MAXIMUM MOMENT

M_{MAX} = 20,105 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE: NA POST

HEIGHT (FT): 8

SPOT FOOTING: NR

HEAVY SIDE: 4X4X1/4 HSS COL

HEIGHT (FT): 8

SPOT FOOTING: NR

MAX SUPPORT LOAD

63810 LBS

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. = 11 7/8 IN.

WIDTH (b)est. = 1 3/4 IN.

OF MEMBERS = 4

Fb = 2,600 PSI

Fv = 285 PSI

E = 1.90E+06 PSI

CF = 1.00

A = 83.13 IN(2)

S = 164.52 IN(3)

I = 976.83 IN(4)

δ_{MAX} @ 7.3 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.41 IN. L/ 424

LL δ_{MAX} = 0.24 IN. L/ 722

$A_{REQ.}$ = 25.21 IN(2)

$S_{REQ.}$ = 92.79 IN(3)

I_{REQ}(TL) = 552.36 IN(4)

I_{REQ}(LL) = 487.38 IN(4)

$BRG_{REQ.}$ = 3 IN.

-20 USE (4) 1-3/4" X 11-7/8" LVL(S)

SAFETY FACTOR = 1.77

BEAM WITH MULTIPLE POINT LOADS

LOCATION: DECK -- SEE STRUCALC

FB - 19

-19 **USE** W12X190

BEAM WITH MULTIPLE POINT LOADS

LOCATION: DECK -- SEE STRUCALC

FB - 18

-18 **USE** W10X88

BEAM WITH MULTIPLE POINT LOADS

LOCATION: DECK -- SEE STRUCALC

FB - 17

-17 **USE** (2) 1-3/4" X 11-7/8" LVL(S)

BEAM WITH MULTIPLE POINT LOADS

LOCATION: MSTR SUITE -- SEE STRUCALC

FB - 16

-16 **USE** W10X39

Project: 17-244 HOLLIS CALCS

Location: FB19
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W12x190 x 30.0 FT
Section Adequate By: 22.7%
Controlling Factor: Deflection

StruCalc Version 10.0.1.6 9/28/2017 11:01:18 AM

DEFLECTIONS	Center	
Live Load	0.81	IN L/442
Dead Load	0.21	in
Total Load	1.02	IN L/352

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

REACTIONS	A		B	
Live Load	21575	lb	24658	lb
Dead Load	6694	lb	7244	lb
Total Load	28269	lb	31902	lb
Bearing Length	2.33	in	2.33	in

BEAM DATA	Center	
Span Length	30	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	30	ft

STEEL PROPERTIES
W12x190 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	14.4	in
Web Thickness:	tw =	1.06	in
Flange Width:	bf =	12.7	in
Flange Thickness:	tf =	1.74	in
Distance to Web Toe of Fillet:	k =	2.33	in
Moment of Inertia About X-X Axis:	Ix =	1890	in4
Section Modulus About X-X Axis:	Sx =	263	in3
Plastic Section Modulus About X-X Axis:	Zx =	311	in3

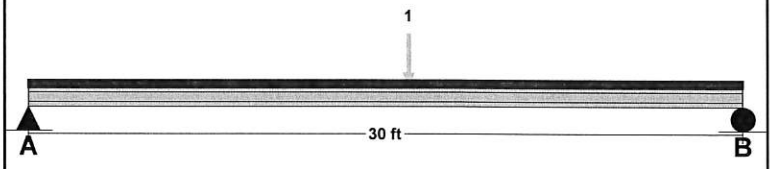
Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	3.65	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	9.19	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	11.48	ft
Nominal Flexural Strength w/ safety factor:	Mn =	775948	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	9.19	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	305280	lb

Controlling Moment: 425473 ft-lb
15.9 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -31901 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	1540.15 in4	1890 in4
Moment:	425473 ft-lb	775948 ft-lb
Shear:	-31901 lb	305280 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	0	plf
Uniform Dead Load	0	plf
Beam Self Weight	190	plf
Total Uniform Load	190	plf

POINT LOADS - CENTER SPAN

Load Number	One *
Live Load	46233 lb
Dead Load	8238 lb
Location	16 ft

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

Project: 17-244 HOLLIS CALCS

Location: FB18
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W10x88 x 17.5 FT (3 + 14.5)
Section Adequate By: 4.6%
Controlling Factor: Deflection

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DEFLECTIONS	Left		Center	
Live Load	0.19	IN 2L/376	-0.15	IN L/1180
Dead Load	0.01	in	0.01	in
Total Load	0.20	IN 2L/358	-0.14	IN L/1212

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

REACTIONS	A		B	
Live Load	46233	lb	15412	lb
Dead Load	8238	lb	2436	lb
Total Load	54471	lb	17848	lb
Uplift (1.5 F.S)	0	**lb**	**-5136**	**lb**
Bearing Length	1.49	in	1.49	in

BEAM DATA	Left		Center	
Span Length	3	ft	14.5	ft
Unbraced Length-Top	0	ft	0	ft
Unbraced Length-Bottom	3	ft	14.5	ft

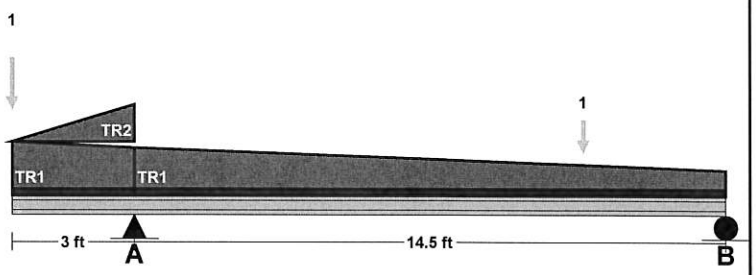
STEEL PROPERTIES
W10x88 - A992-50

Properties:			
Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	10.8	in
Web Thickness:	tw =	0.61	in
Flange Width:	bf =	10.3	in
Flange Thickness:	tf =	0.99	in
Distance to Web Toe of Fillet:	k =	1.49	in
Moment of Inertia About X-X Axis:	Ix =	534	in4
Section Modulus About X-X Axis:	Sx =	98.5	in3
Plastic Section Modulus About X-X Axis:	Zx =	113	in3
Design Properties per AISC 14th Edition Steel Manual:			
Flange Buckling Ratio:	FBR =	5.2	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	12.93	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	14.5	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	9.29	ft
for Eqn. F2-2:	Lr =	51.13	ft
Nominal Flexural Strength w/ safety factor:	Mn =	268251	ft-lb
Controlling Equation:	F2-2		
Web height to thickness ratio:	h/tw =	12.93	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	130680	lb

Controlling Moment: -111531 ft-lb
Over left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 1, 2
Controlling Shear: -38421 lb
At right support of span 1 (Left Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	510.59 in4	534 in4
Moment:	-111531 ft-lb	268251 ft-lb
Shear:	-38421 lb	130680 lb

LOADING DIAGRAM



UNIFORM LOADS	Left		Center	
Uniform Live Load	0	plf	0	plf
Uniform Dead Load	0	plf	0	plf
Beam Self Weight	88	plf	88	plf
Total Uniform Load	88	plf	88	plf

POINT LOADS - LEFT SPAN

Load Number	One *
Live Load	32092 lb
Dead Load	4013 lb
Location	0 ft

CENTER SPAN

Load Number	One *
Live Load	18850 lb
Dead Load	2719 lb
Location	11 ft

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

TRAPEZOIDAL LOADS - LEFT SPAN

Load Number	One	Two
Left Live Load	320 plf	0 plf
Left Dead Load	192 plf	0 plf
Right Live Load	280 plf	240 plf
Right Dead Load	168 plf	168 plf
Load Start	0 ft	0 ft
Load End	3 ft	3 ft
Load Length	3 ft	3 ft

CENTER SPAN

Load Number	One
Left Live Load	280 plf
Left Dead Load	168 plf
Right Live Load	90 plf
Right Dead Load	54 plf
Load Start	0 ft
Load End	14.5 ft
Load Length	14.5 ft

Project: 17-244 HOLLIS CALCS

Location: FB-17
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W12x136 x 29.0 FT
Section Adequate By: 53.2%
Controlling Factor: Deflection

StruCalc Version 10.0.1.6 9/28/2017 11:01:16 AM

DEFLECTIONS	Center	
Live Load	0.47	IN L/735
Dead Load	0.14	in
Total Load	0.61	IN L/571

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

REACTIONS	A		B	
Live Load	12683	lb	10230	lb
Dead Load	4021	lb	3624	lb
Total Load	16704	lb	13854	lb
Bearing Length	1.85	in	1.85	in

BEAM DATA	Center	
Span Length	29	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	29	ft

STEEL PROPERTIES
W12x136 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	13.4	in
Web Thickness:	tw =	0.79	in
Flange Width:	bf =	12.4	in
Flange Thickness:	tf =	1.25	in
Distance to Web Toe of Fillet:	k =	1.85	in
Moment of Inertia About X-X Axis:	Ix =	1240	in4
Section Modulus About X-X Axis:	Sx =	186	in3
Plastic Section Modulus About X-X Axis:	Zx =	214	in3

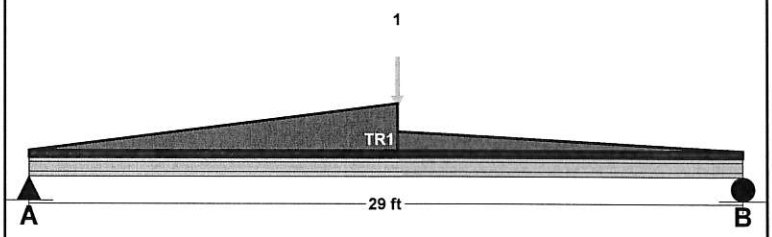
Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	4.96	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	12.28	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	11.16	ft
Nominal Flexural Strength w/ safety factor:	Mn =	533932	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	12.28	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	211720	lb

Controlling Moment: 156292 ft-lb
14.5 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 16703 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	809.35 in4	1240 in4
Moment:	156292 ft-lb	533932 ft-lb
Shear:	16703 lb	211720 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	0	plf
Uniform Dead Load	0	plf
Beam Self Weight	136	plf
Total Uniform Load	136	plf

POINT LOADS - CENTER SPAN		
Load Number	One	
Live Load	4713	lb
Dead Load	761	lb
Location	15	ft

TRAPEZOIDAL LOADS - CENTER SPAN		
Load Number	One	Two
Left Live Load	0 plf	650 plf
Left Dead Load	0 plf	105 plf
Right Live Load	1820 plf	0 plf
Right Dead Load	294 plf	0 plf
Load Start	0 ft	15 ft
Load End	15 ft	29 ft
Load Length	15 ft	14 ft

Project: 17-244 HOLLIS CALCS

Location: FB17 - CHECK
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
(2) 1.75 IN x 11.875 IN x 15.0 FT
1.9E Microllam - iLevel Trus Joist
Section Adequate By: 14.3%
Controlling Factor: Deflection

StruCalc Version 10.0.1.6 9/28/2017 11:01:16 AM

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

DEFLECTIONS	Center
Live Load	0.44 IN L/411
Dead Load	0.02 in
Total Load	0.45 IN L/397

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

REACTIONS	A	B
Live Load	1618 lb	3121 lb
Dead Load	97 lb	97 lb
Total Load	1715 lb	3218 lb
Bearing Length	0.65 in	1.23 in

BEAM DATA	Center
Span Length	15 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	15 ft
Live Load Duration Factor	1.00
Notch Depth	0.00

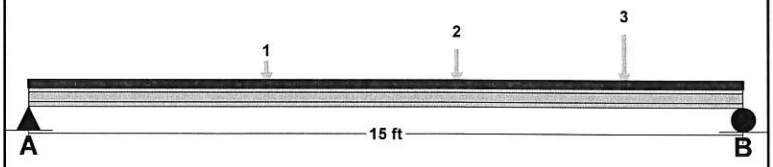
MATERIAL PROPERTIES
1.9E Microllam - iLevel Trus Joist

	Base Values	Adjusted
Bending Stress:	Fb = 2600 psi	Fb' = 2604 psi
	Cd=1.00 CF=1.00	
Shear Stress:	Fv = 285 psi	Fv' = 285 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1900 ksi	E' = 1900 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 750 psi	Fc - ⊥' = 750 psi

Controlling Moment: 11116 ft-lb
9.0 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -3218 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	51.23 in3	82.26 in3
Area (Shear):	16.94 in2	41.56 in2
Moment of Inertia (deflection):	427.47 in4	488.41 in4
Moment:	11116 ft-lb	17848 ft-lb
Shear:	-3218 lb	7897 lb

LOADING DIAGRAM



UNIFORM LOADS	Center
Uniform Live Load	0 plf
Uniform Dead Load	0 plf
Beam Self Weight	13 plf
Total Uniform Load	13 plf

POINT LOADS - CENTER SPAN

Load Number	One	Two	Three
Live Load	948 lb	1516.2 lb	2274.3 lb
Dead Load	0 lb	0 lb	0 lb
Location	5 ft	9 ft	12.5 ft

Project: 17-244 HOLLIS CALCS

Location: FB17 - CHECK 2
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
(2) 1.75 IN x 11.875 IN x 13.5 FT
1.9E Microllam - iLevel Trus Joist
Section Adequate By: 83.7%
Controlling Factor: Deflection

StruCalc Version 10.0.1.6 9/28/2017 11:01:17 AM

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

DEFLECTIONS	Center	
Live Load	0.25	IN L/661
Dead Load	0.05	in
Total Load	0.30	IN L/544

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

REACTIONS	A	B
Live Load	2734 lb	1367 lb
Dead Load	560 lb	324 lb
Total Load	3294 lb	1691 lb
Bearing Length	1.25 in	0.64 in

BEAM DATA	Center
Span Length	13.5 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	13.5 ft
Live Load Duration Factor	1.00
Notch Depth	0.00

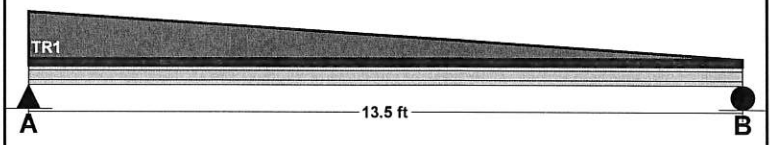
MATERIAL PROPERTIES
1.9E Microllam - iLevel Trus Joist

	Base Values	Adjusted
Bending Stress:	Fb = 2600 psi	Fb' = 2604 psi
	Cd=1.00 CF=1.00	
Shear Stress:	Fv = 285 psi	Fv' = 285 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1900 ksi	E' = 1900 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 750 psi	Fc - ⊥' = 750 psi

Controlling Moment: 8618 ft-lb
5.81 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 3294 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	39.72 in3	82.26 in3
Area (Shear):	17.34 in2	41.56 in2
Moment of Inertia (deflection):	265.94 in4	488.41 in4
Moment:	8618 ft-lb	17848 ft-lb
Shear:	3294 lb	7897 lb

LOADING DIAGRAM



UNIFORM LOADS	Center
Uniform Live Load	0 plf
Uniform Dead Load	0 plf
Beam Self Weight	13 plf
Total Uniform Load	13 plf

TRAPEZOIDAL LOADS - CENTER SPAN	
Load Number	One
Left Live Load	607.5 plf
Left Dead Load	105 plf
Right Live Load	0 plf
Right Dead Load	0 plf
Load Start	0 ft
Load End	13.5 ft
Load Length	13.5 ft

Project: 17-244 HOLLIS CALCS

Location: FB-16
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W10x39 x 16.0 FT
Section Adequate By: 28.0%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.31	IN L/614
Dead Load	0.04	in
Total Load	0.35	IN L/544

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

REACTIONS	A		B	
Live Load	14314	lb	14314	lb
Dead Load	1664	lb	1664	lb
Total Load	15978	lb	15978	lb
Bearing Length	1.03	in	1.03	in

BEAM DATA	Center	
Span Length	16	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	16	ft

STEEL PROPERTIES
W10x39 - A992-50

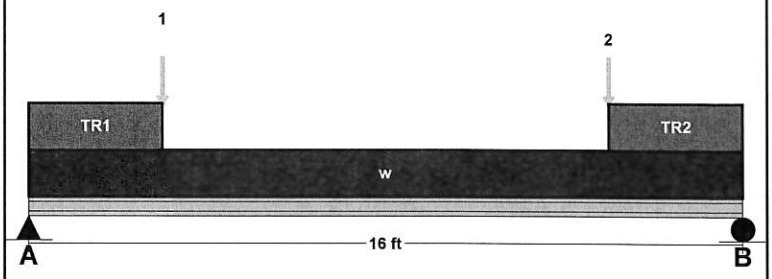
Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	9.92	in
Web Thickness:	tw =	0.32	in
Flange Width:	bf =	7.99	in
Flange Thickness:	tf =	0.53	in
Distance to Web Toe of Fillet:	k =	1.03	in
Moment of Inertia About X-X Axis:	Ix =	209	in4
Section Modulus About X-X Axis:	Sx =	42.1	in3
Plastic Section Modulus About X-X Axis:	Zx =	46.8	in3
Design Properties per AISC 14th Edition Steel Manual:			
Flange Buckling Ratio:	FBR =	7.54	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	24.95	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	6.99	ft
Nominal Flexural Strength w/ safety factor:	Mn =	116767	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	24.95	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	62496	lb

Controlling Moment: 40807 ft-lb
8.0 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 15978 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	163.27 in4	209 in4
Moment:	40807 ft-lb	116767 ft-lb
Shear:	15978 lb	62496 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	40	plf
Uniform Dead Load	24	plf
Beam Self Weight	39	plf
Total Uniform Load	103	plf

POINT LOADS - CENTER SPAN		
Load Number	One	Two
Live Load	9107 lb	9107 lb
Dead Load	755 lb	755 lb
Location	3 ft	13 ft

TRAPEZOIDAL LOADS - CENTER SPAN		
Load Number	One	Two
Left Live Load	1629 plf	1629 plf
Left Dead Load	135 plf	135 plf
Right Live Load	1629 plf	1629 plf
Right Dead Load	135 plf	135 plf
Load Start	0 ft	13 ft
Load End	3 ft	16 ft
Load Length	3 ft	3 ft

SIMPLE SPAN BEAM

LOCATION: GARAGE HDR

FB - 15

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 18.5

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	11.0	0.0	352	220
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**352**	**220**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	285	PSF
	LL	243	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 9.3 FT

b = L-a = 9.3 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 3256 LBS

(LL) = 2035 LBS

(DL) = 1221 LBS

HEAVY SIDE (TL) = 3256 LBS

(LL) = 2035 LBS

(DL) = 1221 LBS

Rrt/wTL = 9.3 FT

x' = 9.3 FT

MAXIMUM MOMENT

M_{MAX} = 15,059 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT — **MAX SUPPORT LOAD**

LIGHT SIDE: 3 2X6 STUDS 7860 LBS

HEIGHT (FT): 10

SPOT FOOTING: N

HEAVY SIDE: 3 2X6 STUDS 7860 LBS

HEIGHT (FT): 10

SPOT FOOTING: N

STEEL BEAM

DEPTH = 10.10 IN.

WIDTH = 4.01 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 4.99 IN(2)

S = 16.20 IN(3)

I = 81.90 IN(4)

δ_{MAX} @ 9.3 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.39 IN. L 568

LL δ_{MAX} = 0.24 IN. L 909

$A_{REQ.}$ = 0.24 IN(2)

$S_{REQ.}$ = 5.48 IN(3)

I_{REQ}(TL) = 34.58 IN(4)

I_{REQ}(LL) = 32.42 IN(4)

-15 **USE** **W10X17**

SAFETY FACTOR = 2.37

BEAM WITH MULTIPLE POINT LOADS

LOCATION: GARAGE -- SEE STRUCALC

FB - 14

-14 **USE** **W10X45**

Project: 17-244 HOLLIS CALCS

Location: FB-14
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W10x45 x 21.0 FT
Section Adequate By: 17.8%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.45	IN L/565
Dead Load	0.10	in
Total Load	0.55	IN L/461

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

REACTIONS	A	B
Live Load	3469 lb	18717 lb
Dead Load	1154 lb	3304 lb
Total Load	4623 lb	22021 lb
Bearing Length	1.12 in	1.12 in

BEAM DATA	Center
Span Length	21 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	21 ft

STEEL PROPERTIES
W10x45 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	10.1	in
Web Thickness:	tw =	0.35	in
Flange Width:	bf =	8.02	in
Flange Thickness:	tf =	0.62	in
Distance to Web Toe of Fillet:	k =	1.12	in
Moment of Inertia About X-X Axis:	Ix =	248	in4
Section Modulus About X-X Axis:	Sx =	49.1	in3
Plastic Section Modulus About X-X Axis:	Zx =	54.9	in3

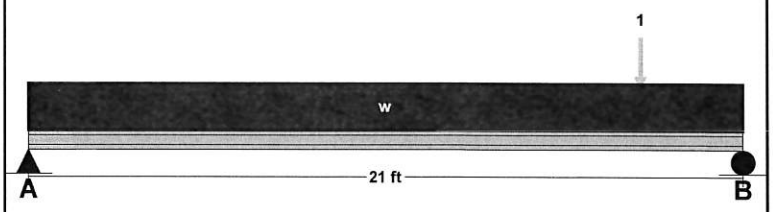
Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	6.47	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	22.46	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	7.1	ft
Nominal Flexural Strength w/ safety factor:	Mn =	136976	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	22.46	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	70700	lb

Controlling Moment: 65170 ft-lb
17.85 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -22020 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	210.54 in4	248 in4
Moment:	65170 ft-lb	136976 ft-lb
Shear:	-22020 lb	70700 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	40	plf
Uniform Dead Load	24	plf
Beam Self Weight	45	plf
Total Uniform Load	109	plf

POINT LOADS - CENTER SPAN		
Load Number	One	Two
Live Load	8150 lb	13196 lb
Dead Load	1845 lb	1164 lb
Location	18 ft	18 ft

Project: 17-244 HOLLIS CALCS

Location: FB-14 OPT
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W10x68 x 13.5 FT
Section Adequate By: 12.1%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.30	IN L/538
Dead Load	0.05	in
Total Load	0.35	IN L/464

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

REACTIONS	A	B
Live Load	30421 lb	19739 lb
Dead Load	4950 lb	3711 lb
Total Load	35371 lb	23450 lb
Bearing Length	1.27 in	1.27 in

BEAM DATA	Center
Span Length	13.5 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	13.5 ft

STEEL PROPERTIES
W10x68 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	10.4	in
Web Thickness:	tw =	0.47	in
Flange Width:	bf =	10.1	in
Flange Thickness:	tf =	0.77	in
Distance to Web Toe of Fillet:	k =	1.27	in
Moment of Inertia About X-X Axis:	Ix =	394	in4
Section Modulus About X-X Axis:	Sx =	75.7	in3
Plastic Section Modulus About X-X Axis:	Zx =	85.3	in3

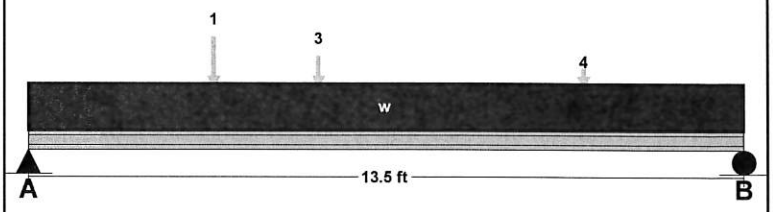
Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	6.56	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	16.72	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	9.15	ft
Nominal Flexural Strength w/ safety factor:	Mn =	212824	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	16.72	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	97760	lb

Controlling Moment: 132966 ft-lb
5.53 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 35371 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	351.59 in4	394 in4
Moment:	132966 ft-lb	212824 ft-lb
Shear:	35371 lb	97760 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	40	plf
Uniform Dead Load	24	plf
Beam Self Weight	68	plf
Total Uniform Load	132	plf

POINT LOADS - CENTER SPAN

Load Number	One	Three	Four
Live Load	25415 lb	16055 lb	8150 lb
Dead Load	4157 lb	1417 lb	1845 lb
Location	3.5 ft	5.5 ft	10.5 ft

SIMPLE SPAN BEAM

LOCATION: GARAGE

FB - 13

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 10.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	14.0	0.0	1379	1190
FLOOR	22.0	0.0	704	440
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**2083**	**1630**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 5.0 FT

b = L-a = 5.0 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 10415 LBS

(LL) = 8150 LBS

(DL) = 2265 LBS

HEAVY SIDE (TL) = 10415 LBS

(LL) = 8150 LBS

(DL) = 2265 LBS

Rrt/wTL = 5.0 FT

x' = 5.0 FT

MAXIMUM MOMENT

M_{MAX} = 26,038 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE: NA POST

HEIGHT (FT): 8

SPOT FOOTING: NR

HEAVY SIDE: NA POST

HEIGHT (FT): 8

SPOT FOOTING: NR

MAX SUPPORT LOAD

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. = 11 7/8 IN.

WIDTH (b)est. = 1 3/4 IN.

OF MEMBERS = 4

Fb = 2,600 PSI

Fv = 285 PSI

E = 1.90E+06 PSI

CF = 1.00

A = 83.13 IN(2)

S = 164.52 IN(3)

I = 976.83 IN(4)

δ_{MAX} @ 5.0 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.25 IN. L/ 475

LL δ_{MAX} = 0.20 IN. L/ 607

$A_{REQ.}$ = 43.97 IN(2)

$S_{REQ.}$ = 120.17 IN(3)

I_{REQ}(TL) = 493.34 IN(4)

I_{REQ}(LL) = 579.08 IN(4)

$BRG_{REQ.}$ = 3 IN.

-13 **USE** **(4) 1-3/4" X 11-7/8" LVL(S)**

SAFETY FACTOR = 1.37

BEAM WITH POINT LOAD

LOCATION: GARAGE

FB - 12

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 21.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	2.7	0.0	86	54
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**86**	**54**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM AMS ABOVE

TL = 23049 LBS

LL = 19890 LBS

LOCATION (a) = 18.0 FT

b = L-a = 3.0 FT (a > b)

EQUIV. UNIFORM TL = 1075 PLF

EQUIV. UNIFORM LL = 928 PLF

REACTIONS

LIGHT SIDE (TL) = 4200 LBS

(LL) = 3408 LBS

(DL) = 791 LBS

HEAVY SIDE (TL) = 20663 LBS

(LL) = 17616 LBS

(DL) = 3048 LBS

Rrt/wTL = 48.6 FT

x' = 18.0 FT

MAXIMUM MOMENT

M_{MAX} = 61,602 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE: NA POST

HEIGHT (FT): 10

SPOT FOOTING: Y 1.32

HEAVY SIDE: NA POST

HEIGHT (FT): 10

SPOT FOOTING: Y 2.89 FT. SQR

MAX SUPPORT LOAD

STEEL BEAM - W/POINT LOAD

DEPTH = 10.10 IN.

WIDTH = 8.02 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 13.30 IN(2)

S = 49.10 IN(3)

I = 248.00 IN(4)

δ_{MAX} @ 11.9 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.05 IN. L 4605

LL δ_{MAX} = 0.03 IN. L 7621

$A_{REQ.}$ = 1.55 IN(2)

$S_{REQ.}$ = 22.40 IN(3)

I_{REQ}(TL) = 120.05 IN(4)

I_{REQ}(LL) = 150.96 IN(4)

-12 **USE** **W10X45**

SAFETY FACTOR = 1.64

BEAM WITH MULTIPLE POINT LOADS

LOCATION: DECK -- SEE STRUCALC

FB - 11

-11 **USE** **W12X136**

Project: 17-244 HOLLIS CALCS

Location: FB11
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W12x136 x 19.0 FT (5 + 14)
Section Adequate By: 20.4%
Controlling Factor: Deflection

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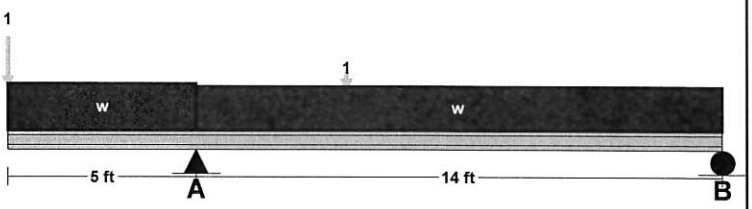
DEFLECTIONS	Left		Center	
Live Load	0.28	IN 2L/434	-0.11	IN L/1516
Dead Load	0.06	in	-0.02	in
Total Load	0.34	IN 2L/352	-0.13	IN L/1305

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

REACTIONS	A		B	
Live Load	73349	lb	14748	lb
Dead Load	20890	lb	-206	lb
Total Load	94239	lb	14542	lb
Uplift (1.5 F.S)	0	**lb**	**-13308**	**lb**
Bearing Length	1.85	in	1.85	in

BEAM DATA	Left		Center	
Span Length	5	ft	14	ft
Unbraced Length-Top	0	ft	0	ft
Unbraced Length-Bottom	5	ft	14	ft

LOADING DIAGRAM



STEEL PROPERTIES
W12x136 - A992-50

UNIFORM LOADS	Left		Center	
Uniform Live Load	1820	plf	1701	plf
Uniform Dead Load	294	plf	294	plf
Beam Self Weight	136	plf	136	plf
Total Uniform Load	2250	plf	2131	plf

POINT LOADS - LEFT SPAN

Load Number	One *	Two *
Live Load	5855 lb	26282 lb
Dead Load	657 lb	9310 lb
Location	0 ft	0 ft

CENTER SPAN

Load Number	One
Live Load	9943 lb
Dead Load	2547 lb
Location	4 ft

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

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	13.4	in
Web Thickness:	tw =	0.79	in
Flange Width:	bf =	12.4	in
Flange Thickness:	tf =	1.25	in
Distance to Web Toe of Fillet:	k =	1.85	in
Moment of Inertia About X-X Axis:	Ix =	1240	in4
Section Modulus About X-X Axis:	Sx =	186	in3
Plastic Section Modulus About X-X Axis:	Zx =	214	in3
Design Properties per AISC 14th Edition Steel Manual:			
Flange Buckling Ratio:	FBR =	4.96	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	12.28	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	14	ft
Limiting Unbraced Length -			
for lateral-torsional buckling:	Lp =	11.16	ft
for Eqn. F2-2:	Lr =	63.17	ft
Nominal Flexural Strength w/ safety factor:	Mn =	522521	ft-lb
Controlling Equation:	F2-2		
Web height to thickness ratio:	h/tw =	12.28	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	211720	lb

Controlling Moment: -238645 ft-lb
Over left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 1, 2
Controlling Shear: -53354 lb
At right support of span 1 (Left Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	1029.87 in4	1240 in4
Moment:	-238645 ft-lb	522521 ft-lb
Shear:	-53354 lb	211720 lb

BEAM WITH POINT LOAD

LOCATION: BEDROOM 1

FB - 10

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 13.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	14.0	0.0	714	420
OTHER	0.0	0.0	0	0
		TOTAL	**714**	**420**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM B10, 14, FB4

TL = 34445 LBS

LL = 29724 LBS

LOCATION (a) = 10.0 FT

b = L-a = 3.0 FT (a > b)

EQUIV. UNIFORM TL = 3763 PLF

EQUIV. UNIFORM LL = 3247 PLF

REACTIONS

LIGHT SIDE (TL) = 12590 LBS

(LL) = 9589 LBS

(DL) = 3000 LBS

HEAVY SIDE (TL) = 31137 LBS

(LL) = 25595 LBS

(DL) = 5542 LBS

Rrt/wTL = 17.6 FT

x' = 10.0 FT

MAXIMUM MOMENT

M_{MAX} = 90,198 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE: 6X6 POST

HEIGHT (FT): 10

SPOT FOOTING: Y 2.26 FT. SQR

HEAVY SIDE: 4X4X1/4 HSS COL

HEIGHT (FT): 10

SPOT FOOTING: Y 3.54 FT. SQR

MAX SUPPORT LOAD

18760 LBS

54840 LBS

STEEL BEAM - W/POINT LOAD

DEPTH = 10.10 IN.

WIDTH = 8.02 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 13.30 IN(2)

S = 49.10 IN(3)

I = 248.00 IN(4)

δ_{MAX} @ 7.2 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.08 IN. L 1920

LL δ_{MAX} = 0.04 IN. L 3506

$A_{REQ.}$ = 2.34 IN(2)

$S_{REQ.}$ = 32.80 IN(3)

I_{REQ}(TL) = 118.95 IN(4)

I_{REQ}(LL) = 143.94 IN(4)

-10 **USE** **W10X45**

SAFETY FACTOR = 1.50

SIMPLE SPAN BEAM

LOCATION: BEDROOM 2

FB - 9

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 10.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	14.0	0.0	448	280
FLOOR	0.0	0.0	0	0
DECK	4.0	0.0	204	120
OTHER	0.0	0.0	0	0
		TOTAL	**652**	**400**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 5.0 FT

b = L-a = 5.0 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 3260 LBS

(LL) = 2000 LBS

(DL) = 1260 LBS

HEAVY SIDE (TL) = 3260 LBS

(LL) = 2000 LBS

(DL) = 1260 LBS

Rrt/wTL = 5.0 FT

x' = 5.0 FT

MAXIMUM MOMENT

M_{MAX} = 8,150 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE: 2 2X6 STUDS

HEIGHT (FT): 8

SPOT FOOTING: N

HEAVY SIDE: 2 2X6 STUDS

HEIGHT (FT): 8

SPOT FOOTING: N

MAX SUPPORT LOAD

3800 LBS

3800 LBS

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. = 9 1/2 IN.

WIDTH (b)est. = 1 3/4 IN.

OF MEMBERS = 3

Fb = 2,600 PSI

Fv = 285 PSI

E = 1.90E+06 PSI

CF = 1.00

A = 49.88 IN(2)

S = 78.97 IN(3)

I = 375.10 IN(4)

δ_{MAX} @ 5.0 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.21 IN. L/ 583

LL δ_{MAX} = 0.13 IN. L/ 950

$A_{REQ.}$ = 14.44 IN(2)

$S_{REQ.}$ = 37.62 IN(3)

I_{REQ}(TL) = 154.42 IN(4)

I_{REQ}(LL) = 142.11 IN(4)

$BRG_{REQ.}$ = 3 IN.

3 -9 **USE** **(3) 1-3/4" X 9-1/2" LVL(S)**

SAFETY FACTOR = 2.10

BEAM WITH POINT LOAD

LOCATION: FAMILY ROOM

FB - 8

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 21.5

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	2.7	0.0	86	54
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**86**	**54**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM FB6

TL = 35726 LBS

LL = 29466 LBS

LOCATION (a) = 17.0 FT

b = L-a = 4.5 FT (a > b)

EQUIV. UNIFORM TL = 2200 PLF

EQUIV. UNIFORM LL = 1815 PLF

REACTIONS

LIGHT SIDE (TL) = 8406 LBS

(LL) = 6748 LBS

(DL) = 1659 LBS

HEAVY SIDE (TL) = 29177 LBS

(LL) = 23879 LBS

(DL) = 5298 LBS

Rrt/wTL = 97.3 FT

x' = 17.0 FT

MAXIMUM MOMENT

M_{MAX} = 130,423 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE: NA POST

HEIGHT (FT): 8

SPOT FOOTING: NR

HEAVY SIDE: NA POST

HEIGHT (FT): 8

SPOT FOOTING: NR

MAX SUPPORT LOAD

STEEL BEAM - W/POINT LOAD

DEPTH = 10.80 IN.

WIDTH = 10.30 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 25.90 IN(2)

S = 98.50 IN(3)

I = 534.00 IN(4)

δ_{MAX} @ 12.1 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.03 IN. L 9340

LL δ_{MAX} = 0.02 IN. L 15165

$A_{REQ.}$ = 2.19 IN(2)

$S_{REQ.}$ = 47.43 IN(3)

I_{REQ}(TL) = 260.40 IN(4)

I_{REQ}(LL) = 318.16 IN(4)

3 -8 **USE** **W10X88**

SAFETY FACTOR = 1.68

SIMPLE SPAN BEAM

LOCATION: FAMILY ROOM

FB - 7

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 17.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	22.0	0.0	704	440
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**704**	**440**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 8.5 FT

b = L-a = 8.5 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 5984 LBS

(LL) = 3740 LBS

(DL) = 2244 LBS

HEAVY SIDE (TL) = 5984 LBS

(LL) = 3740 LBS

(DL) = 2244 LBS

Rrt/wTL = 8.5 FT

x' = 8.5 FT

MAXIMUM MOMENT

M_{MAX} = 25,432 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

MAX SUPPORT LOAD

LIGHT SIDE: 4 2X6 STUDS 16100 LBS

HEIGHT (FT): 10

SPOT FOOTING: Y 1.57 FT. SQR

HEAVY SIDE: 4 2X6 STUDS 16100 LBS

HEIGHT (FT): 10

SPOT FOOTING: Y 1.57 FT. SQR

STEEL BEAM

DEPTH = 10.20 IN.

WIDTH = 4.02 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 5.62 IN(2)

S = 18.80 IN(3)

I = 96.30 IN(4)

δ_{MAX} @ 8.5 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.47 IN. L 431

LL δ_{MAX} = 0.30 IN. L 689

$A_{REQ.}$ = 0.45 IN(2)

$S_{REQ.}$ = 9.25 IN(3)

I_{REQ}(TL) = 53.67 IN(4)

I_{REQ}(LL) = 50.32 IN(4)

3-7 **USE** W10X19

SAFETY FACTOR = 1.79

BEAM WITH MULTIPLE POINT LOADS

LOCATION: FAMILY ROOM -- SEE STRUCALC

FB - 6

3-6 **USE** W12X72

BEAM WITH MULTIPLE POINT LOADS

LOCATION: MUD ROOM -- SEE STRUCALC

FB - 5

3-5 **USE** W10X30

Project: 17-244 HOLLIS CALCS

Location: FB-6
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W12x72 x 21.5 FT
Section Adequate By: 13.1%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.48	IN L/543
Dead Load	0.13	in
Total Load	0.61	IN L/425

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

REACTIONS	A		B	
Live Load	11223	lb	29466	lb
Dead Load	4572	lb	5830	lb
Total Load	15795	lb	35296	lb
Bearing Length	1.27	in	1.27	in

BEAM DATA	Center	
Span Length	21.5	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	21.5	ft

STEEL PROPERTIES
W12x72 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	12.3	in
Web Thickness:	tw =	0.43	in
Flange Width:	bf =	12	in
Flange Thickness:	tf =	0.67	in
Distance to Web Toe of Fillet:	k =	1.27	in
Moment of Inertia About X-X Axis:	Ix =	597	in4
Section Modulus About X-X Axis:	Sx =	97.4	in3
Plastic Section Modulus About X-X Axis:	Zx =	108	in3

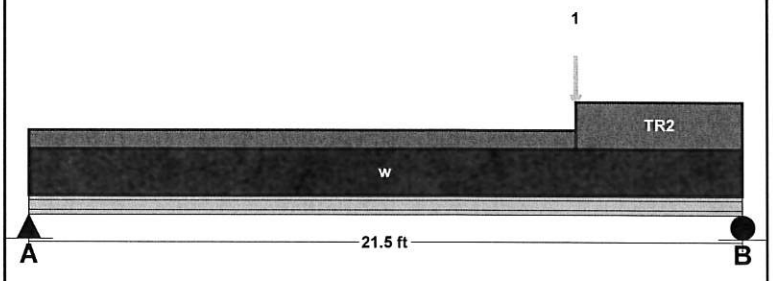
Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	8.96	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	22.7	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	10.74	ft
Nominal Flexural Strength w/ safety factor:	Mn =	269461	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	22.7	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	105780	lb

Controlling Moment: 137404 ft-lb
16.34 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -35296 lb
22.0 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	527.83 in4	597 in4
Moment:	137404 ft-lb	269461 ft-lb
Shear:	-35296 lb	105780 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	340	plf
Uniform Dead Load	204	plf
Beam Self Weight	72	plf
Total Uniform Load	616	plf

POINT LOADS - CENTER SPAN	
Load Number	One
Live Load	18934 lb
Dead Load	1671 lb
Location	16.5 ft

TRAPEZOIDAL LOADS - CENTER SPAN		
Load Number	One	Two
Left Live Load	180 plf	2295 plf
Left Dead Load	108 plf	203 plf
Right Live Load	180 plf	2295 plf
Right Dead Load	108 plf	203 plf
Load Start	0 ft	16.5 ft
Load End	16.5 ft	21.5 ft
Load Length	16.5 ft	5 ft

Project: 17-244 HOLLIS CALCS

Location: FB-5
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W10x30 x 12.0 FT
Section Adequate By: 30.4%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.23	IN L/626
Dead Load	0.03	in
Total Load	0.26	IN L/553

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

REACTIONS	A		B	
Live Load	7862	lb	17008	lb
Dead Load	1551	lb	2008	lb
Total Load	9413	lb	19016	lb
Bearing Length	0.81	in	0.81	in

BEAM DATA	Center	
Span Length	12	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	12	ft

STEEL PROPERTIES
W10x30 - A992-50

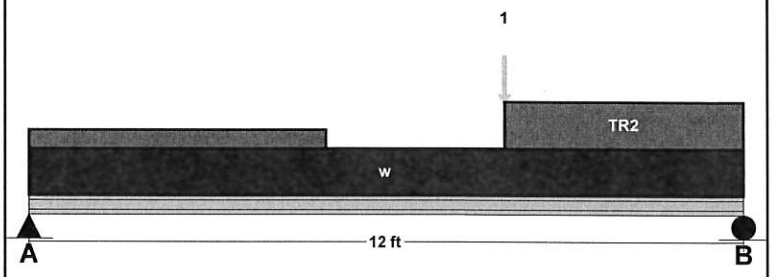
Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	10.5	in
Web Thickness:	tw =	0.3	in
Flange Width:	bf =	5.81	in
Flange Thickness:	tf =	0.51	in
Distance to Web Toe of Fillet:	k =	0.81	in
Moment of Inertia About X-X Axis:	Ix =	170	in4
Section Modulus About X-X Axis:	Sx =	32.4	in3
Plastic Section Modulus About X-X Axis:	Zx =	36.6	in3
Design Properties per AISC 14th Edition Steel Manual:			
Flange Buckling Ratio:	FBR =	5.7	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	29.6	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	4.84	ft
Nominal Flexural Strength w/ safety factor:	Mn =	91317	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	29.6	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	63000	lb

Controlling Moment: 59979 ft-lb
8.04 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -19015 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	130.39 in4	170 in4
Moment:	59979 ft-lb	91317 ft-lb
Shear:	-19015 lb	63000 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	100	plf
Uniform Dead Load	60	plf
Beam Self Weight	30	plf
Total Uniform Load	190	plf

POINT LOADS - CENTER SPAN		
Load Number	One	
Live Load	16154	lb
Dead Load	1339	lb
Location	8	ft

TRAPEZOIDAL LOADS - CENTER SPAN		
Load Number	One	Two
Left Live Load	200 plf	1629 plf
Left Dead Load	120 plf	135 plf
Right Live Load	200 plf	1629 plf
Right Dead Load	120 plf	135 plf
Load Start	0 ft	8 ft
Load End	5 ft	12 ft
Load Length	5 ft	4 ft

SIMPLE SPAN BEAM

LOCATION: TYPICAL FLUSH BEAM

FB - 4

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 10.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	16.0	0.0	1576	1360
FLOOR	1.3	0.0	42	26
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**1618**	**1386**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 5.0 FT

b = L-a = 5.0 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 8088 LBS

(LL) = 6930 LBS

(DL) = 1158 LBS

HEAVY SIDE (TL) = 8088 LBS

(LL) = 6930 LBS

(DL) = 1158 LBS

Rrt/wTL = 5.0 FT

x' = 5.0 FT

MAXIMUM MOMENT

M_{MAX} = 20,220 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE: 4 2X6 STUDS

HEIGHT (FT): 10

SPOT FOOTING: Y 1.82 FT. SQR

HEAVY SIDE: 4 2X6 STUDS

HEIGHT (FT): 10

SPOT FOOTING: Y 1.82 FT. SQR

MAX SUPPORT LOAD

16100 LBS

16100 LBS

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. = 11 7/8 IN.

WIDTH (b)est. = 1 3/4 IN.

OF MEMBERS = 3

Fb = 2,600 PSI

Fv = 285 PSI

E = 1.90E+06 PSI

CF = 1.00

A = 62.34 IN(2)

S = 123.39 IN(3)

I = 732.62 IN(4)

δ_{MAX} @ 5.0 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.26 IN. L/ 459

LL δ_{MAX} = 0.22 IN. L/ 536

$A_{REQ.}$ = 34.14 IN(2)

$S_{REQ.}$ = 93.32 IN(3)

I_{REQ}(TL) = 383.12 IN(4)

I_{REQ}(LL) = 492.39 IN(4)

$BRG_{REQ.}$ = 3 IN.

3 -4 **USE** **(3) 1-3/4" X 11-7/8" LVL(S)**

SAFETY FACTOR = 1.32

SIMPLE SPAN BEAM

LOCATION: STAIRS

FB - 3

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 5.0

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	1.3	0.0	42	26
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**42**	**26**

POINT LOAD

FROM	RB	
TL =	0	LBS
LL =	0	LBS
LOCATION (a) =	2.5	FT
b = L-a =	2.5	FT (a > b)
EQUIV. UNIFORM TL =	0	PLF
EQUIV. UNIFORM LL =	0	PLF

REACTIONS

LIGHT SIDE (TL) =	104	LBS
(LL) =	65	LBS
(DL) =	39	LBS
HEAVY SIDE (TL) =	104	LBS
(LL) =	65	LBS
(DL) =	39	LBS
Rrt/wTL =	2.5	FT
x' =	2.5	FT

MAXIMUM MOMENT

M_{MAX} = 130 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT

LIGHT SIDE:	2	2X6	STUDS	
HEIGHT (FT):	8			
SPOT FOOTING:	N			
HEAVY SIDE:	2	2X6	STUDS	
HEIGHT (FT):	8			
SPOT FOOTING:	N			

MAX SUPPORT LOAD

3800 LBS

3800 LBS

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. =	11 7/8 IN.	Fb =	2,600	PSI	
WIDTH (b)est. =	1 3/4 IN.	Fv =	285	PSI	
# OF MEMBERS =	1	E =	1.90E+06	PSI	
		CF =	1.00		
		A =	20.78	IN(2)	
		S =	41.13	IN(3)	
		I =	244.21	IN(4)	

δ_{MAX} @	2.5	FT. (FROM LIGHT SIDE)
TL δ_{MAX} =	0.00 IN.	L/ 47589
LL δ_{MAX} =	0.00 IN.	L/ 76142
$A_{REQ.}$ =	0.33	IN(2)
$S_{REQ.}$ =	0.60	IN(3)
I_{REQ}(TL) =	1.23	IN(4)
I_{REQ}(LL) =	1.15	IN(4)
$BRG_{REQ.}$ =	3	IN.

3 -3 **USE** **(1) 1-3/4" X 11-7/8" LVL(S)**

SAFETY FACTOR = 62.84

SIMPLE SPAN BEAM

LOCATION: ENTRY HEADERS

FB - 2

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 7.5

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	1.3	0.0	42	26
FLOOR	0.0	0.0	0	0
DECK	13.0	0.0	663	390
OTHER	0.0	0.0	0	0
		TOTAL	**705**	**416**

POINT LOAD

FROM	RB	
TL =	0	LBS
LL =	0	LBS
LOCATION (a) =	3.8	FT
b = L-a =	3.8	FT (a > b)
EQUIV. UNIFORM TL =	0	PLF
EQUIV. UNIFORM LL =	0	PLF

REACTIONS

LIGHT SIDE (TL) =	2642	LBS
(LL) =	1560	LBS
(DL) =	1082	LBS
HEAVY SIDE (TL) =	2642	LBS
(LL) =	1560	LBS
(DL) =	1082	LBS
Rrt/wTL =	3.8	FT
x' =	3.8	FT

MAXIMUM MOMENT

M_{MAX} = 4,954 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT — **MAX SUPPORT LOAD**

LIGHT SIDE: 2	2X6	STUDS	3800	LBS
HEIGHT (FT): 8				
SPOT FOOTING: N				
HEAVY SIDE: 2	2X6	STUDS	3800	LBS
HEIGHT (FT): 8				
SPOT FOOTING: N				

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. =	9 1/2	IN.	Fb =	2,600	PSI	δ_{MAX} @	3.8 FT. (FROM LIGHT SIDE)
WIDTH (b)est. =	1 3/4	IN.	Fv =	285	PSI	TL δ_{MAX} =	0.11 IN. L/ 852
# OF MEMBERS =	2		E =	1.90E+06	PSI	LL δ_{MAX} =	0.06 IN. L/ 1444
			CF =	1.00			
			A =	33.25	IN(2)	$A_{REQ.}$ =	10.97 IN(2)
			S =	52.65	IN(3)	$S_{REQ.}$ =	22.87 IN(3)
			I =	250.07	IN(4)	I_{REQ}(TL) =	70.40 IN(4)
						I_{REQ}(LL) =	62.35 IN(4)
						$BRG_{REQ.}$ =	3 IN.

3 -2 **USE** **(2) 1-3/4" X 9-1/2" LVL(S)**

SAFETY FACTOR = 2.30

SIMPLE SPAN BEAM

LOCATION: TYPICAL HEADER

FB - 1

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 3.5

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	0.0	0.0	0	0
FLOOR	26.0	0.0	832	520
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**832**	**520**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197 PSF
	LL	170 PSF
FLOOR LOAD	TL	64 PSF
	LL	40 PSF
DECK LOAD	TL	102 PSF
	LL	60 PSF
OTHER LOAD	TL	125 PSF
	LL	50 PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 1.8 FT

b = L-a = 1.8 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 1456 LBS

(LL) = 910 LBS

(DL) = 546 LBS

HEAVY SIDE (TL) = 1456 LBS

(LL) = 910 LBS

(DL) = 546 LBS

Rrt/wTL = 1.8 FT

x' = 1.8 FT

MAXIMUM MOMENT

M_{MAX} = 1,274 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 360

L δ_{MAX}: L/ 480

BEAM SUPPORT — **MAX SUPPORT LOAD**

LIGHT SIDE: 2 2X6 STUDS 3800 LBS

HEIGHT (FT): 8

SPOT FOOTING: N

HEAVY SIDE: 2 2X6 STUDS 3800 LBS

HEIGHT (FT): 8

SPOT FOOTING: N

DIMENSIONAL LUMBER

TYPE: DF#2 CF = 1.1

DEPTH (d)est. = 9 1/4 IN.

WIDTH (b)est. = 3 IN.

Fb = 850 PSI

Fv = 180 PSI

E = 1.60E+06 PSI

A = 27.75 IN(2)

S = 42.78 IN(3)

I = 197.86 IN(4)

δ_{MAX} @ 1.8 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.01 IN. L/ 4733

LL δ_{MAX} = 0.01 IN. L/ 7573

$A_{REQ.}$ = 6.79 IN(2)

$S_{REQ.}$ = 16.35 IN(3)

I_{REQ}(TL) = 10.03 IN(4)

I_{REQ}(LL) = 9.41 IN(4)

$BRG_{REQ.}$ = 3 IN.

3 -1 **USE** **(2) - 2 X 10 (S)**

SAFETY FACTOR = 2.62

BEAM WITH MULTIPLE POINT LOADS

LOCATION: COVERED DECK -- SEE STRUCALC

RB - 14

-14 USE **W12X65**

SIMPLE SPAN BEAM

LOCATION: DINING

RB - 13

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 6.5

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	21.0	0.0	2069	1785
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**2069**	**1785**

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DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 3.8 FT

b = L-a = 2.7 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 6723 LBS

(LL) = 5801 LBS

(DL) = 921 LBS

HEAVY SIDE (TL) = 6723 LBS

(LL) = 5801 LBS

(DL) = 921 LBS

Rrt/wTL = 3.3 FT

x' = 3.3 FT

MAXIMUM MOMENT

M_{MAX} = 10,924 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 4X6 POST

HEIGHT (FT): 9

SPOT FOOTING: N

HEAVY SIDE: 4X6 POST

HEIGHT (FT): 9

SPOT FOOTING: N

MAX SUPPORT LOAD

8510 LBS

8510 LBS

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. = 14 IN.

WIDTH (b)est. = 1 3/4 IN.

OF MEMBERS = 2

Fb = 2,600 PSI

Fv = 285 PSI

E = 1.90E+06 PSI

CF = 0.98

A = 49.00 IN(2)

S = 114.33 IN(3)

I = 800.33 IN(4)

δ_{MAX} @ 3.3 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.05 IN. L/ 1428

LL δ_{MAX} = 0.05 IN. L/ 1654

$A_{REQ.}$ = 22.64 IN(2)

$S_{REQ.}$ = 51.39 IN(3)

I_{REQ}(TL) = 134.54 IN(4)

I_{REQ}(LL) = 174.15 IN(4)

$BRG_{REQ.}$ = 3 IN.

-13 USE **(2) 1-3/4" X 14" LVL(S)**

SAFETY FACTOR = 2.16

Project: 17-244 HOLLIS CALCS

Location: RB14
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W12x65 x 24.0 FT
Section Adequate By: 13.5%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.70	IN L/409
Dead Load	0.14	in
Total Load	0.85	IN L/340

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

REACTIONS	A		B	
Live Load	18850	lb	15129	lb
Dead Load	3774	lb	3183	lb
Total Load	22624	lb	18312	lb
Bearing Length	1.20	in	1.20	in

BEAM DATA	Center	
Span Length	24	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	24	ft

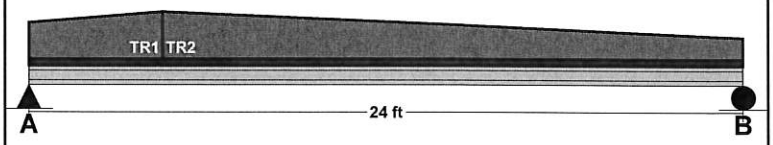
STEEL PROPERTIES
W12x65 - A992-50

Properties:			
Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	12.1	in
Web Thickness:	tw =	0.39	in
Flange Width:	bf =	12	in
Flange Thickness:	tf =	0.61	in
Distance to Web Toe of Fillet:	k =	1.2	in
Moment of Inertia About X-X Axis:	Ix =	533	in4
Section Modulus About X-X Axis:	Sx =	87.9	in3
Plastic Section Modulus About X-X Axis:	Zx =	96.8	in3
Design Properties per AISC 14th Edition Steel Manual:			
Flange Buckling Ratio:	FBR =	9.92	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	24.87	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	10.67	ft
Nominal Flexural Strength w/ safety factor:	Mn =	237004	ft-lb
Controlling Equation:	F3-1		
Web height to thickness ratio:	h/tw =	24.87	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	94380	lb

Controlling Moment: 127183 ft-lb
11.28 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 22624 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	469.6 in4	533 in4
Moment:	127183 ft-lb	237004 ft-lb
Shear:	22624 lb	94380 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	0	plf
Uniform Dead Load	0	plf
Beam Self Weight	65	plf
Total Uniform Load	65	plf

TRAPEZOIDAL LOADS - CENTER SPAN		
Load Number	One	Two
Left Live Load	1445 plf	1870 plf
Left Dead Load	229.5 plf	297 plf
Right Live Load	1870 plf	850 plf
Right Dead Load	297 plf	135 plf
Load Start	0 ft	4.5 ft
Load End	4.5 ft	24 ft
Load Length	4.5 ft	19.5 ft

BEAM WITH POINT LOAD

LOCATION: DINING

RB - 12

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 21.5

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	2.7	0.0	266	230
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**266**	**230**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB7, 13

TL = 28664 LBS

LL = 24735 LBS

LOCATION (a) = 17 FT

b = L-a = 4.3 FT (a > b)

EQUIV. UNIFORM TL = 1706 PLF

EQUIV. UNIFORM LL = 1473 PLF

REACTIONS

LIGHT SIDE (TL) = 8592 LBS

(LL) = 7414 LBS

(DL) = 1178 LBS

HEAVY SIDE (TL) = 25790 LBS

(LL) = 22255 LBS

(DL) = 3535 LBS

Rrt/wTL = 32.3 FT

x' = 17.2 FT

MAXIMUM MOMENT

M_{MAX} = 108.437 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 4X4X1/4 HSS COL

HEIGHT (FT): 11

SPOT FOOTING: N

HEAVY SIDE: 4X4X1/4 HSS COL

HEIGHT (FT): 11

SPOT FOOTING: N

MAX SUPPORT LOAD

50190 LBS

50190 LBS

STEEL BEAM - W/POINT LOAD

DEPTH = 12.10 IN.

WIDTH = 8.05 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 13.10 IN(2)

S = 57.70 IN(3)

I = 348.00 IN(4)

δ_{MAX} @ 11.9 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.15 IN. L 1696

LL δ_{MAX} = 0.13 IN. L 1966

$A_{REQ.}$ = 1.93 IN(2)

$S_{REQ.}$ = 39.43 IN(3)

I_{REQ}(TL) = 231.57 IN(4)

I_{REQ}(LL) = 299.74 IN(4)

-12 USE **W12X45**

SAFETY FACTOR = 1.16

SIMPLE SPAN BEAM

LOCATION: REAR PATIO

RB - 11

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 26.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	9.0	0.0	887	765
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**887**	**765**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 17 FT

b = L-a = 8.8 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 11525 LBS

(LL) = 9945 LBS

(DL) = 1580 LBS

HEAVY SIDE (TL) = 11525 LBS

(LL) = 9945 LBS

(DL) = 1580 LBS

Rrt/wTL = 13.0 FT

x' = 13.0 FT

MAXIMUM MOMENT

M_{MAX} = 74,909 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 4X4X1/4 HSS COL.

HEIGHT (FT): 11

SPOT FOOTING: N

HEAVY SIDE: 4X4X1/4 HSS COL.

HEIGHT (FT): 11

SPOT FOOTING: N

MAX SUPPORT LOAD

50190 LBS

50190 LBS

STEEL BEAM

DEPTH = 10.60 IN.

WIDTH = 10.20 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 22.60 IN(2)

S = 85.90 IN(3)

I = 455.00 IN(4)

δ_{MAX} @ 13.0 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.69 IN. L 452

LL δ_{MAX} = 0.60 IN. L 523

$A_{REQ.}$ = 0.86 IN(2)

$S_{REQ.}$ = 27.24 IN(3)

I_{REQ}(TL) = 241.78 IN(4)

I_{REQ}(LL) = 312.96 IN(4)

-11 USE **W10X77**

SAFETY FACTOR = 1.45

SIMPLE SPAN BEAM

LOCATION: REAR PATIO

RB - 15

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 14.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	9.0	0.0	887	765
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**887**	**765**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 12 FT

b = L-a = 2.0 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 6206 LBS

(LL) = 5355 LBS

(DL) = 851 LBS

HEAVY SIDE (TL) = 6206 LBS

(LL) = 5355 LBS

(DL) = 851 LBS

Rrt/wTL = 7.0 FT

x' = 7.0 FT

MAXIMUM MOMENT

M_{MAX} = 21,719 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 4X4X1/4 HSS COL

HEIGHT (FT): 11

SPOT FOOTING: N

HEAVY SIDE: NA POST

HEIGHT (FT): 11

SPOT FOOTING: N

MAX SUPPORT LOAD

50190 LBS

STEEL BEAM

DEPTH = 10.20 IN.

WIDTH = 5.75 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 6.49 IN(2)

S = 23.20 IN(3)

I = 118.00 IN(4)

δ_{MAX} @ 7.0 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.22 IN. L 750

LL δ_{MAX} = 0.19 IN. L 869

$A_{REQ.}$ = 0.47 IN(2)

$S_{REQ.}$ = 7.90 IN(3)

I_{REQ}(TL) = 37.75 IN(4)

I_{REQ}(LL) = 48.86 IN(4)

-15 USE W10X22

SAFETY FACTOR = 2.42

BEAM WITH MULTIPLE POINT LOADS

LOCATION: COVERED DECK -- SEE STRUCALC

RB - 10

-10 USE W10X88

Project: 17-244 HOLLIS CALCS

Location: RB10
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W10x88 x 28.5 FT
Section Adequate By: 16.3%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.82	IN L/419
Dead Load	0.18	in
Total Load	1.00	IN L/343

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

REACTIONS	A		B	
Live Load	16160	lb	8080	lb
Dead Load	3178	lb	2216	lb
Total Load	19338	lb	10296	lb
Bearing Length	1.49	in	1.49	in

BEAM DATA	Center	
Span Length	28.5	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	28.5	ft

STEEL PROPERTIES
W10x88 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	10.8	in
Web Thickness:	tw =	0.61	in
Flange Width:	bf =	10.3	in
Flange Thickness:	tf =	0.99	in
Distance to Web Toe of Fillet:	k =	1.49	in
Moment of Inertia About X-X Axis:	Ix =	534	in4
Section Modulus About X-X Axis:	Sx =	98.5	in3
Plastic Section Modulus About X-X Axis:	Zx =	113	in3

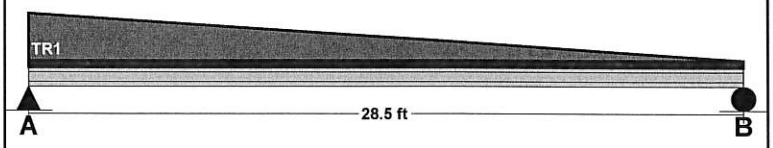
Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	5.2	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	12.93	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	9.29	ft
Nominal Flexural Strength w/ safety factor:	Mn =	281936	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	12.93	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	130680	lb

Controlling Moment: 107919 ft-lb
12.26 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 19337 lb
At left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	459.02 in4	534 in4
Moment:	107919 ft-lb	281936 ft-lb
Shear:	19337 lb	130680 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	0	plf
Uniform Dead Load	0	plf
Beam Self Weight	88	plf
Total Uniform Load	88	plf

TRAPEZOIDAL LOADS - CENTER SPAN		
Load Number	One	
Left Live Load	1701	plf
Left Dead Load	202.5	plf
Right Live Load	0	plf
Right Dead Load	0	plf
Load Start	0	ft
Load End	28.5	ft
Load Length	28.5	ft

BEAM WITH POINT LOAD

LOCATION: DECK

RB - 9

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 12.3

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	24.0	0.0	2364	2040
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**2364**	**2040**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB13

TL = 6723 LBS

LL = 5801 LBS

LOCATION (a) = 7.0 FT

b = L-a = 5.3 FT (a > b)

EQUIV. UNIFORM TL = 1072 PLF

EQUIV. UNIFORM LL = 925 PLF

REACTIONS

LIGHT SIDE (TL) = 17435 LBS

(LL) = 15046 LBS

(DL) = 2390 LBS

HEAVY SIDE (TL) = 18364 LBS

(LL) = 15848 LBS

(DL) = 2517 LBS

Rrt/wTL = 7.4 FT

x' = 7.0 FT

MAXIMUM MOMENT

M_{MAX} = 64,129 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 4 2X6 STUDS

HEIGHT (FT): 9

SPOT FOOTING: Y 2.65 FT. SQR

HEAVY SIDE: 6X6 POST

HEIGHT (FT): 9

SPOT FOOTING: Y 2.72 FT. SQR

MAX SUPPORT LOAD

18140 LBS

20600 LBS

STEEL BEAM - W/POINT LOAD

DEPTH = 10.30 IN.

WIDTH = 5.77 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 7.61 IN(2)

S = 27.90 IN(3)

I = 144.00 IN(4)

δ_{MAX} @ 6.3 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.30 IN. L 497

LL δ_{MAX} = 0.26 IN. L 576

$A_{REQ.}$ = 1.38 IN(2)

$S_{REQ.}$ = 23.32 IN(3)

I_{REQ}(TL) = 92.88 IN(4)

I_{REQ}(LL) = 120.23 IN(4)

3 -9 **USE** **W10X26**

SAFETY FACTOR = 1.20

BEAM WITH POINT LOAD

LOCATION: DECK

RB - 8

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 7.5

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	20.0	0.0	1970	1700
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**1970**	**1700**

POINT LOAD

FROM RB-6

TL = 17582 LBS

LL = 15173 LBS

LOCATION (a) = 4.5 FT

b = L-a = 3.0 FT (a > b)

EQUIV. UNIFORM TL = 4501 PLF

EQUIV. UNIFORM LL = 3884 PLF

REACTIONS

LIGHT SIDE (TL) = 14420 LBS

(LL) = 12444 LBS

(DL) = 1976 LBS

HEAVY SIDE (TL) = 17937 LBS

(LL) = 15479 LBS

(DL) = 2458 LBS

Rrt/wTL = 7.3 FT

x' = 4.5 FT

MAXIMUM MOMENT

M_{MAX} = 44.946 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE:	4	2X6	STUDS	20140 LBS
HEIGHT (FT):	8			
SPOT FOOTING:	N			
HEAVY SIDE:	4	2X6	STUDS	20140 LBS
HEIGHT (FT):	8			
SPOT FOOTING:	N			

MAX SUPPORT LOAD

STEEL BEAM - W/POINT LOAD

DEPTH = 10.20 IN.

WIDTH = 4.02 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 5.62 IN(2)

S = 18.80 IN(3)

I = 96.30 IN(4)

δ_{MAX} @ 3.9 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.09 IN. L 1056

LL δ_{MAX} = 0.07 IN. L 1224

$A_{REQ.}$ = 1.35 IN(2)

$S_{REQ.}$ = 16.34 IN(3)

I_{REQ}(TL) = 36.18 IN(4)

I_{REQ}(LL) = 46.83 IN(4)

3 -8 USE **W10X19**

SAFETY FACTOR = 1.15

SIMPLE SPAN BEAM

LOCATION: NEAR STAIRS

RB - 7

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 16.5

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	27.0	0.0	2660	2295
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**2660**	**2295**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 8.3 FT

b = L-a = 8.3 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 21941 LBS

(LL) = 18934 LBS

(DL) = 3007 LBS

HEAVY SIDE (TL) = 21941 LBS

(LL) = 18934 LBS

(DL) = 3007 LBS

Rrt/wTL = 8.3 FT

x' = 8.3 FT

MAXIMUM MOMENT

M_{MAX} = 90,506 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 6X8 POST

HEIGHT (FT): 11

SPOT FOOTING: N

HEAVY SIDE: 6X8 POST

HEIGHT (FT): 11

SPOT FOOTING: N

MAX SUPPORT LOAD

23020 LBS

23020 LBS

STEEL BEAM

DEPTH = 12.50 IN.

WIDTH = 6.56 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 10.30 IN(2)

S = 45.60 IN(3)

I = 285.00 IN(4)

δ_{MAX} @ 8.3 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.54 IN. L 369

LL δ_{MAX} = 0.46 IN. L 428

$A_{REQ.}$ = 1.65 IN(2)

$S_{REQ.}$ = 32.91 IN(3)

I_{REQ}(TL) = 185.38 IN(4)

I_{REQ}(LL) = 239.96 IN(4)

3 -7 USE **W12X35**

SAFETY FACTOR = 1.19

SIMPLE SPAN BEAM

LOCATION: NEAR STAIRS

RB - 6

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 17.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	21.0	0.0	2069	1785
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**2069**	**1785**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 8.5 FT

b = L-a = 8.5 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 17582 LBS

(LL) = 15173 LBS

(DL) = 2410 LBS

HEAVY SIDE (TL) = 17582 LBS

(LL) = 15173 LBS

(DL) = 2410 LBS

Rrt/wTL = 8.5 FT

x' = 8.5 FT

MAXIMUM MOMENT

M_{MAX} = 74.725 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 6X8 POST

HEIGHT (FT): 11

SPOT FOOTING: N

HEAVY SIDE: 6X8 POST

HEIGHT (FT): 11

SPOT FOOTING: N

MAX SUPPORT LOAD

23020 LBS

23020 LBS

STEEL BEAM

DEPTH = 12.50 IN.

WIDTH = 6.56 IN.

Fb = 33,000 PSI

Fv = 20,000 PSI

E = 2.90E+07 PSI

A = 10.30 IN(2)

S = 45.60 IN(3)

I = 285.00 IN(4)

δ_{MAX} @ 8.5 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.47 IN. L 434

LL δ_{MAX} = 0.41 IN. L 503

$A_{REQ.}$ = 1.32 IN(2)

$S_{REQ.}$ = 27.17 IN(3)

I_{REQ}(TL) = 157.69 IN(4)

I_{REQ}(LL) = 204.12 IN(4)

3 -6 **USE** W12X35

SAFETY FACTOR = 1.40

BEAM WITH MULTIPLE POINT LOADS

LOCATION: CARRIES REAR PATIO ROOF -- SEE STRUCALC

RB - 5

3 -5 **USE** W10X88

Project: 17-244 HOLLIS CALCS

Location: RB5
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W10x77 x 23.0 FT (15 + 8)
Section Adequate By: 38.9%
Controlling Factor: Deflection

StruCalc Version 10.0.1.6 9/28/2017 11:01:19 AM

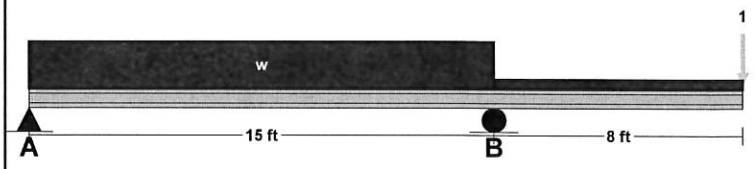
DEFLECTIONS	Center		Right	
Live Load	0.13	IN L/1363	0.38	IN 2L/500
Dead Load	0.02	in	0.00	in
Total Load	0.15	IN L/1222	0.39	IN 2L/494

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

REACTIONS	A		B	
Live Load	11475	lb	21409	lb
Dead Load	1951	lb	4058	lb
Total Load	13426	lb	25467	lb
Uplift (1.5 F.S)	**-1918**	**lb**	0	**lb**
Bearing Length	1.37	in	1.37	in

BEAM DATA	Center		Right	
Span Length	15	ft	8	ft
Unbraced Length-Top	0	ft	0	ft
Unbraced Length-Bottom	15	ft	8	ft

LOADING DIAGRAM



UNIFORM LOADS	Center		Right	
Uniform Live Load	1530	plf	170	plf
Uniform Dead Load	243	plf	15	plf
Beam Self Weight	77	plf	77	plf
Total Uniform Load	1850	plf	262	plf

POINT LOADS - RIGHT SPAN

Load Number	One
Live Load	5355 lb
Dead Load	473 lb
Location	8 ft

STEEL PROPERTIES
W10x77 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	10.6	in
Web Thickness:	tw =	0.53	in
Flange Width:	bf =	10.2	in
Flange Thickness:	tf =	0.87	in
Distance to Web Toe of Fillet:	k =	1.37	in
Moment of Inertia About X-X Axis:	Ix =	455	in4
Section Modulus About X-X Axis:	Sx =	85.9	in3
Plastic Section Modulus About X-X Axis:	Zx =	97.6	in3

Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	5.86	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	14.83	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	15	ft
Limiting Unbraced Length -			
for lateral-torsional buckling:	Lp =	9.18	ft
for Eqn. F2-2:	Lr =	45.26	ft
Nominal Flexural Strength w/ safety factor:	Mn =	228442	ft-lb
Controlling Equation:	F2-2		
Web height to thickness ratio:	h/tw =	14.83	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	112360	lb

Controlling Moment: -55008 ft-lb
Over right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 3
Controlling Shear: -17542 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	327.58 in4	455 in4
Moment:	-55008 ft-lb	228442 ft-lb
Shear:	-17542 lb	112360 lb

SIMPLE SPAN BEAM

LOCATION: MSTR SUITE

RB - 4

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 11.5

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	27.0	0.0	2660	2295
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**2660**	**2295**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 5.8 FT

b = L-a = 5.8 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 15292 LBS

(LL) = 13196 LBS

(DL) = 2096 LBS

HEAVY SIDE (TL) = 15292 LBS

(LL) = 13196 LBS

(DL) = 2096 LBS

Rrt/wTL = 5.8 FT

x' = 5.8 FT

MAXIMUM MOMENT

M_{MAX} = 43,965 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 6X8 POST

HEIGHT (FT): 11

SPOT FOOTING: N

HEAVY SIDE: NA 2X6 STUDS

HEIGHT (FT): 11

SPOT FOOTING: N

MAX SUPPORT LOAD

23020 LBS

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. = 18 IN.

WIDTH (b)est. = 1 3/4 IN.

OF MEMBERS = 3

Fb = 2,600 PSI

Fv = 285 PSI

E = 1.90E+06 PSI

CF = 0.95

A = 94.50 IN(2)

S = 283.50 IN(3)

I = 2551.50 IN(4)

δ_{MAX} @ 5.8 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.22 IN. L/ 639

LL δ_{MAX} = 0.19 IN. L/ 741

$A_{REQ.}$ = 59.37 IN(2)

$S_{REQ.}$ = 213.99 IN(3)

I_{REQ}(TL) = 957.97 IN(4)

I_{REQ}(LL) = 1240.01 IN(4)

$BRG_{REQ.}$ = 3 IN.

3 -4 USE (3) 1-3/4" X 18" LVL(S)

SAFETY FACTOR = 1.32

SIMPLE SPAN BEAM

LOCATION: WIDER HEADER

RB - 3

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 11.0

VENEER (Y/N): NO

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	19.0	0.0	1872	1615
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**1872**	**1615**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 8.5 FT

b = L-a = 2.5 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 10293 LBS

(LL) = 8883 LBS

(DL) = 1411 LBS

HEAVY SIDE (TL) = 10293 LBS

(LL) = 8883 LBS

(DL) = 1411 LBS

Rrt/wTL = 5.5 FT

x' = 5.5 FT

MAXIMUM MOMENT

M_{MAX} = 28.306 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 3 2X6 STUDS

HEIGHT (FT): 8

SPOT FOOTING: N

HEAVY SIDE: 3 2X6 STUDS

HEIGHT (FT): 8

SPOT FOOTING: N

MAX SUPPORT LOAD

11100 LBS

11100 LBS

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. = 14 IN.

WIDTH (b)est. = 1 3/4 IN.

OF MEMBERS = 3

Fb = 2,600 PSI

Fv = 285 PSI

E = 1.90E+06 PSI

CF = 0.98

A = 73.50 IN(2)

S = 171.50 IN(3)

I = 1200.50 IN(4)

δ_{MAX} @ 5.5 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.27 IN. L/ 488

LL δ_{MAX} = 0.23 IN. L/ 566

$A_{REQ.}$ = 42.60 IN(2)

$S_{REQ.}$ = 133.15 IN(3)

I_{REQ}(TL) = 589.97 IN(4)

I_{REQ}(LL) = 763.66 IN(4)

$BRG_{REQ.}$ = 3 IN.

3 -3 USE (3) 1-3/4" X 14" LVL(S)

SAFETY FACTOR = 1.29

SIMPLE SPAN BEAM

LOCATION: WIDE HEADER

RB - 2

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 5.5

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	14.0	0.0	1379	1190
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**1379**	**1190**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 2.8 FT

b = L-a = 2.8 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 3792 LBS

(LL) = 3273 LBS

(DL) = 520 LBS

HEAVY SIDE (TL) = 3792 LBS

(LL) = 3273 LBS

(DL) = 520 LBS

Rrt/wTL = 2.8 FT

x' = 2.8 FT

MAXIMUM MOMENT

M_{MAX} = 5,214 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 3 2X4 STUDS

HEIGHT (FT): 8

SPOT FOOTING: N

HEAVY SIDE: 3 2X4 STUDS

HEIGHT (FT): 8

SPOT FOOTING: N

MAX SUPPORT LOAD

7160 LBS

7160 LBS

STRUCTURAL COMPOSITE LUMBER

TYPE: LVL (1.9E)

DEPTH (d)est. = 9 1/2 IN.

WIDTH (b)est. = 1 3/4 IN.

OF MEMBERS = 2

Fb = 2,600 PSI

Fv = 285 PSI

E = 1.90E+06 PSI

CF = 1.00

A = 33.25 IN(2)

S = 52.65 IN(3)

I = 250.07 IN(4)

δ_{MAX} @ 2.8 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.06 IN. L/ 1104

LL δ_{MAX} = 0.05 IN. L/ 1280

$A_{REQ.}$ = 14.19 IN(2)

$S_{REQ.}$ = 24.02 IN(3)

I_{REQ}(TL) = 54.34 IN(4)

I_{REQ}(LL) = 70.34 IN(4)

$BRG_{REQ.}$ = 3 IN.

3 -2 **USE** **(2) 1-3/4" X 9-1/2" LVL(S)**

SAFETY FACTOR = 2.19

SIMPLE SPAN BEAM

LOCATION: TYPICAL HEADER

RB - 1

DURATION INCREASE = 1.00

BEAM SPAN (FT) = 3.5

TRIBUTARY LOADING

	SPAN (FT)	CANT. (FT)	W_{TL} (PLF)	W_{LL} (PLF)
ROOF	19.0	0.0	1872	1615
FLOOR	0.0	0.0	0	0
FLOOR	0.0	0.0	0	0
DECK	0.0	0.0	0	0
OTHER	0.0	0.0	0	0
		TOTAL	**1872**	**1615**

DESIGN LOADS

FLAT ROOF SNOW LOAD	TL	197	PSF
	LL	170	PSF
FLOOR LOAD	TL	64	PSF
	LL	40	PSF
DECK LOAD	TL	102	PSF
	LL	60	PSF
OTHER LOAD	TL	125	PSF
	LL	50	PSF

POINT LOAD

FROM RB

TL = 0 LBS

LL = 0 LBS

LOCATION (a) = 1.8 FT

b = L-a = 1.8 FT (a > b)

EQUIV. UNIFORM TL = 0 PLF

EQUIV. UNIFORM LL = 0 PLF

REACTIONS

LIGHT SIDE (TL) = 3275 LBS

(LL) = 2826 LBS

(DL) = 449 LBS

HEAVY SIDE (TL) = 3275 LBS

(LL) = 2826 LBS

(DL) = 449 LBS

Rrt/wTL = 1.8 FT

x' = 1.8 FT

MAXIMUM MOMENT

M_{MAX} = 2,866 FT-LBS

δ CRITERIA:

L δ_{MAX}: L/ 240

L δ_{MAX}: L/ 360

BEAM SUPPORT

LIGHT SIDE: 2 2X6 STUDS

HEIGHT (FT): 8

SPOT FOOTING: N

HEAVY SIDE: 2 2X6 STUDS

HEIGHT (FT): 8

SPOT FOOTING: N

MAX SUPPORT LOAD

3800 LBS

3800 LBS

DIMENSIONAL LUMBER

TYPE: DF#2

DEPTH (d)est. = 9 1/4 IN.

WIDTH (b)est. = 4 1/2 IN.

CF = 1.1

Fb = 850 PSI

Fv = 180 PSI

E = 1.60E+06 PSI

A = 41.63 IN(2)

S = 64.17 IN(3)

I = 296.79 IN(4)

δ_{MAX} @ 1.8 FT. (FROM LIGHT SIDE)

TL δ_{MAX} = 0.01 IN. L/ 3156

LL δ_{MAX} = 0.01 IN. L/ 3658

$A_{REQ.}$ = 15.24 IN(2)

$S_{REQ.}$ = 36.71 IN(3)

I_{REQ}(TL) = 22.57 IN(4)

I_{REQ}(LL) = 29.21 IN(4)

$BRG_{REQ.}$ = 3 IN.

} -1 USE (3) - 2 X 10 (S)

SAFETY FACTOR = 1.75

FOOTINGS

	LOCATION	DEAD LOAD	LIVE LOAD	TOTAL LOAD	FOOTING SIZE
CONT FTGS	INTERIOR BEARING WALL	**ROOF** WIDTH FT x SPAN FT @ LOAD PSF = 0 PLF	@ LOAD PSF = 0 PLF	0 PLF	
		FLOOR WIDTH FT x SPAN FT @ LOAD PSF = 264 PLF	@ LOAD PSF = 440 PLF	704 PLF	874 PLF 2,500 PSF
		WALL WIDTH FT x HEIGHT FT @ LOAD PLF = 170 PLF		170 PLF	= 0.3 FT
	USE AS MINIMUM FOOTING	**FOUNDATION** THICK IN. x HEIGHT FT @ LOAD PCF = 0 PLF		0 PLF	**USE:** 1'-4" X CONT
		434 PLF	440 PLF	874 PLF	

	LOCATION	DEAD LOAD	LIVE LOAD	TOTAL LOAD	FOOTING SIZE
CONT FTGS	INTERIOR BEARING WALL STAIRS	**ROOF** WIDTH FT x SPAN FT @ LOAD PSF = 365 PLF	@ LOAD PSF = 2295 PLF	2660 PLF	
		FLOOR WIDTH FT x SPAN FT @ LOAD PSF = 204 PLF	@ LOAD PSF = 340 PLF	544 PLF	3,374 PLF 2,500 PSF
		WALL WIDTH FT x HEIGHT FT @ LOAD PLF = 170 PLF		170 PLF	= 1.3 FT
	USE AS MINIMUM FOOTING	**FOUNDATION** THICK IN. x HEIGHT FT @ LOAD PCF = 0 PLF		0 PLF	**USE:** 1'-8" X CONT
		739 PLF	2,635 PLF	3,374 PLF	
CONT FTGS	EXTERIOR BEARING WALL	**ROOF** WIDTH FT x SPAN FT @ LOAD PSF = 243 PLF	@ LOAD PSF = 1530 PLF	1773 PLF	
		FLOOR WIDTH FT x SPAN FT @ LOAD PSF = 192 PLF	@ LOAD PSF = 320 PLF	512 PLF	3,555 PLF 2,500 PSF
		WALL WIDTH FT x HEIGHT FT @ LOAD PLF = 270 PLF		270 PLF	= 1.4 FT
	USE AS MINIMUM FOOTING	**FOUNDATION** THICK IN. x HEIGHT FT @ LOAD PCF = 1000 PLF		1000 PLF	**USE:** 1'-8" X CONT
		1,705 PLF	1,850 PLF	3,555 PLF	

This Wall in File: Z:\Projects\2017 Projects\17-200 thru 17-299\17-244 UD - Hollis Residence\5.0 Del

Cantilevered Retaining Wall

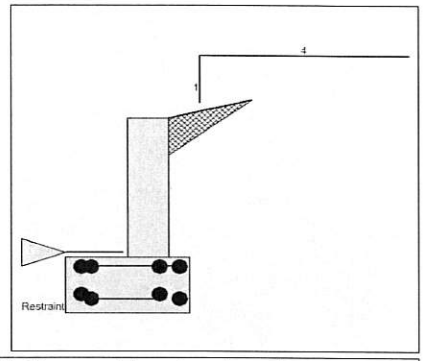
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	2.50 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	4.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	320.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.62 OK
Slab Resists All Sliding !		
Total Bearing Load	=	643 lbs
...resultant ecc.	=	2.72 in
Soil Pressure @ Toe	=	540 psf OK
Soil Pressure @ Heel	=	103 psf OK
Allowable	=	2,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	756 psf
ACI Factored @ Heel	=	144 psf
Footing Shear @ Toe	=	1.5 psi OK
Footing Shear @ Heel	=	0.9 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	256.8 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2012,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.031**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	200.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	166.7
Moment.....Allowable	=	5,412.6
Service Level	psi =	
Strength Level	psi =	2.7
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.25
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0062 in2/ft		
(4/3) * As :	0.0083 in2/ft	Min Stem T&S Reinf Area 0.480 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Dimensions & Strengths

Toe Width	=	1.00 ft
Heel Width	=	1.00
Total Footing Width	=	2.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	756	144 psf
Mu' : Upward	=	327	10 ft-#
Mu' : Downward	=	90	29 ft-#
Mu: Design	=	237	19 ft-#
Actual 1-Way Shear	=	1.52	0.94 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 7 @ 16.00 in
Heel Reinforcing = # 6 @ 16.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area 0.52 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#			.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Item									
Heel Active Pressure	=	256.8	1.19	306.7	Soil Over Heel	=	91.7	1.83	168.1
Surcharge over Heel	=				Sloped Soil Over Heel	=	1.5	1.89	2.9
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=				* Axial Live Load on Stem	=			
	=				Soil Over Toe	=			
					Surcharge Over Toe	=			
Total		256.8	**O.T.M.**	306.7	Stem Weight(s)	=	250.0	1.33	333.3
	=		=		Earth @ Stem Transitions	=			
					Footing Weight	=	300.0	1.00	300.0
					Key Weight	=			
					Vert. Component	=			
					Total =		643.2 lbs	**R.M.=**	804.3

Resisting/Overturning Ratio = 2.62
Vertical Loads used for Soil Pressure = 643.2 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.019	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

This Wall in File: Z:\Projects\2017 Projects\17-200 thru 17-299\17-244 UD - Hollis Residence\5.0 Del

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Cantilevered Retaining Wall

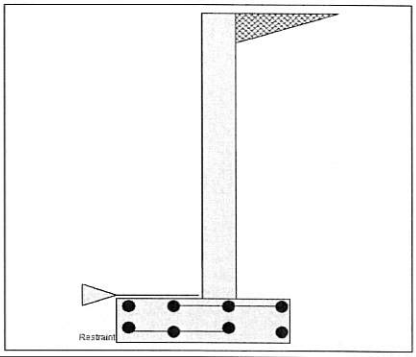
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	6.50 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	360.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.62 OK
Slab Resists All Sliding !		
Total Bearing Load	=	1,950 lbs
...resultant ecc.	=	10.22 in
Soil Pressure @ Toe	=	1,446 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,025 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	14.8 psi OK
Footing Shear @ Heel	=	9.6 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	1,125.0 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2012,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

	Bottom
	Stem OK
Design Height Above Ftg ft =	0.00
Wall Material Above "Ht" =	Concrete
Design Method =	LRFD
Thickness =	8.00
Rebar Size =	# 5
Rebar Spacing =	12.00
Rebar Placed at =	Edge
Design Data	
fb/FB + fa/Fa =	**0.361**
Total Force @ Section	
Service Level lbs =	
Strength Level lbs =	1,352.0
Moment....Actual	
Service Level ft-# =	
Strength Level ft-# =	2,929.3
Moment.....Allowable =	8,121.3
Service Level psi =	
Strength Level psi =	18.2
Shear.....Allowable psi =	75.0
Anet (Masonry) in2 =	
Rebar Depth 'd' in =	6.19
Masonry Data	
f'm psi =	
Fs psi =	
Solid Grouting =	
Modular Ratio 'n' =	
Wall Weight psf =	100.0
Short Term Factor =	
Equiv. Solid Thick. =	
Masonry Block Type =	Medium Weight
Masonry Design Method =	ASD
Concrete Data	
f'c psi =	2,500.0
Fy psi =	60,000.0

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.1109 in2/ft	
(4/3) * As :	0.1479 in2/ft	Min Stem T&S Reinf Area 1.248 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.31 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8382 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Dimensions & Strengths

Toe Width	=	1.75 ft
Heel Width	=	1.75
Total Footing Width	=	3.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,025	0 psf
Mu' : Upward	=	2,430	3 ft-#
Mu' : Downward	=	276	609 ft-#
Mu: Design	=	2,154	606 ft-#
Actual 1-Way Shear	=	14.85	9.61 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 7 @ 16.00 in
Heel Reinforcing = # 6 @ 16.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area 0.91 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure =	1,125.0	2.50	2,812.5	Soil Over Heel =	774.6	2.96	2,291.5
Surcharge over Heel =				Sloped Soil Over Heel =			
Surcharge Over Toe =				Surcharge Over Heel =			
Adjacent Footing Load =				Adjacent Footing Load =			
Added Lateral Load =				Axial Dead Load on Stem =			
Load @ Stem Above Soil =				* Axial Live Load on Stem =			
=				Soil Over Toe =			
				Surcharge Over Toe =			
Total	1,125.0	**O.T.M.**	2,812.5	Stem Weight(s) =	650.0	2.08	1,354.2
=		=		Earth @ Stem Transitions =			
				Footing Weight =	525.0	1.75	918.8
				Key Weight =			
				Vert. Component =			
				Total =	1,949.6 lbs	**R.M.=**	4,564.4

Resisting/Overturning Ratio = 1.62
Vertical Loads used for Soil Pressure = 1,949.6 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.075	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

LATERAL DESIGN

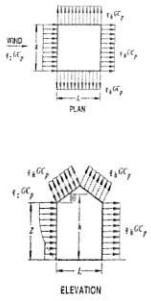
LATERAL RESISTING SYSTEM :

LIGHT-FRAME (WOOD)

WIND DESIGN CRITERIA

MWFRS DIRECTIONAL PROCEDURE (ASCE 7-10, CHAP 27)

BASIC WIND SPEED:	115	MPH FIG 26.5-1A
WIND RISK CATEGORY:	II	
EXPOSURE CATEGORY:	C	
INT. PRESSURE COEF., GC_{pi}:	0.18	TBL 26.11-1
DIRECTION FACTOR, K_d:	0.85	TBL 26.6-1
TOPOGRAPHIC FACTOR, K_{zt}:	1.0	26.8.2
GUST-EFFECT FACTOR, G:	0.85	26.9.1
WINDWARD WALL C_p:	0.8	TBL 27.4-1
α:	10	
z_g:	900	



SEISMIC DESIGN CRITERIA

EQUIVALENT LATERAL FORCE PROCEDURE (ASCE 7-10, 12.8)

SEISMIC RISK CATEGORY:	II
SEISMIC DESIGN CATEGORY:	D0
IMPORTANCE FACTOR, I:	1.0
SHORT PERIOD ACCEL., S_{DS}:	0.863
ONE SEC PERIOD ACCEL., S_{D1}:	0.288
RESPONSE MOD. COEF., R:	6.5
DEFLECTION AMP. FACTOR, C_d:	4.0
OVERSTRENGTH FACTOR, Ω_0:	3.0
DESIGN BASE SHEAR, V:	0.102 *W

	DL (PSF)	LL (PSF)
ROOF LOAD	27	34
FLOOR LOAD	24	0
WALL LOAD	17	0

1-STORY ANALYSIS
ZONE 1

WIND FORCES

WIDTH, L =	26	FT	h/L =	0.54	
DEPTH, B =	55	FT	VELOCITY PRESSURE COEF., K_z:	0.85	TBL 27.3-1
h =	14	FT	VELOCITY PRESSURE COEF., K_h:	0.85	TBL 27.3-1
z =	14	FT	WIND VELOCITY PRESSURE, q_z:	24	PSF EQ. 27.3-1
C_{p1} =	-0.3	FROM FIG. 27.4-1	WIND VELOCITY PRESSURE, q_h:	24	PSF EQ. 27.3-1
C_{p2} =	0.2	FROM FIG. 27.4-1	ROOF WIND PRESSURE, p_1:	-10.6	PSF
ROOF SLOPE	0	/12	ROOF WIND PRESSURE, p_2:	8.6	PSF
ROOF SLOPE	0	DEGREES	ROOF DESIGN WIND PRESSURE, p_R:	0.0	PSF EQ. 27.4-1
			WALL DESIGN WIND PRESSURE, p_F:	21.0	PSF EQ. 27.4-1

	AREA	DESIGN PRESSURE	LOAD (LBS)
ROOF	0.0	0.0	0
WALL	182.0	21.0	3824
		TOTAL	3824

ROOF DIAPHRAGM

DIAPHRAGM LOAD =	3824	LBS
SHEAR LENGTH =	55.0	FT
DIAPHRAGM SHEAR =	70	PLF

SEISMIC FORCES

	AREA (SF)	WEIGHTS (PSF)	ZONE WEIGHT (LBS)
ROOF	1870.0	61	114070
⊥ WALL	364.0	17	6188
|| WALL	385.0	17	6545
		TOTAL	126803
	SHEAR LOAD	12953	LBS

ROOF DIAPHRAGM

DIAPHRAGM LOAD =	12285	LBS
SHEAR LENGTH =	55.0	FT
DIAPHRAGM SHEAR =	223	PLF

SHEAR WALL LOADS

WIND SHEAR LOAD = TOTAL LOAD/1.4 2731 LBS

SEISMIC SHEAR LOAD 12953 LBS

SEISMIC GOVERNS

SW HEIGHT 12 FT
MAX LOAD 12953 LBS
0 LBS RESISTED BY PANELS/P.F.
HEAR LOAD 12953 LBS RESISTED BY SW

WALL LENGTH	TRIB. SPAN	UNIFORM DL (PLF)	PT LOAD (LBS)	NET OVERTURN (FT-LB)	UPLIFT (LBS):	HOLDOWN REQUIRED	S.W. CAPACITY REQUIRED	SHEAR WALL
7.5	4.0	312	780	29202	5062	HD-5	487	SW-3
11.5	4.0	312	780	37601	4251	HD-5	487	SW-3
4.8	4.0	312	780	20711	5609	HD-5	609	SW-4
2.8	4.0	312	780	12955	6015	HD-6	1044	SW-6

TOTAL LENGTH = 26.6 FT
OVERALL WALL SHEAR = **487 PLF**

1-STORY ANALYSIS
ZONE 2

WIND FORCES

WIDTH, L =	32	FT	h/L =	0.81	
DEPTH, B =	64	FT	VELOCITY PRESSURE COEF., K_z:	0.95	TBL 27.3-1
h =	26	FT	VELOCITY PRESSURE COEF., K_h:	0.95	TBL 27.3-1
z =	26	FT	WIND VELOCITY PRESSURE, q_z:	27	PSF EQ. 27.3-1
C_{p1} =	-0.3	FROM FIG. 27.4-1	WIND VELOCITY PRESSURE, q_h:	27	PSF EQ. 27.3-1
C_{p2} =	0.2	FROM FIG. 27.4-1	ROOF WIND PRESSURE, p_1:	-11.9	PSF
ROOF SLOPE	0	/12	ROOF WIND PRESSURE, p_2:	9.6	PSF
ROOF SLOPE	0	DEGREES	ROOF DESIGN WIND PRESSURE, p_R:	0.0	PSF EQ. 27.4-1
			WALL DESIGN WIND PRESSURE, p_F:	23.6	PSF EQ. 27.4-1

	AREA	DESIGN PRESSURE	LOAD (LBS)
ROOF	0.0	0.0	0
WALL	224.0	23.6	5284
		TOTAL	5284

ROOF DIAPHRAGM

DIAPHRAGM LOAD =	5284	LBS
SHEAR LENGTH =	64.0	FT
DIAPHRAGM SHEAR =	83	PLF

SEISMIC FORCES

	AREA (SF)	WEIGHTS (PSF)	ZONE WEIGHT (LBS)
ROOF	2276.0	61	138836
| WALL	448.0	17	7616
|| WALL	448.0	17	7616
		TOTAL	154068
		SHEAR LOAD	15739 LBS

ROOF DIAPHRAGM

DIAPHRAGM LOAD =	14961	LBS
SHEAR LENGTH =	64.0	FT
DIAPHRAGM SHEAR =	234	PLF

SHEAR WALL LOADS

WIND SHEAR LOAD = TOTAL LOAD/1.4 — 3774 LBS

SEISMIC SHEAR LOAD — 15739 LBS

SEISMIC GOVERNS

SW HEIGHT	12	FT
MAX LOAD	15739	LBS
	0	LBS RESISTED BY PANELS/P.F.
HEAR LOAD	15739	LBS RESISTED BY SW

WALL LENGTH	TRIB. SPAN	UNIFORM DL (PLF)	PT LOAD (LBS)	NET OVERTURN (FT-LB)	UPLIFT (LBS):	HOLDOWN REQUIRED	S.W. CAPACITY REQUIRED	SHEAR WALL
30.7	9.0	447	1118	-113477	-3696	NOT REQ'D	357	SW-2
9.4	9.0	447	1118	10004	1383	HD-2	357	SW-2
2.0	6.0	366	915	6003	3902	HD-5	1071	SW-6
2.0	1.0	231	578	6948	4516	HD-5	1071	SW-6

TOTAL LENGTH =	44.1	FT
OVERALL WALL SHEAR =	357	PLF

2-STORY ANALYSIS
ZONE 3

WIND FORCES

WIDTH, L =	27	FT
DEPTH, B =	79	FT
h =	26	FT
z_2 =	26	FT GROUND TO ROOF EAVE
z_1 =	12	FT GROUND TO UPPER FLR
C_{p1} =	-0.2	FROM FIG. 27.4-1
C_{p2} =	0.2	FROM FIG. 27.4-1
ROOF SLOPE	0	/12
ROOF SLOPE	0	DEGREES

h/L =	0.96	
VELOCITY PRESS. COEF., K_{z2}:	0.95	TBL 27.3-1
VELOCITY PRESS. COEF., K_{z1}:	0.85	TBL 27.3-1
VELOCITY PRESS. COEF., K_h:	0.95	TBL 27.3-1
VELOCITY PRESS., q_{z2}:	27	PSF EQ. 27.3-1
VELOCITY PRESS., q_{z1}:	24	PSF EQ. 27.3-1
VELOCITY PRESS., q_h:	27	PSF EQ. 27.3-1
ROOF PRESS., p_1:	-9.6	PSF
ROOF PRESS., p_2:	9.6	PSF
ROOF DESIGN PRESS., p_R:	0.0	PSF EQ. 27.4-1
UPPER WALL DESIGN PRESS., p_{F2}:	23.6	PSF EQ. 27.4-1
MAIN WALL DESIGN PRESS., p_{F1}:	21.5	PSF EQ. 27.4-1

	AREA	DESIGN PRESSURE	LOAD (LBS)
ROOF	0.0	0.0	0
UPPER WALL	189.0	23.6	4458
MAIN WALL	351.0	21.5	7564
		TOTAL	**12022**
UPPER SHEAR WALL LOAD			4458
MAIN SHEAR WALL LOAD			12022

ROOF DIAPHRAGM

DIAPHRAGM LOAD =	4458	LBS
SHEAR LENGTH =	79.0	FT
DIAPHRAGM SHEAR =	56	PLF

FLOOR DIAPHRAGM

DIAPHRAGM LOAD =	7564	LBS
SHEAR LENGTH =	79.0	FT
DIAPHRAGM SHEAR =	96	PLF

SEISMIC FORCES

	AREA (SF)	WEIGHTS (PSF)	ZONE WEIGHT (LBS)
ROOF	1850.0	61	112850
⊥ WALL	378.0	17	6426
∥ WALL	553.0	17	9401
FLOOR	1850.0	24	44400
⊥ WALL	180.0	17	3060
∥ WALL	336.0	17	5712
		TOTAL	**181849**
UPPER SHEAR WALL LOAD			13145 LBS
MAIN SHEAR WALL LOAD			18577 LBS

ROOF DIAPHRAGM

DIAPHRAGM LOAD =	12185	LBS
SHEAR LENGTH =	79.0	FT
DIAPHRAGM SHEAR =	154	PLF

FLOOR DIAPHRAGM

DIAPHRAGM LOAD =	4848	LBS
SHEAR LENGTH =	79.0	FT
DIAPHRAGM SHEAR =	61	PLF

UPPER SHEAR WALL LOADS

WIND SHEAR LOAD = TOTAL LOAD/1.4 — 3184 LBS

SEISMIC SHEAR LOAD — 13145 LBS — **SEISMIC GOVERNS**

SW HEIGHT 12 FT
HEAR LOAD 13145 LBS
0 LBS RESISTED BY PANELS/P.F.
HEAR LOAD 13145 LBS RESISTED BY SW

WALL LENGTH	TRIB. SPAN	UNIFORM DL (PLF)	PT LOAD (LBS)	NET OVERTURN (FT-LB)	UPLIFT (LBS):	STRAP TIE REQUIRED	CAPACITY REQUIRED	SHEAR WALL
3.8	1.0	231	578	20906	7152	ST-4	858	SW-5
3.5	9.0	447	1118	16164	6004	ST-4	931	SW-6
5.1	13.0	555	1388	18948	4830	ST-3	639	SW-4
3.5	9.0	447	1118	16164	6004	ST-4	931	SW-6
3.3	9.0	447	1118	15388	6062	ST-4	988	SW-6
5.0	8.5	434	1084	21753	5656	ST-4	652	SW-4

TOTAL LENGTH = 24.2 FT
OVERALL WALL SHEAR = **543 PLF**

MAIN SHEAR WALL LOADS

WIND SHEAR LOAD = TOTAL LOAD/1.4 — 8887 LBS

SEISMIC SHEAR LOAD — 18577 LBS — **SEISMIC GOVERNS**

SW HEIGHT 12 FT
MAX LOAD 18577 LBS
0 LBS RESISTED BY PANELS/P.F.
HEAR LOAD 18577 LBS RESISTED BY SW

WALL LENGTH	TRIB. SPAN	FORCE ABOVE	UNIFORM DL (PF)	PT LOAD EACH SIDE (LBS)	NET OVERTURN (FT-LB)	UPLIFT FORCE	HOLDOWN REQUIRED	S.W. CAPACITY REQUIRED	SHEAR WALL
3.8	1.0		231	578	32808	8634	HD-7	1270	SW-6
7.3	10.0		474	1185	49166	8756	HD-7	804	SW-5
12.0	5.0		339	848	81224	8799	HD-7	804	SW-5

TOTAL LENGTH = 23.1 FT
OVERALL WALL SHEAR = **804 PLF**