STRUCTURAL CALCULATIONS
AND DETAILS

SONOMA COUNTY WATER AGENCY

REVIEW OF (E) BLDG AND ADD'L EQUIPMENT LOADING

404 AVIATION BLVD

SANTA ROSA, CA 95403

Project No.: **2008034.313**

Issued: **July 10, 2014**

SUMMIT

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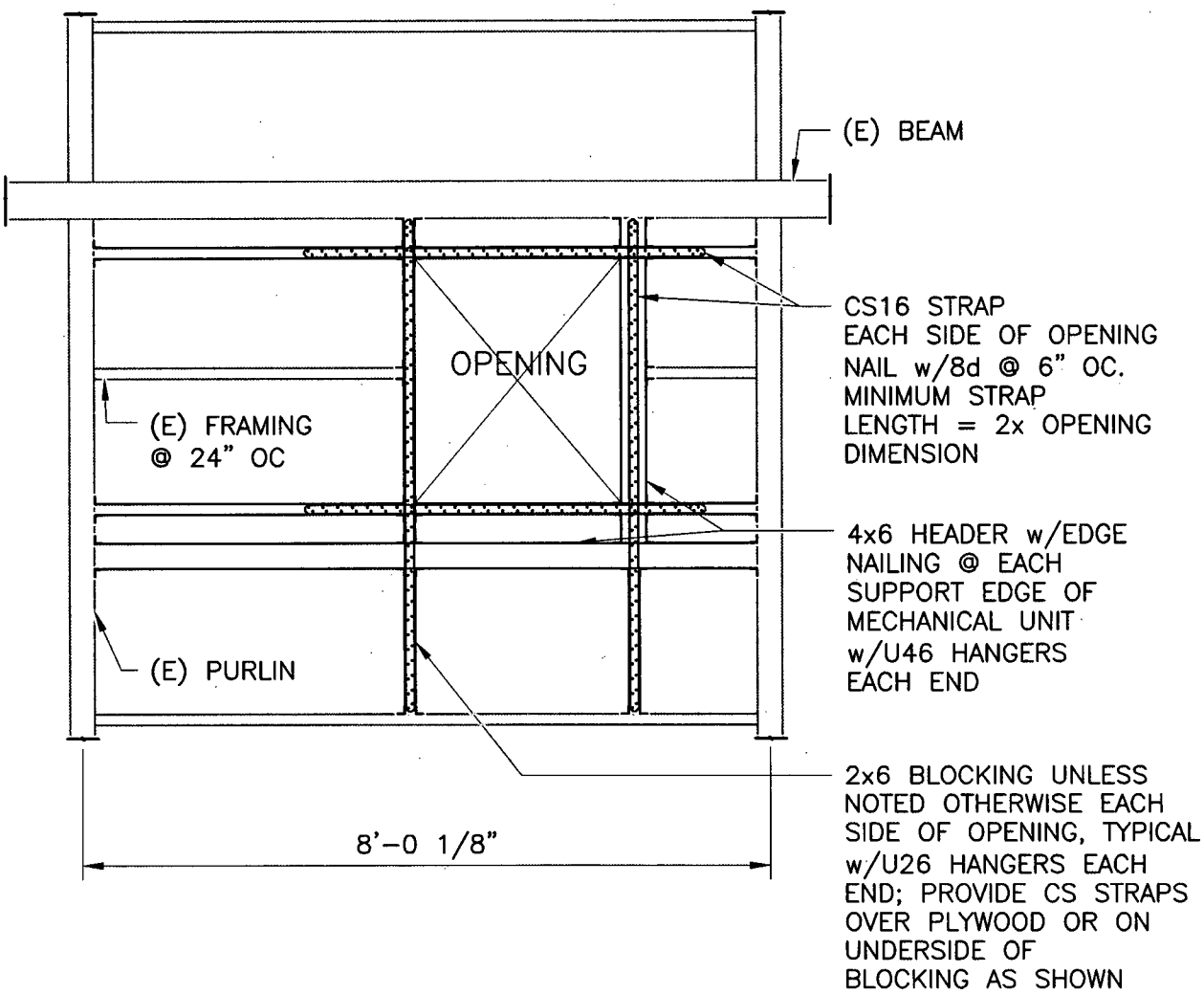
SUMMIT

SONOMA COUNTY WATER AGENCY
404 AVIATION BLVD
SANTA ROSA CA, 95403

MECHANICAL UNIT OPENING DETAIL

PROJECT NO: 2008034.313
DATE 2014-07-10
SHT NO S4.0 OF S4.1
BY RS CHK AT



DETAIL 1
NTS

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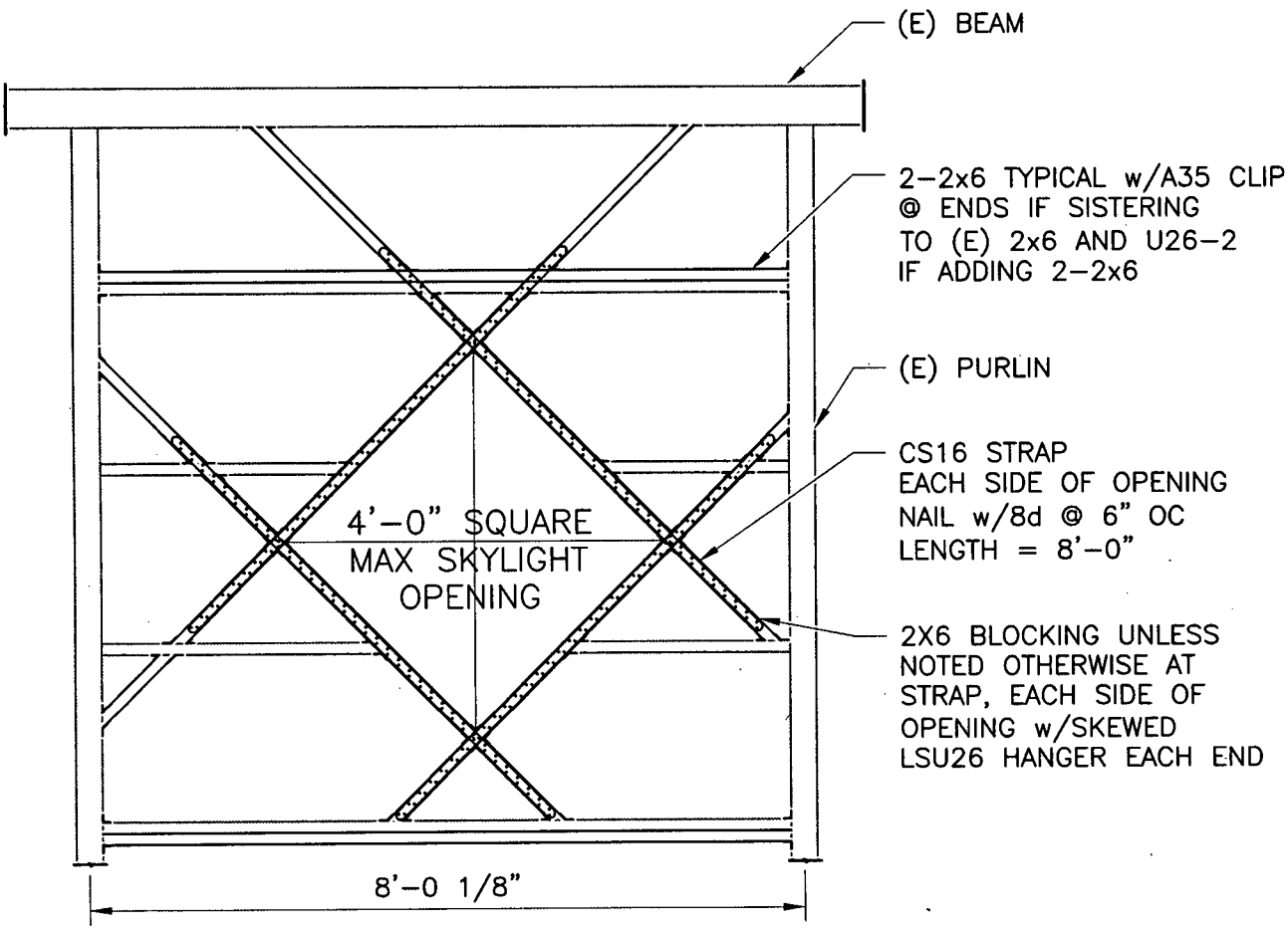
SONOMA COUNTY WATER AGENCY
404 AVIATION BLVD
SANTA ROSA CA, 95403

SKYLIGHT OPENING DETAIL

PROJECT NO 2008034.313
DATE 2014-07-10
SHT NO S4.1 OF S4.1
BY RS CHK AT



DETAIL 2
NTS

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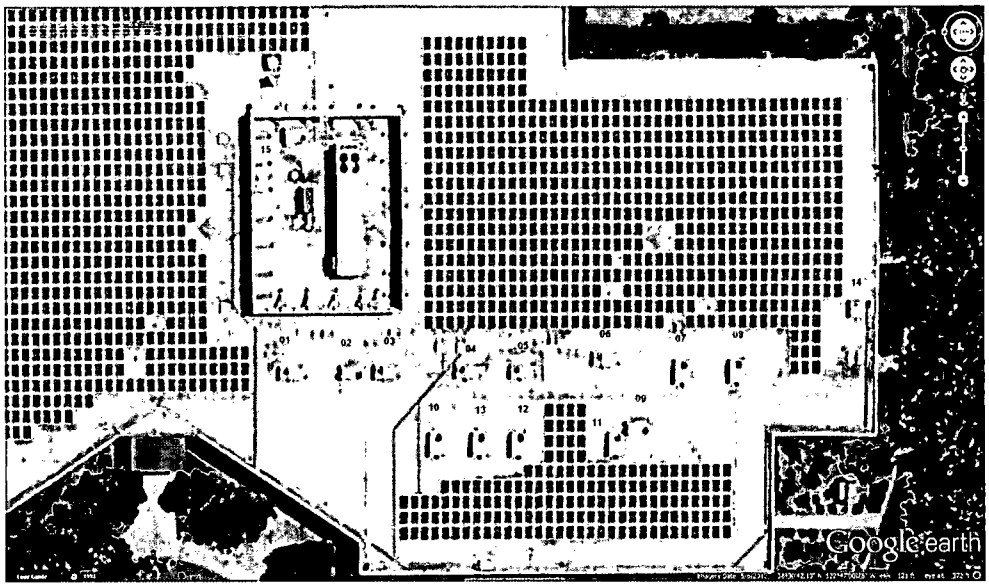
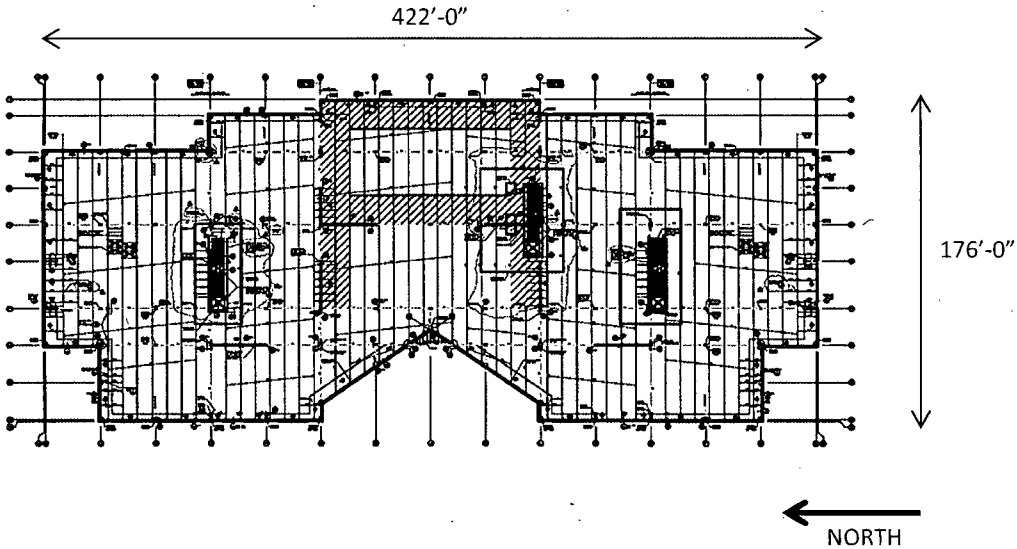
INTRODUCTION

The following calculations cover the review of the existing building loads along with the additional loads from 15 new mechanical units and 2224 PV panels (that were added after original construction) to the roof. These calculations explore the vertical impact and the seismic impact of the additional loads on the existing building.



Mechanical Equipment Plan



GLOBAL DESIGN CRITERIA

Building Code : **2013 California Building Code**
Section 3403 – Existing Structures

GRAVITY LOADS

LIVE LOAD

Roof Live Load = **20 psf** [Reducible per 2013 CBC]

(E) DEAD LOAD

Roof Dead Load DL_{ROOF}

Roofing	=	3.0 psf	
Plywood	=	1.8 psf	
Sub purlin	=	1.1 psf	
Purlin	=	1.4 psf	
Beams	=	1.5 psf	
Insulation	=	0.5 psf	
Ceiling	=	1.8 psf	
Sprinkler	=	1.5 psf	
+ MEP & miscellaneous	=	1.4 psf	
Total Roof Dead Load	=	**14.0 psf**	
Use	=	**15.0 psf**	[From Previous MKM Calcs]
Use	=	**20.0 psf seismic wt**	[Add **5 psf** for partitions in seismic analysis]

Tilt-Up Wall Dead Load DL_{WALL}

Use = **75.0 psf** [From Previous MKM Calcs]

Original Mechanical Units DL_{MECH}

Use = **11870 lbs each** [From Previous MKM Calcs]

Original Screen DL_{SCREEN}

Use = **50 plf x 360 ft** [From Previous MKM Calcs]
= **18 k**

Original Concrete Pad $DL_{CONC\ PAD}$.

Use = **50 psf x 868 sf** [From Previous MKM Calcs]
= **43.4 k**

NEW DEAD LOAD

Mechanical Units $DL_{MECH\ \#1\text{-}\#14}$

Use = **465 lbs**

Mechanical Units $DL_{MECH\ \#15}$

Use = **610 lbs**

PV Panels DL_{PV}

Use = **65 lbs** [Approx. 4.7 psf]

LATERAL LOADS

SEISMIC LOAD

$V = C_s W$

(ASD) C_s = 0.184 [From Previous MKM Calcs]

SUMMARY

- **Assumptions**
  - All (E) loading is taken from MKM prior calculations
  - No live load needs to be considered where there are PV panels or Mechanical Units
- **Calculations**
  - (E) Building weight was calculated
    - Considers full dead load and tilt-up wall loads, 2 (E) mechanical units with concrete pads and screens
  - Added weight was calculated
    - Considers 15 new mechanical units and 2224 PV panels
  - Vertical load increase was calculated and compared to the 5% allowable increase per CBC 2013, Section 3403 Existing Structures
    - Vertical load increase = 0%
    - (E) Framing was checked for added loads
  - Seismic load increase was calculated in N/S and E/W directions and compared to the 10% allowable increase per CBC 2013, Section 3403 Existing Structures
    - Seismic load increase N/S = 9.5%
    - Seismic load increase E/W = 8.2%
- **Findings**
  - Vertical load increase does not exceed 5% limit per CBC 2013, Section 3403 Existing Structures
  - Seismic load increase does not exceed 10% limit per CBC 2013, Section 3403 Existing Structures
    - No PV panels need to be removed from the roof
    - **IN THE EVENT THAT PV PANELS ARE EVER REMOVED FROM THE ROOF, PV PANELS NEAR 15 NEW MECHANICAL UNITS SHALL REMAIN TO PREVENT LIVE LOAD OVERSTRESS OF BEAMS.**

**See following appendices for calculations supporting the above findings

APPENDIX

See the following Appendices for Load Calculations and (E) Framing Checks

APPENDIX A - LOADING REVIEW

EXISTING LOADING

(E) VERTICAL LOADS

ROOF AREA

$(422 \times 176) - 2[(30 \times 40) + (26 \times 90) + (60.75 \times 8)] - (9.5 \times 119) - (23.5 \times 31.5) - (47 \times 31.5)$

AREA = 62520 SF

WALL AREA

INTERIOR = $(32 + 30 + 20 + 26 + 30)2 = 276^{FT}$

$276^{FT}(15^{FT}/2) = 2070^{SF}$

INT. AREA = 2070 SF

EXTERIOR

N/S = $(422 \times 2) = 844^{FT}$

$844^{FT}(110.5^{FT}/2) = 62603^{SF}$

EXT. N/S AREA = 62603 SF

E/W = $(176)2 + (40)2 = 432^{FT}$

$432^{FT}(110.5^{FT}/2) = 35604^{SF}$

EXT. E/W AREA = 35604 SF

	VERTICAL			SEISMIC		
	PSF	AREA (SF)	WEIGHT (K)	PSF	AREA (SF)	WEIGHT (K)
DEAD	15	62520	938	20	62520	1250.4
LIVE	20	62520	1250.4	-	-	-
INT. WALL	75	2070	155.3	-	-	-
EXT. N/S WALL	75	62603	522.3	75	62603	522.3
EXT. E/W WALL	75	35604	267.3	75	35604	267.3
(E) UNITS/etc.	-	-	83.2	-	-	83.2

(E) SEISMIC LOADS

$V = C_S W$

$V_{N/S} = 0.184(1250.4^K + 267.3^K + 83.2^K) = 294.6^K$

$V_{N/S} = 294.6^K$

$V_{E/W} = 0.184(1250.4^K + 522.3^K + 83.2^K) = 341.4^K$

$V_{E/W} = 341.4^K$

ADDITIONAL LOADING FROM MECHANICAL UNITS AND PV PANELS

NEW VERTICAL LOADS

14 mech. units = 14(465#) = 6510
1 mech. unit = 1 (610#) = 610
PV panels = 2224 (65#) = 144560
= 151.7k

NEW SEISMIC LOADS

V = CsW
= 0.184(151.7k)

V = 28k

CHECK LOAD INCREASE PER CBC 2013

VERTICAL LOAD INCREASE

CHECK ADD'L VERTICAL LOAD INCREASE

NEW = 151.7k

"REMOVE" = 20 PSF (30858 SF + 3021 SF) = 624k

$$\frac{NEW}{(E)} = \frac{151.7^k - 624^k}{938^k + 155.3^k + 522.3^k + 267.3^k + 85.2^k} = \frac{-472^k}{1968.1^k} = 0\% \text{ increase} \leq 5\%$$

OK per CBC 2013 §3403.3

LATERAL LOAD INCREASE

CHECK ADD'L LATERAL LOAD INCREASE

$$\frac{NEW}{(E)_{N/S}} = \frac{28^k}{295^k} = 9.5\% \text{ increase} < 10\%$$

OK per CBC 2013 §3403.4

$$\frac{NEW}{(E)_{E/W}} = \frac{28^k}{342^k} = 8.2\% \text{ increase} < 10\%$$

APPENDIX B – CHECK (E) FRAMING MEMBERS

CHECK MEMBERS FOR ADDITIONAL PV LOADING

PURLINS

PURLINS FOR ADDED PV PANELS

Member	Section (I-joist)	Span (FT)	Trib (FT)	D (PSF)	L (PSF)	PV (PSF)	EI	W_{D+PV} (PLF)	V (K)	M (KFT)	D_{D+PV} (IN)	C_D	V_{allow} (K)	M_{allow} (KFT)	L/180 (IN)	V	M	D
P1	18" SSI 425R	20	8	12	20	4.7	1582000000	133.6	1.34	6.68	0.304	1.25	3.50	15.10	1.33	OK	OK	OK
P2	24" SSI 435R	28.5	8	12	16	4.7	3933000000	133.6	1.90	13.56	0.504	1.25	4.52	28.47	1.90	OK	OK	OK
P3	30" SSI 435R	40	8	12	16	4.7	6448000000	133.6	2.67	26.72	1.193	1.25	5.54	36.81	2.67	OK	OK	OK

Notes:

1. It can be assumed that there is no Live load where there are PV panels.
2. Deflection above considers dead load and PV load
3. Dead load to purlins taken as 12psf per MKM calculations
4. Shear and Moments consider Dead load and PV load
5. Allowable shear and moments are based off of ssI Tables and reduced by 3% for "R" top chord (See next page)

Member	Section (I-joist)	Span (FT)	Trib (FT)	D (PSF)	L (PSF)	PV (PSF)	EI	W_{D+PV} (PLF)	V (K)	M (KFT)	D_L (IN)	C_D	TL_{allow} (PLF)	$TL_{L/180}$ (PLF)	TL	L/180
P4	42" SST 44R	46	8	12	16	4.7	38896200000	133.6	3.07	35.34	0.33	1.25	261.50	187.50	OK	OK

Notes:

1. It can be assumed that there is no Live load where there are PV panels.
2. ssT was cambered for dead loads. Deflection above considers live load only
3. Dead load to purlins taken as 12psf per MKM calculations
4. TL compared to ssT Tables (See next page)

All purlins are OK for additional PV loading

BEAMS

Member	Section (GluLam)	Span (FT)	Trib (FT)	D (PSF)	L (PSF)	PV (PSF)	EI	A (IN2)	S (IN3)	C_v	C_D	W_{D+PV} (PLF)	f_v (PSI)	f_b (PSI)	D_{Live} (IN)	F_v (PSI)	F_b (PSI)	L/180 (IN)	V	M	D
B1	5 1/8 x 22 1/2	30	30	15	12	4.7	8757000000	115.3	432.4	0.906	1.25	591.0	115.3	1845.2	0.749	331.3	2718.5	2	OK	OK	OK
B2	5 1/8 x 24	30	34.5	15	12	4.7	10627200000	123	492	0.900	1.25	679.7	124.3	1864.9	0.710	331.3	2701.0	2	OK	OK	OK
B3	5 1/8 x 27	30	43	15	12	4.7	15130800000	138.4	622.7	0.890	1.25	847.1	137.7	1836.5	0.622	331.3	2669.4	2	OK	OK	OK
B4	5 1/8 x 33	30	33	15	12	4.7	27630000000	169.1	930.2	0.872	1.25	650.1	86.5	943.5	0.261	331.3	2616.4	2	OK	OK	OK

Notes:

1. It can be assumed that there is no Live load where there are PV panels.
2. Shear stress and bending stress consider Dead load and PV load.
3. GLBs were cambered for dead loads. Deflection above considers live load only
4. Allowable shear and bending stress are calculated according to NDS 2005

All beams are OK for additional PV loading

FLOOR / ROOF SYSTEMS

ssi JOIST

Design Properties

ssi 324 - F8

Depth in.	M ft-lbs	V lbs	EI x10^6	C x10^6
10	4,365	1,680	299	5.62
11.5	5,204	1,820	413	6.39
12	5,485	1,870	455	6.65
14	6,611	2,055	644	7.70
16	7,742	2,245	868	8.76
18	8,876	2,435	1,127	9.83
20	10,011	2,625	1,421	10.90
22	11,148	2,810	1,752	11.97
24	12,286	3,000	2,120	13.04
26	13,425	3,190	2,525	14.12
28	14,564	3,380	2,969	15.19
30	15,704	3,565	3,451	16.26

ssi 325 - F8

Depth in.	M ft-lbs	V lbs	EI x10^6	C x10^6
10	4,355	1,925	303	7.98
11.5	5,182	2,080	418	9.09
12	5,459	2,130	461	9.46
14	6,568	2,330	653	10.96
16	7,681	2,530	882	12.48
18	8,797	2,735	1,148	14.00
20	9,915	2,935	1,452	15.52
22	11,034	3,135	1,794	17.05
24	12,154	3,335	2,176	18.58
26	13,275	3,540	2,599	20.10
28	14,396	3,740	3,063	21.63
30	15,518	3,940	3,570	23.15

ssi 424 - F8

Depth in.	M ft-lbs	V lbs	EI x10^6	C x10^6
10	6,124	1,680	416	5.71
11.5	7,314	1,820	573	6.48
12	7,713	1,870	631	6.74
14	9,312	2,055	894	7.80
16	10,918	2,245	1,203	8.87
18	12,528	2,435	1,561	9.95
20	14,141	2,625	1,966	11.03
22	15,756	2,810	2,421	12.11
24	17,372	3,000	2,926	13.19
26	18,990	3,190	3,481	14.28
28	20,609	3,380	4,086	15.36
30	22,228	3,565	4,743	16.45

ssi 425 - F8

Depth in.	M ft-lbs	V lbs	EI x10^6	C x10^6
10	6,115	1,787	419	8.13
11.5	7,294	1,995	578	9.24
12	7,688	2,065	637	9.62
14	9,271	2,343	903	11.13
16	10,859	2,621	1,218	12.67
18	12,451	2,899	1,582	14.20
20	14,046	3,178	1,997	15.75
22	15,643	3,456	2,463	17.30
24	17,242	3,734	2,982	18.84
26	18,842	4,012	3,554	20.39
28	20,442	4,290	4,181	21.94
30	22,044	4,568	4,862	23.49

ssi 434 - F8

Depth in.	M ft-lbs	V lbs	EI x10^6	C x10^6
14	12,128	2,055	1,146	8.03
16	14,399	2,245	1,560	9.06
18	16,681	2,435	2,040	10.11
20	18,973	2,625	2,587	11.18
22	21,271	2,810	3,201	12.25
24	23,573	3,000	3,883	13.33
26	25,879	3,190	4,633	14.41
28	28,188	3,380	5,452	15.49
30	30,500	3,565	6,341	16.57

ssi 435 - F8

Depth in.	M ft-lbs	V lbs	EI x10^6	C x10^6
14	12,122	2,343	1,155	11.44
16	14,376	2,621	1,573	12.92
18	16,642	2,899	2,060	14.43
20	18,917	3,178	2,614	15.96
22	21,197	3,456	3,239	17.49
24	23,483	3,734	3,933	19.03
26	25,771	4,012	4,699	20.58
28	28,063	4,290	5,537	22.12
30	30,356	4,568	6,448	23.67

ssi 444 - F8

Depth in.	M ft-lbs	V lbs	EI x10^6	C x10^6
14	15,040	2,055	1,406	8.58
16	18,185	2,245	1,947	9.50
18	21,367	2,435	2,580	10.47
20	24,574	2,625	3,305	11.49
22	27,799	2,810	4,123	12.52
24	31,039	3,000	5,034	13.57
26	34,289	3,190	6,039	14.63
28	37,548	3,380	7,138	15.69
30	40,813	3,565	8,332	16.76

ssi 445 - F8

Depth in.	M ft-lbs	V lbs	EI x10^6	C x10^6
14	15,077	2,343	1,415	12.18
16	18,209	2,621	1,960	13.51
18	21,376	2,899	2,598	14.92
20	24,567	3,178	3,330	16.37
22	27,777	3,456	4,156	17.85
24	31,000	3,734	5,078	19.36
26	34,234	4,012	6,096	20.87
28	37,476	4,290	7,212	22.40
30	40,724	4,568	8,426	23.94

PROOF LOADED QUALITY ASSURANCE

Standard Structures Inc. DEVELOPING BETTER WAYS TO BUILD

PANELIZED ROOF SYSTEMS

SST PURLIN

SST 44R Roof Span Load Tables

SST 44R Roof Span Load Tables

Flange Grade: F8 Load Duration: 1.15

Depth (In.) →	28		32		36		40		44		46		48		50		52		54		56		58	
Span (Ft.)↓	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180
25	519	872	603		688		712		712		712		712		712		712		712		712		712	
26	480	745	558		636		685		685		685		685		685		685		685		685		685	
27	445	641	517	866	589		659		659		659		659		659		659		659		659		659	
28	414	554	481	748	548	972	615		636		636		636		636		636		636		636		636	
29	386	481	448	650	511	845	574		614		614		614		614		614		614		614		614	
30	360	420	419	568	477	738	536	930	593		593		593		593		593		593		593		593	
31	338	369	392	498	447	647	502	815	557		574		574		574		574		574		574		574	
32	317	325	368	439	420	570	471	718	523	884	548	973	556		556		556		556		556		556	
33	298	287	346	388	395	504	443	635	491	781	516	860	539	943	539		539		539		539		539	
34	281	255	326	344	372	447	417	564	463	693	486	763	508	837	524	913	524	993	524		524		524	
35	265	227	308	307	351	398	394	502	437	617	458	680	480	745	501	813	509	885	509	959	509		509	
36	250	203	291	274	332	356	372	448	413	552	433	607	454	666	474	727	494	790	494	857	494	926	494	997
37			275	245	314	319	352	402	391	494	410	544	429	597	449	651	468	708	481	768	481	830	481	894
38			261	221	298	287	334	361	371	444	389	489	407	536	425	585	444	637	462	690	468	746	468	803
39			248	199	283	258	317	326	352	401	369	441	386	483	404	528	421	574	438	622	456	672	456	724
41					256	211	287	266	318	328	334	361	350	396	365	432	381	470	397	509	412	550	428	593
43							261	220	289	271	304	298	318	327	332	357	346	388	361	421	375	455	389	490
45									264	226	277	249	290	273	303	298	316	324	329	351	342	379	355	409

Flange Grade: F8 Load Duration: 1.25

Depth (In.) →	16		20		24		28		32		36		40		44		48		52		56		58	
Span (Ft.)↓	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180	TL	L/180
25	289	229	381	397	472	611	564	872	656		712		712		712		712		712		712		712	
26	267	196	352	340	437	523	522	745	606		685		685		685		685		685		685		685	
28	231	146	304	252	377	389	450	554	523	748	596	972	636		636		636		636		636		636	
30	201	110	264	192	328	295	392	420	455	568	519	738	583	930	593		593		593		593		593	
32			232	148	288	228	344	325	400	439	456	570	512	718	556	884	556		556		556		556	
34			206	116	255	179	305	255	355	344	404	447	454	564	503	693	524	837	524	993	524		524	
36					228	142	272	203	316	274	360	356	405	448	449	552	493	666	494	790	494	926	494	997
38					204	115	244	163	284	221	323	287	363	361	403	444	442	536	468	637	468	746	468	803
40							220	133	256	180	292	233	328	294	364	362	399	437	435	519	445	607	445	654
42							200	109	232	148	265	192	297	242	330	298	362	359	395	427	424	500	424	538
44									212	123	241	159	271	201	300	247	330	298	360	354	389	415	404	447
46											221	133	248	168	275	207	302	250	329	296	356	347	370	374
48											203	113	228	142	252	175	277	211	302	250	327	293	339	316
50													210	120	233	148	256	179	278	212	301	249	313	268
52															215	127	236	153	257	182	279	213	289	229
54																	219	131	239	156	258	183	268	197
56																	204	114	222	135	240	158	249	170
60																					209	120	217	129

NOTES:
1. TL is Dead Load plus the Live Load in pounds per linear foot.
2. Moment and Shear Values have been increased by percentages shown (Load Duration)
3. Standard Structures Inc. recommends 1/4 to 12 minimum roof slope. Where minimum roof slope is not maintained, ponding of water must be considered in the roof design per 1994 UBC section 1605.6.
4. The deflection load column (L/180) is for reference only. In no case shall the design load exceed the load in the TL column.
5. The ssT Purlins are cambered to compensate for Dead Load deflection.

Standard Structures Inc.
DEVELOPING BETTER WAYS TO BUILD

PROOF LOADED
QUALITY ASSURANCE

PONDING CHECK

CHECK PURLINS FOR PONDING

Member	Section (I-joist)	D_o (IN)	RAIN WT.	D (IN)	RAIN WT.	D (IN)	RAIN WT.	D (IN)	RAIN WT.	D (IN)	RAIN WT.	D (IN)	L/180 (IN)	PONDING
P1	18" SSI 425R	0.3040	6.15	0.3051	6.17	0.3051	6.17	0.3051	6.17	0.3051	6.17	0.3051	1.33	OK
P2	24" SSI 435R	0.5042	14.53	0.5073	14.62	0.5073	14.62	0.5073	14.62	0.5073	14.62	0.5073	1.90	OK
P3	30" SSI 435R	1.1934	48.27	1.2107	48.97	1.2109	48.98	1.2109	48.98	1.2109	48.98	1.2109	2.67	OK
P4	42" SST 44R	0.3315	15.42	0.3329	15.48	0.3329	15.48	0.3329	15.48	0.3329	15.48	0.3329	3.07	OK

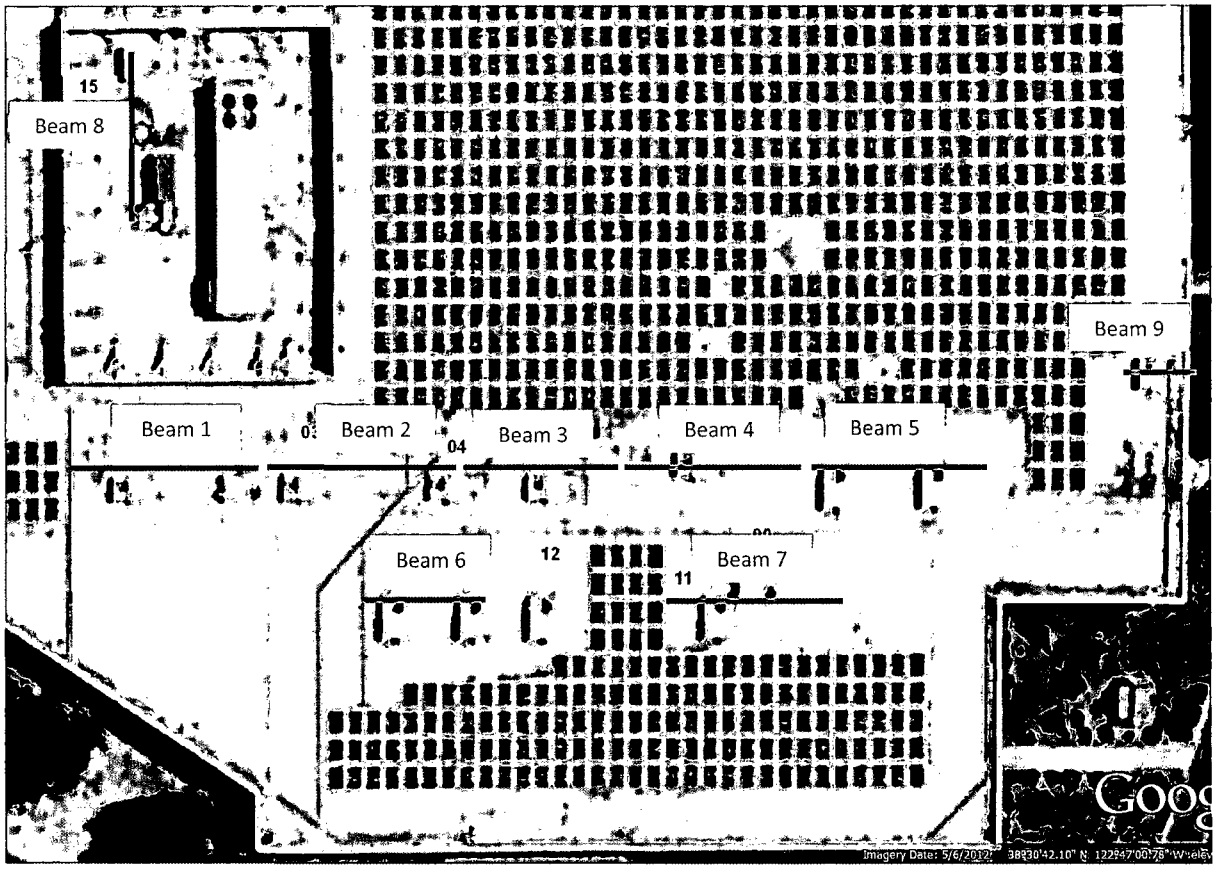
CHECK BEAMS FOR PONDING

Member	Section (Glulam)	D_o (IN)	RAIN WT.	D (IN)	RAIN WT.	D (IN)	RAIN WT.	D (IN)	RAIN WT.	D (IN)	RAIN WT.	D (IN)	L/180 (IN)	PONDING
B1	5 1/8 x 22 1/2	0.7492	33.28	0.7529	33.44	0.7529	33.44	0.7529	33.44	0.7529	33.44	0.7529	2.00	OK
B2	5 1/8 x 24	0.7100	31.54	0.7129	31.66	0.7129	31.66	0.7129	31.66	0.7129	31.66	0.7129	2.00	OK
B4	5 1/8 x 27	0.6215	27.61	0.6233	27.68	0.6233	27.68	0.6233	27.68	0.6233	27.68	0.6233	2.00	OK
B4	5 1/8 x 33	0.2612	11.60	0.2616	11.62	0.2616	11.62	0.2616	11.62	0.2616	11.62	0.2616	2.00	OK

Note: Purlins (P1-P3) not cambered for dead load – Initial deflection based on Dead load and PV load
Beams and P4 were cambered for dead load – Initial deflection based on Live load

STRESS CHECK FOR ADDED MECHANICAL UNIT POINT LOADS

BEAM IDENTIFICATION

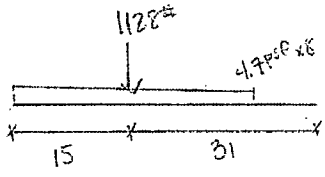


BEAM STRESS CHECKS

Note: Live load (12psf) > PV load (4.5psf)
All beams are conservatively checked initially for dead (14psf) and live loads (12psf) with the added mechanical unit point loads

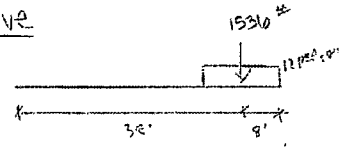
If the beam was overstressed, it was checked for actual PV and live loads:

PV loading



PV = (15/46)(1128#) = 368#/8 = 46plf

Live



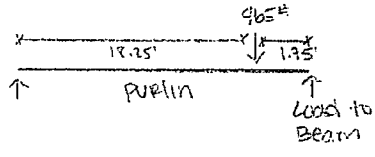
L = (38/46)(1536) = 1269#/8 = 159plf

All mechanical unit weights are applied as a single point load at the midpoint of the unit along the beam
No live load is applied at the location of a mechanical unit

mechanical unit loads

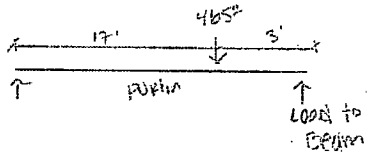
units oriented N/S :

(18.25/20)465# = 424#



units oriented E/W :

(17/20)465 = 395#



BEAM 1

Wood Beam

File = P:\Project\2003\200303-1\Docs\STRUCT-1\TASK31-2\SUMMIT-1\CALCSW-2\BEAMCH-1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 — **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 1 - BM3; UNITS 1-2

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : ASCE 7-05

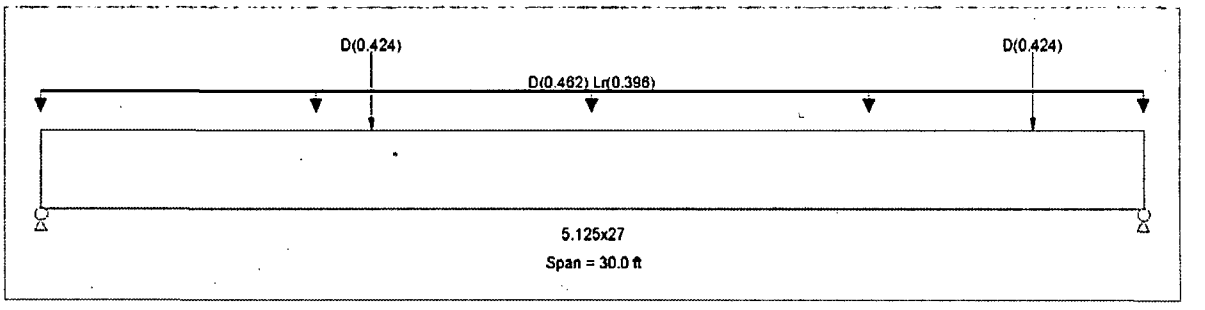
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-05

Wood Species : DF/DF
Wood Grade : 24F - V4

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

		E : Modulus of Elasticity	
Fb - Tension	2,400.0 psi	Ebend- xx	1,800.0ksi
Fb - Compr	1,850.0 psi	Eminbend - xx	930.0ksi
Fc - Prll	1,650.0 psi	Ebend- yy	1,600.0ksi
Fc - Perp	650.0 psi	Eminbend - yy	830.0ksi
Fv	265.0 psi	Density	32.210pcf
Ft	1,100.0 psi		



Applied Loads — Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0140, Lr = 0.0120 ksf, Tributary Width = 33.0 ft, (EXISTING DEAD)
Point Load : D = 0.4240 k @ 9.0 ft, (UNIT 1)
Point Load : D = 0.4240 k @ 27.0 ft, (UNIT 2)

DESIGN SUMMARY — **Design OK**

Maximum Bending Stress Ratio	=	0.715 : 1	Maximum Shear Stress Ratio	=	0.376 : 1
Section used for this span		5.125x27	Section used for this span		5.125x27
fb : Actual	=	1,909.27psi	fv : Actual	=	124.66 psi
FB : Allowable	=	2,669.39psi	Fv : Allowable	=	331.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	14.891ft	Location of maximum on span	=	27.810 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.480 in	Ratio =	750
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.069 in	Ratio =	336
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.394	0.210	1.25	0.890	1.00	1.00	1.00	1.00	1.00	54.53	1,050.80	2669.39	6.43	69.67	331.25
+D+L+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.394	0.210	1.25	0.890	1.00	1.00	1.00	1.00	1.00	54.53	1,050.80	2669.39	6.43	69.67	331.25
+D+Lr+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.715	0.376	1.25	0.890	1.00	1.00	1.00	1.00	1.00	99.07	1,909.27	2669.39	11.50	124.66	331.25
+D+S+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.394	0.210	1.25	0.890	1.00	1.00	1.00	1.00	1.00	54.53	1,050.80	2669.39	6.43	69.67	331.25
+D+0.750Lr+0.750L+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.635	0.335	1.25	0.890	1.00	1.00	1.00	1.00	1.00	87.94	1,694.65	2669.39	10.23	110.91	331.25

Wood Beam

File = P:\Project\2008\200903-1\Docs\STRUCT-1\TASK31-2\SUMMIT-1\CALCSW-2\BEAMCH-1.EC6
ENERCALC, INC. 1983-2014, Build 6.14.6.15, Ver 6.14.6.15

Lic. # : KW-06000146 — **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 1 - BM3: UNITS 1-2

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
+D+0.750L+0.750S+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.394	0.210	1.25	0.890	1.00	1.00	1.00	1.00	1.00	54.53	1,050.80	2669.39	6.43	69.67	331.25
+D+W+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.394	0.210	1.25	0.890	1.00	1.00	1.00	1.00	1.00	54.53	1,050.80	2669.39	6.43	69.67	331.25
+D+0.70E+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.394	0.210	1.25	0.890	1.00	1.00	1.00	1.00	1.00	54.53	1,050.80	2669.39	6.43	69.67	331.25
+D+0.750Lr+0.750L+0.750W+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.635	0.335	1.25	0.890	1.00	1.00	1.00	1.00	1.00	87.94	1,694.65	2669.39	10.23	110.91	331.25
+D+0.750L+0.750S+0.750W+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.394	0.210	1.25	0.890	1.00	1.00	1.00	1.00	1.00	54.53	1,050.80	2669.39	6.43	69.67	331.25
+D+0.750Lr+0.750L+0.5250E+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.635	0.335	1.25	0.890	1.00	1.00	1.00	1.00	1.00	87.94	1,694.65	2669.39	10.23	110.91	331.25
+D+0.750L+0.750S+0.5250E+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.394	0.210	1.25	0.890	1.00	1.00	1.00	1.00	1.00	54.53	1,050.80	2669.39	6.43	69.67	331.25
+0.60D+W+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.236	0.126	1.25	0.890	1.00	1.00	1.00	1.00	1.00	32.72	630.48	2669.39	3.86	41.80	331.25
+0.60D+0.70E+H					0.890	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.236	0.126	1.25	0.890	1.00	1.00	1.00	1.00	1.00	32.72	630.48	2669.39	3.86	41.80	331.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.0693	15.000		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	13.209	13.379
Overall MINimum	5.940	5.940
D Only	7.269	7.439
Lr Only	5.940	5.940
D+Lr	13.209	13.379

BEAM 2

Assume Unit 4 is directly above column.

Wood Beam

File = P:\Project\2008\200803~1\Docs\STRUCT~1\TASK31~2\SUMMIT~1\CALCSW~2\BEAMCH~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 — Licensee : SUMMIT ENGINEERING, INC.

Description : BEAM CHECK 2 - BM1, UNITS 3-4

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10

Load Combination Set : ASCE 7-05

Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-05

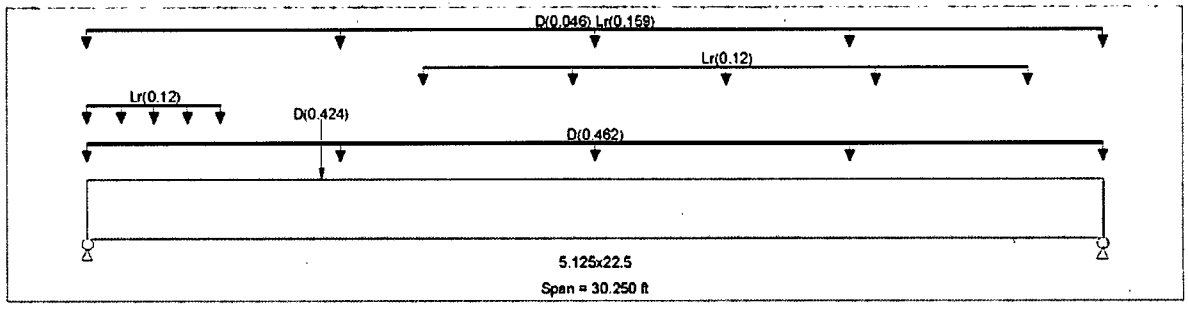
Wood Species : DF/DF
Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi
Fb - Compr	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0ksi
Eminbend - xx	930.0ksi
Ebend- yy	1,600.0ksi
Eminbend - yy	830.0ksi
Density	32.210pcf

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling



Applied Loads — Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0140 ksf, Tributary Width = 33.0 ft, (EXISTING DEAD)
Point Load : D = 0.4240 k @ 7.0 ft, (UNIT 3)
Uniform Load : Lr = 0.0120 ksf, Extent = 0.0 –>> 4.0 ft, Tributary Width = 10.0 ft, (EXISTING LIVE)
Uniform Load : Lr = 0.0120 ksf, Extent = 10.0 –>> 28.0 ft, Tributary Width = 10.0 ft, (EXISTING LIVE)
Uniform Load : D = 0.0460, Lr = 0.1590 , Tributary Width = 1.0 ft, (PV + LIVE)

DESIGN SUMMARY — **Design OK**

Maximum Bending Stress Ratio	=	0.908 : 1	Maximum Shear Stress Ratio	=	0.408 : 1
Section used for this span		5.125x22.5	Section used for this span		5.125x22.5
fb : Actual	=	2,465.18psi	fv : Actual	=	135.24 psi
FB : Allowable	=	2,716.25psi	Fv : Allowable	=	331.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	15.235ft	Location of maximum on span	=	28.484 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.548 in	Ratio =	662
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.679 in	Ratio =	216
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.609	0.279	1.25	0.905	1.00	1.00	1.00	1.00	1.00	59.60	1,653.93	2716.25	7.11	92.51	331.25
+D+L+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.609	0.279	1.25	0.905	1.00	1.00	1.00	1.00	1.00	59.60	1,653.93	2716.25	7.11	92.51	331.25
+D+Lr+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.908	0.408	1.25	0.905	1.00	1.00	1.00	1.00	1.00	88.83	2,465.18	2716.25	10.40	135.24	331.25
+D+S+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.609	0.279	1.25	0.905	1.00	1.00	1.00	1.00	1.00	59.60	1,653.93	2716.25	7.11	92.51	331.25

Wood Beam

File = P:\Project\2003\200303-1\Docs\STRUCT~1\TASK31~2\SUMMIT~1\CALCSW~2\BEAMCH~1.EC6
ENERCALC, INC. 1983-2014, Build 6.14.6.15, Ver.6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 2 - BM1, UNITS 3-4

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
+D+0.750Lr+0.750L+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.833	0.374	1.25	0.905	1.00	1.00	1.00	1.00	1.00	81.52	2,262.27	2716.25	9.52	123.82	331.25
+D+0.750L+0.750S+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.609	0.279	1.25	0.905	1.00	1.00	1.00	1.00	1.00	59.60	1,653.93	2716.25	7.11	92.51	331.25
+D+W+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.609	0.279	1.25	0.905	1.00	1.00	1.00	1.00	1.00	59.60	1,653.93	2716.25	7.11	92.51	331.25
+D+0.70E+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.609	0.279	1.25	0.905	1.00	1.00	1.00	1.00	1.00	59.60	1,653.93	2716.25	7.11	92.51	331.25
+D+0.750Lr+0.750L+0.750W+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.833	0.374	1.25	0.905	1.00	1.00	1.00	1.00	1.00	81.52	2,262.27	2716.25	9.52	123.82	331.25
+D+0.750L+0.750S+0.750W+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.609	0.279	1.25	0.905	1.00	1.00	1.00	1.00	1.00	59.60	1,653.93	2716.25	7.11	92.51	331.25
+D+0.750Lr+0.750L+0.5250E+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.833	0.374	1.25	0.905	1.00	1.00	1.00	1.00	1.00	81.52	2,262.27	2716.25	9.52	123.82	331.25
+D+0.750L+0.750S+0.5250E+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.609	0.279	1.25	0.905	1.00	1.00	1.00	1.00	1.00	59.60	1,653.93	2716.25	7.11	92.51	331.25
+0.60D+W+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.365	0.168	1.25	0.905	1.00	1.00	1.00	1.00	1.00	35.76	992.36	2716.25	4.27	55.51	331.25
+0.60D+0.70E+H					0.905	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.250 ft	1	0.365	0.168	1.25	0.905	1.00	1.00	1.00	1.00	1.00	35.76	992.36	2716.25	4.27	55.51	331.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.6786	15.235		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.666	11.575
Overall MINimum	3.656	3.793
D Only	8.009	7.782
Lr Only	3.656	3.793
D+Lr	11.666	11.575

BEAM 3

Assume unit 4 is directly above column

Wood Beam

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ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 — Licensee : SUMMIT ENGINEERING, INC.

Description : BEAM CHECK 3 - BM1. UNIT 4-5

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10

Load Combination Set : ASCE 7-05

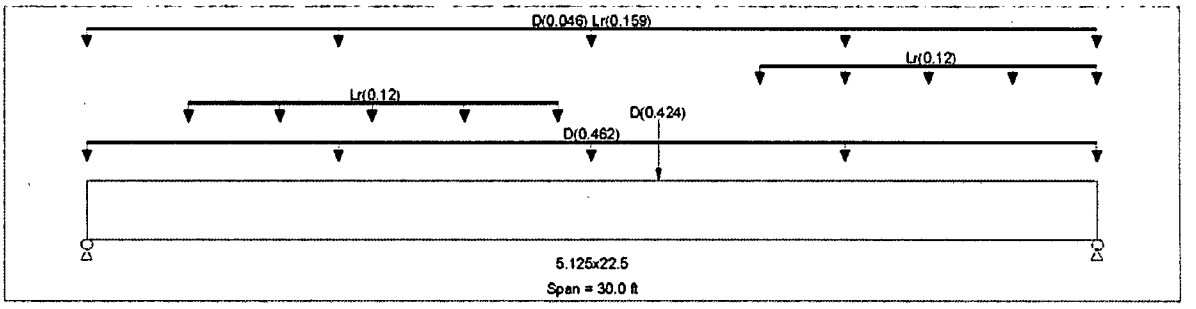
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-05

Wood Species : DF/DF
Wood Grade : 24F - V4

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,400.0 psi	*E : Modulus of Elasticity*			
Fb - Compr	1,850.0 psi	Ebend- xx	1,800.0ksi		
Fc - Prll	1,650.0 psi	Eminbend - xx	930.0ksi		
Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi		
Fv	265.0 psi	Eminbend - yy	830.0ksi		
Ft	1,100.0 psi	Density	32.210pcf		



Applied Loads — Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0140 ksf, Tributary Width = 33.0 ft, (EXISTING DEAD)
Point Load : D = 0.4240 k @ 17.0 ft, (UNIT 5)
Uniform Load : Lr = 0.0120 ksf, Extent = 3.0 –>> 14.0 ft, Tributary Width = 10.0 ft, (EXISTING LIVE)
Uniform Load : Lr = 0.0120 ksf, Extent = 20.0 –>> 30.0 ft, Tributary Width = 10.0 ft, (EXISTING LIVE)
Uniform Load : D = 0.0460, Lr = 0.1590 , Tributary Width = 1.0 ft, (PV + LIVE)

DESIGN SUMMARY — **Design OK**

Maximum Bending Stress Ratio	=	0.882 1	Maximum Shear Stress Ratio	=	0.399 : 1
Section used for this span		5.125x22.5	Section used for this span		5.125x22.5
fb : Actual	=	2,397.76psi	fv : Actual	=	132.09 psi
FB : Allowable	=	2,718.51psi	Fv : Allowable	=	331.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	15.000ft	Location of maximum on span	=	28.139 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.501 in	Ratio =	718
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.611 in	Ratio =	223
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination	Max Stress Ratios											Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.612	0.272	1.25	0.906	1.00	1.00	1.00	1.00	1.00	59.94	1,663.35	2718.51	6.91	89.95	331.25
+D+L+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.612	0.272	1.25	0.906	1.00	1.00	1.00	1.00	1.00	59.94	1,663.35	2718.51	6.91	89.95	331.25
+D+Lr+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.882	0.399	1.25	0.906	1.00	1.00	1.00	1.00	1.00	86.40	2,397.76	2718.51	10.15	132.09	331.25
+D+S+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.612	0.272	1.25	0.906	1.00	1.00	1.00	1.00	1.00	59.94	1,663.35	2718.51	6.91	89.95	331.25

Wood Beam

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ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 3 - BM1. UNIT 4-5

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+0.750Lr+0.750L+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.814	0.367	1.25	0.906	1.00	1.00	1.00	1.00	1.00	79.78	2,213.98	2718.51	9.34	121.55	331.25
+D+0.750L+0.750S+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.612	0.272	1.25	0.906	1.00	1.00	1.00	1.00	1.00	59.94	1,663.35	2718.51	6.91	89.95	331.25
+D+W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.612	0.272	1.25	0.906	1.00	1.00	1.00	1.00	1.00	59.94	1,663.35	2718.51	6.91	89.95	331.25
+D+0.70E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.612	0.272	1.25	0.906	1.00	1.00	1.00	1.00	1.00	59.94	1,663.35	2718.51	6.91	89.95	331.25
+D+0.750Lr+0.750L+0.750W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.814	0.367	1.25	0.906	1.00	1.00	1.00	1.00	1.00	79.78	2,213.98	2718.51	9.34	121.55	331.25
+D+0.750L+0.750S+0.750W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.612	0.272	1.25	0.906	1.00	1.00	1.00	1.00	1.00	59.94	1,663.35	2718.51	6.91	89.95	331.25
+D+0.750Lr+0.750L+0.5250E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.814	0.367	1.25	0.906	1.00	1.00	1.00	1.00	1.00	79.78	2,213.98	2718.51	9.34	121.55	331.25
+D+0.750L+0.750S+0.5250E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.612	0.272	1.25	0.906	1.00	1.00	1.00	1.00	1.00	59.94	1,663.35	2718.51	6.91	89.95	331.25
+0.60D+W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.367	0.163	1.25	0.906	1.00	1.00	1.00	1.00	1.00	35.96	998.01	2718.51	4.15	53.97	331.25
+0.60D+0.70E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.367	0.163	1.25	0.906	1.00	1.00	1.00	1.00	1.00	35.96	998.01	2718.51	4.15	53.97	331.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.6107	15.000		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.335	11.619
Overall MINimum	3.531	3.759
D Only	7.804	7.860
Lr Only	3.531	3.759
D+Lr	11.335	11.619

BEAM 4

Wood Beam

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ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 4 - BM4. UNIT 6

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : ASCE 7-05

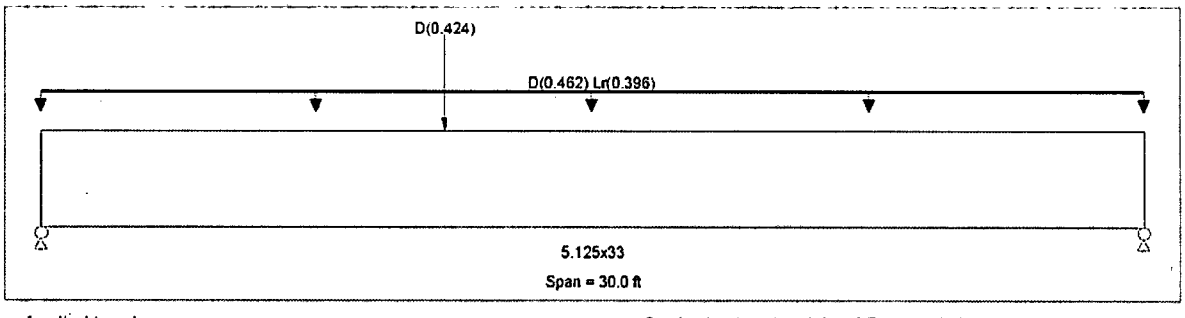
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-05

Wood Species : DF/DF
Wood Grade : 24F - V4

		E : Modulus of Elasticity	
Fb - Tension	2,400.0 psi	Ebend- xx	1,800.0ksi
Fb - Compr	1,850.0 psi	Eminbend - xx	930.0ksi
Fc - Prll	1,650.0 psi	Ebend- yy	1,600.0ksi
Fc - Perp	650.0 psi	Eminbend - yy	830.0ksi
Fv	265.0 psi	Density	32.210pcf
Ft	1,100.0 psi		

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling



Applied Loads

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

Uniform Load : D = 0.0140, Lr = 0.0120 ksf, Tributary Width = 33.0 ft, (EXISTING)
Point Load : D = 0.4240 k @ 11.0 ft, (UNIT 6)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.488 : 1	Maximum Shear Stress Ratio	=	0.289 : 1
Section used for this span		5.125x33	Section used for this span		5.125x33
fb : Actual	=	1,275.49psi	fv : Actual	=	95.70 psi
FB : Allowable	=	2,616.36psi	Fv : Allowable	=	331.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	14.781ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.263 in	Ratio =	1370
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.583 in	Ratio =	617
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.268	0.159	1.25	0.872	1.00	1.00	1.00	1.00	1.00	54.33	700.93	2616.36	5.93	52.63	331.25
+D+L+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.268	0.159	1.25	0.872	1.00	1.00	1.00	1.00	1.00	54.33	700.93	2616.36	5.93	52.63	331.25
+D+Lr+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.488	0.289	1.25	0.872	1.00	1.00	1.00	1.00	1.00	98.87	1,275.49	2616.36	10.79	95.70	331.25
+D+S+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.268	0.159	1.25	0.872	1.00	1.00	1.00	1.00	1.00	54.33	700.93	2616.36	5.93	52.63	331.25
+D+0.750Lr+0.750L+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.433	0.256	1.25	0.872	1.00	1.00	1.00	1.00	1.00	87.74	1,131.84	2616.36	9.58	84.93	331.25
+D+0.750L+0.750S+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

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ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 4 - BM4, UNIT 6

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 30.0 ft	1	0.268	0.159	1.25	0.872	1.00	1.00	1.00	1.00	1.00	54.33	700.93	2616.36	5.93	52.63	331.25
+D+W+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.268	0.159	1.25	0.872	1.00	1.00	1.00	1.00	1.00	54.33	700.93	2616.36	5.93	52.63	331.25
+D+0.70E+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.268	0.159	1.25	0.872	1.00	1.00	1.00	1.00	1.00	54.33	700.93	2616.36	5.93	52.63	331.25
+D+0.750Lr+0.750L+0.750W+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.433	0.256	1.25	0.872	1.00	1.00	1.00	1.00	1.00	87.74	1,131.84	2616.36	9.58	84.93	331.25
+D+0.750L+0.750S+0.750W+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.268	0.159	1.25	0.872	1.00	1.00	1.00	1.00	1.00	54.33	700.93	2616.36	5.93	52.63	331.25
+D+0.750Lr+0.750L+0.5250E+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.433	0.256	1.25	0.872	1.00	1.00	1.00	1.00	1.00	87.74	1,131.84	2616.36	9.58	84.93	331.25
+D+0.750L+0.750S+0.5250E+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.268	0.159	1.25	0.872	1.00	1.00	1.00	1.00	1.00	54.33	700.93	2616.36	5.93	52.63	331.25
+0.60D+W+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.161	0.095	1.25	0.872	1.00	1.00	1.00	1.00	1.00	32.60	420.56	2616.36	3.56	31.58	331.25
+0.60D+0.70E+H					0.872	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.161	0.095	1.25	0.872	1.00	1.00	1.00	1.00	1.00	32.60	420.56	2616.36	3.56	31.58	331.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.5829	15.000		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	13.139	13.025
Overall MINimum	5.940	5.940
D Only	7.199	7.085
Lr Only	5.940	5.940
D+Lr	13.139	13.025

BEAM 5

Wood Beam

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ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 5 - BM1, UNITS 7-8

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : ASCE 7-05

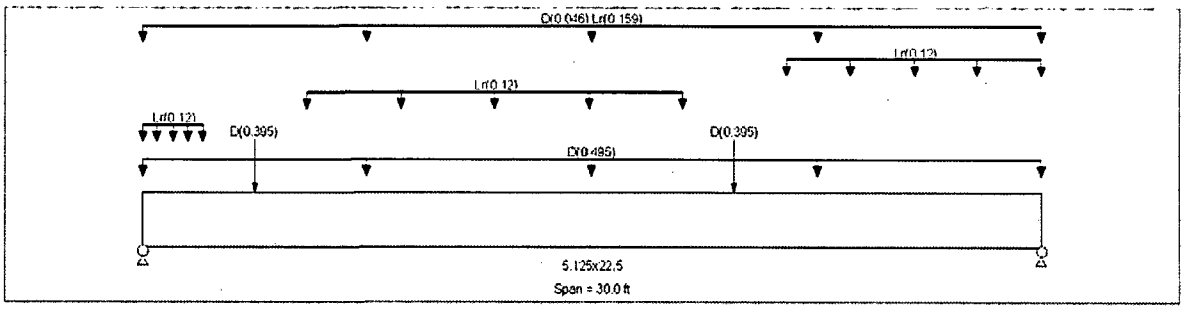
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-05

Wood Species : DF/DF
Wood Grade : 24F - V4

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,400.0 psi	*E : Modulus of Elasticity*	
Fb - Compr	1,850.0 psi	Ebend- xx	1,800.0ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	930.0ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Fv	265.0 psi	Eminbend - yy	830.0ksi
Ft	1,100.0 psi	Density	32.210pcf



Applied Loads — Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0150 ksf, Tributary Width = 33.0 ft, (EXISTING DEAD)
Point Load : D = 0.3950 k @ 3.750 ft, (UNIT 7)
Point Load : D = 0.3950 k @ 19.750 ft, (UNIT 8)
Uniform Load : Lr = 0.0120 ksf, Extent = 0.0 -->> 2.0 ft, Tributary Width = 10.0 ft, (EXISTING LIVE)
Uniform Load : Lr = 0.0120 ksf, Extent = 5.50 -->> 18.0 ft, Tributary Width = 10.0 ft, (EXISTING LIVE)
Uniform Load : Lr = 0.0120 ksf, Extent = 21.50 -->> 30.0 ft, Tributary Width = 10.0 ft, (EXISTING LIVE)
Uniform Load : D = 0.0460, Lr = 0.1590 , Tributary Width = 1.0 ft, (PV + LIVE)

DESIGN SUMMARY — **Design OK**

Maximum Bending Stress Ratio	=	0.940 : 1	Maximum Shear Stress Ratio	=	0.422 : 1
Section used for this span		5.125x22.5	Section used for this span		5.125x22.5
fb : Actual	=	2,555.14 psi	fv : Actual	=	139.89 psi
FB : Allowable	=	2,718.51 psi	Fv : Allowable	=	331.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	15.000 ft	Location of maximum on span	=	28.139 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.527 in	Ratio =	683
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.713 in	Ratio =	210
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.650	0.298	1.25	0.906	1.00	1.00	1.00	1.00	1.00	63.63	1,765.88	2718.51	7.59	98.71	331.25
+D+L+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.650	0.298	1.25	0.906	1.00	1.00	1.00	1.00	1.00	63.63	1,765.88	2718.51	7.59	98.71	331.25
+D+Lr+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.940	0.422	1.25	0.906	1.00	1.00	1.00	1.00	1.00	92.08	2,555.14	2718.51	10.75	139.89	331.25

Wood Beam

File = P:\Project\2003\00303-1\Docs\STRUCT-1\TASK31-2\SUMMIT-1\CALCSW-2\BEAMCH-1.ECS
ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 5 - BM1. UNITS 7-8

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+S+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.650	0.298	1.25	0.906	1.00	1.00	1.00	1.00	1.00	63.63	1,765.88	2718.51	7.59	98.71	331.25
+D+0.750Lr+0.750L+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.867	0.391	1.25	0.906	1.00	1.00	1.00	1.00	1.00	84.96	2,357.78	2718.51	9.95	129.49	331.25
+D+0.750L+0.750S+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.650	0.298	1.25	0.906	1.00	1.00	1.00	1.00	1.00	63.63	1,765.88	2718.51	7.59	98.71	331.25
+D+W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.650	0.298	1.25	0.906	1.00	1.00	1.00	1.00	1.00	63.63	1,765.88	2718.51	7.59	98.71	331.25
+D+0.70E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.650	0.298	1.25	0.906	1.00	1.00	1.00	1.00	1.00	63.63	1,765.88	2718.51	7.59	98.71	331.25
+D+0.750Lr+0.750L+0.750W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.867	0.391	1.25	0.906	1.00	1.00	1.00	1.00	1.00	84.96	2,357.78	2718.51	9.95	129.49	331.25
+D+0.750L+0.750S+0.750W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.650	0.298	1.25	0.906	1.00	1.00	1.00	1.00	1.00	63.63	1,765.88	2718.51	7.59	98.71	331.25
+D+0.750Lr+0.750L+0.5250E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.867	0.391	1.25	0.906	1.00	1.00	1.00	1.00	1.00	84.96	2,357.78	2718.51	9.95	129.49	331.25
+D+0.750L+0.750S+0.5250E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.650	0.298	1.25	0.906	1.00	1.00	1.00	1.00	1.00	63.63	1,765.88	2718.51	7.59	98.71	331.25
+0.60D+W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.390	0.179	1.25	0.906	1.00	1.00	1.00	1.00	1.00	38.18	1,059.53	2718.51	4.55	59.23	331.25
+0.60D+0.70E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.390	0.179	1.25	0.906	1.00	1.00	1.00	1.00	1.00	38.18	1,059.53	2718.51	4.55	59.23	331.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.7135	15.000		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	12.270	12.280
Overall MINimum	3.674	3.856
D Only	8.596	8.424
Lr Only	3.674	3.856
D+Lr	12.270	12.280

BEAM 6

Wood Beam

File = P:\Project\2008\200803-1\Docs\STRUCT-1\TASK31-2\SUMMIT-1\CALCSW-2\BEAMCH-1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 Licensee : SUMMIT ENGINEERING, INC.

Description : BEAM CHECK 6 - BM1, UNIT 10

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : ASCE 7-05

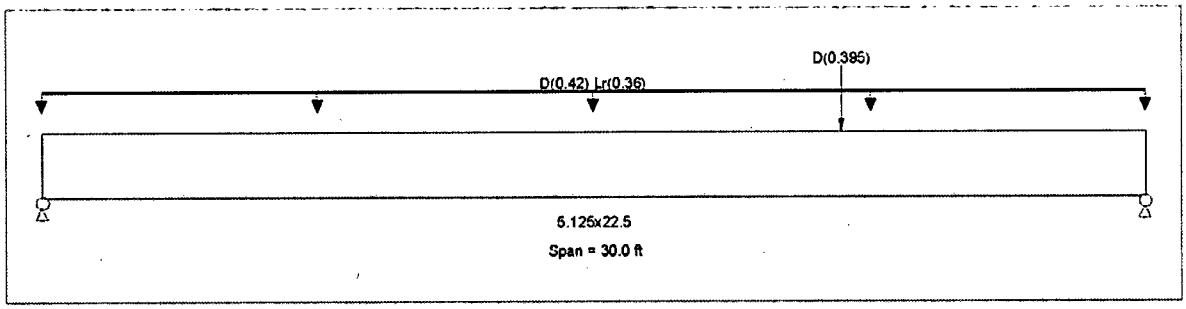
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-05

Wood Species : DF/DF
Wood Grade : 24F - V4

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,400.0 psi	*E : Modulus of Elasticity*	
Fb - Compr	1,850.0 psi	Ebend- xx	1,800.0ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	930.0ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Fv	265.0 psi	Eminbend - yy	830.0ksi
Ft	1,100.0 psi	Density	32.210pcf



Applied Loads

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

Uniform Load : D = 0.0140, Lr = 0.0120 ksf, Tributary Width = 30.0 ft, (EXISTING)
Point Load : D = 0.3950 k @ 21.750 ft, (UNIT 10)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.912 : 1	Maximum Shear Stress Ratio	=	0.414 : 1
Section used for this span		5.125x22.5	Section used for this span		5.125x22.5
fb : Actual	=	2,480.54 psi	fv : Actual	=	137.03 psi
FB : Allowable	=	2,718.51 psi	Fv : Allowable	=	331.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	15.109 ft	Location of maximum on span	=	28.139 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.754 in	Ratio =	477
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.666 in	Ratio =	216
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.499	0.228	1.25	0.906	1.00	1.00	1.00	1.00	1.00	48.89	1,356.82	2718.51	5.80	75.51	331.25
+D+L+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.499	0.228	1.25	0.906	1.00	1.00	1.00	1.00	1.00	48.89	1,356.82	2718.51	5.80	75.51	331.25
+D+Lr+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.912	0.414	1.25	0.906	1.00	1.00	1.00	1.00	1.00	89.39	2,480.54	2718.51	10.53	137.03	331.25
+D+S+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.499	0.228	1.25	0.906	1.00	1.00	1.00	1.00	1.00	48.89	1,356.82	2718.51	5.80	75.51	331.25
+D+0.750Lr+0.750L+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.809	0.367	1.25	0.906	1.00	1.00	1.00	1.00	1.00	79.26	2,199.58	2718.51	9.35	121.65	331.25
+D+0.750L+0.750S+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

File = P:\Project\2003\200003-1\Docs\STRUCT~1\TASK31~2\SUMMIT~1\CALCSW~2\BEAMCH~1.EC6
ENERCALC, INC. 1983-2014, Build 6.14.6.15, Ver.6.14.6.15

Lic. # : KW-06000146 — **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 6 - BM1, UNIT 10

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
Length = 30.0 ft	1	0.499	0.228	1.25	0.906	1.00	1.00	1.00	1.00	1.00	48.89	1,356.82	2718.51	5.80	75.51	331.25
+D+W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.499	0.228	1.25	0.906	1.00	1.00	1.00	1.00	1.00	48.89	1,356.82	2718.51	5.80	75.51	331.25
+D+0.70E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.499	0.228	1.25	0.906	1.00	1.00	1.00	1.00	1.00	48.89	1,356.82	2718.51	5.80	75.51	331.25
+D+0.750Lr+0.750L+0.750W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.809	0.367	1.25	0.906	1.00	1.00	1.00	1.00	1.00	79.26	2,199.58	2718.51	9.35	121.65	331.25
+D+0.750L+0.750S+0.750W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.499	0.228	1.25	0.906	1.00	1.00	1.00	1.00	1.00	48.89	1,356.82	2718.51	5.80	75.51	331.25
+D+0.750Lr+0.750L+0.5250E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.809	0.367	1.25	0.906	1.00	1.00	1.00	1.00	1.00	79.26	2,199.58	2718.51	9.35	121.65	331.25
+D+0.750L+0.750S+0.5250E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.499	0.228	1.25	0.906	1.00	1.00	1.00	1.00	1.00	48.89	1,356.82	2718.51	5.80	75.51	331.25
+0.60D+W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.299	0.137	1.25	0.906	1.00	1.00	1.00	1.00	1.00	29.34	814.09	2718.51	3.48	45.30	331.25
+0.60D+0.70E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.299	0.137	1.25	0.906	1.00	1.00	1.00	1.00	1.00	29.34	814.09	2718.51	3.48	45.30	331.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.6656	15.109		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.809	11.986
Overall MINimum	5.400	5.400
D Only	6.409	6.586
Lr Only	5.400	5.400
D+Lr	11.809	11.986

BEAM 7

Beam size is not noted on original plans – Assume B1, but should verify in field.

Wood Beam

File = P:\Project\2003\200303-1\Docs\STRUCT~1\TASK31~2\SUMMIT~1\CALCSW~2\BEAMCH~1.EC6
ENERCALC, INC. 1983-2014, Build 6.14.6.15, Ver.6.14.6.15

Lic. # : KW-06000146 — Licensee : SUMMIT ENGINEERING, INC.

Description : BEAM CHECK 7 - BM1; UNITS 9,11

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : ASCE 7-05

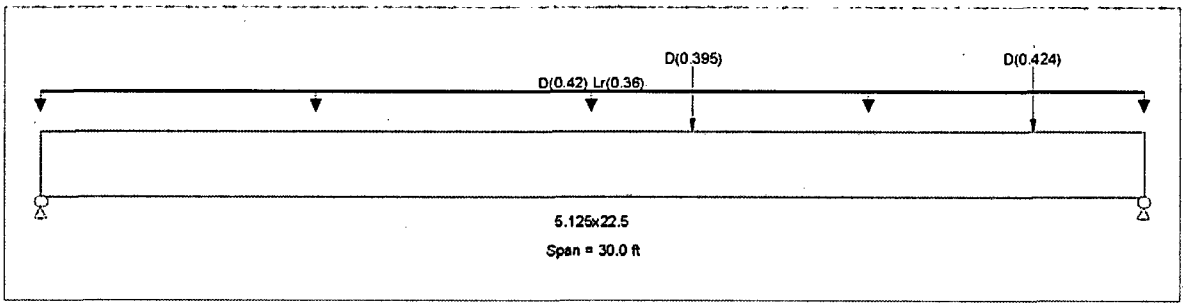
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-05

Wood Species : DF/DF
Wood Grade : 24F - V4

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,400.0 psi	*E : Modulus of Elasticity*	
Fb - Compr	1,850.0 psi	Ebend- xx	1,800.0ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	930.0ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Fv	265.0 psi	Eminbend - yy	830.0ksi
Ft	1,100.0 psi	Density	32.210pcf



Applied Loads — Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0140, Lr = 0.0120 ksf, Tributary Width = 30.0 ft, (EXISTING)
Point Load : D = 0.4240 k @ 27.0 ft, (UNIT 9)
Point Load : D = 0.3950 k @ 17.750 ft, (UNIT 11)

DESIGN SUMMARY — **Design OK**

Maximum Bending Stress Ratio	=	0.927 : 1	Maximum Shear Stress Ratio	=	0.427 : 1
Section used for this span		5.125x22.5	Section used for this span		5.125x22.5
fb : Actual	=	2,520.63psi	fv : Actual	=	141.31 psi
FB : Allowable	=	2,718.51psi	Fv : Allowable	=	331.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	15.219ft	Location of maximum on span	=	28.139 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.754 in	Ratio =	477
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.689 in	Ratio =	213
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only																
Length = 30.0 ft	1	0.514	0.241	1.25	0.906	1.00	1.00	1.00	1.00	1.00	50.35	1,397.37	2718.51	6.13	79.79	331.25
+D+L+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.514	0.241	1.25	0.906	1.00	1.00	1.00	1.00	1.00	50.35	1,397.37	2718.51	6.13	79.79	331.25
+D+Lr+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.927	0.427	1.25	0.906	1.00	1.00	1.00	1.00	1.00	90.83	2,520.63	2718.51	10.86	141.31	331.25
+D+S+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.514	0.241	1.25	0.906	1.00	1.00	1.00	1.00	1.00	50.35	1,397.37	2718.51	6.13	79.79	331.25
+D+0.750Lr+0.750L+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.824	0.380	1.25	0.906	1.00	1.00	1.00	1.00	1.00	80.71	2,239.76	2718.51	9.68	125.93	331.25

Wood Beam

File = P:\Project\2005\200803-1\Docs\STRUCT-1\TASK31-2\SUMMIT-1\CALCSW-2\BEAMCH-1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 7 - BM1: UNITS 9.11

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
+D+0.750L+0.750S+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.514	0.241	1.25	0.906	1.00	1.00	1.00	1.00	1.00	50.35	1,397.37	2718.51	6.13	79.79	331.25
+D+W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.514	0.241	1.25	0.906	1.00	1.00	1.00	1.00	1.00	50.35	1,397.37	2718.51	6.13	79.79	331.25
+D+0.70E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.514	0.241	1.25	0.906	1.00	1.00	1.00	1.00	1.00	50.35	1,397.37	2718.51	6.13	79.79	331.25
+D+0.750Lr+0.750L+0.750W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.824	0.380	1.25	0.906	1.00	1.00	1.00	1.00	1.00	80.71	2,239.76	2718.51	9.68	125.93	331.25
+D+0.750L+0.750S+0.750W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.514	0.241	1.25	0.906	1.00	1.00	1.00	1.00	1.00	50.35	1,397.37	2718.51	6.13	79.79	331.25
+D+0.750Lr+0.750L+0.5250E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.824	0.380	1.25	0.906	1.00	1.00	1.00	1.00	1.00	80.71	2,239.76	2718.51	9.68	125.93	331.25
+D+0.750L+0.750S+0.5250E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.514	0.241	1.25	0.906	1.00	1.00	1.00	1.00	1.00	50.35	1,397.37	2718.51	6.13	79.79	331.25
+0.60D+W+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.308	0.145	1.25	0.906	1.00	1.00	1.00	1.00	1.00	30.21	838.42	2718.51	3.68	47.87	331.25
+0.60D+0.70E+H					0.906	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 30.0 ft	1	0.308	0.145	1.25	0.906	1.00	1.00	1.00	1.00	1.00	30.21	838.42	2718.51	3.68	47.87	331.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.6889	15.109		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.904	12.315
Overall MINimum	5.400	5.400
D Only	6.504	6.915
Lr Only	5.400	5.400
D+Lr	11.904	12.315

BEAM 8

Wood Beam

File = P:\Project\2008\200803-1\Docs\STRUCT-1\TASK31-2\SUMMIT-1\CALCSW-2\BEAMCH-1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 8 - B1. UNIT 15

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : ASCE 7-05

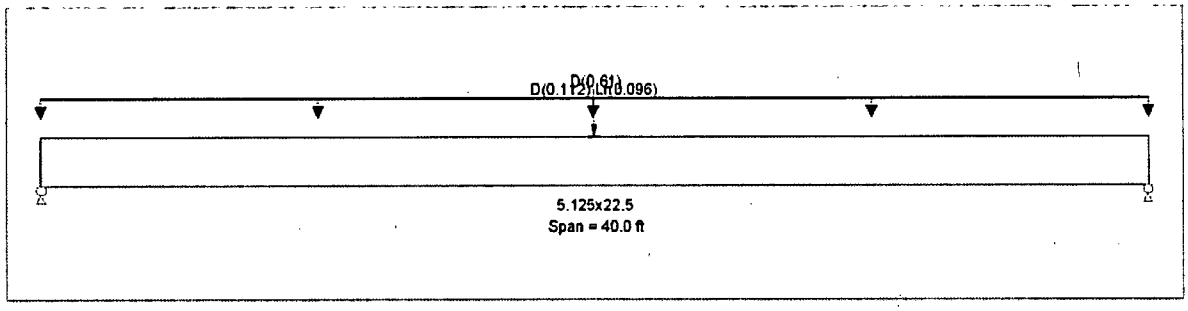
Material Properties

Analysis Method : Allowable Stress Design
Load Combination ASCE 7-05

Wood Species : DF/DF
Wood Grade : 24F - V4

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,400.0 psi	*E : Modulus of Elasticity*	
Fb - Compr	1,850.0 psi	Ebend- xx	1,800.0ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	930.0ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Fv	265.0 psi	Eminbend - yy	830.0ksi
Ft	1,100.0 psi	Density	32.210pcf



Applied Loads

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

Uniform Load : D = 0.0140, Lr = 0.0120 ksf, Tributary Width = 8.0 ft, (Existing)
Point Load : D = 0.610 k @ 20.0 ft, (Unit 15)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.501 : 1	Maximum Shear Stress Ratio	=	0.161 : 1
Section used for this span		5.125x22.5	Section used for this span		5.125x22.5
fb : Actual	=	1,323.71 psi	fv : Actual	=	53.34 psi
FB : Allowable	=	2,641.42 psi	Fv : Allowable	=	331.25 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	20.000 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.635 in	Ratio =	755
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.538 in	Ratio =	312
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.299	0.092	1.25	0.880	1.00	1.00	1.00	1.00	1.00	28.50	790.89	2641.42	2.35	30.55	331.25
+D+L+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.299	0.092	1.25	0.880	1.00	1.00	1.00	1.00	1.00	28.50	790.89	2641.42	2.35	30.55	331.25
+D+Lr+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.501	0.161	1.25	0.880	1.00	1.00	1.00	1.00	1.00	47.70	1,323.71	2641.42	4.10	53.34	331.25
+D+S+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.299	0.092	1.25	0.880	1.00	1.00	1.00	1.00	1.00	28.50	790.89	2641.42	2.35	30.55	331.25
+D+0.750Lr+0.750L+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.451	0.144	1.25	0.880	1.00	1.00	1.00	1.00	1.00	42.90	1,190.50	2641.42	3.66	47.64	331.25
+D+0.750L+0.750S+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

File = P:\Project\2008\00903-1\Docs\STRUCT-1\TASK31-2\SUMMIT-1\CALCSW-2\BEAMCH-1.EC6
ENERCALC, INC. 1983-2014, Build 6.14.6.15, Ver.6.14.6.15

Lic. # : KW-06000146 — **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 8 - B1, UNIT 15

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
Length = 40.0 ft	1	0.299	0.092	1.25	0.880	1.00	1.00	1.00	1.00	1.00	28.50	790.89	2641.42	2.35	30.55	331.25
+D+W+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.299	0.092	1.25	0.880	1.00	1.00	1.00	1.00	1.00	28.50	790.89	2641.42	2.35	30.55	331.25
+D+0.70E+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.299	0.092	1.25	0.880	1.00	1.00	1.00	1.00	1.00	28.50	790.89	2641.42	2.35	30.55	331.25
+D+0.750Lr+0.750L+0.750W+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.451	0.144	1.25	0.880	1.00	1.00	1.00	1.00	1.00	42.90	1,190.50	2641.42	3.66	47.64	331.25
+D+0.750L+0.750S+0.750W+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.299	0.092	1.25	0.880	1.00	1.00	1.00	1.00	1.00	28.50	790.89	2641.42	2.35	30.55	331.25
+D+0.750Lr+0.750L+0.5250E+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.451	0.144	1.25	0.880	1.00	1.00	1.00	1.00	1.00	42.90	1,190.50	2641.42	3.66	47.64	331.25
+D+0.750L+0.750S+0.5250E+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.299	0.092	1.25	0.880	1.00	1.00	1.00	1.00	1.00	28.50	790.89	2641.42	2.35	30.55	331.25
+0.60D+W+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.180	0.055	1.25	0.880	1.00	1.00	1.00	1.00	1.00	17.10	474.54	2641.42	1.41	18.33	331.25
+0.60D+0.70E+H					0.880	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 40.0 ft	1	0.180	0.055	1.25	0.880	1.00	1.00	1.00	1.00	1.00	17.10	474.54	2641.42	1.41	18.33	331.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.5376	20.148		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.465	4.465
Overall MINimum	1.920	1.920
D Only	2.545	2.545
Lr Only	1.920	1.920
D+Lr	4.465	4.465

BEAM 9

Wood Beam

File = P:\Project\2008\200803~1\Docs\STRUCT~1\TASK31~2\SUMMIT~1\CALCSW~2\BEAMCH~1.EC6
ENERCALC, INC 1983-2014, Build:6.14.6.15, Ver:6.14.6.15

Lic. # : KW-06000146 **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 9 - 4x6, unit 14

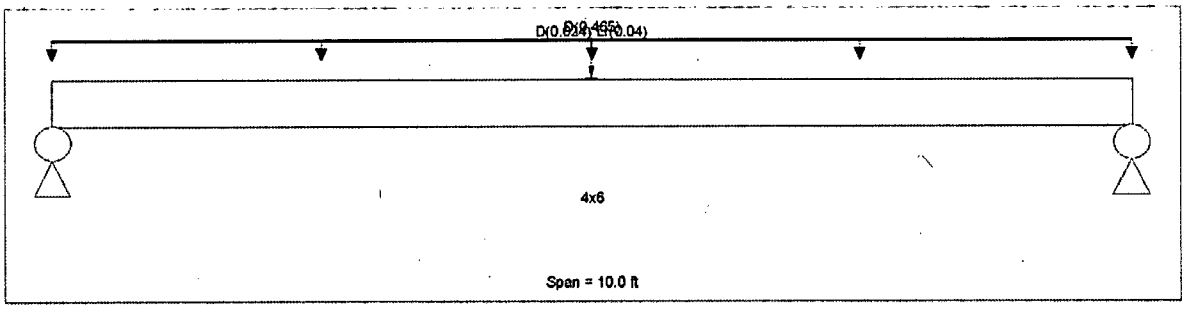
CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : ASCE 7-05

Material Properties

Analysis Method :	Allowable Stress Design	Fb - Tension	900.0 psi	*E : Modulus of Elasticity*	
Load Combination	ASCE 7-05	Fb - Compr	900.0 psi	Ebend- xx	1,600.0ksi
		Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species	: Douglas Fir - Larch	Fc - Perp	625.0 psi		
Wood Grade	: No.2	Fv	180.0 psi		
		Ft	575.0 psi	Density	32.210pcf

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling



Applied Loads — Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0120, Lr = 0.020 ksf, Tributary Width = 2.0 ft, (Existing)
Point Load : D = 0.4650 k @ 5.0 ft, (Unit 14)

DESIGN SUMMARY — **Design OK**

Maximum Bending Stress Ratio	=	0.913 : 1	Maximum Shear Stress Ratio	=	0.182 : 1
Section used for this span		4x6	Section used for this span		4x6
fb : Actual	=	1,334.59psi	fv : Actual	=	40.87 psi
FB : Allowable	=	1,462.50psi	Fv : Allowable	=	225.00 psi
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span	=	5.000ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.117 in	Ratio =	1029
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.403 in	Ratio =	297
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	M	fb	Fb	V	fv	Fv
D Only													0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.680	0.118	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.46	994.57	1462.50	0.34	26.65	225.00
+D+L+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.680	0.118	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.46	994.57	1462.50	0.34	26.65	225.00
+D+Lr+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.913	0.182	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.96	1,334.59	1462.50	0.52	40.87	225.00
+D+S+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.680	0.118	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.46	994.57	1462.50	0.34	26.65	225.00
+D+0.750Lr+0.750L+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.854	0.166	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.84	1,249.59	1462.50	0.48	37.31	225.00
+D+0.750L+0.750S+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

File = P:\Project\2003\200003-1\Docs\STRUCT-1\TASK31-2\SUMMIT-1\CALCSW-2\BEAMCH-1.EC6
ENERCALC, INC 1983-2014, Build 6.14.6.15, Ver.6.14.6.15

Lic. # : KW-06000146 — **Licensee : SUMMIT ENGINEERING, INC.**

Description : BEAM CHECK 9 - 4x6, unit 14

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	C_{FN}	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
Length = 10.0 ft	1	0.680	0.118	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.46	994.57	1462.50	0.34	26.65	225.00
+D+W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.680	0.118	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.46	994.57	1462.50	0.34	26.65	225.00
+D+0.70E+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.680	0.118	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.46	994.57	1462.50	0.34	26.65	225.00
+D+0.750Lr+0.750L+0.750W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.854	0.166	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.84	1,249.59	1462.50	0.48	37.31	225.00
+D+0.750L+0.750S+0.750W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.680	0.118	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.46	994.57	1462.50	0.34	26.65	225.00
+D+0.750Lr+0.750L+0.5250E+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.854	0.166	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.84	1,249.59	1462.50	0.48	37.31	225.00
+D+0.750L+0.750S+0.5250E+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.680	0.118	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.46	994.57	1462.50	0.34	26.65	225.00
+0.60D+W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.408	0.071	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.88	596.74	1462.50	0.21	15.99	225.00
+0.60D+0.70E+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.408	0.071	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.88	596.74	1462.50	0.21	15.99	225.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.4033	5.036		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.553	0.553
Overall MINimum	0.200	0.200
D Only	0.353	0.353
Lr Only	0.200	0.200
D+Lr	0.553	0.553