

DESIGN CRITERIA

CODES / SPECIFICATIONS:

1. CBC 2010, ASCE 7-05

GENERAL:

1. IT IS THE GENERAL CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS BEFORE IMPLEMENTATION OF STRUCTURAL WORK. THE STRUCTURAL ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCY.
2. THE DESIGN ADEQUACY AND SAFETY OF ERECTION BRACING, SHORING, TEMPORARY SUPPORTS, ETC. IS SOLE RESPONSIBILITY OF THE CONTRACTOR, AND HAS NOT BEEN CONSIDERED BY STRUCTURAL ENGINEER IN THIS PACKAGE. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE PRIOR TO THE APPLICATION OF ALL SHEAR WALLS, ROOF AND FLOOR DIAPHRAGMS AND FINISH MATERIALS. HE SHALL PROVIDE THE NECESSARY BRACING TO PROVIDE STABILITY PRIOR TO THE APPLICATION OF THE AFOREMENTIONED MATERIALS. OBSERVATION VISITS TO THE SITE BY STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.
3. CONSTRUCTION MATERIALS SHALL BE SPREAD OUT IF PLACED ON FRAMED FLOORS OR ROOF. LOAD SHALL NOT EXCEED THE DESIGN LIVE LOAD PER SQUARE FOOT.
4. SPECIALIZED GUARD RAILS AND HANDRAILS PROVIDED BY GONTRACTOR SHALL BE DESIGNED TO WITHSTAND A LATERAL LOAD OF 20 POUNDS PER LINEAR FOOT APPLIED HORIZONTALLY AT RIGHT ANGLES TO TOP RAIL. (50 PLF FOR COMMERCIAL), AND DESIGNED FOR A CONCENTRATED LOAD OF 200 POUNDS APLIED TO THE HANDRAIL AT ANY POINT.

CONCRETE:

1. ALL CONCRETE SHALL CONFORM TO THE LATEST EDITION OF THE CALIFORNIA BUILDING CODE.
2. THE STRUCTURAL ENGINEER SHALL APPROVE LOCATION OF ALL CONSTRUCTION JOINTS FOR CONCRETE WALLS, BEAMS, AND STRUCTURAL SLABS.
3. "CONCRETE MIX SHALL CONFORM TO C.B.C. SECTION 1905, AND ACI 318 SECTION R5.2 BASED ON SULFATE EXPOSURE AS DETERMINED IN SOILS REPORT" ALL CEMENT SHALL CONFORM TO ASTM C-150
4. ALL AGGREGATE SHALL BE COMPARABLE TO 'SAN GABRIEL VALLEY' AGGREGATE. THE SHRINKAGE SHALL BE AS PER ASTM C-157 WITH THE AVERAGE DRYING SHRINKAGE AT 28-DAYS NOT EXCEEDING 0.04%.
5. DRYPACK SHALL BE COMPOSED OF ONE PART PORTLAND CEMENT TO NOT MORE THAN THREE PARTS SAND.
6. ALL STRUCTURAL CONCRETE (MINIMUM) $F_c = 3,000$ PSI WITH SPECIAL INSPECTION.
7. ALL SLAB-ON-GRADE $F_c = 2,500$ PSI
8. ALL CONTINUOUS FOOTINGS AND PADS $F_c = 2,500$ PSI
9. ALL CONCRETE SHALL REACH MINIMUM COMPRESSIVE STRENGTH 28 – DAYS.
10. ALL CONCRETE WITH F_c GREATER THAN 2,500 PSI SHALL HAVE SPECIAL INSPECTION PER SECTION 1704.4.4 OF THE CALIFORNIA BUILDING CODE UNLESS NOTED OTHERWISE.

REINFORCING STEEL:

1. REINFORCING STEEL SHALL BE ASTM A-615-40 FOR NO.4 BARS AND SMALLER. ALL REINFORCING SHALL BE ASTM A-615-60 FOR NO.5 BARS AND LARGER. WELDED WIRE FABRIC TO BE ASTM A-185, LAP 1-1/2 SPACES, 9" MIN. FOR STRUCTURAL SLABS ALL REINFORCING NO. 5 AND LARGER TO BE ASTM A-615-60
2. SPLICING OF BARS IN CONCRETE SHALL HAVE A LAPPING OF: 48 DIA. FOR NO.4 BARS & SMALLER, 72 DIA. FOR NO.5 NO.6 BARS, AND 90 DIA. FOR NO.7 BARS & LARGER OR 24" MIN. MASONRY REINFORCEMENT SHALL HAVE LAPPINGS OF 40 DIA. OR 2'-0" WHICHEVER IS GREATER.

3. CONCRETE PROTECTION FOR REINFORCEMENT SHALL BE AT LEAST EQUAL TO THE DIAMETER OF THE BARS. COVER SHALL BE AS FOLLOWS:
 - A. POURED AGAINST EARTH 3"
 - B. POURED AGAINST FORM BELOW GRADE 2"
 - C. FORMED SLABS 1"
 - D. SLABS ON GRADE (FROM TOP OF SLAB) 1"
 - E. COLUMNS AND BEAMS TO MAIN BARS 2"

STRUCTURAL STEEL:

1. THE METAL FABRICATOR SHALL BE RESPONSIBLE FOR ALL METAL FABRICATION DESIGNS IN ACCORDANCE WITH ALL NATIONAL, STATE AND LOCAL CODES AND POLICIES AS WELL AS THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION AND ANY OTHER INDUSTRY STANDARDS. ALL METAL FABRICATION DESIGNS ARE TO BE SUBMITTED TO AND APPROVED BY THE LOCAL BUILDING INSPECTION DEPARTMENT RESPONSIBLE FOR THE PROJECT PRIOR TO FABRICATION. ALL DIMENSIONS, DETAILS, ETC., SHOWN HEREON ARE TO BE VERIFIED WITH ALL AFFECTED SUBCONTRACTORS, FIELD CONDITIONS, AND THE REQUIREMENTS OF ALL GOVERNING AGENCIES AND FABRICATION STANDARDS. FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH "SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS", AISC, CURRENT EDITION. STEEL TO CONFORM TO ASTM A-36.
2. STRUCTURAL AND MISC. STEEL TO CONFORM TO ASTM A-572 GRADE 50; OR ASTM A992, GRADE 50 (UNLESS NOTED OTHERWISE, PLATES, ANGLES AND CHANNEL SHAPES MAY BE ASTM A-36)
3. PIPE COLUMNS SHALL CONFORM TO ASTM A-53-B (TYPE E OR S). TUBE COLUMNS SHALL CONFORM TO ASTM A-501 or A-500 GRADE B.
4. ALL WELDING SHALL BE PERFORMED BY CERTIFIED WELDERS, USING THE ELECTRIC SHIELDING PROCESS AND CONFORMING TO AWS SPECIFICATION, E70XX ELECTRODE.
5. FILLET WELDS NOTED ARE FOR DESIGN LOADS. FOR WELDS TO HEAVIER SECTIONS, USE PREHEAT OR INCREASE WELD SIZE PER AISC SPECIFICATIONS.
6. ALL STRUCTURAL STEEL SHALL BE FABRICATED IN THE SHOP OF LICENSED FABRICATOR AND SHOP DRAWINGS SHALL BE SUBMITTED TO STRUCTURAL ENGINEER THROUGH THE ARCHITECT FOR APPROVAL PRIOR TO FABRICATION. ANY PROPOSED DEVIATION, ADDITION, OR QUESTIONS, SHALL BE NOTED CONSPICUOUSLY AND CLEARLY ON THE SHOP DRAWINGS. STEEL FABRICATOR SHALL FIELD CHECK ALL DIMENSIONS PRIOR TO ERECTION TO PROVIDE FOR A PROPER FIT. ALL FIELD WELDING (EXCEPT MINOR AND TACK WELDING) SHALL BE CONTINUOUSLY INSPECTED BY AN APPROVED WELDING INSPECTOR.
7. USE 3/4" ROUND MACHINE BOLTS, 13/16" ROUND HOLES, FOR ALL CONNECTIONS, UNLESS OTHERWISE SHOWN. ALL BOLTS SHALL CONFORM TO ASTM A-307 FOR UNFINISHED BOLTS, EXCEPT WHERE SPECIFICALLY NOTED AS HIGH STRENGTH BOLTS WHICH SHALL CONFORM TO ASTM A-325 OR ASTM A-490. HI TENSILE BOLTS SHALL BE THE FRICTION TYPE AND THERE SHALL BE NO PAINT, OIL, LACQUER, OR GALVANIZING BETWEEN THE CONTACT SURFACE. HIGH STRENGTH BOLTS REQUIRE SPECIAL INSPECTION PER SEC. 1704A3.3
8. ALL STEEL EXPOSED TO WEATHER SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
9. WHERE FINISH IS ATTACHED TO STRUCTURAL STEEL PROVIDE 1/2" BOLT HOLES AT 4'-0" O/C FOR ATTACHMENT OF NAILERS. SEE ARCHITECTURAL DRAWINGS FOR FINISHES. (OR NELSON STUDS 1/2" X 3").

FOUNDATION:

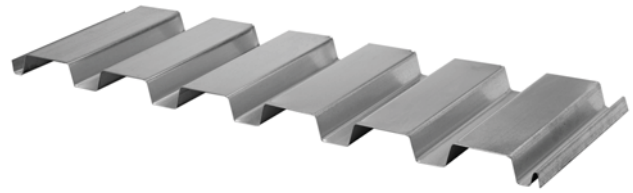
1. MINIMUM SOIL CRITERIA PER 2007 CBC TABLE 1804.2 ARE USED FOR FOUNDATION DESIGN UNLESS A SOIL REPORT IS SUBMITTED.

MASONRY:

1. CONCRETE BLOCK SHALL BE OF SIZES SHOWN ON ARCHITECTURAL DRAWINGS AND/OR CALLED FOR IN SPECS. AND CONFORM TO ASTM C90-86, GRADE "N-1" NORMALWEIGHT UNITS WITH MAXIMUM LINEAR SHRINKAGE OF 0.06% F'M = 1500 PSI GROUTED REINFORCED CELLS.
2. MORTAR MIX SHALL BE COMPOSED OF ONE PART PORTLAND CEMENT AND THREE PARTS SAND AND NOT LESS THAN ¼ PART NOR MORE THAN ½ PART LIME PUTTY FOR TYPE 'S' MORTAR. MINIMUM COMPRESSION STRENGTH TO BE F'C = 2000 PSI.
3. GROUT MIX SHALL BE COMPOSED OF ONE PART PORTLAND CEMENT TO 2.1 TO 3.0 MAX PARTS SAND AND NOT LESS THAN TWO PARTS PEA GRAVEL, MAX. GROUT LIFT = 4'-0" SPECIAL INSPECTIONS SHALL BE REQUESTED FOR HIGH LIFT GROUTING. MINIMUM COMPRESSION STRENGTH TO BE F'Ç = 2000 PSI.
4. ALL MASONRY, EXCEPT VENEER, SHALL BE REINFORCED GROUTED MASONRY, GROUT CELLS CONTAINING REINFORCING UNLESS NOTED OTHERWISE. GROUT SOLID ALL MASONRY RETAINING EARTH UP TO 6" ABOVE RETAINING WALL.
5. ALL VERTICAL REINFORCING IN MASONRY WALLS OTHER THAN RETAINING EARTH SHALL BE LOCATED IN THE CENTER OF THE WALL, U.N.O.

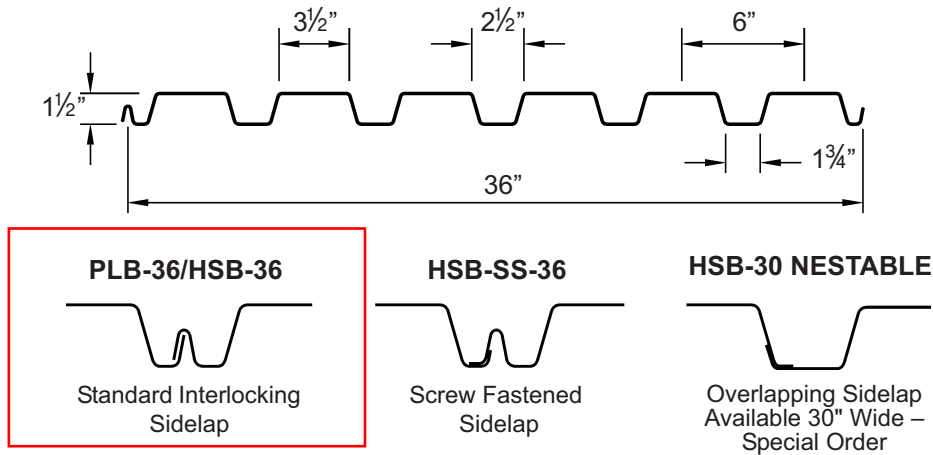
Type PLB™ -36/HSB® -36

- 1½" (38 mm) Deep Roof Deck
- Primer Painted or Galvanized



Dimensions

VERTICAL LOADS

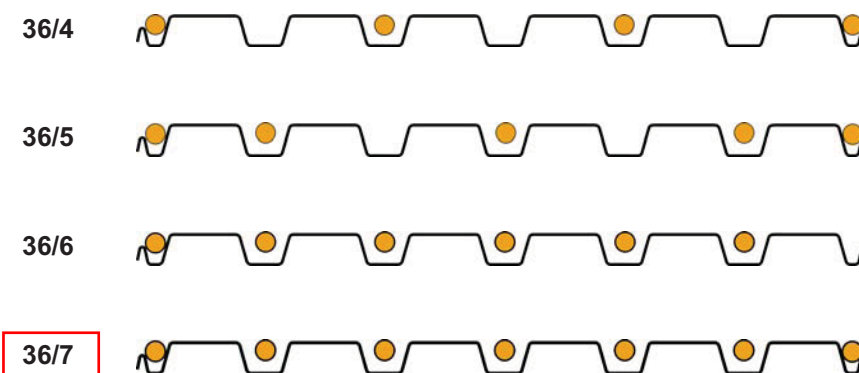


Deck Weight and Section Properties

Gage	Weight (psf, N/m ²)		Properties per ft (m) of Width			Allowable Reactions per ft (m) of Width (lb, N)				
	Galv G60 Z180	Painted	I in. ⁴ mm ⁴	+S in. ³ mm ³	-S in. ³ mm ³	End Bearing			Interior Bearing	
						2" 51 mm	3" 76 mm	4" 102 mm	3" 76 mm	4" 102 mm
22	1.9 91.0	1.8 86.2	0.175 238,978	0.187 10,054	0.198 10,645	487 7,107	585 8,537	683 9,968	1250 18,242	1498 21,862
20	2.3 110.1	2.2 105.3	0.216 294,967	0.235 12,634	0.248 13,333	665 9,705	784 11,442	903 13,178	1790 26,123	2118 30,910
18	2.9 138.9	2.8 134.1	0.302 412,408	0.322 17,312	0.335 18,011	1226 17,892	1407 20,534	1588 23,175	3062 44,687	3551 51,823
16	3.5 167.6	3.4 162.8	0.377 514,827	0.411 22,097	0.417 22,419	2208 32,223	2484 36,251	2761 40,294	4789 69,890	5266 76,851

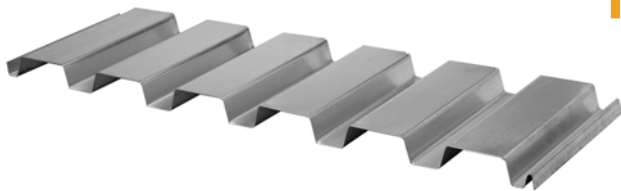
Note: Bending strength limited to 22,800 psi (157,200 kPa).

Attachment Patterns to Supports



Metric Conversions	
1½"	38 mm
1¾"	44 mm
2½"	64 mm
3"	76 mm
3½"	89 mm
6"	152 mm
36"	914 mm

Type PLB™ -36/HSB®-36



- 1½" (38 mm) Deep Roof Deck
- Primer Painted or Galvanized

TYP.

BETWEEN GRID
A1 & B

ALLOWABLE UNIFORM LOADS (psf, N/m²)

SPAN GAGE		SPAN (ft-in., mm)																		
		4'-0"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"	11'-6"	12'-0"			
SINGLE	22	STRESS	178 8,523	114 5,458	94 4,501	79 3,783	67 3,208	58 2,777	51 2,442	44 2,107	39 1,867	35 1,676	31 1,484	28 1,341						
		L/240	◆◆◆	92 4,405	69 3,304	53 2,538	42 2,011	34 1,628	27 1,293	22 1,053	19 910	16 766	13 622	11 527						
	20	STRESS	223 10,677	143 6,847	118 5,650	99 4,740	85 4,070	73 3,495	64 3,064	56 2,681	49 2,346	44 2,107	40 1,915	36 1,724	32 1,532	30 1,436	27 1,293	25 1,197		
		L/240	222 10,629	113 5,410	85 4,070	66 3,160	52 2,490	41 1,963	34 1,628	28 1,341	23 1,101	19 910	17 814	14 670	12 575	11 527	9 431	8 383		
	18	STRESS	300 14,364	196 9,385	162 7,757	136 6,512	116 5,554	100 4,788	87 4,166	76 3,639	68 3,256	60 2,873	54 2,586	49 2,346	44 2,107	40 1,915	37 1,772	34 1,628		
		L/240	◆◆◆	159 7,613	119 5,698	92 4,405	72 3,447	58 2,777	47 2,250	39 1,867	32 1,532	27 1,293	23 1,101	20 958	17 814	15 718	13 622	11 527		
	16	STRESS	300 14,364	250 11,970	207 9,911	174 8,331	148 7,086	127 6,081	111 5,315	98 4,692	86 4,118	77 3,687	69 3,304	62 2,969	57 2,729	52 2,490	47 2,250	43 2,059		
		L/240	—	198 9,480	149 7,134	115 5,506	90 4,309	72 3,447	59 2,825	48 2,298	40 1,915	34 1,628	29 1,389	25 1,197	21 1,005	19 910	16 766	14 670		
	DOUBLE	22	STRESS	188 9,001	120 5,746	99 4,740	84 4,022	71 3,399	61 2,921	54 2,586	47 2,250	42 2,011	37 1,772	33 1,580	30 1,436					
			L/240	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	32 1,532	28 1,341				
		20	STRESS	236 11,300	151 7,230	125 5,985	105 5,027	89 4,261	77 3,687	67 3,208	59 2,825	52 2,490	47 2,250	42 2,011	38 1,819	34 1,628	31 1,484	29 1,389	26 1,245	
			L/240	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	47 2,250	40 1,915	34 1,628	29 1,389	26 1,245	22 1,053	20 958	
18		STRESS	300 14,364	204 9,768	168 8,044	141 6,751	121 5,794	104 4,980	91 4,357	80 3,830	70 3,352	63 3,016	56 2,681	51 2,442	46 2,202	42 2,011	39 1,867	35 1,676		
		L/240	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	56 2,681	48 2,298	41 1,963	36 1,724	31 1,484	28 1,341		
16		STRESS	300 14,364	254 12,162	210 10,055	176 8,427	150 7,182	129 6,177	113 5,410	99 4,740	88 4,213	78 3,735	70 3,352	63 3,016	57 2,729	52 2,490	48 2,298	44 2,107		
		L/240	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆	70 3,352	60 2,873	51 2,442	45 2,155	39 1,867	34 1,628		
TRIPLE		22	STRESS	235 11,252	150 7,182	124 5,937	105 5,027	89 4,261	77 3,687	67 3,208	59 2,825	52 2,490	46 2,202	42 2,011	38 1,819					
			L/240	◆◆◆	◆◆◆	◆◆◆	100 4,788	79 3,783	63 3,016	51 2,442	42 2,011	35 1,676	30 1,436	25 1,197	22 1,053					
		20	STRESS	295 14,125	188 9,001	156 7,469	131 6,272	112 5,363	96 4,597	84 4,022	74 3,543	65 3,112	58 2,777	52 2,490	47 2,250	43 2,059	39 1,867	36 1,724	33 1,580	
			L/240	◆◆◆	◆◆◆	◆◆◆	124 5,937	97 4,644	78 3,735	63 3,016	52 2,490	44 2,107	37 1,772	31 1,484	27 1,293	23 1,101	20 958	18 862	15 718	
	18	STRESS	300 14,364	255 12,209	210 10,055	177 8,475	151 7,230	130 6,224	113 5,410	99 4,740	88 4,213	79 3,783	71 3,399	64 3,064	58 2,777	53 2,538	48 2,298	44 2,107		
		L/240	◆◆◆	◆◆◆	◆◆◆	173 8,283	136 6,512	109 5,219	89 4,261	73 3,495	61 2,921	51 2,442	44 2,107	37 1,772	32 1,532	28 1,341	25 1,197	22 1,053		
	16	STRESS	300 14,364	300 14,364	262 12,545	220 10,534	188 9,001	162 7,757	141 6,751	124 5,937	110 5,267	98 4,692	88 4,213	79 3,783	72 3,447	65 3,112	60 2,873	55 2,633		
		L/240	◆◆◆	◆◆◆	◆◆◆	216 10,342	170 8,140	136 6,512	111 5,315	91 4,357	76 3,639	64 3,064	54 2,586	47 2,250	40 1,915	35 1,676	31 1,484	27 1,293		

VERTICAL LOADS

Type HSB®-36



- 7 Weld Pattern at Supports ■
- Button Punch or 1½" Top Seam Weld ■
- Primer Painted or Galvanized ■

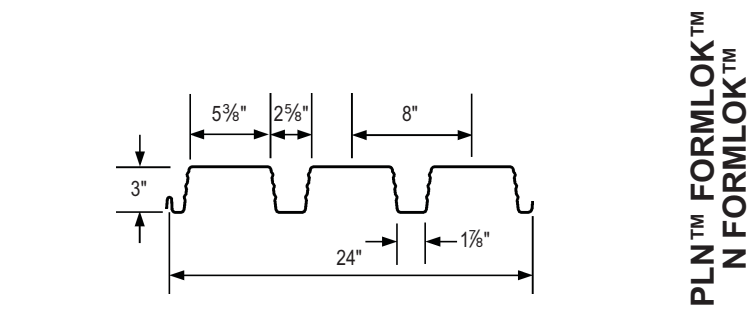
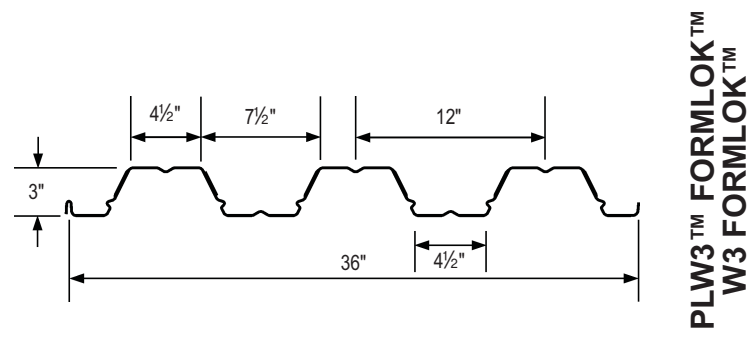
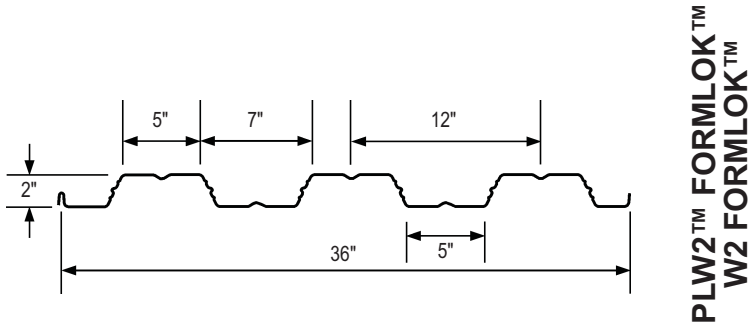
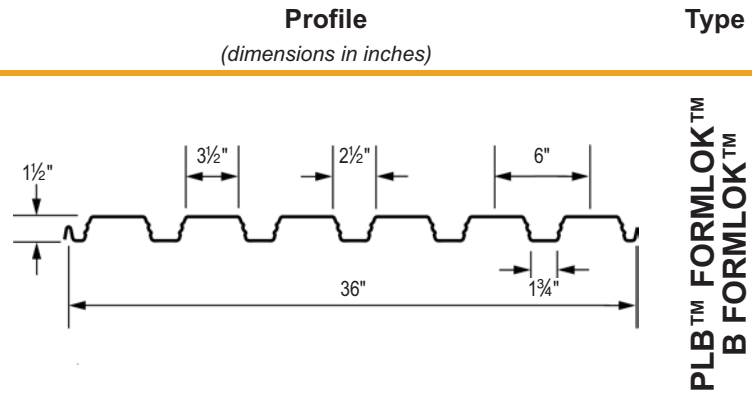
Allowable Diaphragm Shear Values, q (plf, kN/m) and Flexibility Factors, F ((in./lb)x10⁶, (mm/N)x10⁶)

GAGE	SIDELAP ATTACHMENT	SPAN (ft-in., mm)									
		4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	
18	BP @ 24"	q	1405 20.50	1140 16.64	943 13.76	818 11.94	712 10.39	640 9.34	574 8.38	527 7.69	482 7.03
		F	3.1+17R 17.7+97R	4.0+14R 22.8+80R	5.2+11R 29.7+63R	6.7+10R 38.3+57R	8.7+9R 49.7+51R	10.9+8R 62.2+46R	13.7+7R 78.2+40R	16.8+6R 95.9+34R	20.6+6R 117.6+34R
18	BP @ 12"	q	1475 21.53	1188 17.34	996 14.54	860 12.55	757 11.05	678 9.89	614 8.96	562 8.20	518 7.56
		F	3.0+17R 17.1+97R	3.9+14R 22.3+80R	5.0+11R 28.6+63R	6.5+10R 37.1+57R	8.3+9R 47.4+51R	10.4+8R 59.4+46R	12.9+7R 73.7+40R	15.9+6R 90.8+34R	19.2+6R 109.6+34R
16	TSW @ 24"	q	1571 22.93	1495 21.82	1229 17.94	1206 17.60	1044 15.24	1039 15.16	926 13.51	928 13.54	844 12.32
		F	6.8+2R 38.8+11R	6.7+2R 38.3+11R	9.1+1R 52.0+6R	9.0+1R 51.4+6R	11.4+1R 65.1+6R	11.2+1R 64.0+6R	13.7+1R 78.2+6R	13.4+1R 76.5+6R	15.9+1R 90.8+6R
16	TSW @ 18"	q	1895 27.66	1730 25.25	1424 20.78	1363 19.89	1312 19.15	1155 16.86	1131 16.51	1110 16.20	1010 14.74
		F	4.8+2R 27.4+11R	5.2+2R 29.7+11R	6.9+1R 39.4+6R	7.1+1R 40.5+6R	7.4+1R 42.3+6R	9.1+1R 52.0+6R	9.4+1R 53.7+6R	9.6+1R 54.8+6R	11.3+1R 64.5+6R
16	TSW @ 12"	q	2191 31.98	1952 28.49	1767 25.79	1612 23.53	1495 21.82	1405 20.50	1332 19.44	1257 18.34	1057 15.43
		F	3.9+2R 22.3+11R	4.3+2R 24.6+11R	4.8+1R 27.4+6R	5.2+1R 29.7+6R	5.6+1R 32.0+6R	6.0+1R 34.3+6R	6.4+1R 36.5+6R	6.7+1R 38.3+6R	7.1+1R 40.5+6R
16	TSW @ 6"	q	2878 42.00	2535 37.00	2304 33.62	2139 31.22	2014 29.39	1878 27.41	1521 22.20	1257 18.34	1057 15.43
		F	2.6+2R 14.8+11R	2.8+2R 16.0+11R	2.9+1R 16.6+6R	3.0+1R 17.1+6R	3.2+1R 18.3+6R	3.3+1R 18.8+6R	3.4+1R 19.4+6R	3.5+1R 20.0+6R	3.6+1R 20.6+6R
16	BP @ 24"	q	1825 26.63	1475 21.53	1223 17.85	1058 15.44	922 13.46	826 12.05	741 10.81	679 9.91	621 9.06
		F	2.8+9R 16.0+51R	3.7+7R 21.1+40R	4.9+6R 28.0+34R	6.5+5R 37.1+29R	8.5+4R 48.5+23R	10.8+4R 61.7+23R	13.6+4R 77.7+23R	16.8+3R 95.9+17R	20.6+3R 117.6+17R
16	BP @ 12"	q	1891 27.60	1521 22.20	1273 18.58	1097 16.01	964 14.07	862 12.58	779 11.37	712 10.39	656 9.57
		F	2.7+9R 15.4+51R	3.6+7R 20.6+40R	4.8+6R 27.4+34R	6.3+5R 36.0+29R	8.1+4R 46.3+23R	10.4+4R 59.4+23R	13.0+4R 74.2+23R	16.1+3R 91.9+17R	19.6+3R 111.9+17R
16	TSW @ 24"	q	2171 31.68	2043 29.82	1675 24.44	1630 23.79	1406 20.52	1390 20.29	1236 18.04	1233 17.99	1119 16.33
		F	5.0+1R 28.6+6R	5.1+1R 29.1+6R	6.9+1R 39.4+6R	6.8+1R 38.8+6R	8.7+1R 49.7+6R	8.6+1R 49.1+6R	10.6+1R 60.5+6R	10.4 59.4	12.4 70.8
16	TSW @ 18"	q	2599 37.93	2350 34.30	1929 28.15	1833 26.75	1734 25.31	1540 22.47	1487 21.70	1431 20.88	1324 19.32
		F	3.6+1R 20.6+6R	4.0+1R 22.8+6R	5.2+1R 29.7+6R	5.5+1R 31.4+6R	5.7+1R 32.5+6R	7.1+1R 40.5+6R	7.3+1R 41.7+6R	7.5 42.8	8.9 50.8
16	TSW @ 12"	q	2985 43.56	2556 37.30	2270 33.13	2065 30.14	1912 27.90	1793 26.17	1699 24.80	1622 23.67	1478 21.57
		F	3.0+1R 17.1+6R	3.3+1R 18.8+6R	3.7+1R 21.1+6R	4.0+1R 22.8+6R	4.3+1R 24.6+6R	4.7+1R 26.8+6R	5.0+1R 28.6+6R	5.3 30.3	5.6 32.0
16	TSW @ 6"	q	3664 53.47	3215 46.92	2914 42.53	2698 39.37	2538 37.04	2413 35.22	2129 31.07	1759 25.67	1478 21.57
		F	2.0+1R 11.4+6R	2.2+1R 12.6+6R	2.3+1R 13.1+6R	2.4+1R 13.7+6R	2.5+1R 14.3+6R	2.6+1R 14.8+6R	2.7+1R 15.4+6R	2.8 16.0	2.9 16.6

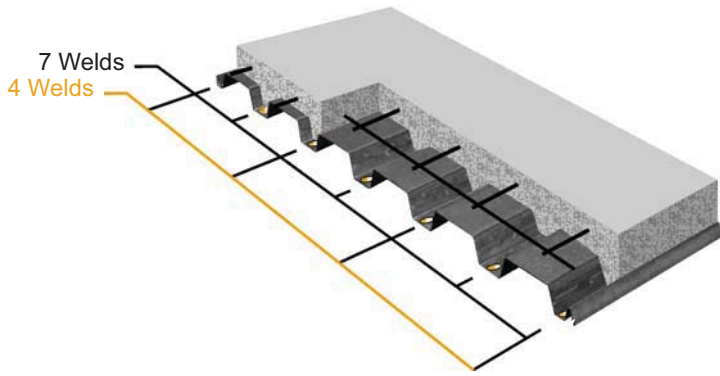
BP = Button Punch; TSW = Top Seam Weld

HSB®
WELDS

Gage	Weight		Section Properties per ft (m) of width		
	Galv	Phos/ Painted	I	+ S	- S
	psf N/m ²	psf N/m ²	in. ⁴ mm ⁴	in. ³ mm ³	in. ³ mm ³
22	1.9	1.8	0.175	0.187	0.198
	91.0	86.2	238,978	10,054	10,645
20	2.3	2.2	0.216	0.235	0.248
	110.1	105.3	294,967	12,634	13,333
18	2.9	2.8	0.302	0.322	0.335
	138.9	134.1	412,408	17,312	18,011
16	3.5	3.4	0.377	0.411	0.417
	167.6	162.8	514,827	22,097	22,419
22	1.8	1.7	0.340	0.283	0.287
	86.2	81.4	464,300	15,215	15,430
21	2.0	1.9	0.382	0.321	0.328
	95.8	91.0	521,655	17,258	17,634
20	2.1	2.0	0.423	0.361	0.370
	100.5	95.8	577,644	19,408	19,892
19	2.4	2.3	0.508	0.442	0.453
	114.9	110.1	693,719	23,763	24,355
18	2.7	2.5	0.555	0.510	0.511
	129.3	119.7	757,901	27,419	27,473
16	3.3	3.1	0.694	0.639	0.639
	158.0	148.4	947,718	34,355	34,355
22	1.9	1.8	0.718	0.418	0.444
	91.0	86.2	980,492	22,473	23,871
21	2.1	2.0	0.837	0.495	0.531
	100.5	95.8	1,142,997	26,613	28,548
20	2.3	2.2	0.896	0.534	0.564
	110.1	105.3	1,223,567	28,709	30,322
19	2.7	2.6	1.075	0.674	0.683
	129.3	124.5	1,468,007	36,236	36,720
18	2.9	2.7	1.203	0.767	0.767
	138.9	129.3	1,642,802	41,236	41,236
16	3.5	3.3	1.509	0.960	0.960
	167.6	158.0	2,060,672	51,612	51,612
22	2.2	2.1	0.613	0.361	0.446
	105.3	100.5	837,105	19,408	23,978
20	2.6	2.5	0.780	0.466	0.548
	124.5	119.7	1,065,159	25,054	29,462
18	3.5	3.4	1.146	0.664	0.737
	167.6	162.8	1,564,964	35,699	39,623
16	4.2	4.1	1.542	0.851	0.914
	201.1	196.3	2,105,737	45,752	49,139



PLB™ and B FORMLOK™



- 3½ in. (89 mm) TOTAL SLAB DEPTH ■
- Light Weight Concrete ■
- 110 pcf (1,760 kg/m³)
- 23.2 psf (1,111 N/m²)
- Galvanized or Phosphatized/Painted ■

Deck Weight and Section Properties

Gage	Weight (psf, N/m ²)		Properties per ft (m) of Width			Allowable Reactions per ft (m) of Width (lb, N)				
	Galv G60 Z180	Phos/ Painted	I in. ⁴ mm ⁴	+S in. ³ mm ³	-S in. ³ mm ³	End Bearing			Interior Bearing	
						2" 51 mm	3" 76 mm	4" 102 mm	3" 76 mm	4" 102 mm
18	2.9 138.9	2.8 134.1	0.302 412,408	0.322 17,312	0.335 18,011	1226 17,892	1407 20,534	1588 23,175	3062 44,687	3551 51,823
16	3.5 167.6	3.4 162.8	0.377 514,827	0.411 22,097	0.417 22,419	2208 32,223	2484 36,251	2761 40,294	4789 69,890	5266 76,851

Allowable Superimposed Loads (psf, kN/m²)

Gage	Spans	Span (ft-in., mm)										
		6'-0" 1,830	6'-6" 1,980	7'-0" 2,130	7'-6" 2,290	8'-0" 2,440	8'-6" 2,590	9'-0" 2,740	9'-6" 2,900	10'-0" 3,050	10'-6" 3,200	11'-0" 3,350
18	1	298 14.3	261 12.5	230 11.0	205 9.8	184 8.8	167 8.0	128 6.1	115 5.5	104 5.0	94 4.5	85 4.1
	2	298 14.3	261 12.5	230 11.0	205 9.8	184 8.8	167 8.0	152 7.3	136 6.5	116 5.6	94 4.5	85 4.1
	3	298 14.3	261 12.5	230 11.0	205 9.8	184 8.8	167 8.0	152 7.3	136 6.5	116 5.6	100 4.8	85 4.1
16	1	298 14.3	260 12.4	230 11.0	205 9.8	184 8.8	166 7.9	151 7.2	138 6.6	127 6.1	93 4.5	84 4.0
	2	298 14.3	260 12.4	230 11.0	205 9.8	184 8.8	166 7.9	151 7.2	138 6.6	127 6.1	112 5.4	97 4.6
	3	298 14.3	260 12.4	230 11.0	205 9.8	184 8.8	166 7.9	151 7.2	138 6.6	127 6.1	112 5.4	97 4.6

Shoring required in shaded areas to right of heavy line

Diaphragm Shear Values, q (plf, kN/m) and Flexibility Factors, F ((in./lb)x10⁶, (mm/N)x10⁶)

Gage	Welds	Span (ft-in., mm)										
		6'-0" 1,830	6'-6" 1,980	7'-0" 2,130	7'-6" 2,290	8'-0" 2,440	8'-6" 2,590	9'-0" 2,740	9'-6" 2,900	10'-0" 3,050	10'-6" 3,200	11'-0" 3,350
18	q4	1720 25.10	1660 24.23	1605 23.42	1560 22.77	1520 22.18	1485 21.67	1455 21.23	1430 20.87	1400 20.43	1380 20.14	1360 19.85
	F4	0.38 2.2	0.39 2.2	0.41 2.3	0.42 2.4	0.43 2.5	0.44 2.5	0.45 2.6	0.46 2.6	0.46 2.6	0.47 2.7	0.48 2.7
	q7	2055 29.99	1970 28.75	1895 27.66	1830 26.71	1775 25.90	1725 25.17	1680 24.52	1640 23.93	1605 23.42	1570 22.91	1540 22.47
	F7	0.32 1.8	0.33 1.9	0.34 1.9	0.36 2.1	0.37 2.1	0.38 2.2	0.39 2.2	0.40 2.3	0.41 2.3	0.41 2.3	0.42 2.4
16	q4	1890 27.58	1815 26.49	1750 25.54	1690 24.66	1640 23.93	1595 23.28	1560 22.77	1525 22.26	1490 21.74	1465 21.38	1435 20.94
	F4	0.31 1.8	0.32 1.8	0.33 1.9	0.34 1.9	0.35 2.0	0.36 2.1	0.37 2.1	0.38 2.2	0.39 2.2	0.40 2.3	0.41 2.3
	q7	2310 33.71	2200 32.11	2105 30.72	2025 29.55	1955 28.53	1890 27.58	1835 26.78	1785 26.05	1745 25.47	1700 24.81	1665 24.30
	F7	0.25 1.4	0.26 1.5	0.28 1.6	0.29 1.7	0.30 1.7	0.31 1.8	0.32 1.8	0.33 1.9	0.33 1.9	0.34 1.9	0.35 2.0

Allowable Diaphragm Shears

Table 5: Allowable Diaphragm Shears for FORMLOK Decks with Concrete Fill and Shear Studs at Collectors (pounds/lineal foot (kN/m))¹⁻⁵

Concrete Type ⁶	Concrete Thickness ⁷	Spacing of Shear Studs ⁸						F
		12" 305 mm	16" 406 mm	18" 457 mm	24" 610 mm	32" 813 mm	36" 914 mm	
NW	2" 51 mm	3780 55.16	3780 55.16	3780 55.16	3400 49.62	2500 36.48	2270 33.13	0.40 2.3
	2½" 64 mm	4730 69.03	4730 69.03	4530 66.11	3400 49.62	2500 36.48	2270 33.13	0.32 1.8
	3½" 89 mm	6620 96.61	5100 74.43	4530 66.11	3400 49.62	2500 36.48	2270 33.13	0.23 1.3
	2" 51 mm	3540 51.66	3540 51.66	3540 51.66	2900 42.32	2180 31.81	1930 28.17	0.56 3.2
	LW	2½" 64 mm	4430 64.65	4350 63.48	3860 56.33	2900 42.32	2180 31.81	1930 28.17
	3¼" 83 mm	5760 84.06	4350 63.48	3860 56.33	2900 42.32	2180 31.81	1930 28.17	0.34 1.9

¹ The allowable values are based on concrete slab reinforcement with an area at least 0.0025 times the area of fill above the deck. Welded wire fabric of the sizes listed below meet this requirement. Where the tabulated allowable values are not required, reinforcement can be reduced with allowable diaphragm values according to the schedule below. The fabric is placed approximately 1 in. (25 mm) below the top of the concrete.

Concrete Type	Concrete Thickness ⁷	Minimum Fabric for Tabulated Shear Values	Maximum Allowable Shears for 6x6 – W1.4xW1.4 (152x152–MW9xMW9)
NW	2" 51 mm	6x6–W4xW4 152x152–MW26xMW26	1600 plf* 23.35 kN/m
	2½" 64 mm	6x6–W4xW4 152x152–MW26xMW26	1990 plf 29.04 kN/m
	3½" 89 mm	4x4–W4xW4 102x102–MW26xMW26	2790 plf 40.72 kN/m
	2" 51 mm	6x6–W4xW4 152x152–MW26xMW26	1360 plf* 19.85 kN/m
	LW	2½" 64 mm	6x6–W4xW4 152x152–MW26xMW26
	3¼" 83 mm	4x4–W4xW4 102x102–MW26xMW26	2200 plf 32.11 kN/m

*Also compare to allowable diaphragm capacity for FORMLOK decks with concrete on pages 36 – 107.

² Connector diameter must be less than or equal to 2.5 times the steel support thickness unless connector is located directly over support web.

³ See Figure 8 for details.

Limiting Wall Heights — Curtain Wall



(S) Stud Member	Spacing (in) o.c.	5 psf			15 psf			20 psf			25 psf			30 psf			35 psf			40 psf			50 psf		
		L/120	L/240	L/360	L/240	L/360	L/600	L/240	L/360	L/600	L/240	L/360	L/600	L/240	L/360	L/600	L/240	L/360	L/600	L/240	L/360	L/600	L/240	L/360	L/600
600S137-33	12	34' 7"	27' 5"	24' 0"	19' 0"	16' 7"	14' 0"	17' 3"	15' 1"	12' 9"	16' 0"	14' 0"	11' 10"	15' 1"	13' 2"	11' 1"	14' 4"	12' 6"	10' 6"	13' 8"	12' 0"	10' 1"	12' 9"	11' 1"	9' 4"
600S137-33	16	31' 5"	24' 11"	21' 9"	17' 3"	15' 1"	12' 9"	15' 8"	13' 8"	11' 7"	14' 7"	12' 9"	10' 9"	13' 8"	12' 0"	10' 1"	13' 0"	11' 4"	9' 7"	12' 5"	10' 10"	9' 2"	11' 7"	10' 1"	8' 6"
600S137-33	24	27' 5"	21' 9"	19' 0"	15' 1"	13' 2"	11' 1"	13' 8"	12' 0"	10' 1"	12' 9"	11' 1"	9' 4"	12' 0"	10' 5"	8' 10"	11' 3"	9' 11"	8' 4"	10' 6"	9' 6"	8' 0"	9' 5"	8' 10"	7' 5"
600S162-33	12	36' 1"	28' 7"	25' 0"	19' 10"	17' 4"	14' 7"	18' 0"	15' 9"	13' 3"	16' 9"	14' 7"	12' 4"	15' 9"	13' 9"	11' 7"	14' 11"	13' 0"	11' 0"	14' 3"	12' 6"	10' 6"	13' 3"	11' 7"	9' 9"
600S162-33	16	32' 9"	26' 0"	22' 8"	18' 0"	15' 9"	13' 3"	16' 4"	14' 3"	12' 0"	15' 2"	13' 3"	11' 2"	14' 3"	12' 6"	10' 6"	13' 7"	11' 10"	10' 0"	13' 0"	11' 4"	9' 7"	12' 0"	10' 6"	8' 10"
600S162-33	24	28' 7"	22' 8"	19' 10"	15' 9"	13' 9"	11' 7"	14' 3"	12' 6"	10' 6"	13' 3"	11' 7"	9' 9"	12' 6"	10' 11"	9' 2"	11' 10"	10' 4"	8' 9"	11' 3"	9' 11"	8' 4"	10' 0"	9' 2"	7' 9"
600S200-33	12	37' 9"	29' 11"	26' 2"	20' 9"	18' 2"	15' 3"	18' 10"	16' 6"	13' 11"	17' 6"	15' 3"	12' 11"	16' 6"	14' 5"	12' 1"	15' 8"	13' 8"	11' 6"	14' 11"	13' 1"	11' 0"	13' 11"	12' 1"	10' 3"
600S200-33	16	34' 4"	27' 3"	23' 9"	18' 10"	16' 6"	13' 11"	17' 2"	14' 11"	12' 7"	15' 11"	13' 11"	11' 8"	14' 11"	13' 1"	11' 0"	14' 2"	12' 5"	10' 5"	13' 7"	11' 10"	10' 0"	12' 7"	11' 0"	9' 3"
600S200-33	24	29' 11"	23' 9"	20' 9"	16' 6"	14' 5"	12' 1"	14' 11"	13' 1"	11' 0"	13' 11"	12' 1"	10' 3"	13' 1"	11' 5"	9' 7"	12' 5"	10' 10"	9' 2"	11' 7"	10' 4"	8' 9"	10' 4"	9' 7"	8' 1"
600S137-43	12	37' 8"	29' 10"	26' 1"	20' 8"	18' 1"	15' 3"	18' 10"	16' 5"	13' 10"	17' 5"	15' 3"	12' 10"	16' 5"	14' 4"	12' 1"	15' 7"	13' 7"	11' 6"	14' 11"	13' 0"	11' 0"	13' 10"	12' 1"	10' 2"
600S137-43	16	34' 2"	27' 2"	23' 8"	18' 10"	16' 5"	13' 10"	17' 1"	14' 11"	12' 7"	15' 10"	13' 10"	11' 8"	14' 11"	13' 0"	11' 0"	14' 2"	12' 4"	10' 5"	13' 7"	11' 10"	10' 0"	12' 7"	11' 0"	9' 3"
600S137-43	24	29' 10"	23' 8"	20' 8"	16' 5"	14' 4"	12' 1"	14' 11"	13' 0"	11' 0"	13' 10"	12' 1"	10' 2"	13' 0"	11' 4"	9' 7"	12' 4"	10' 10"	9' 1"	11' 10"	10' 4"	8' 8"	11' 0"	9' 7"	8' 1"
600S162-43	12	39' 3"	31' 2"	27' 3"	21' 7"	18' 10"	15' 11"	19' 7"	17' 2"	14' 5"	18' 2"	15' 11"	13' 5"	17' 2"	14' 11"	12' 7"	16' 3"	14' 2"	12' 0"	15' 7"	13' 7"	11' 5"	14' 5"	12' 7"	10' 8"
600S162-43	16	35' 8"	28' 4"	24' 9"	19' 7"	17' 2"	14' 5"	17' 10"	15' 7"	13' 1"	16' 6"	14' 5"	12' 2"	15' 7"	13' 7"	11' 5"	14' 9"	12' 11"	10' 11"	14' 2"	12' 4"	10' 5"	13' 1"	11' 5"	9' 8"
600S162-43	24	31' 2"	24' 9"	21' 7"	17' 2"	14' 11"	12' 7"	15' 7"	13' 7"	11' 5"	14' 5"	12' 7"	10' 8"	13' 7"	11' 10"	10' 0"	12' 11"	11' 3"	9' 6"	12' 4"	10' 9"	9' 1"	11' 5"	10' 0"	8' 5"
600S200-43	12	41' 3"	32' 9"	28' 7"	22' 8"	19' 10"	16' 8"	20' 7"	18' 0"	15' 2"	19' 1"	16' 8"	14' 1"	18' 0"	15' 9"	13' 3"	17' 1"	14' 11"	12' 7"	16' 4"	14' 3"	12' 0"	15' 2"	13' 3"	11' 2"
600S200-43	16	37' 6"	29' 9"	26' 0"	20' 7"	18' 0"	15' 2"	18' 9"	16' 4"	13' 9"	17' 4"	15' 2"	12' 9"	16' 4"	14' 3"	12' 0"	15' 6"	13' 7"	11' 5"	14' 10"	13' 0"	10' 11"	13' 9"	12' 0"	10' 2"
600S200-43	24	32' 9"	26' 0"	22' 8"	18' 0"	15' 9"	13' 3"	16' 4"	14' 3"	12' 0"	15' 2"	13' 3"	11' 2"	14' 3"	12' 6"	10' 6"	13' 7"	11' 10"	10' 0"	13' 0"	11' 4"	9' 6"	12' 0"	10' 6"	8' 10"
600S137-54	12	40' 4"	32' 0"	28' 0"	22' 2"	19' 5"	16' 4"	20' 2"	17' 7"	14' 10"	18' 9"	16' 4"	13' 9"	17' 7"	15' 5"	13' 0"	16' 9"	14' 7"	12' 4"	16' 0"	14' 0"	11' 9"	14' 10"	13' 0"	10' 11"
600S137-54	16	36' 8"	29' 1"	25' 5"	20' 2"	17' 7"	14' 10"	18' 4"	16' 0"	13' 6"	17' 0"	14' 10"	12' 6"	16' 0"	14' 0"	11' 9"	15' 2"	13' 3"	11' 2"	14' 6"	12' 8"	10' 8"	13' 6"	11' 9"	9' 11"
600S137-54	24	32' 0"	25' 5"	22' 2"	17' 7"	15' 5"	13' 0"	16' 0"	14' 0"	11' 9"	14' 10"	13' 0"	10' 11"	14' 0"	12' 2"	10' 3"	13' 3"	11' 7"	9' 9"	12' 8"	11' 1"	9' 4"	11' 9"	10' 3"	8' 8"
600S162-54	12	42' 2"	33' 5"	29' 2"	23' 2"	20' 3"	17' 1"	21' 1"	18' 5"	15' 6"	19' 6"	17' 1"	14' 5"	18' 5"	16' 1"	13' 6"	17' 5"	15' 3"	12' 10"	16' 8"	14' 7"	12' 3"	15' 6"	13' 6"	11' 5"
600S162-54	16	38' 3"	30' 4"	26' 6"	21' 1"	18' 5"	15' 6"	19' 1"	16' 8"	14' 1"	17' 9"	15' 6"	13' 1"	16' 8"	14' 7"	12' 3"	15' 10"	13' 10"	11' 8"	15' 2"	13' 3"	11' 2"	14' 1"	12' 3"	10' 4"
600S162-54	24	33' 5"	26' 6"	23' 2"	18' 5"	16' 1"	13' 6"	16' 8"	14' 7"	12' 3"	15' 6"	13' 6"	11' 5"	14' 7"	12' 9"	10' 9"	13' 10"	12' 1"	10' 2"	13' 3"	11' 7"	9' 9"	12' 3"	10' 9"	9' 1"
600S200-54	12	44' 3"	35' 2"	30' 8"	24' 4"	21' 3"	17' 11"	22' 1"	19' 4"	16' 3"	20' 6"	17' 11"	15' 1"	19' 4"	16' 10"	14' 3"	18' 4"	16' 0"	13' 6"	17' 7"	15' 4"	12' 11"	16' 3"	14' 3"	12' 0"
600S200-54	16	40' 3"	31' 11"	27' 11"	22' 1"	19' 4"	16' 3"	20' 1"	17' 7"	14' 10"	18' 8"	16' 3"	13' 9"	17' 7"	15' 4"	12' 11"	16' 8"	14' 7"	12' 3"	15' 11"	13' 11"	11' 9"	14' 10"	12' 11"	10' 11"
600S200-54	24	35' 2"	27' 11"	24' 4"	19' 4"	16' 10"	14' 3"	17' 7"	15' 4"	12' 11"	16' 3"	14' 3"	12' 0"	15' 4"	13' 5"	11' 3"	14' 7"	12' 8"	10' 9"	13' 11"	12' 2"	10' 3"	12' 11"	11' 3"	9' 6"
600S137-68	12	43' 3"	34' 4"	30' 0"	23' 9"	20' 9"	17' 6"	21' 7"	18' 10"	15' 11"	20' 1"	17' 6"	14' 9"	18' 10"	16' 6"	13' 11"	17' 11"	15' 8"	13' 2"	17' 2"	15' 0"	12' 7"	15' 11"	13' 11"	11' 9"
600S137-68	16	39' 4"	31' 2"	27' 3"	21' 7"	18' 10"	15' 11"	19' 8"	17' 2"	14' 5"	18' 3"	15' 11"	13' 5"	17' 2"	15' 0"	12' 7"	16' 3"	14' 3"	12' 0"	15' 7"	13' 7"	11' 6"	14' 5"	12' 7"	10' 8"
600S137-68	24	34' 4"	27' 3"	23' 9"	18' 10"	16' 6"	13' 11"	17' 2"	15' 0"	12' 7"	15' 11"	13' 11"	11' 9"	15' 0"	13' 1"	11' 0"	14' 3"	12' 5"	10' 6"	13' 7"	11' 10"	10' 0"	12' 7"	11' 0"	9' 3"
600S162-68	12	45' 2"	35' 10"	31' 4"	24' 10"	21' 8"	18' 3"	22' 7"	19' 8"	16' 7"	20' 11"	18' 3"	15' 5"	19' 8"	17' 3"	14' 6"	18' 9"	16' 4"	13' 9"	17' 11"	15' 8"	13' 2"	16' 7"	14' 6"	12' 3"
600S162-68	16	41' 0"	32' 7"	28' 5"	22' 7"	19' 8"	16' 7"	20' 6"	17' 11"	15' 1"	19' 0"	16' 7"	14' 0"	17' 11"	15' 8"	13' 2"	17' 0"	14' 10"	12' 6"	16' 3"	14' 2"	12' 0"	15' 1"	13' 2"	11' 1"
600S162-68	24	35' 10"	28' 5"	24' 10"	19' 8"	17' 3"	14' 6"	17' 11"	15' 8"	13' 2"	16' 7"	14' 6"	12' 3"	15' 8"	13' 8"	11' 6"	14' 10"	13' 0"	10' 11"	14' 2"	12' 5"	10' 5"	13' 2"	11' 6"	9' 8"
600S200-68	12	47' 6"	37' 8"	32' 11"	26' 2"	22' 10"	19' 3"	23' 9"	20' 9"	17' 6"	22' 0"	19' 3"	16' 3"	20' 9"	18' 1"	15' 3"	19' 8"	17' 2"	14' 6"	18' 10"	16' 5"	13' 10"	17' 6"	15' 3"	12' 10"
600S200-68	16	43' 2"	34' 3"	29' 11"	23' 9"	20' 9"	17' 6"	21' 7"	18' 10"	15' 10"	20' 0"	17' 6"	14' 9"	18' 10"	16' 5"	13' 10"	17' 11"	15' 7"	13' 2"	17' 1"	14' 11"	12' 7"	15' 10"	13' 10"	11' 8"
600S200-68	24	37' 8"	29' 11"	26' 2"	20' 9"	18' 1"	15' 3"	18' 10"	16' 5"	13' 10"	17' 6"	15' 3"	12' 10"	16' 5"	14' 4"	12' 1"	15' 7"	13' 8"	11' 6"	14' 11"	13' 1"	11' 0"	13' 10"	12' 1"	10' 2"
600S137-97	12	47' 10"	38' 0"	33' 2"	26' 4"	23' 0"	19' 5"	23' 11"	20' 11"	17' 7"	22' 2"	19' 5"	16' 4"	20' 11"	18' 3"	15' 4"	19' 10"	17' 4"	14' 7"	19' 0"	16' 7"	14' 0"	17' 7"	15' 4"	12' 11"
600S137-97	16	43' 6"	34' 6"	30' 2"	23' 11"	20' 11"	17' 7"	21' 9"	19' 0"	16' 0"	20' 2"	17' 7"	14' 10"	19' 0"	16' 7"	14' 0"	18' 0"	15' 9"	13' 3"	17' 3"	15' 1"	12' 8"	16' 0"	14' 0"	11' 9"
600S137-97	24	38' 0"	30' 2"	26' 4"	20' 11"	18' 3"	15' 4"	19' 0"	16' 7"	14' 0"	17' 7"	15' 4"	12' 11"	16' 7"	14' 6"	12' 2"	15' 9"	13' 9"	11' 7"	15' 1"	13' 2"	11' 1"	14' 0"	12' 2"	10' 3"
600S162-97	12	50' 1"	39' 9"	34' 8"	27' 6"	24' 1"	20' 3"	25' 0"	21' 10"	18' 5"	23' 3"	20' 3"	17' 1"	21' 10"	19' 1"	16' 1"	20' 9"	18' 1"	15' 3"	19' 10"	17' 4"	14' 7"	18' 5"	16' 1"	13' 7"
600S162-97	16	45' 6"	36' 1"	31' 6"	25' 0"	21' 10"	18' 5"	22' 9"	19' 10"	16' 9"	21' 1"	18' 5"	15' 6"	19' 10"	17' 4"	14' 7"	18' 10"	16' 6"	13' 11"	18' 0"	15' 9"	13' 3"	16' 9"	14' 7"	12' 4"
600S162-97	24	39' 9"	31' 6"	27' 6"	21' 10"	19' 1"	16' 1"	19' 10"	17' 4"	14' 7"	18' 5"	16' 1"	13' 7"	17' 4"	15' 2"	12' 9"	16' 6"	14' 4"	12' 1"	15' 9"	13' 9"	11' 7"	14' 7"	12' 9"	10' 9"
600S200-97	12	52' 9"	41' 10"	36' 7"	29' 0"	25' 4"	21' 4"	26' 4"	23' 0"	19' 5"	24' 6"	21' 4"	18' 0"	23' 0"	20' 1"	16' 11"	21' 10"	19' 1"	16' 1"	20' 11"	18' 3"	15' 5"	19' 5"	16' 11"	14' 3"
600S200-97	16	47' 11"	38' 0"	33' 3"	26' 4"	23' 0"	19' 5"	23' 11"	20' 11"	17' 8"	22' 3"	19' 5"	16' 4"	20' 11"	18' 3"	15' 5"	19' 10"								

Section Properties

Structural (S) Stud Section Properties

Section	Design Thickness (in)	Gross							Effective 33ksi					Effective 50ksi					Torsional				
		Area (in ²)	Weight (lb/ft)	I _{xx} (in ⁴)	S _{xx} (in ³)	R _x (in)	I _{yy} (in ⁴)	R _y (in)	I _{xx} (in ⁴)	S _{xx} (in ³)	M _a (in-k)	V _a (lb)	Y _{cg} (in)	I _{xx} (in ⁴)	S _{xx} (in ³)	M _a (in-k)	V _a (lb)	Y _{cg} (in)	J ¹⁰⁰⁰ (in ⁴)	C _w (in ⁶)	X _o (in)	R _o (in)	β
250S137-33	0.0346	0.197	0.67	0.203	0.163	1.015	0.052	0.515	0.203	0.156	3.09	1040	1.272						0.079	0.075	-1.170	1.633	0.486
250S137-43	0.0451	0.255	0.87	0.261	0.208	1.010	0.067	0.511	0.261	0.205	4.53	1350	1.260						0.173	0.094	-1.158	1.620	0.489
250S137-54	0.0566	0.316	1.07	0.318	0.255	1.004	0.080	0.504	0.318	0.255	5.76	1656	1.250	0.318	0.244	8.22	2510	1.274	0.337	0.113	-1.150	1.608	0.488
250S137-68	0.0713	0.390	1.33	0.386	0.309	0.994	0.095	0.495	0.386	0.309	7.19	2017	1.250	0.386	0.308	10.65	3057	1.251	0.661	0.134	-1.142	1.593	0.486
250S162-33	0.0346	0.223	0.76	0.235	0.188	1.027	0.087	0.624	0.235	0.180	3.55	1040	1.274						0.089	0.144	-1.501	1.923	0.390
250S162-43	0.0451	0.289	0.98	0.302	0.242	1.022	0.111	0.620	0.302	0.240	5.22	1350	1.253						0.196	0.182	-1.489	1.909	0.392
250S162-54	0.0566	0.358	1.22	0.370	0.296	1.016	0.135	0.613	0.370	0.296	6.57	1656	1.250	0.370	0.288	8.62	2510	1.267	0.383	0.219	-1.482	1.898	0.391
250S162-68	0.0713	0.443	1.51	0.450	0.360	1.007	0.162	0.605	0.450	0.360	8.21	2017	1.250	0.450	0.357	12.10	3057	1.255	0.752	0.262	-1.474	1.885	0.389
350S162-33	0.0346	0.258	0.88	0.508	0.290	1.404	0.098	0.617	0.508	0.279	5.50	1046	1.779						0.103	0.273	-1.351	2.044	0.563
350S162-43	0.0451	0.334	1.14	0.654	0.374	1.400	0.125	0.612	0.654	0.372	8.08	1777	1.755						0.227	0.345	-1.339	2.031	0.565
350S162-54	0.0566	0.415	1.41	0.804	0.460	1.392	0.152	0.606	0.804	0.460	10.20	2403	1.750	0.804	0.447	13.37	3446	1.773	0.443	0.418	-1.331	2.019	0.566
350S162-68	0.0713	0.515	1.75	0.985	0.563	1.383	0.184	0.597	0.985	0.563	12.83	2959	1.750	0.985	0.557	18.89	4483	1.758	0.872	0.503	-1.321	2.004	0.565
362S137-33	0.0346	0.236	0.80	0.479	0.264	1.424	0.059	0.501	0.479	0.254	5.02	1039	1.842						0.094	0.162	-1.026	1.826	0.684
362S137-43	0.0451	0.306	1.04	0.616	0.340	1.419	0.075	0.497	0.616	0.334	7.38	1777	1.826						0.207	0.204	-1.015	1.814	0.687
362S137-54	0.0566	0.379	1.29	0.756	0.417	1.411	0.091	0.490	0.756	0.417	9.43	2497	1.812	0.756	0.400	13.47	3446	1.844	0.405	0.246	-1.006	1.801	0.688
362S137-68	0.0713	0.470	1.60	0.922	0.509	1.401	0.109	0.480	0.922	0.509	11.87	3076	1.812	0.922	0.508	17.56	4661	1.814	0.797	0.294	-0.996	1.784	0.689
362S162-33	0.0346	0.262	0.89	0.551	0.304	1.450	0.099	0.616	0.551	0.292	5.77	1039	1.843						0.105	0.293	-1.335	2.065	0.582
362S162-43	0.0451	0.340	1.16	0.710	0.392	1.445	0.127	0.611	0.710	0.389	8.46	1777	1.818						0.230	0.371	-1.323	2.052	0.585
362S162-54	0.0566	0.422	1.44	0.873	0.481	1.438	0.154	0.604	0.873	0.481	10.69	2497	1.812	0.873	0.468	14.00	3446	1.836	0.451	0.449	-1.314	2.040	0.585
362S162-68	0.0713	0.524	1.78	1.069	0.590	1.429	0.186	0.596	1.069	0.590	13.44	3076	1.812	1.069	0.584	19.80	4661	1.820	0.887	0.540	-1.305	2.024	0.585
362S200-33	0.0346	0.297	1.01	0.648	0.358	1.478	0.177	0.772	0.643	0.318	6.29	1039	1.898						0.118	0.571	-1.770	2.432	0.470
362S200-43	0.0451	0.385	1.31	0.836	0.461	1.474	0.227	0.767	0.836	0.448	8.85	1777	1.834						0.261	0.726	-1.758	2.419	0.472
362S200-54	0.0566	0.479	1.63	1.030	0.568	1.467	0.277	0.761	1.030	0.568	12.36	2497	1.812	1.030	0.509	15.25	3446	1.898	0.511	0.884	-1.750	2.407	0.471
362S200-68	0.0713	0.595	2.02	1.265	0.698	1.458	0.337	0.753	1.265	0.698	15.54	3076	1.812	1.265	0.673	22.34	4661	1.844	1.008	1.070	-1.741	2.393	0.470
400S137-33	0.0346	0.249	0.85	0.603	0.301	1.556	0.061	0.496	0.603	0.290	5.74	936	2.031						0.099	0.200	-0.987	1.908	0.732
400S137-43	0.0451	0.323	1.10	0.776	0.388	1.551	0.078	0.491	0.776	0.382	8.43	1777	2.014						0.219	0.253	-0.976	1.897	0.735
400S137-54	0.0566	0.401	1.36	0.953	0.477	1.542	0.094	0.484	0.953	0.477	10.78	2777	2.000	0.953	0.457	15.40	3446	2.034	0.428	0.305	-0.967	1.884	0.737
400S137-68	0.0713	0.497	1.69	1.165	0.582	1.531	0.112	0.475	1.165	0.582	13.58	3429	2.000	1.165	0.581	20.10	5196	2.002	0.842	0.365	-0.956	1.866	0.738
400S162-33	0.0346	0.275	0.94	0.692	0.346	1.586	0.103	0.611	0.692	0.332	6.57	936	2.032						0.110	0.358	-1.288	2.133	0.635
400S162-43	0.0451	0.357	1.21	0.892	0.446	1.581	0.131	0.606	0.892	0.443	9.63	1777	2.006						0.242	0.453	-1.276	2.121	0.638
400S162-54	0.0566	0.443	1.51	1.098	0.549	1.574	0.159	0.600	1.098	0.549	12.18	2777	2.000	1.098	0.533	15.96	3446	2.026	0.473	0.550	-1.268	2.108	0.638
400S162-68	0.0713	0.550	1.87	1.346	0.673	1.564	0.192	0.591	1.346	0.673	15.34	3429	2.000	1.346	0.666	22.60	5196	2.009	0.933	0.663	-1.258	2.092	0.639
400S200-33	0.0346	0.310	1.05	0.812	0.406	1.619	0.183	0.769	0.805	0.362	7.16	936	2.091						0.124	0.689	-1.715	2.481	0.522
400S200-43	0.0451	0.402	1.37	1.047	0.524	1.615	0.235	0.764	1.047	0.509	10.06	1777	2.023						0.272	0.876	-1.703	2.468	0.524
400S200-54	0.0566	0.500	1.70	1.292	0.646	1.608	0.287	0.758	1.292	0.646	14.06	2777	2.000	1.292	0.580	17.36	3446	2.091	0.534	1.068	-1.695	2.456	0.524
400S200-68	0.0713	0.622	2.12	1.589	0.795	1.599	0.349	0.750	1.589	0.795	17.68	3429	2.000	1.589	0.766	25.41	5196	2.035	1.054	1.295	-1.686	2.441	0.523
550S162-33	0.0346	0.327	1.11	1.458	0.530	2.112	0.113	0.589	1.458	0.512	10.11	670	2.787						0.130	0.704	-1.134	2.468	0.789
550S162-43	0.0451	0.424	1.44	1.883	0.685	2.107	0.145	0.584	1.883	0.681	14.79	1487	2.757						0.288	0.894	-1.123	2.458	0.791
550S162-54	0.0566	0.528	1.80	2.324	0.845	2.098	0.176	0.577	2.324	0.845	18.76	2799	2.750	2.324	0.821	24.59	2967	2.782	0.564	1.088	-1.114	2.445	0.792
550S162-68	0.0713	0.657	2.24	2.861	1.040	2.086	0.212	0.568	2.861	1.040	23.72	4442	2.750	2.861	1.031	34.94	5468	2.761	1.114	1.316	-1.103	2.427	0.793
600S137-33	0.0346	0.318	1.08	1.582	0.527	2.229	0.069	0.464	1.582	0.510	10.07	612	3.039						0.127	0.493	-0.823	2.421	0.884
600S137-43	0.0451	0.413	1.41	2.042	0.681	2.223	0.087	0.459	2.042	0.670	14.80	1358	3.018						0.280	0.625	-0.813	2.411	0.886
600S137-54	0.0566	0.514	1.75	2.518	0.839	2.213	0.105	0.452	2.518	0.839	18.98	2708	3.000	2.518	0.809	27.23	2708	3.042	0.549	0.757	-0.804	2.398	0.888
600S137-68	0.0713	0.640	2.18	3.094	1.031	2.200	0.125	0.443	3.094	1.031	24.05	4442	3.000	3.094	1.029	35.60	5468	3.002	1.084	0.911	-0.793	2.380	0.889
600S137-97	0.1017	0.889	3.03	4.188	1.396	2.170	0.159	0.422	4.188	1.396	34.48	7372	3.000	4.188	1.396	50.80	11124	3.000	3.066	1.179	-0.770	2.341	0.892
600S162-33	0.0346	0.344	1.17	1.793	0.598	2.282	0.116	0.581	1.793	0.577	11.41	612	3.039						0.137	0.851	-1.091	2.595	0.823
600S162-43	0.0451	0.447	1.52	2.316	0.772	2.276	0.148	0.576	2.316	0.767	16.68	1358	3.007						0.303	1.082	-1.081	2.585	0.825
600S162-54	0.0566	0.556	1.89	2.860	0.953	2.267	0.180	0.570	2.860	0.953	21.17	2708	3.000	2.860	0.927	27.76	2708	3.034	0.594	1.318	-1.072	2.572	0.826
600S162-68	0.0713	0.693	2.36	3.525	1.175	2.255	0.218	0.560	3.525	1.175	26.79	4442	3.000	3.525	1.164	39.46	5468	3.011	1.174	1.596	-1.061	2.554	0.828
600S162-97	0.1017	0.966	3.29	4.797	1.599	2.229	0.283	0.541	4.797	1.599	38.37	7372	3.000	4.797	1.599	56.73	11124	3.000	3.329	2.093	-1.039	2.518	0.830
600S200-33	0.0346	0.379	1.29	2.075	0.692	2																	

Steel Beam

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

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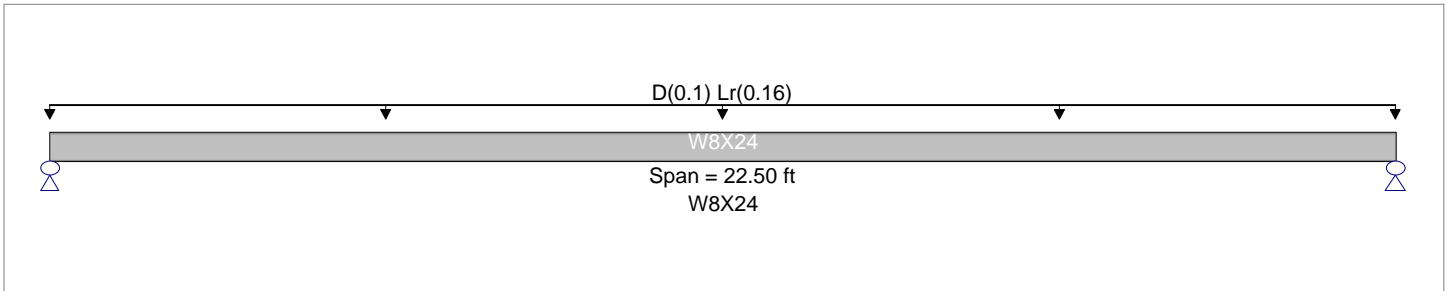
Description : Beam-1

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.10, Lr = 0.160 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.312 : 1	Maximum Shear Stress Ratio =	0.082 : 1
Section used for this span	W8X24	Section used for this span	W8X24
Mu : Applied	17.978 k-ft	Vu : Applied	3.196 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	11.250ft	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	0.388 in	Ratio =	696
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.689 in	Ratio =	392
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
+D	Dsgn. L = 22.50 ft	1	0.312	0.082	17.98		17.98	96.25	57.63	1.00	1.00	3.20	58.29	38.86	
+D+Lr+H	Dsgn. L = 22.50 ft	1	0.136	0.036	7.85		7.85	96.25	57.63	1.00	1.00	1.40	58.29	38.86	
+D+0.750Lr+0.750L+H	Dsgn. L = 22.50 ft	1	0.312	0.082	17.98		17.98	96.25	57.63	1.00	1.00	3.20	58.29	38.86	
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 22.50 ft	1	0.268	0.071	15.45		15.45	96.25	57.63	1.00	1.00	2.75	58.29	38.86	
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 22.50 ft	1	0.268	0.071	15.45		15.45	96.25	57.63	1.00	1.00	2.75	58.29	38.86	
	Dsgn. L = 22.50 ft	1	0.268	0.071	15.45		15.45	96.25	57.63	1.00	1.00	2.75	58.29	38.86	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.6886	11.363		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.196	3.196
D Only	1.396	1.396
Lr Only	1.800	1.800
D+Lr	3.196	3.196

Steel Beam

10642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Roof Beams & Posts.ecx
ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

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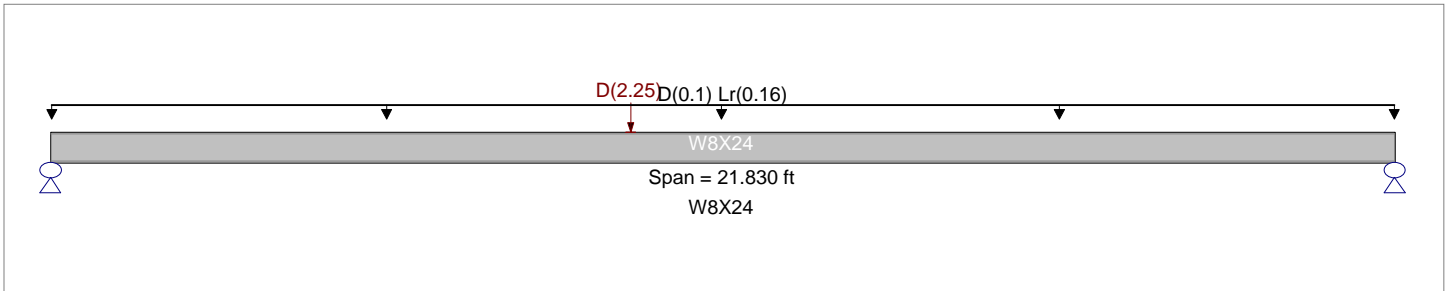
Description : Beam-1.1 (supporting additional load from equipment)

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.10, Lr = 0.160 k/ft, Tributary Width = 1.0 ft
Point Load : D = 2.250 k @ 9.420 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.496 : 1	Maximum Shear Stress Ratio =	0.113 : 1
Section used for this span	W8X24	Section used for this span	W8X24
Mu : Applied	28.613 k-ft	Vu : Applied	4.380 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	9.496ft	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	0.344 in Ratio =	762	
Max Upward L+Lr+S Deflection	0.000 in Ratio =	0 <360	
Max Downward Total Deflection	0.955 in Ratio =	274	
Max Upward Total Deflection	0.000 in Ratio =	0 <240	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 21.83 ft	1	0.496	0.113	28.61		28.61	96.25	57.63	1.00	1.00	4.38	58.29	38.86
+D+Lr+H	Dsgn. L = 21.83 ft	1	0.334	0.068	19.25		19.25	96.25	57.63	1.00	1.00	2.63	58.29	38.86
+D+0.750Lr+0.750L+H	Dsgn. L = 21.83 ft	1	0.496	0.113	28.61		28.61	96.25	57.63	1.00	1.00	4.38	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 21.83 ft	1	0.456	0.101	26.27		26.27	96.25	57.63	1.00	1.00	3.94	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 21.83 ft	1	0.456	0.101	26.27		26.27	96.25	57.63	1.00	1.00	3.94	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.9551	10.806		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.380	4.072
D Only	2.634	2.325
Lr Only	1.746	1.746
D+Lr	4.380	4.072

Steel Beam

10642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Roof Beams & Posts.ecx
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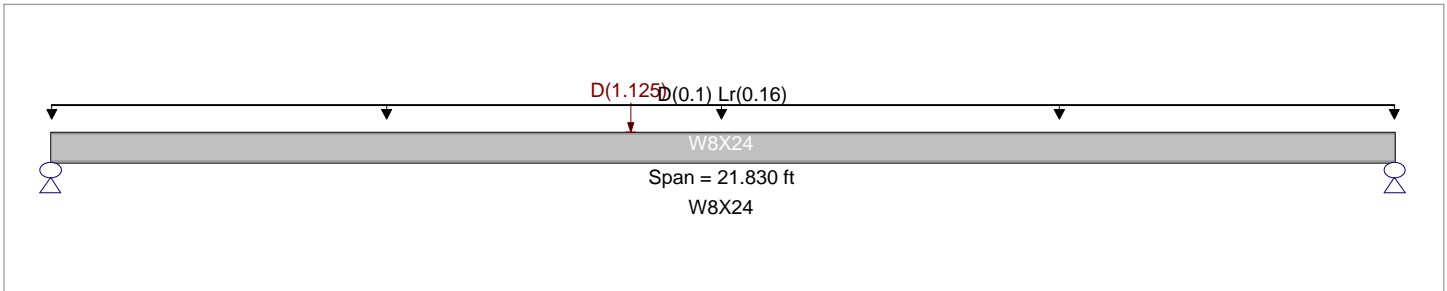
Description : Beam-1.2 (supporting additional load from equipment)

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Uniform Load : D = 0.10, Lr = 0.160 k/ft, Tributary Width = 1.0 ft
 Point Load : D = 1.125 k @ 9.420 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.393 : 1	Maximum Shear Stress Ratio =	0.096 : 1
Section used for this span	W8X24	Section used for this span	W8X24
Mu : Applied	22.625 k-ft	Vu : Applied	3.741 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	9.496ft	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	0.344 in	Ratio =	762
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.783 in	Ratio =	334
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 21.83 ft	1	0.393	0.096	22.63		22.63	96.25	57.63	1.00	1.00	3.74	58.29	38.86
+D+Lr+H	Dsgn. L = 21.83 ft	1	0.230	0.051	13.26		13.26	96.25	57.63	1.00	1.00	1.99	58.29	38.86
+D+0.750Lr+0.750L+H	Dsgn. L = 21.83 ft	1	0.393	0.096	22.63		22.63	96.25	57.63	1.00	1.00	3.74	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 21.83 ft	1	0.352	0.085	20.28		20.28	96.25	57.63	1.00	1.00	3.30	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 21.83 ft	1	0.352	0.085	20.28		20.28	96.25	57.63	1.00	1.00	3.30	58.29	38.86
	Dsgn. L = 21.83 ft	1	0.352	0.085	20.28		20.28	96.25	57.63	1.00	1.00	3.30	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.7825	10.806		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.740	3.586
D Only	1.994	1.840
Lr Only	1.746	1.746
D+Lr	3.740	3.586

Steel Beam

10642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Roof Beams & Posts.ecx
 ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

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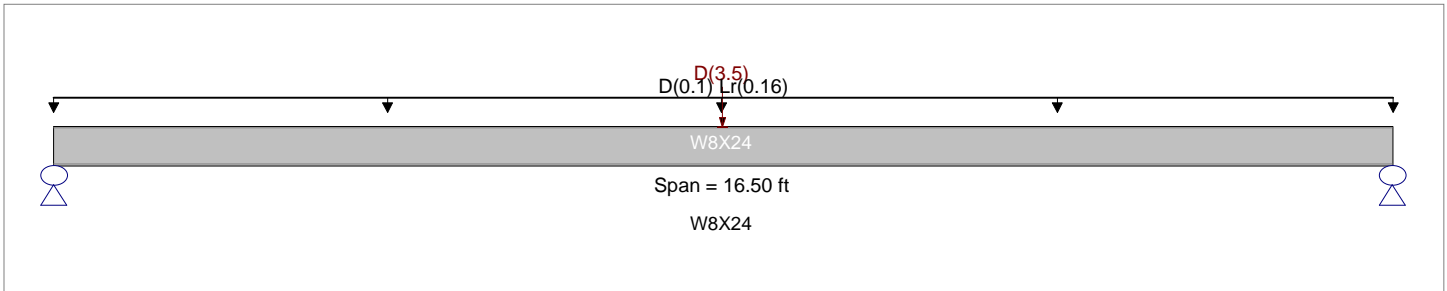
Description : Beam-1.3 (supporting additional load from equipment)

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Uniform Load : D = 0.10, Lr = 0.160 k/ft, Tributary Width = 1.0 ft
 Point Load : D = 3.50 k @ 8.250 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.418 : 1	Maximum Shear Stress Ratio =	0.105 : 1
Section used for this span	W8X24	Section used for this span	W8X24
Mu : Applied	24.106 k-ft	Vu : Applied	4.094 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	8.250ft	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	0.112 in	Ratio =	1765
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.437 in	Ratio =	453
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 16.50 ft	1	0.418	0.105	24.11		24.11	96.25	57.63	1.00	1.00	4.09	58.29	38.86
+D+Lr+H	Dsgn. L = 16.50 ft	1	0.324	0.071	18.66		18.66	96.25	57.63	1.00	1.00	2.77	58.29	38.86
+D+0.750Lr+0.750L+H	Dsgn. L = 16.50 ft	1	0.418	0.105	24.11		24.11	96.25	57.63	1.00	1.00	4.09	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 16.50 ft	1	0.395	0.097	22.74		22.74	96.25	57.63	1.00	1.00	3.76	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 16.50 ft	1	0.395	0.097	22.74		22.74	96.25	57.63	1.00	1.00	3.76	58.29	38.86
	Dsgn. L = 16.50 ft	1	0.395	0.097	22.74		22.74	96.25	57.63	1.00	1.00	3.76	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.4369	8.333		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.094	4.094
D Only	2.774	2.774
Lr Only	1.320	1.320
D+Lr	4.094	4.094

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Roof Beams.ecf
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

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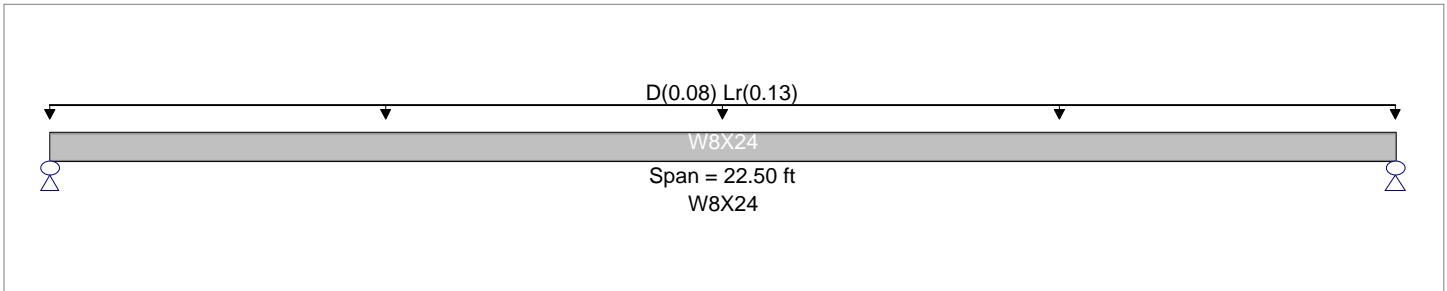
Description : Beam-2

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.080, Lr = 0.130 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.257 : 1	Maximum Shear Stress Ratio =	0.068 : 1
Section used for this span	W8X24	Section used for this span	W8X24
Mu : Applied	14.814 k-ft	Vu : Applied	2.634 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	11.250ft	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	0.315 in	Ratio =	856
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.567 in	Ratio =	475
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 22.50 ft	1	0.257	0.068	14.81		14.81	96.25	57.63	1.00	1.00	2.63	58.29	38.86
+D+Lr+H	Dsgn. L = 22.50 ft	1	0.114	0.030	6.59		6.59	96.25	57.63	1.00	1.00	1.17	58.29	38.86
+D+0.750Lr+0.750L+H	Dsgn. L = 22.50 ft	1	0.257	0.068	14.81		14.81	96.25	57.63	1.00	1.00	2.63	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 22.50 ft	1	0.221	0.058	12.76		12.76	96.25	57.63	1.00	1.00	2.27	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 22.50 ft	1	0.221	0.058	12.76		12.76	96.25	57.63	1.00	1.00	2.27	58.29	38.86
	Dsgn. L = 22.50 ft	1	0.221	0.058	12.76		12.76	96.25	57.63	1.00	1.00	2.27	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.5674	11.363		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.634	2.634
D Only	1.171	1.171
Lr Only	1.463	1.463
D+Lr	2.634	2.634

Steel Beam

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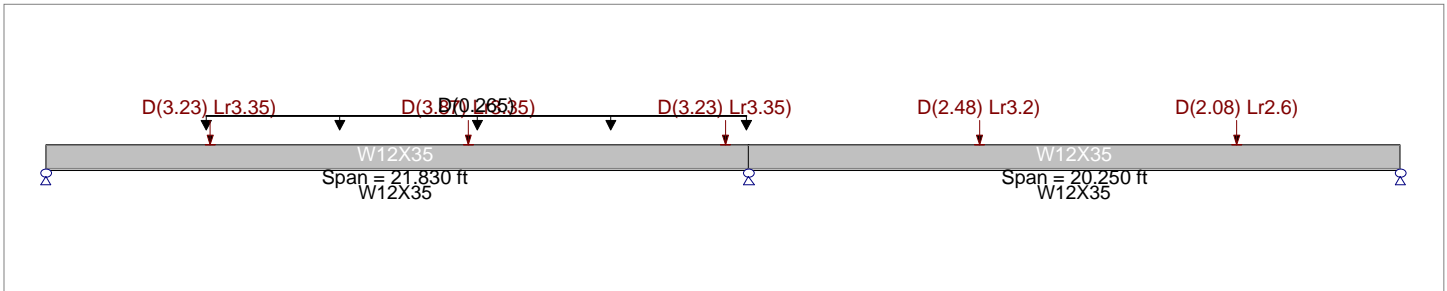
Description : Beam-3 (Cont. Beam)-REV3 w/ unit on top

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.2650 k/ft, Extent = 5.0 -->> 21.750 ft, Tributary Width = 1.0 ft
Point Load : D = 3.230, Lr = 3.350 k @ 5.125 ft
Point Load : D = 3.870, Lr = 3.350 k @ 13.125 ft
Point Load : D = 3.230, Lr = 3.350 k @ 21.125 ft
Load(s) for Span Number 2
Point Load : D = 2.480, Lr = 3.20 k @ 7.170 ft
Point Load : D = 2.080, Lr = 2.60 k @ 15.170 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.402 : 1	Maximum Shear Stress Ratio =	0.236 : 1
Section used for this span	W12X35	Section used for this span	W12X35
Mu : Applied	51.330 k-ft	Vu : Applied	17.707 k
Mn / Omega : Allowable	127.745 k-ft	Vn/Omega : Allowable	75.0 k
Load Combination	+D+Lr+H, LL Comb Run (LL)	Load Combination	+D+Lr+H, LL Comb Run (LL)
Location of maximum on span	21.830ft	Location of maximum on span	21.830 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward L+Lr+S Deflection	0.181 in	Ratio =	1445
Max Upward L+Lr+S Deflection	-0.071 in	Ratio =	3422
Max Downward Total Deflection	0.441 in	Ratio =	593
Max Upward Total Deflection	-0.100 in	Ratio =	2436

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
Dsgn. L = 21.83 ft		1	0.402	0.236	45.68	-51.33	51.33	213.33	127.74	1.00	1.00	17.71	112.50	75.00
Dsgn. L = 20.25 ft		2	0.402	0.103	19.62	-51.33	51.33	213.33	127.74	1.00	1.00	7.73	112.50	75.00
+D														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+L+H, LL Comb Run (*L)														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+L+H, LL Comb Run (L*)														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+L+H, LL Comb Run (LL)														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+Lr+H, LL Comb Run (*L)														
Dsgn. L = 21.83 ft		1	0.303	0.148	24.03	-38.67	38.67	213.33	127.74	1.00	1.00	11.08	112.50	75.00
Dsgn. L = 20.25 ft		2	0.303	0.095	19.62	-38.67	38.67	213.33	127.74	1.00	1.00	7.11	112.50	75.00
+D+Lr+H, LL Comb Run (L*)														
Dsgn. L = 21.83 ft		1	0.358	0.231	45.68	-42.48	45.68	213.33	127.74	1.00	1.00	17.30	112.50	75.00
Dsgn. L = 20.25 ft		2	0.333	0.061	3.02	-42.48	42.48	213.33	127.74	1.00	1.00	4.58	112.50	75.00

Steel Beam

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 ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

Lic. # : KW-06008291

Licensee : ED NAJJARINE

Description : Beam-3 (Cont. Beam)-REV3 w/ unit on top

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+Lr+H, LL Comb Run (LL)														
Dsgn. L = 21.83 ft		1	0.402	0.236	41.87	-51.33	51.33	213.33	127.74	1.00	1.00	17.71	112.50	75.00
Dsgn. L = 20.25 ft		2	0.402	0.103	16.41	-51.33	51.33	213.33	127.74	1.00	1.00	7.73	112.50	75.00
+D+S+H														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750Lr+0.750L+H, LL Comb Run (*)														
Dsgn. L = 21.83 ft		1	0.285	0.146	24.91	-36.46	36.46	213.33	127.74	1.00	1.00	10.98	112.50	75.00
Dsgn. L = 20.25 ft		2	0.285	0.084	16.26	-36.46	36.46	213.33	127.74	1.00	1.00	6.32	112.50	75.00
+D+0.750Lr+0.750L+H, LL Comb Run (L)														
Dsgn. L = 21.83 ft		1	0.322	0.209	41.20	-39.32	41.20	213.33	127.74	1.00	1.00	15.65	112.50	75.00
Dsgn. L = 20.25 ft		2	0.308	0.059	3.80	-39.32	39.32	213.33	127.74	1.00	1.00	4.42	112.50	75.00
+D+0.750Lr+0.750L+H, LL Comb Run (L)														
Dsgn. L = 21.83 ft		1	0.360	0.213	38.30	-45.95	45.95	213.33	127.74	1.00	1.00	15.95	112.50	75.00
Dsgn. L = 20.25 ft		2	0.360	0.090	13.85	-45.95	45.95	213.33	127.74	1.00	1.00	6.79	112.50	75.00
+D+0.750L+0.750S+H, LL Comb Run (*L)														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750L+0.750S+H, LL Comb Run (L*)														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750L+0.750S+H, LL Comb Run (LL)														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+W+H														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.70E+H														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750Lr+0.750L+0.750W+H, LL Com														
Dsgn. L = 21.83 ft		1	0.285	0.146	24.91	-36.46	36.46	213.33	127.74	1.00	1.00	10.98	112.50	75.00
Dsgn. L = 20.25 ft		2	0.285	0.084	16.26	-36.46	36.46	213.33	127.74	1.00	1.00	6.32	112.50	75.00
+D+0.750Lr+0.750L+0.750W+H, LL Com														
Dsgn. L = 21.83 ft		1	0.322	0.209	41.20	-39.32	41.20	213.33	127.74	1.00	1.00	15.65	112.50	75.00
Dsgn. L = 20.25 ft		2	0.308	0.059	3.80	-39.32	39.32	213.33	127.74	1.00	1.00	4.42	112.50	75.00
+D+0.750Lr+0.750L+0.750W+H, LL Com														
Dsgn. L = 21.83 ft		1	0.360	0.213	38.30	-45.95	45.95	213.33	127.74	1.00	1.00	15.95	112.50	75.00
Dsgn. L = 20.25 ft		2	0.360	0.090	13.85	-45.95	45.95	213.33	127.74	1.00	1.00	6.79	112.50	75.00
+D+0.750L+0.750S+0.750W+H, LL Coml														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750L+0.750S+0.750W+H, LL Coml														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750L+0.750S+0.750W+H, LL Coml														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750Lr+0.750L+0.5250E+H, LL Con														
Dsgn. L = 21.83 ft		1	0.285	0.146	24.91	-36.46	36.46	213.33	127.74	1.00	1.00	10.98	112.50	75.00
Dsgn. L = 20.25 ft		2	0.285	0.084	16.26	-36.46	36.46	213.33	127.74	1.00	1.00	6.32	112.50	75.00
+D+0.750Lr+0.750L+0.5250E+H, LL Con														
Dsgn. L = 21.83 ft		1	0.322	0.209	41.20	-39.32	41.20	213.33	127.74	1.00	1.00	15.65	112.50	75.00
Dsgn. L = 20.25 ft		2	0.308	0.059	3.80	-39.32	39.32	213.33	127.74	1.00	1.00	4.42	112.50	75.00
+D+0.750Lr+0.750L+0.5250E+H, LL Con														
Dsgn. L = 21.83 ft		1	0.360	0.213	38.30	-45.95	45.95	213.33	127.74	1.00	1.00	15.95	112.50	75.00
Dsgn. L = 20.25 ft		2	0.360	0.090	13.85	-45.95	45.95	213.33	127.74	1.00	1.00	6.79	112.50	75.00
+D+0.750L+0.750S+0.5250E+H, LL Corr														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750L+0.750S+0.5250E+H, LL Corr														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+D+0.750L+0.750S+0.5250E+H, LL Corr														
Dsgn. L = 21.83 ft		1	0.233	0.142	27.74	-29.83	29.83	213.33	127.74	1.00	1.00	10.68	112.50	75.00
Dsgn. L = 20.25 ft		2	0.233	0.053	6.19	-29.83	29.83	213.33	127.74	1.00	1.00	3.95	112.50	75.00
+0.60D+W+H														
Dsgn. L = 21.83 ft		1	0.140	0.085	16.64	-17.90	17.90	213.33	127.74	1.00	1.00	6.41	112.50	75.00
Dsgn. L = 20.25 ft		2	0.140	0.032	3.71	-17.90	17.90	213.33	127.74	1.00	1.00	2.37	112.50	75.00



Steel Beam

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 ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

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Description : Beam-3 (Cont. Beam)-REV3 w/ unit on top

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+H														
Dsgn. L =	21.83 ft	1	0.140	0.085	16.64	-17.90	17.90	213.33	127.74	1.00	1.00	6.41	112.50	75.00
Dsgn. L =	20.25 ft	2	0.140	0.032	3.71	-17.90	17.90	213.33	127.74	1.00	1.00	2.37	112.50	75.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.4415	10.243		0.0000	0.000
D+Lr	2	0.1212	10.592	D+Lr	-0.0997	6.387

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	8.283	25.440	3.962
D Only	4.855	14.631	1.318
Lr Only, LL Comb Run (*L)	-0.405	3.561	2.644
Lr Only, LL Comb Run (L*)	3.428	7.247	-0.625
Lr Only, LL Comb Run (LL)	3.023	10.809	2.019
D+Lr, LL Comb Run (*L)	4.450	18.192	3.962
D+Lr, LL Comb Run (L*)	8.283	21.878	0.693
D+Lr, LL Comb Run (LL)	7.877	25.440	3.337

Steel Beam

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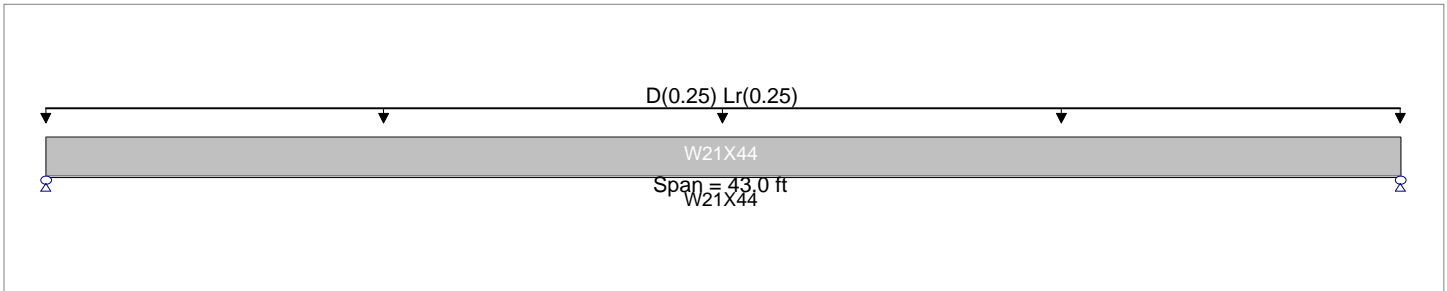
Description : Beam - 4 w/ LL Reduction

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.250, Lr = 0.250 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.528 : 1	Maximum Shear Stress Ratio =	0.081 : 1
Section used for this span	W21X44	Section used for this span	W21X44
Mu : Applied	125.790 k-ft	Vu : Applied	11.701 k
Mn / Omega : Allowable	238.024 k-ft	Vn/Omega : Allowable	144.90 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	21.500ft	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	0.793 in	Ratio =	650
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.726 in	Ratio =	298
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 43.00 ft	1	0.528	0.081	125.79		125.79	397.50	238.02	1.00	1.00	11.70	217.35	144.90
+D+Lr+H	Dsgn. L = 43.00 ft	1	0.286	0.044	68.01		68.01	397.50	238.02	1.00	1.00	6.33	217.35	144.90
+D+0.750Lr+0.750L+H	Dsgn. L = 43.00 ft	1	0.528	0.081	125.79		125.79	397.50	238.02	1.00	1.00	11.70	217.35	144.90
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 43.00 ft	1	0.468	0.071	111.34		111.34	397.50	238.02	1.00	1.00	10.36	217.35	144.90
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 43.00 ft	1	0.468	0.071	111.34		111.34	397.50	238.02	1.00	1.00	10.36	217.35	144.90
	Dsgn. L = 43.00 ft	1	0.468	0.071	111.34		111.34	397.50	238.02	1.00	1.00	10.36	217.35	144.90

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.7262	21.715		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.701	11.701
D Only	6.326	6.326
Lr Only	5.375	5.375
D+Lr	11.701	11.701

Steel Beam

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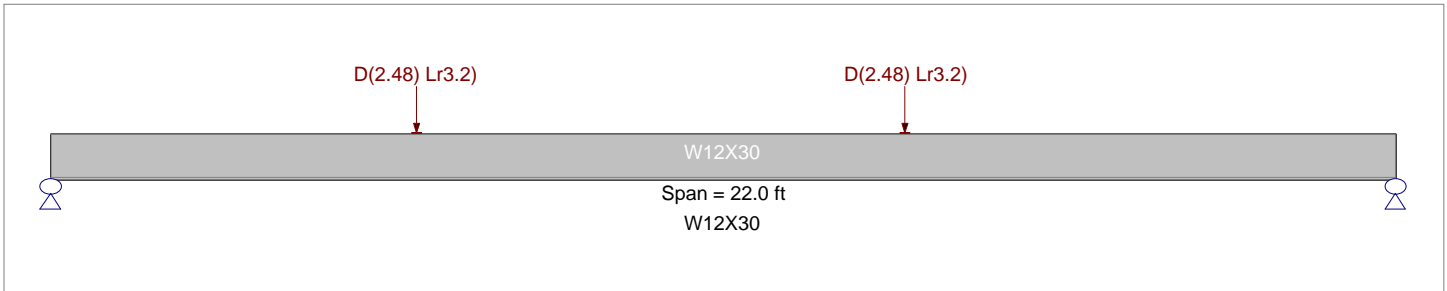
Description : Beam - 5

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Load(s) for Span Number 1
Point Load : D = 2.480, Lr = 3.20 k @ 6.0 ft
Point Load : D = 2.480, Lr = 3.20 k @ 14.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.400 : 1	Maximum Shear Stress Ratio =	0.102 : 1
Section used for this span	W12X30	Section used for this span	W12X30
Mu : Applied	42.972 k-ft	Vu : Applied	6.526 k
Mn / Omega : Allowable	107.535 k-ft	Vn/Omega : Allowable	63.960 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	13.970ft	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	0.293 in	Ratio =	900
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.543 in	Ratio =	486
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
Dsgn. L = 22.00 ft		1	0.400	0.102	42.97		42.97	179.58	107.53	1.00	1.00	6.53	95.94	63.96
+D														
Dsgn. L = 22.00 ft		1	0.183	0.047	19.71		19.71	179.58	107.53	1.00	1.00	3.03	95.94	63.96
+D+Lr+H														
Dsgn. L = 22.00 ft		1	0.400	0.102	42.97		42.97	179.58	107.53	1.00	1.00	6.53	95.94	63.96
+D+0.750Lr+0.750L+H														
Dsgn. L = 22.00 ft		1	0.346	0.088	37.16		37.16	179.58	107.53	1.00	1.00	5.65	95.94	63.96
+D+0.750Lr+0.750L+0.750W+H														
Dsgn. L = 22.00 ft		1	0.346	0.088	37.16		37.16	179.58	107.53	1.00	1.00	5.65	95.94	63.96
+D+0.750Lr+0.750L+0.5250E+H														
Dsgn. L = 22.00 ft		1	0.346	0.088	37.16		37.16	179.58	107.53	1.00	1.00	5.65	95.94	63.96

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.5432	11.000		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	6.525	5.493
D Only	3.035	2.584
Lr Only	3.491	2.909
D+Lr	6.525	5.493

Steel Beam

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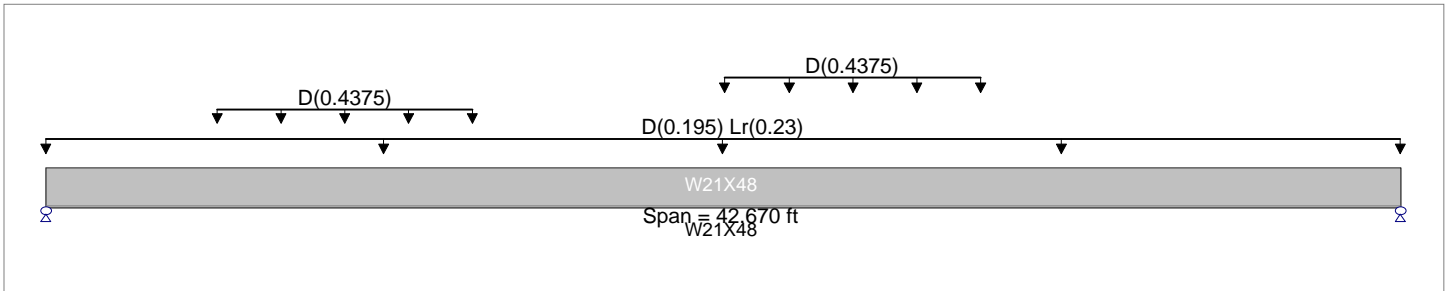
Description : Beam - 5.1 (Supporting additional load from equipment)

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.1950, Lr = 0.230 k/ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.4375 k/ft, Extent = 5.430 --> 13.430 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.4375 k/ft, Extent = 21.430 --> 29.430 ft, Tributary Width = 1.0 ft, (Equipment Half Weight)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.584 : 1	Maximum Shear Stress Ratio =	0.099 : 1
Section used for this span	W21X48	Section used for this span	W21X48
Mu : Applied	154.571 k-ft	Vu : Applied	14.232 k
Mn / Omega : Allowable	264.771 k-ft	Vn/Omega : Allowable	144.20 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	22.188ft	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	0.622 in	Ratio =	823
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.827 in	Ratio =	280
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
Dsgn. L = 42.67 ft		1	0.584	0.099	154.57		154.57	442.17	264.77	1.00	1.00	14.23	216.30	144.20	
+D															
Dsgn. L = 42.67 ft		1	0.386	0.065	102.31		102.31	442.17	264.77	1.00	1.00	9.32	216.30	144.20	
+D+Lr+H															
Dsgn. L = 42.67 ft		1	0.584	0.099	154.57		154.57	442.17	264.77	1.00	1.00	14.23	216.30	144.20	
+D+0.750Lr+0.750L+H															
Dsgn. L = 42.67 ft		1	0.534	0.090	141.51		141.51	442.17	264.77	1.00	1.00	13.01	216.30	144.20	
+D+0.750Lr+0.750L+0.750W+H															
Dsgn. L = 42.67 ft		1	0.534	0.090	141.51		141.51	442.17	264.77	1.00	1.00	13.01	216.30	144.20	
+D+0.750Lr+0.750L+0.5250E+H															
Dsgn. L = 42.67 ft		1	0.534	0.090	141.51		141.51	442.17	264.77	1.00	1.00	13.01	216.30	144.20	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.8275	21.335		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	14.232	12.951
D Only	9.325	8.044
Lr Only	4.907	4.907
D+Lr	14.232	12.951

Steel Beam

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 ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

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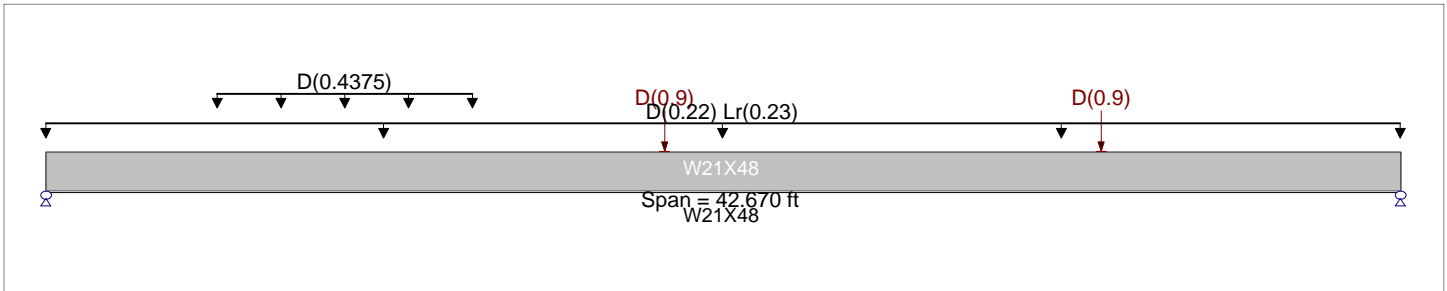
Description : Beam - 5.2 (Supporting additional load from equipment)

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Uniform Load : D = 0.220, Lr = 0.230 k/ft, Tributary Width = 1.0 ft
 Uniform Load : D = 0.4375 k/ft, Extent = 5.430 --> 13.430 ft, Tributary Width = 1.0 ft
 Point Load : D = 0.90 k @ 19.50 ft, (Equipment Weight)
 Point Load : D = 0.90 k @ 33.250 ft, (Equipment Weight)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.543 : 1	Maximum Shear Stress Ratio =	0.097 : 1
Section used for this span	W21X48	Section used for this span	W21X48
Mu : Applied	143.814 k-ft	Vu : Applied	14.039 k
Mn / Omega : Allowable	264.771 k-ft	Vn/Omega : Allowable	144.20 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	19.628ft	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	0.622 in	Ratio =	823
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.711 in	Ratio =	299
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
Dsgn. L = 42.67 ft		1	0.543	0.097	143.81		143.81	442.17	264.77	1.00	1.00	14.04	216.30	144.20
+D														
Dsgn. L = 42.67 ft		1	0.347	0.063	91.83		91.83	442.17	264.77	1.00	1.00	9.13	216.30	144.20
+D+Lr+H														
Dsgn. L = 42.67 ft		1	0.543	0.097	143.81		143.81	442.17	264.77	1.00	1.00	14.04	216.30	144.20
+D+0.750Lr+0.750L+H														
Dsgn. L = 42.67 ft		1	0.494	0.089	130.81		130.81	442.17	264.77	1.00	1.00	12.81	216.30	144.20
+D+0.750Lr+0.750L+0.750W+H														
Dsgn. L = 42.67 ft		1	0.494	0.089	130.81		130.81	442.17	264.77	1.00	1.00	12.81	216.30	144.20
+D+0.750Lr+0.750L+0.5250E+H														
Dsgn. L = 42.67 ft		1	0.494	0.089	130.81		130.81	442.17	264.77	1.00	1.00	12.81	216.30	144.20

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.7109	21.122		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	14.039	12.511
D Only	9.132	7.604
Lr Only	4.907	4.907
D+Lr	14.039	12.511

Steel Beam

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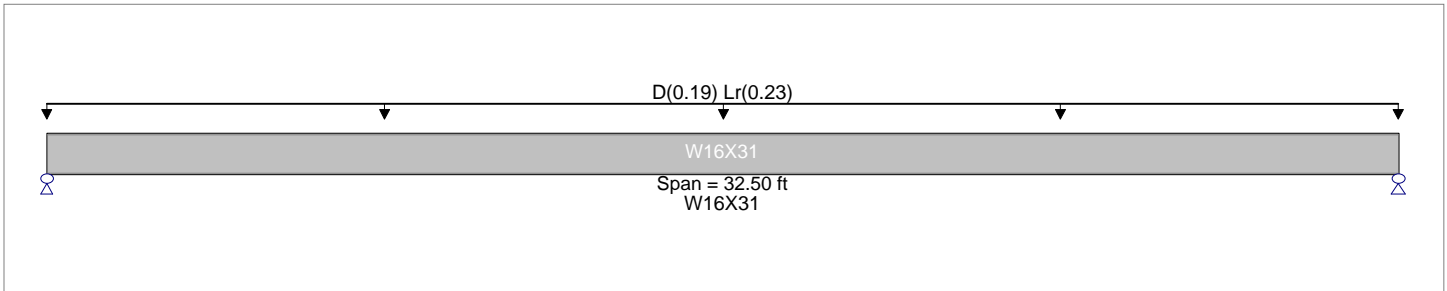
Description : Beam - 7 w/ LL Reduction-REV

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Uniform Load : D = 0.190, Lr = 0.230 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.442 : 1	Maximum Shear Stress Ratio =	0.084 : 1
Section used for this span	W16X31	Section used for this span	W16X31
Mu : Applied	59.556 k-ft	Vu : Applied	7.330 k
Mn / Omega : Allowable	134.731 k-ft	Vn/Omega : Allowable	87.450 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	16.250ft	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	0.535 in	Ratio =	728
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.050 in	Ratio =	371
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
+D	Dsgn. L = 32.50 ft	1	0.442	0.084	59.56		59.56	225.00	134.73	1.00	1.00	7.33	131.18	87.45	
+D+Lr+H	Dsgn. L = 32.50 ft	1	0.217	0.041	29.19		29.19	225.00	134.73	1.00	1.00	3.59	131.18	87.45	
+D+0.750Lr+0.750L+H	Dsgn. L = 32.50 ft	1	0.442	0.084	59.56		59.56	225.00	134.73	1.00	1.00	7.33	131.18	87.45	
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 32.50 ft	1	0.386	0.073	51.96		51.96	225.00	134.73	1.00	1.00	6.40	131.18	87.45	
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 32.50 ft	1	0.386	0.073	51.96		51.96	225.00	134.73	1.00	1.00	6.40	131.18	87.45	
	Dsgn. L = 32.50 ft	1	0.386	0.073	51.96		51.96	225.00	134.73	1.00	1.00	6.40	131.18	87.45	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.0495	16.413		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	7.330	7.330
D Only	3.593	3.593
Lr Only	3.738	3.738
D+Lr	7.330	7.330

Steel Beam

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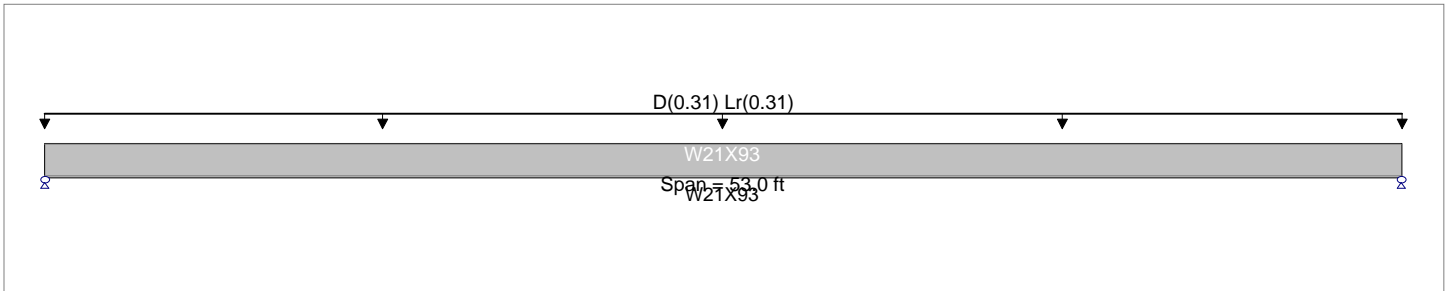
Description : Beam - 8 w/ LL Reduction-REV

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Uniform Load : D = 0.310, Lr = 0.310 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.454 : 1	Maximum Shear Stress Ratio =	0.075 : 1
Section used for this span	W21X93	Section used for this span	W21X93
Mu : Applied	250.327 k-ft	Vu : Applied	18.893 k
Mn / Omega : Allowable	551.397 k-ft	Vn/Omega : Allowable	250.56 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	26.500ft	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	0.924 in	Ratio =	688
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	2.125 in	Ratio =	299
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 53.00 ft	1	0.454	0.075	250.33		250.33	920.83	551.40	1.00	1.00	18.89	375.84	250.56
+D+Lr+H	Dsgn. L = 53.00 ft	1	0.257	0.043	141.48		141.48	920.83	551.40	1.00	1.00	10.68	375.84	250.56
+D+0.750Lr+0.750L+H	Dsgn. L = 53.00 ft	1	0.454	0.075	250.33		250.33	920.83	551.40	1.00	1.00	18.89	375.84	250.56
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 53.00 ft	1	0.405	0.067	223.12		223.12	920.83	551.40	1.00	1.00	16.84	375.84	250.56
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 53.00 ft	1	0.405	0.067	223.12		223.12	920.83	551.40	1.00	1.00	16.84	375.84	250.56
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 53.00 ft	1	0.405	0.067	223.12		223.12	920.83	551.40	1.00	1.00	16.84	375.84	250.56

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	2.1253	26.765		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	18.893	18.893
D Only	10.678	10.678
Lr Only	8.215	8.215
D+Lr	18.893	18.893

Steel Beam

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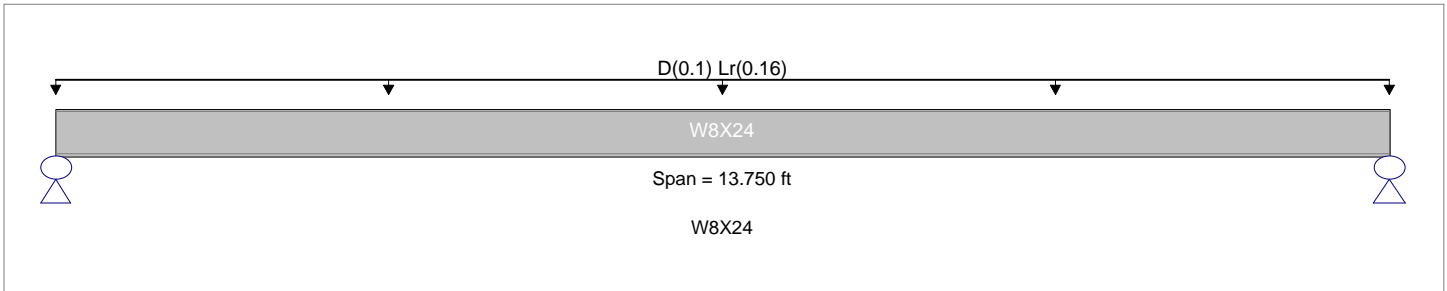
Description : Beam - 9

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.10, Lr = 0.160 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.116 : 1	Maximum Shear Stress Ratio =	0.050 : 1
Section used for this span	W8X24	Section used for this span	W8X24
Mu : Applied	6.714 k-ft	Vu : Applied	1.953 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	6.875ft	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	0.054 in	Ratio =	3050
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.096 in	Ratio =	1718
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 13.75 ft	1	0.116	0.050	6.71		6.71	96.25	57.63	1.00	1.00	1.95	58.29	38.86
+D+Lr+H	Dsgn. L = 13.75 ft	1	0.051	0.022	2.93		2.93	96.25	57.63	1.00	1.00	0.85	58.29	38.86
+D+0.750Lr+0.750L+H	Dsgn. L = 13.75 ft	1	0.116	0.050	6.71		6.71	96.25	57.63	1.00	1.00	1.95	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 13.75 ft	1	0.100	0.043	5.77		5.77	96.25	57.63	1.00	1.00	1.68	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 13.75 ft	1	0.100	0.043	5.77		5.77	96.25	57.63	1.00	1.00	1.68	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 13.75 ft	1	0.100	0.043	5.77		5.77	96.25	57.63	1.00	1.00	1.68	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.0960	6.944		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.953	1.953
D Only	0.853	0.853
Lr Only	1.100	1.100
D+Lr	1.953	1.953

Steel Beam

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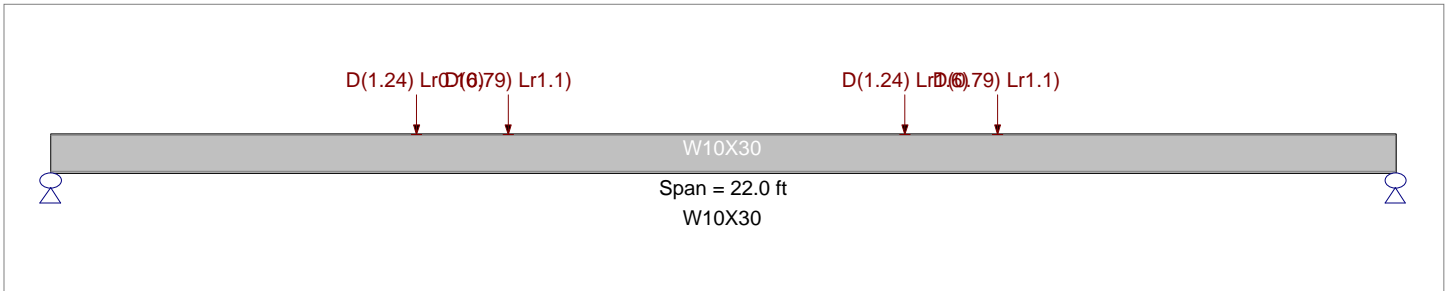
Description : Beam - 10

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Load(s) for Span Number 1
Point Load : D = 1.240, Lr = 0.160 k @ 6.0 ft
Point Load : D = 0.790, Lr = 1.10 k @ 7.50 ft
Point Load : D = 1.240, Lr = 1.60 k @ 14.0 ft
Point Load : D = 0.790, Lr = 1.10 k @ 15.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.352 : 1	Maximum Shear Stress Ratio =	0.071 : 1
Section used for this span	W10X30	Section used for this span	W10X30
Mu : Applied	32.156 k-ft	Vu : Applied	4.496 k
Mn / Omega : Allowable	91.317 k-ft	Vn/Omega : Allowable	63.0 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	13.970ft	Location of maximum on span	22.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward L+Lr+S Deflection	0.264 in	Ratio =	999
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.557 in	Ratio =	473
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values					Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
Dsgn. L = 22.00 ft		1	0.352	0.071	32.16		32.16	152.50	91.32	1.00	1.00	4.50	94.50	63.00
+D														
Dsgn. L = 22.00 ft		1	0.177	0.039	16.13		16.13	152.50	91.32	1.00	1.00	2.44	94.50	63.00
+D+Lr+H														
Dsgn. L = 22.00 ft		1	0.352	0.071	32.16		32.16	152.50	91.32	1.00	1.00	4.50	94.50	63.00
+D+0.750Lr+0.750L+H														
Dsgn. L = 22.00 ft		1	0.308	0.063	28.15		28.15	152.50	91.32	1.00	1.00	3.94	94.50	63.00
+D+0.750Lr+0.750L+0.750W+H														
Dsgn. L = 22.00 ft		1	0.308	0.063	28.15		28.15	152.50	91.32	1.00	1.00	3.94	94.50	63.00
+D+0.750Lr+0.750L+0.5250E+H														
Dsgn. L = 22.00 ft		1	0.308	0.063	28.15		28.15	152.50	91.32	1.00	1.00	3.94	94.50	63.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.5574	11.220		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.186	4.496
D Only	2.438	2.284
Lr Only	1.748	2.212
D+Lr	4.186	4.496

Steel Beam

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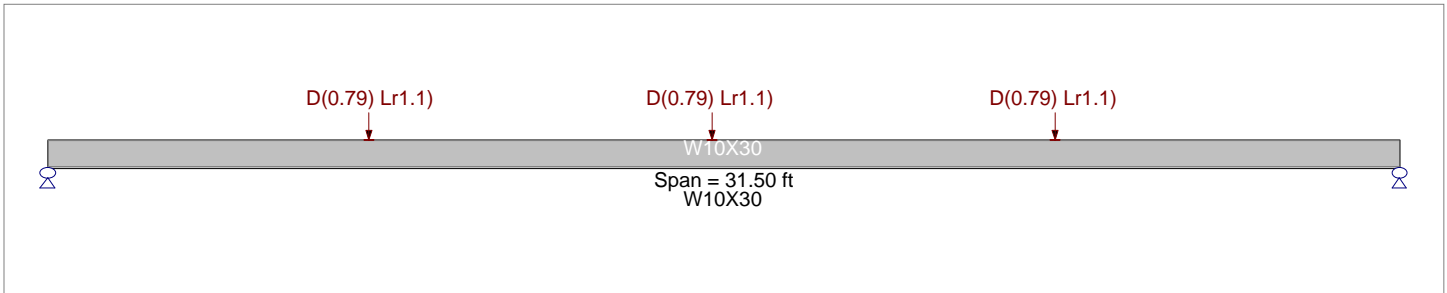
Description : Beam - 11

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Load(s) for Span Number 1
 Point Load : D = 0.790, Lr = 1.10 k @ 7.50 ft
 Point Load : D = 0.790, Lr = 1.10 k @ 15.50 ft
 Point Load : D = 0.790, Lr = 1.10 k @ 23.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.363 : 1	Maximum Shear Stress Ratio =	0.053 : 1
Section used for this span	W10X30	Section used for this span	W10X30
Mu : Applied	33.186 k-ft	Vu : Applied	3.354 k
Mn / Omega : Allowable	91.317 k-ft	Vn/Omega : Allowable	63.0 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	15.435 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	0.596 in	Ratio =	633
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.161 in	Ratio =	325
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
Dsgn. L = 31.50 ft		1	0.363	0.053	33.19		33.19	152.50	91.32	1.00	1.00	3.35	94.50	63.00	
+D															
Dsgn. L = 31.50 ft		1	0.176	0.027	16.04		16.04	152.50	91.32	1.00	1.00	1.68	94.50	63.00	
+D+Lr+H															
Dsgn. L = 31.50 ft		1	0.363	0.053	33.19		33.19	152.50	91.32	1.00	1.00	3.35	94.50	63.00	
+D+0.750Lr+0.750L+H															
Dsgn. L = 31.50 ft		1	0.316	0.047	28.90		28.90	152.50	91.32	1.00	1.00	2.93	94.50	63.00	
+D+0.750Lr+0.750L+0.750W+H															
Dsgn. L = 31.50 ft		1	0.316	0.047	28.90		28.90	152.50	91.32	1.00	1.00	2.93	94.50	63.00	
+D+0.750Lr+0.750L+0.5250E+H															
Dsgn. L = 31.50 ft		1	0.316	0.047	28.90		28.90	152.50	91.32	1.00	1.00	2.93	94.50	63.00	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	1.1608	15.750		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.354	3.264
D Only	1.678	1.640
Lr Only	1.676	1.624
D+Lr	3.354	3.264

Steel Beam

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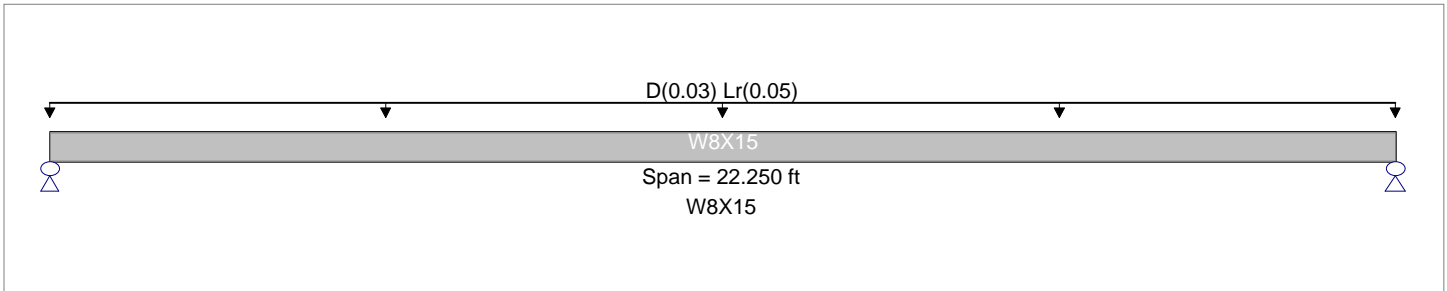
Description : Beam - 12

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.030, Lr = 0.050 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.173 : 1	Maximum Shear Stress Ratio =	0.027 : 1
Section used for this span	W8X15	Section used for this span	W8X15
Mu : Applied	5.886 k-ft	Vu : Applied	1.058 k
Mn / Omega : Allowable	33.932 k-ft	Vn/Omega : Allowable	39.739 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	11.125ft	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	0.200 in	Ratio =	1337
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.380 in	Ratio =	702
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 22.25 ft	1	0.173	0.027	5.89		5.89	56.67	33.93	1.00	1.00	1.06	59.61	39.74
+D+Lr+H	Dsgn. L = 22.25 ft	1	0.082	0.013	2.79		2.79	56.67	33.93	1.00	1.00	0.50	59.61	39.74
+D+0.750Lr+0.750L+H	Dsgn. L = 22.25 ft	1	0.173	0.027	5.89		5.89	56.67	33.93	1.00	1.00	1.06	59.61	39.74
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 22.25 ft	1	0.151	0.023	5.11		5.11	56.67	33.93	1.00	1.00	0.92	59.61	39.74
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 22.25 ft	1	0.151	0.023	5.11		5.11	56.67	33.93	1.00	1.00	0.92	59.61	39.74

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.3798	11.236		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.058	1.058
D Only	0.502	0.502
Lr Only	0.556	0.556
D+Lr	1.058	1.058

Steel Beam

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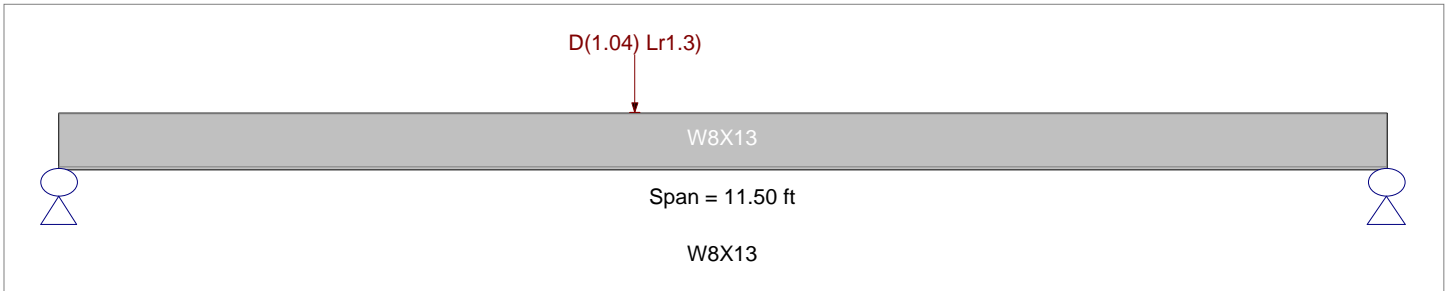
Description : Beam - 12.1

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Load(s) for Span Number 1
 Point Load : D = 1.040, Lr = 1.30 k @ 5.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.240 : 1	Maximum Shear Stress Ratio =	0.038 : 1
Section used for this span	W8X13	Section used for this span	W8X13
Mu : Applied	6.823 k-ft	Vu : Applied	1.398 k
Mn / Omega : Allowable	28.443 k-ft	Vn/Omega : Allowable	36.754 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	5.003ft	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	0.061 in	Ratio =	2259
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.114 in	Ratio =	1205
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
+D	Dsgn. L = 11.50 ft	1	0.240	0.038	6.82		6.82	47.50	28.44	1.00	1.00	1.40	55.13	36.75
+D+Lr+H	Dsgn. L = 11.50 ft	1	0.111	0.018	3.15		3.15	47.50	28.44	1.00	1.00	0.66	55.13	36.75
+D+0.750Lr+0.750L+H	Dsgn. L = 11.50 ft	1	0.240	0.038	6.82		6.82	47.50	28.44	1.00	1.00	1.40	55.13	36.75
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 11.50 ft	1	0.208	0.033	5.90		5.90	47.50	28.44	1.00	1.00	1.21	55.13	36.75
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 11.50 ft	1	0.208	0.033	5.90		5.90	47.50	28.44	1.00	1.00	1.21	55.13	36.75
	Dsgn. L = 11.50 ft	1	0.208	0.033	5.90		5.90	47.50	28.44	1.00	1.00	1.21	55.13	36.75

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.1144	5.578		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.398	1.093
D Only	0.663	0.527
Lr Only	0.735	0.565
D+Lr	1.398	1.093

Steel Beam

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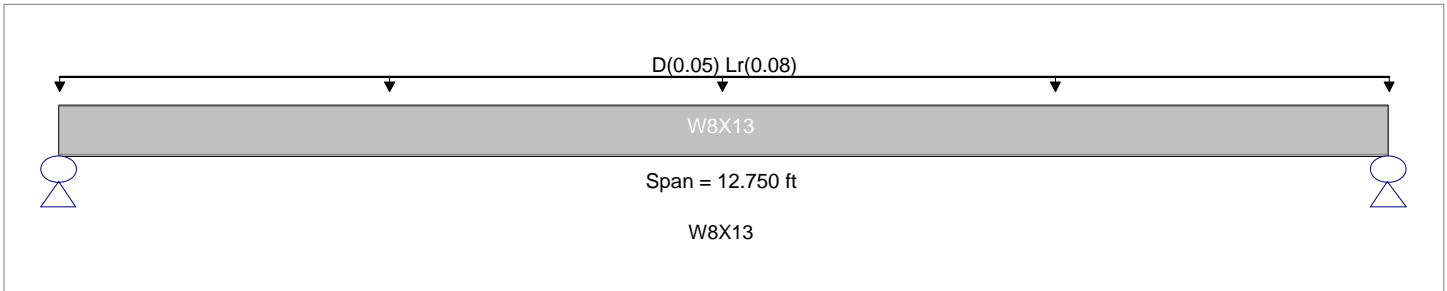
Description : Beam - 12.2

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.050, Lr = 0.080 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.102 : 1	Maximum Shear Stress Ratio =	0.025 : 1
Section used for this span	W8X13	Section used for this span	W8X13
Mu : Applied	2.907 k-ft	Vu : Applied	0.9121 k
Mn / Omega : Allowable	28.443 k-ft	Vn/Omega : Allowable	36.754 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	6.375ft	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	0.042 in	Ratio =	3664
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.075 in	Ratio =	2049
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
+D	Dsgn. L = 12.75 ft	1	0.102	0.025	2.91		2.91	47.50	28.44	1.00	1.00	0.91	55.13	36.75	
+D+Lr+H	Dsgn. L = 12.75 ft	1	0.045	0.011	1.28		1.28	47.50	28.44	1.00	1.00	0.40	55.13	36.75	
+D+0.750Lr+0.750L+H	Dsgn. L = 12.75 ft	1	0.102	0.025	2.91		2.91	47.50	28.44	1.00	1.00	0.91	55.13	36.75	
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 12.75 ft	1	0.088	0.021	2.50		2.50	47.50	28.44	1.00	1.00	0.78	55.13	36.75	
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 12.75 ft	1	0.088	0.021	2.50		2.50	47.50	28.44	1.00	1.00	0.78	55.13	36.75	
	Dsgn. L = 12.75 ft	1	0.088	0.021	2.50		2.50	47.50	28.44	1.00	1.00	0.78	55.13	36.75	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.0747	6.439		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.912	0.912
D Only	0.402	0.402
Lr Only	0.510	0.510
D+Lr	0.912	0.912

Steel Beam

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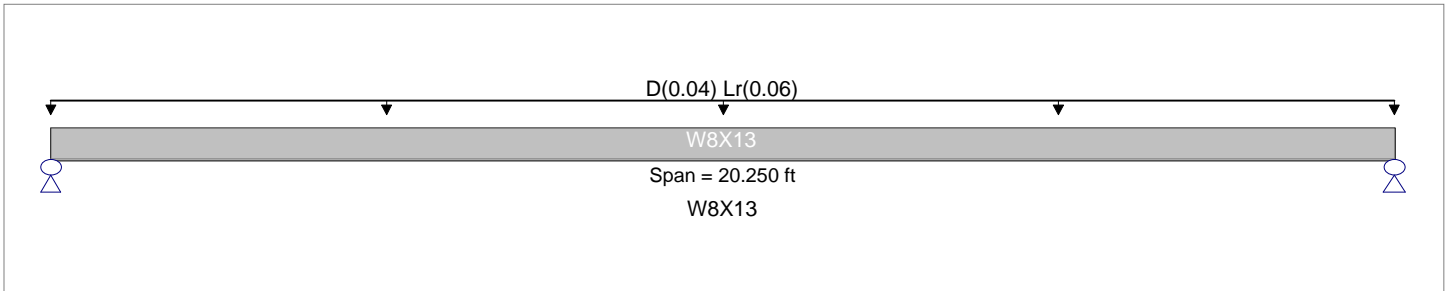
Description : Beam - 12.3

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.040, Lr = 0.060 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.204 : 1	Maximum Shear Stress Ratio =	0.031 : 1
Section used for this span	W8X13	Section used for this span	W8X13
Mu : Applied	5.796 k-ft	Vu : Applied	1.145 k
Mn / Omega : Allowable	28.443 k-ft	Vn/Omega : Allowable	36.754 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	10.125ft	Location of maximum on span	20.250 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward L+Lr+S Deflection	0.199 in	Ratio =	1219
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.375 in	Ratio =	647
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
+D	Dsgn. L = 20.25 ft	1	0.204	0.031	5.80		5.80	47.50	28.44	1.00	1.00	1.14	55.13	36.75	
+D+Lr+H	Dsgn. L = 20.25 ft	1	0.096	0.015	2.72		2.72	47.50	28.44	1.00	1.00	0.54	55.13	36.75	
+D+0.750Lr+0.750L+H	Dsgn. L = 20.25 ft	1	0.204	0.031	5.80		5.80	47.50	28.44	1.00	1.00	1.14	55.13	36.75	
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 20.25 ft	1	0.177	0.027	5.03		5.03	47.50	28.44	1.00	1.00	0.99	55.13	36.75	
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 20.25 ft	1	0.177	0.027	5.03		5.03	47.50	28.44	1.00	1.00	0.99	55.13	36.75	
	Dsgn. L = 20.25 ft	1	0.177	0.027	5.03		5.03	47.50	28.44	1.00	1.00	0.99	55.13	36.75	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.3755	10.226		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.145	1.145
D Only	0.537	0.537
Lr Only	0.608	0.608
D+Lr	1.145	1.145

Steel Beam

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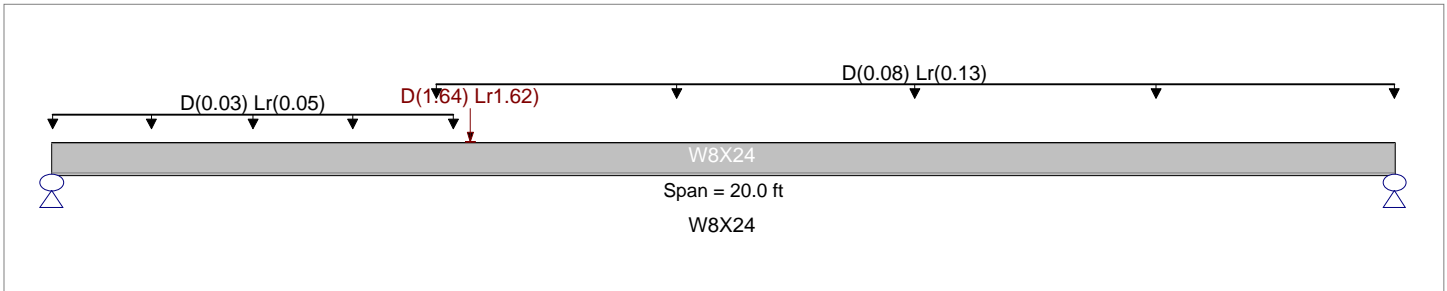
Description : Beam - 12.4

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Load for Span Number 1

Uniform Load : D = 0.030, Lr = 0.050 k/ft, Extent = 0.0 -->> 6.0 ft, Tributary Width = 1.0 ft
 Uniform Load : D = 0.080, Lr = 0.130 k/ft, Extent = 5.750 -->> 20.0 ft, Tributary Width = 1.0 ft
 Point Load : D = 1.640, Lr = 1.620 k @ 6.250 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.393 : 1	Maximum Shear Stress Ratio =	0.102 : 1
Section used for this span	W8X24	Section used for this span	W8X24
Mu : Applied	22.668 k-ft	Vu : Applied	3.956 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	6.300ft	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	0.336 in	Ratio =	714
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.643 in	Ratio =	373
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
Dsgn. L = 20.00 ft		1	0.393	0.102	22.67		22.67	96.25	57.63	1.00	1.00	3.96	58.29	38.86
+D														
Dsgn. L = 20.00 ft		1	0.190	0.050	10.98		10.98	96.25	57.63	1.00	1.00	1.93	58.29	38.86
+D+Lr+H														
Dsgn. L = 20.00 ft		1	0.393	0.102	22.67		22.67	96.25	57.63	1.00	1.00	3.96	58.29	38.86
+D+0.750Lr+0.750L+H														
Dsgn. L = 20.00 ft		1	0.343	0.089	19.75		19.75	96.25	57.63	1.00	1.00	3.45	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H														
Dsgn. L = 20.00 ft		1	0.343	0.089	19.75		19.75	96.25	57.63	1.00	1.00	3.45	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H														
Dsgn. L = 20.00 ft		1	0.343	0.089	19.75		19.75	96.25	57.63	1.00	1.00	3.45	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr	1	0.6426	9.600		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.956	3.258
D Only	1.928	1.514
Lr Only	2.029	1.744
D+Lr	3.956	3.258

Steel Beam

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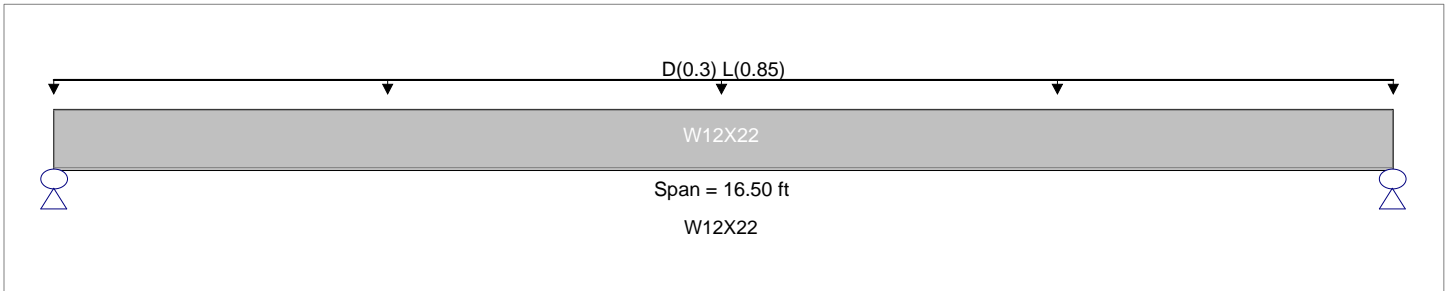
Description : Beam-14-REV.

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.30, L = 0.850 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.546 : 1	Maximum Shear Stress Ratio =	0.151 : 1
Section used for this span	W12X22	Section used for this span	W12X22
Mu : Applied	39.887 k-ft	Vu : Applied	9.669 k
Mn / Omega : Allowable	73.104 k-ft	Vn/Omega : Allowable	63.960 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	8.250ft	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	0.316 in	Ratio =	626
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.436 in	Ratio =	454
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
+D	Dsgn. L = 16.50 ft	1	0.546	0.151	39.89		39.89	122.08	73.10	1.00	1.00	9.67	95.94	63.96	
+D+L+H	Dsgn. L = 16.50 ft	1	0.150	0.042	10.96		10.96	122.08	73.10	1.00	1.00	2.66	95.94	63.96	
+D+0.750Lr+0.750L+H	Dsgn. L = 16.50 ft	1	0.546	0.151	39.89		39.89	122.08	73.10	1.00	1.00	9.67	95.94	63.96	
+D+0.750L+0.750S+H	Dsgn. L = 16.50 ft	1	0.447	0.124	32.65		32.65	122.08	73.10	1.00	1.00	7.92	95.94	63.96	
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 16.50 ft	1	0.447	0.124	32.65		32.65	122.08	73.10	1.00	1.00	7.92	95.94	63.96	
+D+0.750L+0.750S+0.750W+H	Dsgn. L = 16.50 ft	1	0.447	0.124	32.65		32.65	122.08	73.10	1.00	1.00	7.92	95.94	63.96	
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 16.50 ft	1	0.447	0.124	32.65		32.65	122.08	73.10	1.00	1.00	7.92	95.94	63.96	
+D+0.750L+0.750S+0.5250E+H	Dsgn. L = 16.50 ft	1	0.447	0.124	32.65		32.65	122.08	73.10	1.00	1.00	7.92	95.94	63.96	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.4355	8.333		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	9.669	9.669
D Only	2.657	2.657
L Only	7.013	7.013



Title : Colusa Casino - Building Expansion
Dsgnr:
Project Desc.: Floor Beams

Job # 10642

Project Notes :

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Steel Beam

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Description : Beam-14-REV.

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
D+L	9.669	9.669

Steel Beam

10642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Floor beams Design.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

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Description : Beam-15 (Cont.)-REV1

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 24.92 ft		1	0.679	0.336	111.95	-123.59	123.59	304.17	182.14	1.00	1.00	32.82	146.40	97.60
Dsgn. L = 17.08 ft		2	0.679	0.336	15.59	-123.59	123.59	304.17	182.14	1.00	1.00	32.82	146.40	97.60
+D+0.750Lr+0.750L+0.5250E+H														
Dsgn. L = 24.92 ft		1	0.739	0.382	115.89	-134.66	134.66	304.17	182.14	1.00	1.00	37.25	146.40	97.60
Dsgn. L = 17.08 ft		2	0.739	0.343	10.22	-134.66	134.66	304.17	182.14	1.00	1.00	33.46	146.40	97.60
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L = 24.92 ft		1	0.679	0.336	111.95	-123.59	123.59	304.17	182.14	1.00	1.00	32.82	146.40	97.60
Dsgn. L = 17.08 ft		2	0.679	0.336	15.59	-123.59	123.59	304.17	182.14	1.00	1.00	32.82	146.40	97.60

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L+Lr	1	0.8604	11.693	D+L+Lr	0.0000	0.000
	2	0.0000	11.693		-0.1165	4.598

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	16.535	83.339	2.547
D Only	6.353	32.848	0.556
L Only	9.559	40.449	1.991
Lr Only	0.623	10.042	-0.864
L+Lr	10.182	50.491	1.127
D+Lr	6.976	42.890	-0.308
D+L	15.912	73.297	2.547
D+L+Lr	16.535	83.339	1.683

Steel Beam

I 10642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Floor beams Design.ecx
 ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

Lic. # : KW-06008291

Licensee : ED NAJJARINE

Description : Beam-15 (Cont.)-REV2

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 24.92 ft		1	0.728	0.368	115.13	-132.51	132.51	304.17	182.14	1.00	1.00	35.91	146.40	97.60
Dsgn. L = 17.08 ft		2	0.728	0.342	11.27	-132.51	132.51	304.17	182.14	1.00	1.00	33.34	146.40	97.60
+D+0.750Lr+0.750L+0.5250E+H														
Dsgn. L = 24.92 ft		1	0.795	0.446	119.47	-144.72	144.72	304.17	182.14	1.00	1.00	43.50	146.40	97.60
Dsgn. L = 17.08 ft		2	0.795	0.349	5.35	-144.72	144.72	304.17	182.14	1.00	1.00	34.05	146.40	97.60
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L = 24.92 ft		1	0.728	0.368	115.13	-132.51	132.51	304.17	182.14	1.00	1.00	35.91	146.40	97.60
Dsgn. L = 17.08 ft		2	0.728	0.342	11.27	-132.51	132.51	304.17	182.14	1.00	1.00	33.34	146.40	97.60

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L+Lr	1	0.9067	11.885	D+L+Lr	0.0000	0.000
	2	0.0000	11.885		-0.1370	4.861

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	16.975	90.440	2.025
D Only	6.729	38.914	0.034
L Only	9.559	40.449	1.991
Lr Only	0.687	11.077	-0.953
L+Lr	10.246	51.526	1.038
D+Lr	7.416	49.990	-0.920
D+L	16.289	79.363	2.025
D+L+Lr	16.975	90.440	1.072

Steel Beam

File: WNS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ec6
 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

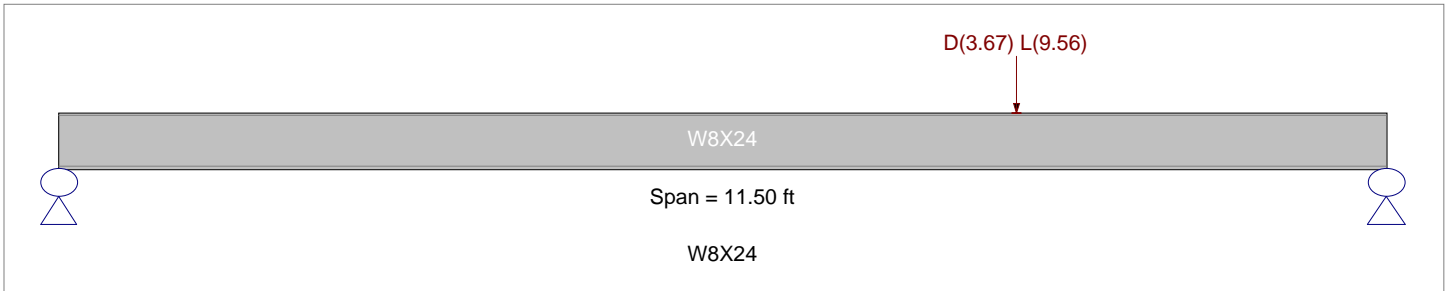
Description : Beam-16

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Load(s) for Span Number 1
 Point Load : D = 3.670, L = 9.560 k @ 8.30 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.534 : 1	Maximum Shear Stress Ratio =	0.249 : 1
Section used for this span	W8X24	Section used for this span	W8X24
Mu : Applied	30.803 k-ft	Vu : Applied	9.687 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	8.280ft	Location of maximum on span	11.500 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward L+Lr+S Deflection	0.167 in	Ratio =	827
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.235 in	Ratio =	587
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
Dsgn. L = 11.50 ft		1	0.534	0.249	30.80		30.80	96.25	57.63	1.00	1.00	9.69	58.29	38.86
+D														
Dsgn. L = 11.50 ft		1	0.152	0.072	8.78		8.78	96.25	57.63	1.00	1.00	2.79	58.29	38.86
+D+L+H														
Dsgn. L = 11.50 ft		1	0.534	0.249	30.80		30.80	96.25	57.63	1.00	1.00	9.69	58.29	38.86
+D+0.750Lr+0.750L+H														
Dsgn. L = 11.50 ft		1	0.439	0.205	25.30		25.30	96.25	57.63	1.00	1.00	7.96	58.29	38.86
+D+0.750L+0.750S+H														
Dsgn. L = 11.50 ft		1	0.439	0.205	25.30		25.30	96.25	57.63	1.00	1.00	7.96	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H														
Dsgn. L = 11.50 ft		1	0.439	0.205	25.30		25.30	96.25	57.63	1.00	1.00	7.96	58.29	38.86
+D+0.750L+0.750S+0.750W+H														
Dsgn. L = 11.50 ft		1	0.439	0.205	25.30		25.30	96.25	57.63	1.00	1.00	7.96	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H														
Dsgn. L = 11.50 ft		1	0.439	0.205	25.30		25.30	96.25	57.63	1.00	1.00	7.96	58.29	38.86
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L = 11.50 ft		1	0.439	0.205	25.30		25.30	96.25	57.63	1.00	1.00	7.96	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.2348	6.383		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.820	9.687
D Only	1.160	2.787



Title : Colusa Casino - Building Expansion
Dsgnr:
Project Desc.: Floor Beams

Job # 10642

Project Notes :

Printed: 22 MAR 2011, 11:47AM

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ec6
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Beam-16

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
L Only	2.660	6.900
D+L	3.820	9.687

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\JN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ecf
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

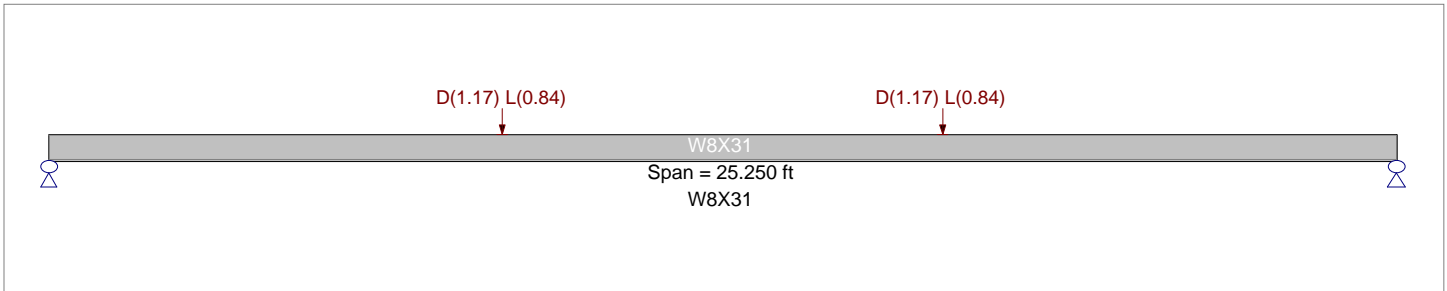
Licensee :

Description : Beam-17

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Material Properties
Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Load(s) for Span Number 1
Point Load : D = 1.170, L = 0.840 k @ 8.50 ft
Point Load : D = 1.170, L = 0.840 k @ 16.750 ft

DESIGN SUMMARY

Design N.G.

Maximum Bending Stress Ratio =	0.258 : 1	Maximum Shear Stress Ratio =	0.053 : 1
Section used for this span	W8X31	Section used for this span	W8X31
Mu : Applied	19.559 k-ft	Vu : Applied	2.402 k
Mn / Omega : Allowable	75.767 k-ft	Vn/Omega : Allowable	45.60 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	12.625ft	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	0.264 in	Ratio =	1149
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.721 in	Ratio =	420
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope														
Dsgn. L = 25.25 ft		1	0.258	0.053	19.56		19.56	126.53	75.77	1.00	1.00	2.40	68.40	45.60
+D														
Dsgn. L = 25.25 ft		1	0.164	0.034	12.42		12.42	126.53	75.77	1.00	1.00	1.56	68.40	45.60
+D+L+H														
Dsgn. L = 25.25 ft		1	0.258	0.053	19.56		19.56	126.53	75.77	1.00	1.00	2.40	68.40	45.60
+D+0.750Lr+0.750L+H														
Dsgn. L = 25.25 ft		1	0.235	0.048	17.77		17.77	126.53	75.77	1.00	1.00	2.19	68.40	45.60
+D+0.750L+0.750S+H														
Dsgn. L = 25.25 ft		1	0.235	0.048	17.77		17.77	126.53	75.77	1.00	1.00	2.19	68.40	45.60
+D+0.750Lr+0.750L+0.750W+H														
Dsgn. L = 25.25 ft		1	0.235	0.048	17.77		17.77	126.53	75.77	1.00	1.00	2.19	68.40	45.60
+D+0.750L+0.750S+0.750W+H														
Dsgn. L = 25.25 ft		1	0.235	0.048	17.77		17.77	126.53	75.77	1.00	1.00	2.19	68.40	45.60
+D+0.750Lr+0.750L+0.5250E+H														
Dsgn. L = 25.25 ft		1	0.235	0.048	17.77		17.77	126.53	75.77	1.00	1.00	2.19	68.40	45.60
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L = 25.25 ft		1	0.235	0.048	17.77		17.77	126.53	75.77	1.00	1.00	2.19	68.40	45.60

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.7207	12.751		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.402	2.402



Title : Colusa Casino - Building Expansion
Dsgnr:
Project Desc.: Floor Beams

Job # 10642

Project Notes :

Printed: 22 MAR 2011, 10:17AM

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\JN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ecf
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Beam-17

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
D Only	1.562	1.562
L Only	0.840	0.840
D+L	2.402	2.402

Steel Beam

File: WNS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ec6
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

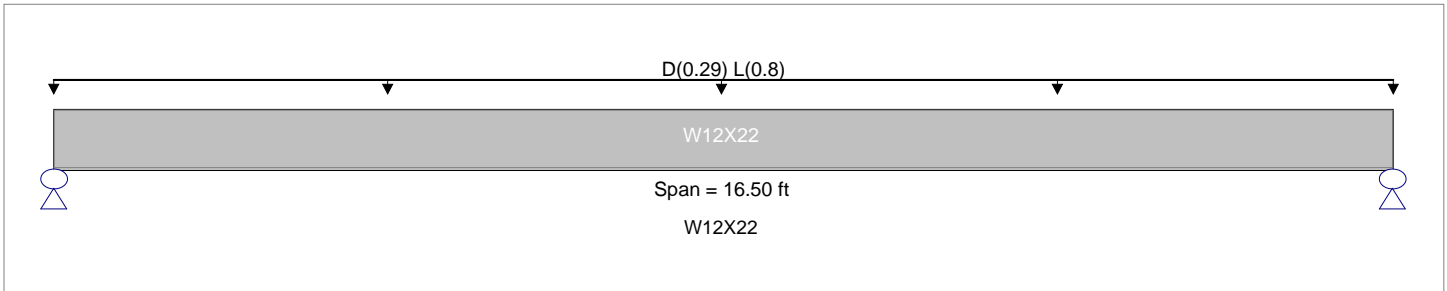
Description : Beam-18-REV.

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.290, L = 0.80 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.518 : 1	Maximum Shear Stress Ratio =	0.143 : 1
Section used for this span	W12X22	Section used for this span	W12X22
Mu : Applied	37.845 k-ft	Vu : Applied	9.174 k
Mn / Omega : Allowable	73.104 k-ft	Vn/Omega : Allowable	63.960 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	8.250ft	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	0.297 in	Ratio =	666
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.413 in	Ratio =	479
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
+D	Dsgn. L = 16.50 ft	1	0.518	0.143	37.84		37.84	122.08	73.10	1.00	1.00	9.17	95.94	63.96	
+D+L+H	Dsgn. L = 16.50 ft	1	0.145	0.040	10.62		10.62	122.08	73.10	1.00	1.00	2.57	95.94	63.96	
+D+0.750Lr+0.750L+H	Dsgn. L = 16.50 ft	1	0.518	0.143	37.84		37.84	122.08	73.10	1.00	1.00	9.17	95.94	63.96	
+D+0.750L+0.750S+H	Dsgn. L = 16.50 ft	1	0.425	0.118	31.04		31.04	122.08	73.10	1.00	1.00	7.52	95.94	63.96	
+D+0.750Lr+0.750L+0.750W+H	Dsgn. L = 16.50 ft	1	0.425	0.118	31.04		31.04	122.08	73.10	1.00	1.00	7.52	95.94	63.96	
+D+0.750L+0.750S+0.750W+H	Dsgn. L = 16.50 ft	1	0.425	0.118	31.04		31.04	122.08	73.10	1.00	1.00	7.52	95.94	63.96	
+D+0.750Lr+0.750L+0.5250E+H	Dsgn. L = 16.50 ft	1	0.425	0.118	31.04		31.04	122.08	73.10	1.00	1.00	7.52	95.94	63.96	
+D+0.750L+0.750S+0.5250E+H	Dsgn. L = 16.50 ft	1	0.425	0.118	31.04		31.04	122.08	73.10	1.00	1.00	7.52	95.94	63.96	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.4132	8.333		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	9.174	9.174
D Only	2.574	2.574
L Only	6.600	6.600



Title : Colusa Casino - Building Expansion
Dsgnr:
Project Desc.: Floor Beams

Job # 10642

Project Notes :

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Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ec6
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Beam-18-REV.

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
D+L	9.174	9.174

Steel Beam

File: WNS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ec6
 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Beam-17-REV.

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
 Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
 Bending Axis : Major Axis Bending
 Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
 E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
 Uniform Load : D = 0.310, L = 0.880 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.584 : 1	Maximum Shear Stress Ratio =	0.174 : 1
Section used for this span	W14X30	Section used for this span	W14X30
Mu : Applied	68.870 k-ft	Vu : Applied	12.964 k
Mn / Omega : Allowable	118.014 k-ft	Vn/Omega : Allowable	74.520 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	10.625ft	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	0.482 in	Ratio =	528
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.669 in	Ratio =	381
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
Dsgn. L = 21.25 ft		1	0.584	0.174	68.87		68.87	197.08	118.01	1.00	1.00	12.96	111.78	74.52	
+D															
Dsgn. L = 21.25 ft		1	0.163	0.048	19.20		19.20	197.08	118.01	1.00	1.00	3.61	111.78	74.52	
+D+L+H															
Dsgn. L = 21.25 ft		1	0.584	0.174	68.87		68.87	197.08	118.01	1.00	1.00	12.96	111.78	74.52	
+D+0.750Lr+0.750L+H															
Dsgn. L = 21.25 ft		1	0.478	0.143	56.45		56.45	197.08	118.01	1.00	1.00	10.63	111.78	74.52	
+D+0.750L+0.750S+H															
Dsgn. L = 21.25 ft		1	0.478	0.143	56.45		56.45	197.08	118.01	1.00	1.00	10.63	111.78	74.52	
+D+0.750Lr+0.750L+0.750W+H															
Dsgn. L = 21.25 ft		1	0.478	0.143	56.45		56.45	197.08	118.01	1.00	1.00	10.63	111.78	74.52	
+D+0.750L+0.750S+0.750W+H															
Dsgn. L = 21.25 ft		1	0.478	0.143	56.45		56.45	197.08	118.01	1.00	1.00	10.63	111.78	74.52	
+D+0.750Lr+0.750L+0.5250E+H															
Dsgn. L = 21.25 ft		1	0.478	0.143	56.45		56.45	197.08	118.01	1.00	1.00	10.63	111.78	74.52	
+D+0.750L+0.750S+0.5250E+H															
Dsgn. L = 21.25 ft		1	0.478	0.143	56.45		56.45	197.08	118.01	1.00	1.00	10.63	111.78	74.52	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.6686	10.731		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	12.964	12.964
D Only	3.614	3.614
L Only	9.350	9.350



Title : Colusa Casino - Building Expansion
Dsgnr:
Project Desc.: Floor Beams

Job # 10642

Project Notes :

Printed: 22 MAR 2011, 10:49AM

Steel Beam

File: \NS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ec6
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Beam-17-REV.

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
D+L	12.964	12.964

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ec6
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

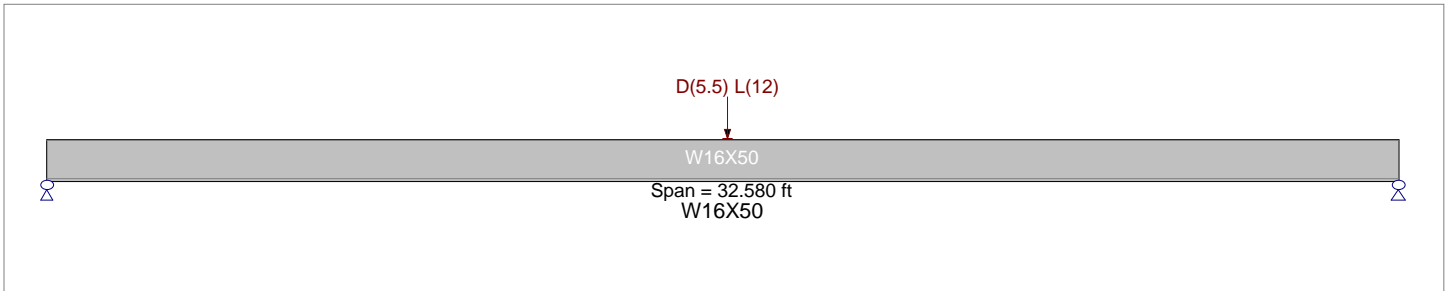
Description : Beam-20-REV

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Load(s) for Span Number 1
Point Load : D = 5.50, L = 12.0 k @ 16.420 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.649 : 1	Maximum Shear Stress Ratio =	0.078 : 1
Section used for this span	W16X50	Section used for this span	W16X50
Mu : Applied	148.877 k-ft	Vu : Applied	9.635 k
Mn / Omega : Allowable	229.541 k-ft	Vn/Omega : Allowable	123.88 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	16.453ft	Location of maximum on span	32.580 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward L+Lr+S Deflection	0.788 in	Ratio =	496
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.215 in	Ratio =	321
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
Dsgn. L = 32.58 ft		1	0.649	0.078	148.88		148.88	383.33	229.54	1.00	1.00	9.63	185.82	123.88	
+D															
Dsgn. L = 32.58 ft		1	0.224	0.029	51.34		51.34	383.33	229.54	1.00	1.00	3.59	185.82	123.88	
+D+L+H															
Dsgn. L = 32.58 ft		1	0.649	0.078	148.88		148.88	383.33	229.54	1.00	1.00	9.63	185.82	123.88	
+D+0.750Lr+0.750L+H															
Dsgn. L = 32.58 ft		1	0.542	0.066	124.49		124.49	383.33	229.54	1.00	1.00	8.12	185.82	123.88	
+D+0.750L+0.750S+H															
Dsgn. L = 32.58 ft		1	0.542	0.066	124.49		124.49	383.33	229.54	1.00	1.00	8.12	185.82	123.88	
+D+0.750Lr+0.750L+0.750W+H															
Dsgn. L = 32.58 ft		1	0.542	0.066	124.49		124.49	383.33	229.54	1.00	1.00	8.12	185.82	123.88	
+D+0.750L+0.750S+0.750W+H															
Dsgn. L = 32.58 ft		1	0.542	0.066	124.49		124.49	383.33	229.54	1.00	1.00	8.12	185.82	123.88	
+D+0.750Lr+0.750L+0.5250E+H															
Dsgn. L = 32.58 ft		1	0.542	0.066	124.49		124.49	383.33	229.54	1.00	1.00	8.12	185.82	123.88	
+D+0.750L+0.750S+0.5250E+H															
Dsgn. L = 32.58 ft		1	0.542	0.066	124.49		124.49	383.33	229.54	1.00	1.00	8.12	185.82	123.88	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	1.2154	16.453		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	9.495	9.635
D Only	3.543	3.587



Title : Colusa Casino - Building Expansion
Dsgnr:
Project Desc.: Floor Beams

Job # 10642

Project Notes :

Printed: 22 MAR 2011, 10:53AM

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ec6
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Beam-20-REV

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
L Only	5.952	6.048
D+L	9.495	9.635

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\JN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ecf
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Beam-21

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method :

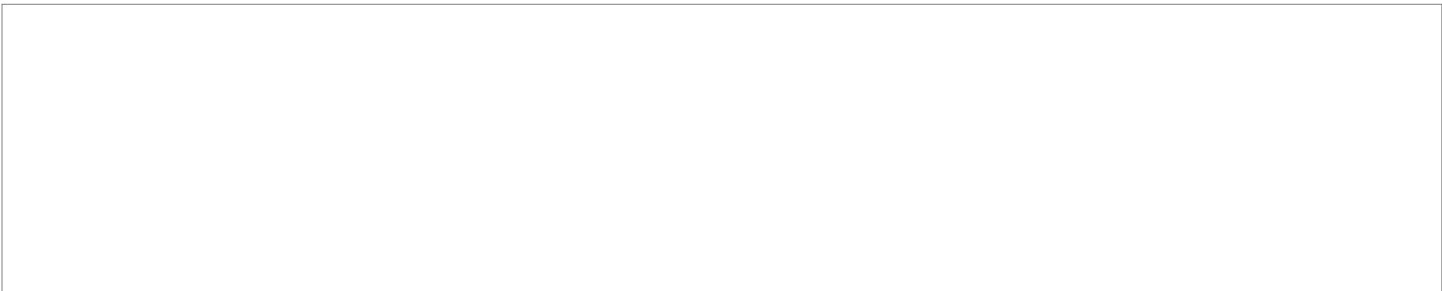
Fy : Steel Yield : ksi

Beam Bracing :

E: Modulus : ksi

Bending Axis : Major Axis Bending

Load Combination :



Applied Loads

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

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.623 : 1	Maximum Shear Stress Ratio =	0.137 : 1
Section used for this span	W18X65	Section used for this span	W18X65
Mu : Applied	206.611 k-ft	Vu : Applied	22.624 k
Mn * Phi : Allowable	331.836 k-ft	Vn * Phi : Allowable	165.60 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	14.018ft	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	0.793 in	Ratio =	476
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0
Max Downward Total Deflection	1.147 in	Ratio =	329
Max Upward Total Deflection	0.000 in	Ratio =	0

Maximum Forces & Stresses for Load Combinations

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
------------------	------	---------------	------------------	------------------	---------------	------------------

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4	Support 5	Support 6	Support 7	Support 8	Support 9
------------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\JN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ecf
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

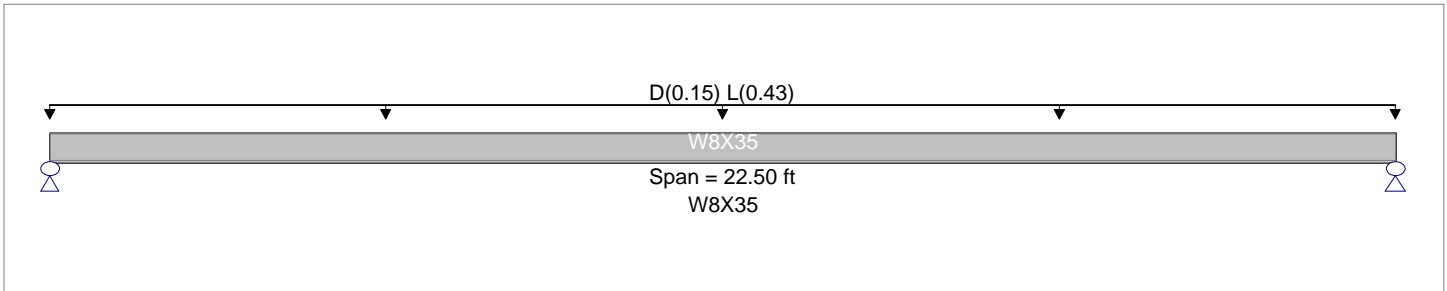
Description : Beam-22

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.150, L = 0.430 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.450 : 1	Maximum Shear Stress Ratio =	0.137 : 1
Section used for this span	W8X35	Section used for this span	W8X35
Mu : Applied	38.922 k-ft	Vu : Applied	6.919 k
Mn / Omega : Allowable	86.577 k-ft	Vn/Omega : Allowable	50.344 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	11.250ft	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	0.679 in	Ratio =	397
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.971 in	Ratio =	278
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
Overall MAXimum Envelope															
Dsgn. L = 22.50 ft		1	0.450	0.137	38.92		38.92	144.58	86.58	1.00	1.00	6.92	75.52	50.34	
+D															
Dsgn. L = 22.50 ft		1	0.135	0.041	11.71		11.71	144.58	86.58	1.00	1.00	2.08	75.52	50.34	
+D+L+H															
Dsgn. L = 22.50 ft		1	0.450	0.137	38.92		38.92	144.58	86.58	1.00	1.00	6.92	75.52	50.34	
+D+0.750Lr+0.750L+H															
Dsgn. L = 22.50 ft		1	0.371	0.113	32.12		32.12	144.58	86.58	1.00	1.00	5.71	75.52	50.34	
+D+0.750L+0.750S+H															
Dsgn. L = 22.50 ft		1	0.371	0.113	32.12		32.12	144.58	86.58	1.00	1.00	5.71	75.52	50.34	
+D+0.750Lr+0.750L+0.750W+H															
Dsgn. L = 22.50 ft		1	0.371	0.113	32.12		32.12	144.58	86.58	1.00	1.00	5.71	75.52	50.34	
+D+0.750L+0.750S+0.750W+H															
Dsgn. L = 22.50 ft		1	0.371	0.113	32.12		32.12	144.58	86.58	1.00	1.00	5.71	75.52	50.34	
+D+0.750Lr+0.750L+0.5250E+H															
Dsgn. L = 22.50 ft		1	0.371	0.113	32.12		32.12	144.58	86.58	1.00	1.00	5.71	75.52	50.34	
+D+0.750L+0.750S+0.5250E+H															
Dsgn. L = 22.50 ft		1	0.371	0.113	32.12		32.12	144.58	86.58	1.00	1.00	5.71	75.52	50.34	

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.9707	11.363		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	6.919	6.919
D Only	2.082	2.082
L Only	4.838	4.838



Title : Colusa Casino - Building Expansion
Dsgnr:
Project Desc.: Floor Beams

Job # 10642

Project Notes :

Printed: 22 MAR 2011, 3:58PM

Steel Beam

File: \\NS-SERV\shared\NS PROJECTS\JN 10642 Colusa Casino-Keystone Engineering\Floor beams Design.ecf
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Beam-22

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
D+L	6.919	6.919

Steel Column

0642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Roof Beams & Posts.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

Lic. # : KW-06008291

Licensee : ED NAJJARINE

Description : steel column at bm 3 - Middle support

General Information

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Steel Section Name : **HSS4X4X1/4**
 Analysis Method : **2006 IBC & ASCE 7-05**
 Steel Stress Grade
 Fy : Steel Yield **36.0 ksi**
 E : Elastic Bending Modulus **29,000.0 ksi**
 Load Combination : **Allowable Stress**

Overall Column Height **12.0 ft**
 Top & Bottom Fixity **Top & Bottom Pinned**
 Brace condition for deflection (buckling) along columns :
 X-X (width) axis : **Unbraced Length for X-X Axis buckling = 12 ft, K = 1.0**
 Y-Y (depth) axis : **Unbraced Length for Y-Y Axis buckling = 12 ft, K = 1.0**

Applied Loads

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

Column self weight included : 146.17 lbs * Dead Load Factor
 AXIAL LOADS . . .
 Axial Load at 12.0 ft, D = 14.630, LR = 10.810 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.5644** : 1
 Load Combination **+D+Lr+H**
 Location of max.above base **0.0 ft**
 At maximum location values are . . .
 Pu : Axial **25.586 k**
 Pn / Omega : Allowable **45.330 k**
 Mu-x : Applied **0.0 k-ft**
 Mn-x / Omega : Allowable **8.425 k-ft**
 Mu-y : Applied **0.0 k-ft**
 Mn-y / Omega : Allowable **8.425 k-ft**

Maximum SERVICE Load Reactions . .
 Top along X-X **0.0 k**
 Bottom along X-X **0.0 k**
 Top along Y-Y **0.0 k**
 Bottom along Y-Y **0.0 k**

Maximum SERVICE Load Deflections . . .
 Along Y-Y **0.0 in** at **0.0ft** above base
 for load combination :
 Along X-X **0.0 in** at **0.0ft** above base
 for load combination :

PASS Maximum Shear Stress Ratio = **0.0** : 1
 Load Combination
 Location of max.above base **0.0 ft**
 At maximum location values are . . .
 Vu : Applied **0.0 k**
 Vn / Omega : Allowable **0.0 k**

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio	Status	Location

Maximum Reactions - Unfactored

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		Y-Y Axis Reaction		Axial Reaction
	@ Base	@ Top	@ Base	@ Top	@ Base

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
------------------	---------------------	----------	---------------------	----------

Steel Section Properties : **HSS4X4X1/4**

Project Notes :

Printed: 14 JUL 2011, 1:12PM

Steel Column

0642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Roof Beams & Posts.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

Lic. # : KW-06008291

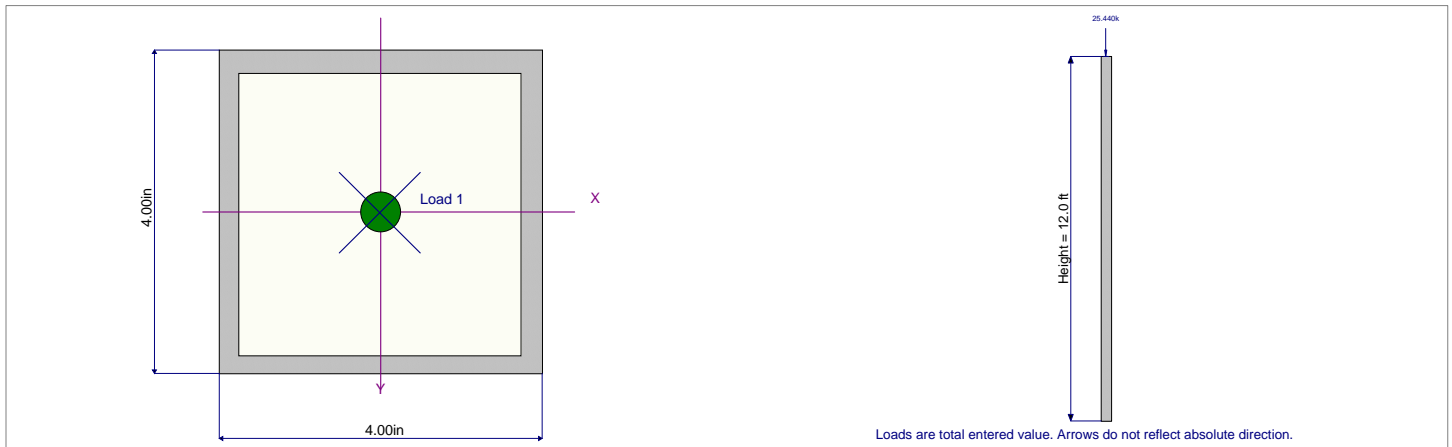
Licensee : ED NAJJARINE

Description : steel column at bm 3 - Middle support

Steel Section Properties : HSS4X4X1/4

Depth	=	4.000 in	I xx	=	7.80 in ⁴	J	=	12.800 in ⁴
Web Thick	=	0.000 in	S xx	=	3.90 in ³			
Flange Width	=	4.000 in	R xx	=	1.520 in			
Flange Thick	=	0.250 in						
Area	=	3.370 in ²	I yy	=	7.800 in ⁴			
Weight	=	12.181 plf	S yy	=	3.900 in ³			
			R yy	=	1.520 in			

Ycg = 0.000 in



Steel Column

I:\10642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Floor beams Design.ecx
ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

Lic. # : KW-06008291

Licensee : ED NAJJARINE

Description : check column at floor level (supporting bm 15-Middle support)

General Information

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Steel Section Name : **HSS5X5X1/2**
 Analysis Method : **2006 IBC & ASCE 7-05**
 Steel Stress Grade
 Fy : Steel Yield **36.0 ksi**
 E : Elastic Bending Modulus **29,000.0 ksi**
 Load Combination : **Allowable Stress**

Overall Column Height **12.0 ft**
 Top & Bottom Fixity **Top & Bottom Pinned**
 Brace condition for deflection (buckling) along columns :
 X-X (width) axis : **Unbraced Length for X-X Axis buckling = 12 ft, K = 1.0**
 Y-Y (depth) axis : **Unbraced Length for Y-Y Axis buckling = 12 ft, K = 1.0**

Applied Loads

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

Column self weight included : 339.65 lbs * Dead Load Factor
 AXIAL LOADS . . .
 Axial Load at 12.0 ft, D = 38.910, LR = 11.080, L = 40.450 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6532** : 1
 Load Combination **+D+L+H**
 Location of max.above base **0.0 ft**
 At maximum location values are . . .
 Pu : Axial **79.70 k**
 Pn / Omega : Allowable **122.02 k**
 Mu-x : Applied **0.0 k-ft**
 Mn-x / Omega : Allowable **23.533 k-ft**
 Mu-y : Applied **0.0 k-ft**
 Mn-y / Omega : Allowable **23.533 k-ft**

PASS Maximum Shear Stress Ratio = **0.0** : 1
 Load Combination
 Location of max.above base **0.0 ft**
 At maximum location values are . . .
 Vu : Applied **0.0 k**
 Vn / Omega : Allowable **0.0 k**

Maximum SERVICE Load Reactions . . .
 Top along X-X **0.0 k**
 Bottom along X-X **0.0 k**
 Top along Y-Y **0.0 k**
 Bottom along Y-Y **0.0 k**

Maximum SERVICE Load Deflections . . .
 Along Y-Y **0.0 in** at **0.0 ft** above base
 for load combination :
 Along X-X **0.0 in** at **0.0 ft** above base
 for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio	Status	Location

Maximum Reactions - Unfactored

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		Y-Y Axis Reaction		Axial Reaction
	@ Base	@ Top	@ Base	@ Top	@ Base

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
------------------	---------------------	----------	---------------------	----------

Steel Section Properties : **HSS5X5X1/2**

Project Notes :

Printed: 14 JUL 2011, 1:16PM

Steel Column

I 10642 Colusa Casino-Keystone Engineering\Colusa Building Expansion\Structural Calcs\Floor beams Design.ecx
 ENERCALC, INC. 1983-2011, Build:6.11.4.5, Ver:6.11.4.5

Lic. # : KW-06008291

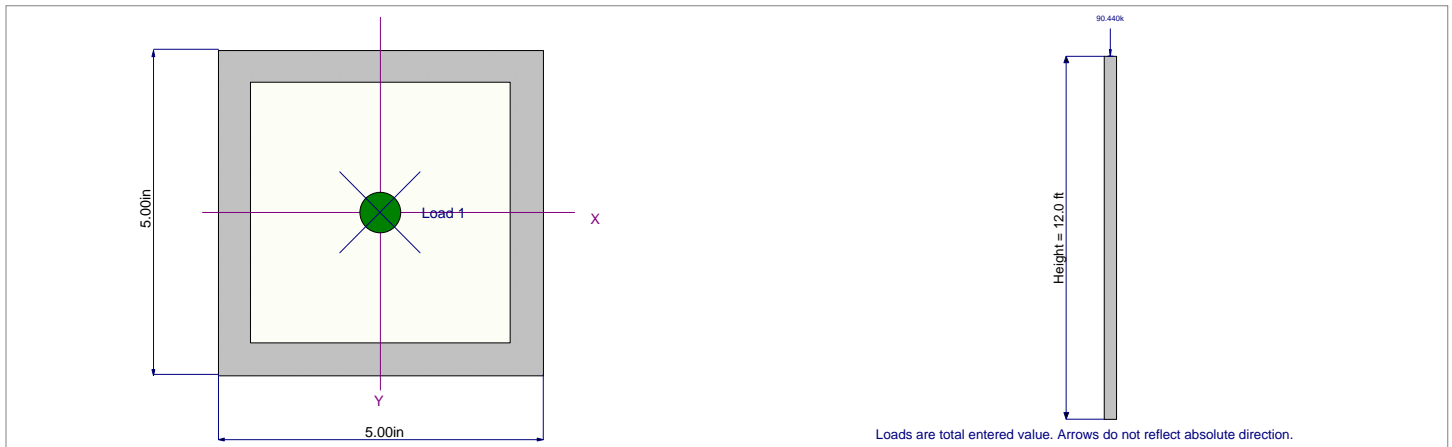
Licensee : ED NAJJARINE

Description : check column at floor level (supporting bm 15-Middle support)

Steel Section Properties : HSS5X5X1/2

Depth	=	5.000 in	I xx	=	26.00 in ⁴	J	=	44.600 in ⁴
Web Thick	=	0.000 in	S xx	=	10.40 in ³			
Flange Width	=	5.000 in	R xx	=	1.820 in			
Flange Thick	=	0.500 in						
Area	=	7.880 in ²	I yy	=	26.000 in ⁴			
Weight	=	28.304 plf	S yy	=	10.400 in ³			
			R yy	=	1.820 in			

Ycg = 0.000 in



Project Name = Colusa Casino
Date = Mon Mar 21 15:44:01 PDT 2011

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 39.407312
Longitude = -122.009585
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - $F_a = 1.0$, $F_v = 1.0$
Data are based on a 0.01 deg grid spacing

Period	Sa
(sec)	(g)
0.2	0.644 (Ss, Site Class B)
1.0	0.260 (S1, Site Class B)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 39.407312
Longitude = -122.009585
Spectral Response Accelerations SMs and SM1
SMs = $F_a \times S_s$ and SM1 = $F_v \times S_1$
Site Class D - $F_a = 1.285$, $F_v = 1.88$

Period	Sa
(sec)	(g)
0.2	0.828 (SMs, Site Class D)
1.0	0.489 (SM1, Site Class D)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 39.407312
Longitude = -122.009585
Design Spectral Response Accelerations SDs and SD1
SDs = $2/3 \times SMs$ and SD1 = $2/3 \times SM1$
Site Class D - $F_a = 1.285$, $F_v = 1.88$

Period	Sa
(sec)	(g)
0.2	0.552 (SDs, Site Class D)

SEISMIC DESIGN, BASED ON IBC 06/CBC 07/ ASCE 7-05:

Input Data:

Number of Floors $n := 2$

Importance Factor (ASCE 11.5.1) $I := 1.0$

Building Location Zip Code: 95932 Long := 39.407312 Lat := -122.009585

Site Class (A,B,C,D,E,F) no soil report, use D

The Coefficient (ASCE Tab 12.8-2) $C_t := 0.028$ $x := 0.8$

The Coefficient (ASCE Tab 12.2.1) $R := 3.5$

Seismic Coefficients :

$$S_{DS} := 0.590 \quad S_{D1} := 0.350$$

Building Period :

Total Building Height $h_n := 22$ ft

Approximate Fundamental Period $T_a := C_t \cdot (h_n)^x$ $T_a = 0.332$

$k := \begin{cases} 1 & \text{if } T_a \leq 0.5 \\ 2 & \text{if } T_a > 0.5 \end{cases} \quad k = 1$ (If T is between 0.5s and 2.5 s, you can use linear interpolation) (ASCE 12.8.3, p 130)

$$T_o := 0.2 \cdot \frac{S_{D1}}{S_{DS}} \quad T_o = 0.119 \quad (\text{ASCE 11.4.5, p 115})$$

$$T_s := \frac{S_{D1}}{S_{DS}} \quad T_s = 0.593 \quad (\text{ASCE 11.4.5, p 115})$$

$$T_L := 8 \quad (\text{ASCE Figure 22-15, p 228})$$

Seismic Response Coefficient per ASCE 7-05, Section 12.8.1.1

$$C_s := \frac{S_{DS} \cdot I}{R} \quad C_s = 0.169$$

$$T_a \leq T_L$$

$$C_{s_max} := \frac{S_{D1} \cdot I}{T_a \cdot R} \quad C_{s_max} = 0.301 > C_s = 0.169 \quad \text{O.K.} \quad (12.8 - 3)$$

$$C_{s_min} := 0.01 < C_s = 0.169 \quad \text{O.K.} \quad (12.8 - 5)$$

Structure Weight, Vertical Loading Distribution:

One foot strip in the Longitudinal direction: L1 (North-South direction)

$$RDL := 12 \cdot \text{psf} \quad INTW := 14 \cdot \text{psf} \quad L_R := 56 \cdot \text{ft} \quad h_2 := 10 \cdot \text{ft}$$

$$FDL := 35 \cdot \text{psf} \quad EXTW := 16 \cdot \text{psf} \quad L_F := 56 \cdot \text{ft} \quad h_1 := 12 \cdot \text{ft}$$

$$\text{No of int. walls,} \quad n_R := 0 \quad n_F := 1$$

$$R := RDL \cdot (L_R) \quad R = 672 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$EWR := EXTW \cdot \left(\frac{h_2}{2} \right) \cdot 2 \quad EWR = 160 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$IWR := INTW \cdot \frac{h_2}{2} \cdot n_R \quad IWR = 0 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$F := FDL \cdot (L_F) \quad F = 1960 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$EWF := \left[EXTW \cdot \left(\frac{h_2 + h_1}{2} \right) \cdot 2 \right] \quad EWF = 352 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$IWF := INTW \cdot \left(\frac{h_2}{2} + \frac{h_1}{2} \right) \cdot n_F \quad IWF = 154 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{RL1} := R + EWR + IWR \quad W_{RL1} = 832 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{FL1} := F + EWF + IWF \quad W_{FL1} = 2466 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{L1} := W_{RL1} + W_{FL1} \quad W_{L1} = 3298 \cdot \frac{\text{lbf}}{\text{ft}}$$

Vertical Distribution Factor per ASCE 7-05, Section 12.8.3 (12.8 – 12)

Longitudinal direction, L1

$$C_{v,L1} := \frac{W_{RL1} \cdot (h_1 + h_2)^1}{W_{RL1} \cdot (h_1 + h_2)^1 + W_{FL1} \cdot h_1^1} \quad C_{v,L1} = 0.382$$

One foot strip in the Transversal direction:

T1 (East-West direction)

$$\underline{\underline{RDL}} := 12 \cdot \text{psf}$$

$$\underline{\underline{EXTW2}} := 100 \cdot \text{psf}$$

$$\underline{\underline{L_R}} := 68 \cdot \text{ft}$$

$$\underline{\underline{h_2}} := 10 \cdot \text{ft}$$

$$\underline{\underline{FDL}} := 35 \cdot \text{psf}$$

$$\underline{\underline{EXTW1}} := 14 \cdot \text{psf}$$

$$\underline{\underline{L_F}} := 68 \cdot \text{ft}$$

$$\underline{\underline{h_1}} := 12 \cdot \text{ft}$$

No of int. walls,

$$\underline{\underline{n_R}} := 0$$

$$\underline{\underline{n_F}} := 0$$

$$\underline{\underline{R}} := RDL \cdot (L_R)$$

$$R = 816 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{\underline{EWR}} := (\underline{\underline{EXTW1}} + \underline{\underline{EXTW2}}) \cdot \left(\frac{h_2}{2} \right) \cdot 1$$

$$EWR = 570 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{\underline{IWR}} := \underline{\underline{INTW}} \cdot \frac{h_2}{2} \cdot n_R$$

$$IWR = 0 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{\underline{F}} := \underline{\underline{FDL}} \cdot (L_F)$$

$$F = 2380 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{\underline{EWF}} := \left[(\underline{\underline{EXTW1}} + \underline{\underline{EXTW2}}) \cdot \left(\frac{h_2 + h_1}{2} \right) \cdot 1 \right]$$

$$EWF = 1254 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{\underline{IWF}} := \underline{\underline{INTW}} \cdot \left(\frac{h_2}{2} + \frac{h_1}{2} \right) \cdot n_F$$

$$IWF = 0 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{RT1} := R + EWR + IWR$$

$$W_{RT1} = 1386 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{FT1} := F + EWF + IWF$$

$$W_{FT1} = 3634 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{T1} := W_{RT1} + W_{FT1}$$

$$W_{T1} = 5020 \cdot \frac{\text{lbf}}{\text{ft}}$$

Vertical Distribution Factor per ASCE 7-05, Section 12.8.3

(12.8 – 12)

Transverse direction, T1

$$C_{v.T1} := \frac{W_{RT1} \cdot (h_1 + h_2)^1}{W_{RT1} \cdot (h_1 + h_2)^1 + W_{FT1} \cdot h_1^1}$$

$$C_{v.T1} = 0.411$$

One foot strip in the Transversal direction:

T2

$$\underline{RDL} := 12 \cdot \text{psf}$$

$$\underline{EXTW2} := 100 \cdot \text{psf}$$

$$\underline{L_R} := 22.5 \cdot \text{ft}$$

$$\underline{h_2} := 10 \cdot \text{ft}$$

$$\underline{FDL} := 35 \cdot \text{psf}$$

$$\underline{EXTW1} := 14 \cdot \text{psf}$$

$$\underline{L_F} := 22.5 \cdot \text{ft}$$

$$\underline{h_1} := 12 \cdot \text{ft}$$

No of int. walls,

$$\underline{n_R} := 0$$

$$\underline{n_F} := 0$$

$$\underline{R} := RDL \cdot (L_R)$$

$$R = 270 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{EWR} := (EXTW1 + EXTW2) \cdot \left(\frac{h_2}{2}\right) \cdot 1$$

$$EWR = 570 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{IWR} := INTW \cdot \frac{h_2}{2} \cdot n_R$$

$$IWR = 0 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{F} := FDL \cdot (L_F)$$

$$F = 788 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{EWF} := \left[(EXTW1 + EXTW2) \cdot \left(\frac{h_2 + h_1}{2}\right) \cdot 1 \right]$$

$$EWF = 1254 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$\underline{IWF} := INTW \cdot \left(\frac{h_2}{2} + \frac{h_1}{2}\right) \cdot n_F$$

$$IWF = 0 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{RT2} := R + EWR + IWR$$

$$W_{RT2} = 840 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{FT2} := F + EWF + IWF$$

$$W_{FT2} = 2042 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{T2} := W_{RT2} + W_{FT2}$$

$$W_{T2} = 2882 \cdot \frac{\text{lbf}}{\text{ft}}$$

Vertical Distribution Factor per ASCE 7-05, Section 12.8.3

(12.8 – 12)

Transverse direction, T2

$$C_{v,T2} := \frac{W_{RT2} \cdot (h_1 + h_2)^1}{W_{RT2} \cdot (h_1 + h_2)^1 + W_{FT2} \cdot h_1^1}$$

$$C_{v,T2} = 0.43$$

One foot strip in the Transversal direction:

T3

$$RDL := 12 \cdot \text{psf}$$

$$EXTW2 := 100 \cdot \text{psf}$$

$$L_R := 68 \cdot \text{ft}$$

$$h_2 := 10 \cdot \text{ft}$$

$$FDL := 35 \cdot \text{psf}$$

$$EXTW1 := 14 \cdot \text{psf}$$

$$L_F := 68 \cdot \text{ft}$$

$$h_1 := 12 \cdot \text{ft}$$

No of int. walls,

$$n_R := 0$$

$$n_F := 0$$

$$R := RDL \cdot (L_R)$$

$$R = 816 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$EWR := (EXTW1 + EXTW2) \cdot \left(\frac{h_2}{2}\right) \cdot 1$$

$$EWR = 570 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$IWR := INTW \cdot \frac{h_2}{2} \cdot n_R$$

$$IWR = 0 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$F := FDL \cdot (L_F)$$

$$F = 2380 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$EWF := \left[(EXTW1 + EXTW2) \cdot \left(\frac{h_2 + h_1}{2}\right) \cdot 1 \right]$$

$$EWF = 1254 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$IWF := INTW \cdot \left(\frac{h_2}{2} + \frac{h_1}{2}\right) \cdot n_F$$

$$IWF = 0 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{RT3} := R + EWR + IWR$$

$$W_{RT3} = 1386 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{FT3} := F + EWF + IWF$$

$$W_{FT3} = 3634 \cdot \frac{\text{lbf}}{\text{ft}}$$

$$W_{T3} := W_{RT3} + W_{FT3}$$

$$W_{T3} = 5020 \cdot \frac{\text{lbf}}{\text{ft}}$$

Vertical Distribution Factor per ASCE 7-05, Section 12.8.3

(12.8 – 12)

Transverse direction, T3

$$C_{v.T3} := \frac{W_{RT3} \cdot (h_1 + h_2)^1}{W_{RT3} \cdot (h_1 + h_2)^1 + W_{FT3} \cdot h_1^1}$$

$$C_{v.T3} = 0.411$$

Seismic Base Shear:

Longitudinal direction, L1

$$V_{L1} := C_s \cdot W_{L1}$$

$$V_{L1} = 556 \cdot \frac{\text{lbf}}{\text{ft}}$$

Transverse direction, T1

$$V_{T1} := C_s \cdot W_{T1}$$

$$V_{T1} = 846 \cdot \frac{\text{lbf}}{\text{ft}}$$

Transverse direction, T2

$$V_{T2} := C_s \cdot W_{T2}$$

$$V_{T2} = 486 \cdot \frac{\text{lbf}}{\text{ft}}$$

Transverse direction, T3

$$V_{T3} := C_s \cdot W_{T3}$$

$$V_{T3} = 846 \cdot \frac{\text{lbf}}{\text{ft}}$$

Roof (2nd Level) Shear Forces:

Longitudinal direction, L1

$$F_{2,L1} := C_{v,L1} \cdot V_{L1}$$

$$F_{2,L1} = 212 \cdot \frac{\text{lbf}}{\text{ft}}$$

Transverse direction, T1

$$F_{2,T1} := C_{v,T1} \cdot V_{T1}$$

$$F_{2,T1} = 348 \cdot \frac{\text{lbf}}{\text{ft}}$$

Transverse direction, T2

$$F_{2,T2} := C_{v,T2} \cdot V_{T2}$$

$$F_{2,T2} = 209 \cdot \frac{\text{lbf}}{\text{ft}}$$

Transverse direction, T3

$$F_{2,T3} := C_{v,T3} \cdot V_{T3}$$

$$F_{2,T3} = 348 \cdot \frac{\text{lbf}}{\text{ft}}$$

LATERAL RESISTING ELEMENTS SHEAR LOAD DISTRIBUTION

Longitudinal Direction

Wall No.	Fx1 (lbs)	TW1 (ft)	Fx2 (lbs)	TW2 (ft)	Vx (lbs)	L (ft)	(0.7).Vx (lbs)	v (plf)	Use Shear Type
<i>See plan</i>		<i>Tributary Width 1</i>		<i>Tributary Width 2</i>		<i>Total wall length See plan</i>	<i>Rho=1.30</i>	Wall Shear per ft	See below for description
1-Roof	212	33.7	0	0	7144	frame	5001	-	OMF
1-Floor	572	33.7	0	0	19276	frame	13493	-	OMF

Transverse Direction

Wall No.	Fx1 (lbs)	TW1 (ft)	Fx2 (lbs)	TW2 (ft)	Vx (lbs)	L (ft)	(0.7).Vx (lbs)	v (plf)	Use Shear Type
<i>See plan</i>		<i>Tributary Width 1</i>		<i>Tributary Width 2</i>		<i>Total wall length See plan</i>	<i>Rho=1.3</i>	Wall Shear per ft	See below for description
B-Roof	348	21	0	0	7308	frame	5116	-	OMF
B-Floor	846	21	0	0	17766	frame	12436	-	OMF
E-Roof	348	21	0	0	7308	frame	5116	-	OMF
E-Floor	846	21	0	0	17766	frame	12436	-	OMF
A-Roof	348	16	0	0	5568	frame	3898	-	OMF
A-Floor	846	16	0	0	13536	frame	9475	-	OMF

Diaphragm Analysis @ Roof (between GRID 1 & 4):

$$\text{kip} := 1000 \cdot \text{lbf}$$

Diaphragm Load per foot, $F_r := 419 \cdot \left(\frac{1}{1.4}\right) \cdot \frac{\text{lbf}}{\text{ft}}$ $F_r = 299 \cdot \frac{\text{lbf}}{\text{ft}}$

Distance between chords, $L := 67.5 \cdot \text{ft}$

Depth of Diaphragm, $D := 44 \cdot \text{ft}$

Allowable shear for roof metal deck $q_{all} := 712 \cdot \frac{\text{lbf}}{\text{ft}}$ 18 Gage, HSB-36 7 weld pattern @ Support

Diaphragm shear at supports,

$$V_r := (F_r) \cdot \left(\frac{L}{2}\right) \cdot \left(\frac{1}{D}\right) \quad V_r = 230 \cdot \frac{\text{lbf}}{\text{ft}} < \quad q_{all} = 712 \cdot \frac{\text{lbf}}{\text{ft}} \quad \text{OK}$$

Diaphragm Analysis @ Floor (between grid 1 & 4) :

$$\text{kip} := 1000 \cdot \text{lbf}$$

Diaphragm Load per foot, $F_f := 1009 \cdot \left(\frac{1}{1.4}\right) \cdot \frac{\text{lbf}}{\text{ft}}$ $F_f = 721 \cdot \frac{\text{lbf}}{\text{ft}}$

Distance between chords, $L := 67.5 \cdot \text{ft}$

Depth of Diaphragm, $D := 44 \cdot \text{ft}$

Allowable shear for floor diaphragm (18 Gage, 3 1/4" Light Weight Conc, studs @ 16" o.c.) $q_{all} := 4350 \cdot \frac{\text{lbf}}{\text{ft}}$

Diaphragm shear at supports,

$$V_f := (F_f) \cdot \left(\frac{L}{2}\right) \cdot \left(\frac{1}{D}\right) \quad V_f = 553 \cdot \frac{\text{lbf}}{\text{ft}} < \quad q_{all} = 4350 \cdot \frac{\text{lbf}}{\text{ft}} \quad \text{OK}$$

1.1) CHECK 4-3/8"φ HILTI KB-TZ WITH 2" EMBEDMENT INTO CONCRETE (ICC ESR-1917, LARR # 25701):

Strength Reduction Factors, Steel-Tension	$\phi_{st} := 0.75$	ACI 318-05 D4.4
Strength Reduction Factors, Steel-Shear	$\phi_{ss} := 0.65$	
Strength Reduction Factors, Concrete-Tension	$\phi_{ct} := 0.65$	Condition B
Strength Reduction Factors, Concrete-Tension	$\phi_{cs} := 0.7$	Condition B
Number of Bolts,	$n := 1$	
Concrete Strength:	$f_c := 2500$	psi
For Normal wt. Concrete	$\lambda := 1$	
Hilti KB TZ Ult. Strength:	$f_{ut} := 106000$	psi
Bolt Diameter:	$d_o := .375$	in
Effective Hilti Bolt Area:	$A_{se} := 0.052$	in ²
Critical Edge Distance	$C_{cr} := 4.37$	in for concrete thickness of 4".
Actual Edge Distance,	$C := 6$	in
Actual Bolts Spacing,	$S := 0$	in
Pullout Strength-Uncracked concrete	$T_{all_unc} := 2515$	lbf
Steel Strength in Shear-Seismic	$V_{all_s} := 2255$	lbf
Effective Depth of Bolt:	$h_{ef} := 2$	in

A.1. STEEL STRENGTH IN TENSION

$$N_s := \frac{(\phi_{st}) \cdot n \cdot f_{ut} \cdot A_{se}}{1000} \cdot k \quad N_s = 4.134 \cdot k$$

A.2 ALLOWABLE CONCRETE BREAKOUT STRENGTH IN TENSION

ACI 318-05 D4.1.1, D.4.1.2
D.5.1.2 & D.5.2.2

$k_{unc} := 17$	ACI 318-05 D.5.2.2
$\psi_{ec_N} := 1$	ACI 318-05 D.5.2.4
$\psi_{unc_N} := 1.41$	ACI 318-05 D.5.2.6
$\psi_{ed_N} := 1$	ACI 318-05 D.5.2.5 For $C \geq (1.5)h_{ef}$
$\psi_{cp_N} := 1$	ACI 318-05 D.5.2.7 For $C \geq (1.5)h_{ef}$

$$\psi_{edge} := \max\left(\frac{1.5 \cdot h_{ef}}{C_{cr}}, \frac{C}{C_{cr}}\right)$$

ACI 318-05 D.5.2.7 For $C \geq (1.5)h_{ef}$

$$\psi_{edge} = 1.371$$

Hilti KB TZ ICC ESR-1917

Concrete Breakout Area in Tension based on 1.5xhef Edge distance (one bolt):

$$A_{No} := 9 \cdot h_{ef}^2 \quad A_{No} = 36 \text{ in}^2$$

Concrete Breakout Area in Tension based on Actual Edge distance (Curb Condition) for $C > 1.5 h_{ef}$:

$$A_{Nc} := (1.5 \cdot h_{ef} + 1.5 \cdot h_{ef} + S) \cdot (1.5 \cdot h_{ef} + 1.5 \cdot h_{ef})$$

$$A_{Nc} = 36 \text{ in}^2$$

$$N_{cbg} := \frac{\lambda \cdot \left(\phi_{ct} \cdot \frac{A_{Nc}}{A_{No}} \cdot \psi_{ec_N} \cdot \psi_{ed_N} \cdot \psi_{unc_N} \cdot \psi_{cp_N} \cdot \psi_{edge} \right) \cdot \left(k_{unc} \cdot \sqrt{f_c} \cdot h_{ef}^{1.5} \right)}{1000} \cdot k$$

$$N_{cbg} = 3.022 \cdot k$$

A.3 ALLOWABLE CONCRETE BREAKOUT STRENGTH IN TENSION PER ICC ESR-1917

$$N_{pn_fc} := (\phi_{ct}) \cdot (n) \cdot (T_{all_unc}) \cdot \left(\sqrt{\frac{f_c}{2500}} \right) \cdot \text{lbf}$$

$$N_{pn_fc} = 1.63 \cdot k$$

Net Tension Strength,

$$T_{all} := \min(N_{cbg}, N_{pn_fc}, N_s)$$

$$T_{all} = 1.635 \cdot k$$

B.1 ALLOWABLE CONCRETE BREAKOUT IN SHEAR

ACI 318-05 D.6.2.1b & D.6.2.3

Length of Bolt for shear (torque-controlled Anchors)

$$l_e := 2 \cdot d_o \quad l_e = 0.75 \text{ in} \quad \text{ACI 318-05 D.6.2.2}$$

Concrete Breakout Area in Shear based on Actual Edge distance for concrete thickness $> 1.5x C$:

$$A_{Vc} := [(1.5 \cdot C) \cdot (2) + S] \cdot (1.5 \cdot C)$$

$$A_{Vc} = 162 \text{ in}^2$$

Concrete Breakout Area in Shear based on single Bolt projected area:

$$A_{Vco} := 4.5 \cdot C^2 \quad A_{Vco} = 162 \text{ in}^2$$

$$\psi_{ec_V} := 1$$

ACI 318-05 D.6.2.5

$$\psi_{c_V} := 1$$

ACI 318-05 D.6.2.7

$$\psi_{ed_V} := 1$$

ACI 318-05 D.6.2.6

$$V_c := \frac{\lambda \cdot \left(\phi_{cs} \cdot \frac{A_{Vc}}{A_{Vco}} \cdot \psi_{ec_V} \cdot \psi_{ed_V} \cdot \psi_{c_V} \right) \cdot \left[8 \cdot \left(\frac{l_e}{d_o} \right)^{0.2} \cdot \sqrt{d_o} \cdot \sqrt{f_c} \cdot C^{1.5} \right]}{1000} \cdot k$$

$$V_c = 2.895 \cdot k$$

B.2 ALLOWABLE CONCRETE BREAKOUT STRENGTH IN SHEAR PER ICC ESR-1917

$$V_{pn_fc} := (\phi_{ct}) \cdot (n) \cdot (V_{all_s}) \cdot \left(\sqrt{\frac{f_c}{2500}} \right) \cdot \text{lbf}$$

$$V_{pn_fc} = 1.47 \cdot k$$

Net Shear Strength,

$$V_{all} := \min(V_c, V_{pn_fc})$$

$$V_{all} = 1.466 \cdot k$$

C. ACTUAL LOADING -STRENGTH LEVEL

$$V_u := V_h \quad V_u = 135.299 \cdot \text{lbf} < V_{all} = 1466 \cdot \text{lbf}$$

$$T_u := P_{down} \quad T_u = 1429 \cdot \text{lbf} < T_{all} = 1635 \cdot \text{lbf}$$

D. CHECK COMBINED SHEAR AND TENSION FOR CONCRETE

$$\left[\left(\frac{V_u}{V_{all}} \right) + \left(\frac{T_u}{T_{all}} \right) \right] = 0.966 < 1.2 \quad \text{OK}$$

2) 5000 Gallons Vault Tank w/ spillbox Seismic Anchorage: (UL-2085 Vault Tank)

Tank dead load $W_p := 23700 \cdot \text{lbf}$

From Table 13.6-1 for rigid equipment, non ductile shallow anchors and ASCE 7-05 section 13.4.2, & Table 11.5-1

$$a := 1$$

$$R_p := 1.5$$

$$h_r := 0 \text{ft}$$

$$z_x := 0 \cdot \text{ft}$$

$$I := 1$$

$$F_p := \frac{(0.4) \cdot (a_p) \cdot (S_{DS}) \cdot (I_p)}{(R_p)} \cdot \left[1 + 2 \cdot \left(\frac{z_x}{h_r} \right) \right] \cdot W_p \quad F_p = 3729 \cdot \text{lbf} \quad \text{Eq 13.3-1}$$

$$F_{p_{max}} := 1.6 \cdot S_{DS} \cdot I_p \cdot W_p \quad F_{p_{max}} = 22373 \cdot \text{lbf} > F_p = 3729 \cdot \text{lbf} \quad \text{OK} \quad \text{Eq 13.3-2}$$

$$F_{p_{min}} := 0.3 \cdot S_{DS} \cdot I_p \cdot W_p \quad F_{p_{min}} = 4195 \cdot \text{lbf} > F_p = 3729 \cdot \text{lbf} \quad \text{Governs} \quad \text{Eq 13.3-3}$$

Use $F_p := F_{p_{min}}$

Applicable Load combination per AISC 7-05, **D+0.7E** (Section 2.4.1, Combination)
0.6D - 0.7E (Section 2.4.1, Combination 8)

Vertical Distance from center of gravity to connection, e.1 $e_1 := 42.5 \cdot \text{in}$

Horizontal Distance from center of gravity to left connection, e.2 $e_2 := 51 \cdot \text{in}$

Horizontal Distance from center of gravity to right connection, e.3 $e_3 := 51 \cdot \text{in}$

Number of anchors considered in the analysis, N $N := 8$

Per ASCE 7-05 Section 12.4.2, plus 1.3 increase per section 13.4.2, $E = E_h + E_v$

$$E_h := 1.3 \cdot F_p \quad E_h = 5453 \cdot \text{lbf} \quad E_v := (1.3) \cdot (0.2) \cdot (S_{DS}) \cdot (W_p) \quad E_v = 3636 \cdot \text{lbf} \quad \text{Eq 12.4-4}$$

Max. downward Reaction per anchor

$$P_{down} := \left[\left(\frac{1}{0.5 \cdot N} \right) \cdot \left(\frac{0.7 \cdot E_h \cdot e_1 + 1 \cdot W_p \cdot e_2 + 0.7 \cdot E_v \cdot e_2}{e_2 + e_3} \right) \right] \quad P_{down} = 3678 \cdot \text{lbf}$$

Max. uplift Reaction per anchor

$$P_{\text{max}} := \max \left[\left(\frac{1}{0.5 \cdot N} \right) \cdot \left[\frac{0.7 \cdot E_h \cdot e_1 + (-0.6) \cdot W_p \cdot e_2 + 0.7 \cdot E_v \cdot e_2}{e_2 + e_3} \right], 0 \text{ lbf} \right] \quad P_{\text{up}} = 0 \cdot \text{lbf}$$

Max. Shear Reaction per corner

$$V_h := 0.7 \cdot \frac{E_h}{N} \quad V_h = 477 \cdot \text{lbf}$$

2.1) CHECK 1/2" φ HILTI KB-TZ - 3 1/4" EFFECTIVE EMBED (4" TOTAL EMBED) INTO CONC. (ICC ESR-1917):

Strength Reduction Factors, Steel-Tension $\phi_{\text{st}} := 0.75$ ACI 318-05 D4.4

Strength Reduction Factors, Steel-Shear $\phi_{\text{ss}} := 0.65$

Strength Reduction Factors, Concrete-Tension $\phi_{\text{ct}} := 0.65$ Condition B

Strength Reduction Factors, Concrete-Tension $\phi_{\text{cc}} := 0.7$ Condition B

Number of Bolts, $n := 1$

Bolt outside Diameter: $d_b := .5$ in

Effective Depth of Bolt (Table 3): $h_{\text{ef}} := 3.25$ in

Min. Concrete thickness (Table 3): $h_{\text{min}} := 6$ in

Critical Edge Distance (Table 3): $C_{\text{ac}} := 7.5$ in

Min. Edge Distance (Table 3): $C_{\text{min}} := 2.375$ in

Min. Anchor Spacing (Table 3): $S_{\text{min}} := 2.375$ in

Min. hole depth in Concrete (Table 3): $h_o := 4$ in

Hilti KB TZ yield Strength (Table 3): $f_y := 84800$ psi

Hilti KB TZ Ult. Strength (Table 3): $f_{\text{ut}} := 106000$ psi

Effective tensile Hilti Bolt Area (Table 3): $A_{\text{st}} := 0.101$ in²

Hilti KB TZ Strength in Tension (Table 3): $N_{\text{st}} := 10705$ lbf

Hilti KB TZ Strength in Shear-Seismic (Table 3): $V_{\text{seis}} := 6405$ lbf

Pullout Strength-Uncracked concrete (Table 3): $N_{\text{p_uncr}} := 5515$ lbf

(E) Concrete Strength (assumed): $f_c := 2500$ psi

For Normal wt. Concrete $\lambda := 1$

Actual Edge Distance,

$$C := C_{\min}$$

$$C := \min(C, C_{ac}) \quad C = 2.375 \text{ in}$$

Actual Bolts Spacing,

$$S := 0 \text{ in}$$

1A. STEEL STRENGTH IN TENSION

$$N_s := \frac{(\phi_{st}) \cdot n \cdot f_{ut} \cdot A_{se}}{1000} \cdot k$$

$$N_s = 8.03 \cdot k$$

1B. ALLOWABLE CONCRETE BREAKOUT STRENGTH IN TENSION

ACI 318-05 D4.1.1, D.4.1.2
D.5.1.2 & D.5.2.2

$$k_{unc} := 17 \quad \text{ACI 318-05 D.5.2.2}$$

$$\psi_{unc,N} := 1.41$$

ICC, Table 3

$$\psi_{ec,N} := 1.41 \quad \text{ACI 318-05 D.5.2.4}$$

$$\psi_{ed,N} := 1$$

ACI 318-05 D.5.2.5

$$\psi_{cp,N} := \max\left(\frac{1.5 \cdot h_{ef}}{C_{ac}}, \frac{C}{C_{ac}}\right)$$

Hilti KB TZ ICC ESR-1917, section 4.1.3, Table 3

Concrete Breakout Area in Tension based on
1.5xhef Edge distance (one bolt):

$$A_{Nco} := 9 \cdot h_{ef}^2$$

$$A_{Nco} = 95.063 \text{ in}^2$$

Concrete Breakout Area in Tension based on
Actual Edge distance (Curb Condition) for C>1.5 hef:

$$A_{Nc} := (1.5 \cdot h_{ef} + 1.5 \cdot h_{ef} + S) \cdot (1.5 \cdot h_{ef} + 1.5 \cdot h_{ef})$$

$$A_{Nc} = 95.063 \text{ in}^2$$

$$N_{cbg} := \frac{\lambda \cdot \left(\phi_{ct} \cdot \frac{A_{Nc}}{A_{Nco}} \cdot \psi_{ec,N} \cdot \psi_{ed,N} \cdot \psi_{unc,N} \cdot \psi_{cp,N} \right) \cdot \left(k_{unc} \cdot \sqrt{f_c} \cdot h_{ef}^{1.5} \right)}{1000} \cdot k$$

$$N_{cbg} = 4.183 \cdot k$$

1C. ALLOWABLE CONCRETE BREAKOUT STRENGTH IN TENSION PER ICC ESR-1917

$$N_{pn,fc} := (\phi_{ct}) \cdot (n) \cdot (N_{p,uncr}) \cdot \left(\sqrt{\frac{f_c}{2500}} \right) \cdot \text{lbf}$$

$$N_{pn,fc} = 3.58 \cdot k$$

Net Tension Strength,

$$T_{all} := \min(N_{cbg}, N_{pn,fc}, N_s)$$

$$T_{all} = 3.585 \cdot k$$

2A. ALLOWABLE CONCRETE BREAKOUT IN SHEAR

ACI 318-05 D.6.2.1b & D.6.2.3

Length of Bolt for shear (torque-controlled Anchors)

$$l_e := 2 \cdot d_o$$

ACI 318-05 D.6.2.2

$$l_e = 1 \text{ in}$$

Concrete Breakout Area in Shear based on Actual Edge distance for concrete thickness > 1.5x C :

$$A_{Vc} := [(1.5 \cdot C) \cdot (2) + S] \cdot (1.5 \cdot C)$$

$$A_{Vc} = 25.38 \text{ in}^2$$

Concrete Breakout Area in Shear based on single Bolt projected area:

$$A_{Vco} := 4.5 \cdot C^2$$

$$A_{Vco} = 25.38 \text{ in}^2$$

$$\psi_{ec,V} := 1$$

ACI 318-05 D.6.2.5

$$\psi_{ed,V} := 1$$

ACI 318-05 D.6.2.6

$$\psi_{c,V} := 1$$

ACI 318-05 D.6.2.7

$$V_c := \frac{\lambda \cdot \left(\phi_{cs} \cdot \frac{A_{Vc}}{A_{Vco}} \cdot \psi_{ec,V} \cdot \psi_{ed,V} \cdot \psi_{c,V} \right) \cdot \left[8 \cdot \left(\frac{l_e}{d_o} \right)^{0.2} \cdot \sqrt{d_o} \cdot \sqrt{f_c} \cdot C^{1.5} \right]}{1000} \cdot k$$

$$V_c = 0.832 \cdot k$$

2B. ALLOWABLE CONCRETE BREAKOUT STRENGTH IN SHEAR PER ICC ESR-1917

$$V_{pn_{fc}} := (\phi_{ct}) \cdot (n) \cdot (V_{seis}) \cdot \left(\sqrt{\frac{f_c}{2500}} \right) \cdot \text{lb}$$

$$V_{pn_{fc}} = 4.16 \cdot k$$

Net Shear Strength,

$$V_{all} := \min(V_c, V_{pn_{fc}})$$

$$V_{all} = 0.832 \cdot k$$

C. ACTUAL LOADING -STRENGTH LEVEL

$$V_u := V_h \quad V_u = 477.17 \cdot \text{lb} < V_{all} = 832 \cdot \text{lb}$$

$$T_u := P_{up} \quad T_u = 0 \cdot \text{lb} < T_{all} = 3585 \cdot \text{lb}$$

D. CHECK COMBINED SHEAR AND TENSION FOR CONCRETE

$$\left[\left(\frac{V_u}{V_{all}} \right) + \left(\frac{T_u}{T_{all}} \right) \right] = 0.573 < 1.2 \quad \text{OK}$$

3) Equipment at Roof Level Seismic Anchorage: (Model No. AHU-26S)

Unit-dead load $W_p := 9000 \cdot \text{lbf}$

From Table 13.6-1 for rigid equipment, non ductile shallow anchors and ASCE 7-05 section 13.4.2, & Table 11.5-1

$$a_m := 1 \quad R_m := 1.5 \quad h_r := 23.75 \text{ ft}$$

$$z_x := 23.75 \cdot \text{ft} \quad I_p := 1$$

$$F_{pw} := \frac{(0.4) \cdot (a_p) \cdot (S_{DS}) \cdot (I_p)}{(R_p)} \cdot \left[1 + 2 \cdot \left(\frac{z_x}{h_r} \right) \right] \cdot W_p \quad F_p = 4248 \cdot \text{lbf} \quad \text{Eq 13.3-1}$$

$$F_{p_{max}} := 1.6 \cdot S_{DS} \cdot I_p \cdot W_p \quad F_{p_{max}} = 8496 \cdot \text{lbf} > F_p = 4248 \cdot \text{lbf} \quad \text{OK} \quad \text{Eq 13.3-2}$$

$$F_{p_{min}} := 0.3 \cdot S_{DS} \cdot I_p \cdot W_p \quad F_{p_{min}} = 1593 \cdot \text{lbf} > F_p = 4248 \cdot \text{lbf} \quad \text{Governs} \quad \text{Eq 13.3-3}$$

Use $F_p := F_p$

Applicable Load combination per AISC 7-05, **D+0.7E** (Section 2.4.1, Combination)

0.6D - 0.7E (Section 2.4.1, Combination 8)

Vertical Distance from center of gravity to connection, e.1 $e_1 := 46 \cdot \text{in}$

Horizontal Distance from center of gravity to left connection, e.2 $e_2 := 48 \cdot \text{in}$

Horizontal Distance from center of gravity to right connection, e.3 $e_3 := 48 \cdot \text{in}$

Use 5/8" ϕ puddle welds @ 6" o.c. per detail 17/SD3.0

Number of puddle welds $N := \frac{204 \cdot \text{in}}{12 \cdot \text{in}} \quad N = 17$

Per ASCE 7-05 Section 12.4.2, $E = E_h + E_v$

$$E_{hw} := 1 \cdot F_p \quad E_h = 4248 \cdot \text{lbf} \quad E_{vw} := (1) \cdot (0.2) \cdot (S_{DS}) \cdot (W_p) \quad E_v = 1062 \cdot \text{lbf} \quad \text{Eq 12.4-4}$$

Max. downward Reaction per weld

$$P_{down} := \left[\left(\frac{1}{0.5 \cdot N} \right) \cdot \left(\frac{0.7 \cdot E_h \cdot e_1 + 1 \cdot W_p \cdot e_2 + 0.7 \cdot E_v \cdot e_2}{e_2 + e_3} \right) \right] \quad P_{down} = 741 \cdot \text{lbf}$$

Max. uplift Reaction per weld

$$P_{up} := \max \left[\left(\frac{1}{0.5 \cdot N} \right) \cdot \left[\frac{0.7 \cdot E_h \cdot e_1 + (-0.6) \cdot W_p \cdot e_2 + 0.7 \cdot E_v \cdot e_2}{e_2 + e_3} \right], 0 \text{ lbf} \right] \quad P_{up} = 0 \cdot \text{lbf}$$

Max. Shear Reaction per weld

$$V_h := 0.7 \cdot \frac{E_h}{N} \quad V_h = 175 \cdot \text{lbf}$$

Allowable tension / shear per weld $T_w := 0.4 \cdot (70 \cdot \text{ksi}) \cdot \frac{3.14}{4} \cdot \left(\frac{5}{8}\right)^2 \cdot \text{in}^2$

$T_w = 8586 \cdot \text{lbf} > P_{\text{down}} = 740.771 \cdot \text{lbf} \quad \text{ok}$

$> V_h = 174.918 \cdot \text{lbf} \quad \text{ok}$

4) LEHE2081 CAT Diesel Generator Seismic Anchorage:

Generator Dead Load $W_p := 30349 \cdot \text{lbf}$

From Table 13.6-1 for rigid equipment, non ductile shallow anchors and ASCE 7-05 section 13.4.2, & Table 11.5-1

$a_p := 1$ $R_p := 1.5$ $h_a := 0 \text{ft}$
 $z_x := 0 \cdot \text{ft}$ $I_p := 1$

$F_p := \frac{(0.4) \cdot (a_p) \cdot (S_{DS}) \cdot (I_p)}{(R_p)} \cdot \left[1 + 2 \cdot \left(\frac{z_x}{h_r} \right) \right] \cdot W_p$ $F_p = 4775 \cdot \text{lbf}$ Eq 13.3-1

$F_{p_{\text{max}}} := 1.6 \cdot S_{DS} \cdot I_p \cdot W_p$ $F_{p_{\text{max}}} = 28649 \cdot \text{lbf} > F_p = 4775 \cdot \text{lbf} \quad \text{OK}$ Eq 13.3-2

$F_{p_{\text{min}}} := 0.3 \cdot S_{DS} \cdot I_p \cdot W_p$ $F_{p_{\text{min}}} = 5372 \cdot \text{lbf} > F_p = 4775 \cdot \text{lbf} \quad \text{Governs}$ Eq 13.3-3

Use $F_p := F_{p_{\text{min}}}$

Applicable Load combination per AISC 7-05, **D+0.7E** (Section 2.4.1, Combination)
0.6D - 0.7E (Section 2.4.1, Combination 8)

Vertical Distance from center of gravity to connection, e.1 $e_1 := 60 \cdot \text{in}$
Horizontal Distance from center of gravity to left connection, e.2 $e_2 := 52 \cdot \text{in}$
Horizontal Distance from center of gravity to right connection, e.3 $e_3 := 52 \cdot \text{in}$
Number of anchors considered in the analysis, N $N := 8$

Per ASCE 7-05 Section 12.4.2, plus 1.3 increase per section 13.4.2, $E = E_h + E_v$

$E_h := 1.3 \cdot F_p$ $E_h = 6983 \cdot \text{lbf}$ $E_v := (1.3) \cdot (0.2) \cdot (S_{DS}) \cdot (W_p)$ $E_v = 4656 \cdot \text{lbf}$ Eq 12.4-4

Max. downward Reaction per anchor

$P_{\text{down}} := \left[\left(\frac{1}{0.5 \cdot N} \right) \cdot \left(\frac{0.7 \cdot E_h \cdot e_1 + 1 \cdot W_p \cdot e_2 + 0.7 \cdot E_v \cdot e_2}{e_2 + e_3} \right) \right]$ $P_{\text{down}} = 4906 \cdot \text{lbf}$

Max. uplift Reaction per anchor

$$P_{\text{up}} := \max \left[\left(\frac{1}{0.5 \cdot N} \right) \cdot \left[\frac{0.7 \cdot E_h \cdot e_1 + (-0.6) \cdot W_p \cdot e_2 + 0.7 \cdot E_v \cdot e_2}{e_2 + e_3} \right], 0 \text{ lbf} \right] \quad P_{\text{up}} = 0 \cdot \text{lbf}$$

Max. Shear Reaction per corner

$$V_{\text{lb}} := 0.7 \cdot \frac{E_h}{N} \quad V_h = 611 \cdot \text{lbf}$$

4.1) CHECK 1/2"φ HILTI KB-TZ - 3 1/4" EFFECTIVE EMBED (4" TOTAL EMBED) INTO CONC. (ICC ESR-1917):

Strength Reduction Factors, Steel-Tension $\phi_{\text{st}} := 0.75$ ACI 318-05 D4.4

Strength Reduction Factors, Steel-Shear $\phi_{\text{ss}} := 0.65$

Strength Reduction Factors, Concrete-Tension $\phi_{\text{ct}} := 0.65$ Condition B

Strength Reduction Factors, Concrete-Tension $\phi_{\text{cs}} := 0.7$ Condition B

Number of Bolts, $n := 1$

Bolt outside Diameter: $d := .5$ in

Effective Depth of Bolt (Table 3): $h_{\text{ef}} := 3.25$ in

Min. Concrete thickness (Table 3): $h_{\text{min}} := 6$ in

Critical Edge Distance (Table 3): $C_{\text{cr}} := 7.5$ in

Min. Edge Distance (Table 3): $C_{\text{min}} := 2.375$ in

Min. Anchor Spacing (Table 3): $S_{\text{min}} := 2.375$ in

Min. hole depth in Concrete (Table 3): $h := 4$ in

Hilti KB TZ yield Strength (Table 3): $f_y := 84800$ psi

Hilti KB TZ Ult. Strength (Table 3): $f_{\text{ult}} := 106000$ psi

Effective tensile Hilti Bolt Area (Table 3): $A_{\text{se}} := 0.101$ in²

Hilti KB TZ Strength in Tension (Table 3): $N_s := 10705$ lbf

Hilti KB TZ Strength in Shear-Seismic (Table 3): $V_{\text{seis}} := 6405$ lbf

Pullout Strength-Uncracked concrete (Table 3): $N_{\text{pr,uncr}} := 5515$ lbf

(E) Concrete Strength (assumed): $f'_c := 2500$ psi

For Normal wt. Concrete $\lambda := 1$

Actual Edge Distance, $C := C_{\text{min}}$

Actual Bolts Spacing, $C := \min(C, C_{ac})$ $C = 2.375$ in
 $S := 0$ in

1A. STEEL STRENGTH IN TENSION

$N_s := \frac{(\phi_{st}) \cdot n \cdot f_{ut} \cdot A_{se}}{1000} \cdot k$ $N_s = 8.03 \cdot k$

1B. ALLOWABLE CONCRETE BREAKOUT STRENGTH IN TENSION ACI 318-05 D4.1.1, D.4.1.2
D.5.1.2 & D.5.2.2

$k_{con} := 17$ ACI 318-05 D.5.2.2 $\psi_{unc_N} := 1.41$ ICC, Table 3

$\psi_{ec_N} := 1.41$ ACI 318-05 D.5.2.4 $\psi_{ed_N} := 1$ ACI 318-05 D.5.2.5

$\psi_{con_N} := \max\left(\frac{1.5 \cdot h_{ef}}{C_{ac}}, \frac{C}{C_{ac}}\right)$ Hilti KB TZ ICC ESR-1917, section 4.1.3, Table 3

Concrete Breakout Area in Tension based on 1.5xhef Edge distance (one bolt): $A_{Nco} := 9 \cdot h_{ef}^2$ $A_{Nco} = 95.063$ in²

Concrete Breakout Area in Tension based on Actual Edge distance (Curb Condition) for C>1.5 hef: $A_{Nc} := (1.5 \cdot h_{ef} + 1.5 \cdot h_{ef} + S) \cdot (1.5 \cdot h_{ef} + 1.5 \cdot h_{ef})$
 $A_{Nc} = 95.063$ in²

$N_{cbg} := \frac{\lambda \cdot \left(\phi_{ct} \cdot \frac{A_{Nc}}{A_{Nco}} \cdot \psi_{ec_N} \cdot \psi_{ed_N} \cdot \psi_{unc_N} \cdot \psi_{cp_N} \right) \cdot \left(k_{unc} \cdot \sqrt{f_c} \cdot h_{ef}^{1.5} \right)}{1000} \cdot k$ $N_{cbg} = 4.183 \cdot k$

1C. ALLOWABLE CONCRETE BREAKOUT STRENGTH IN TENSION PER ICC ESR-1917

$N_{pn_{fc}} := (\phi_{ct}) \cdot (n) \cdot (N_{p_{uncr}}) \cdot \left(\sqrt{\frac{f_c}{2500}} \right) \cdot \text{lbf}$ $N_{pn_{fc}} = 3.58 \cdot k$

Net Tension Strength, $T_{all} := \min(N_{cbg}, N_{pn_{fc}}, N_s)$ $T_{all} = 3.585 \cdot k$

2A. ALLOWABLE CONCRETE BREAKOUT IN SHEAR ACI 318-05 D.6.2.1b & D.6.2.3

Length of Bolt for shear (torque-controlled Anchors) $l_{ev} := 2 \cdot d_o$ ACI 318-05 D.6.2.2

$l_e = 1$ in

Concrete Breakout Area in Shear based on Actual Edge distance for concrete thickness > 1.5xC: $A_{Vc} := [(1.5 \cdot C) \cdot (2) + S] \cdot (1.5 \cdot C)$
 $A_{Vc} = 25.38$ in²

Concrete Breakout Area in Shear based on single Bolt projected area:

$$A_{V_{co}} := 4.5 \cdot C^2$$

$$A_{V_{co}} = 25.38 \text{ in}^2$$

$$\psi_{ec_{-V}} := 1$$

ACI 318-05 D.6.2.5

$$\psi_{ed_{-V}} := 1$$

ACI 318-05 D.6.2.6

$$\psi_{c_{-V}} := 1$$

ACI 318-05 D.6.2.7

$$V_c := \frac{\lambda \cdot \left(\phi_{cs} \cdot \frac{A_{Vc}}{A_{Vco}} \cdot \psi_{ec_{-V}} \cdot \psi_{ed_{-V}} \cdot \psi_{c_{-V}} \right) \cdot \left[8 \cdot \left(\frac{l_e}{d_o} \right)^{0.2} \cdot \sqrt{d_o} \cdot \sqrt{f_c} \cdot C^{1.5} \right]}{1000} \cdot k \quad V_c = 0.832 \cdot k$$

2B. ALLOWABLE CONCRETE BREAKOUT STRENGTH IN SHEAR PER ICC ESR-1917

$$V_{pn_{fc}} := (\phi_{ct}) \cdot (n) \cdot (V_{seis}) \cdot \left(\sqrt{\frac{f_c}{2500}} \right) \cdot \text{lbf} \quad V_{pn_{fc}} = 4.16 \cdot k$$

Net Shear Strength,

$$V_{all} := \min(V_c, V_{pn_{fc}})$$

$$V_{all} = 0.832 \cdot k$$

C. ACTUAL LOADING -STRENGTH LEVEL

$$V_u := V_h \quad V_u = 611.039 \cdot \text{lbf} < \quad V_{all} = 832 \cdot \text{lbf}$$

$$T_u := P_{up} \quad T_u = 0 \cdot \text{lbf} < \quad T_{all} = 3585 \cdot \text{lbf}$$

D. CHECK COMBINED SHEAR AND TENSION FOR CONCRETE

$$\left[\left(\frac{V_u}{V_{all}} \right) + \left(\frac{T_u}{T_{all}} \right) \right] = 0.734 < 1.2 \quad \text{OK}$$

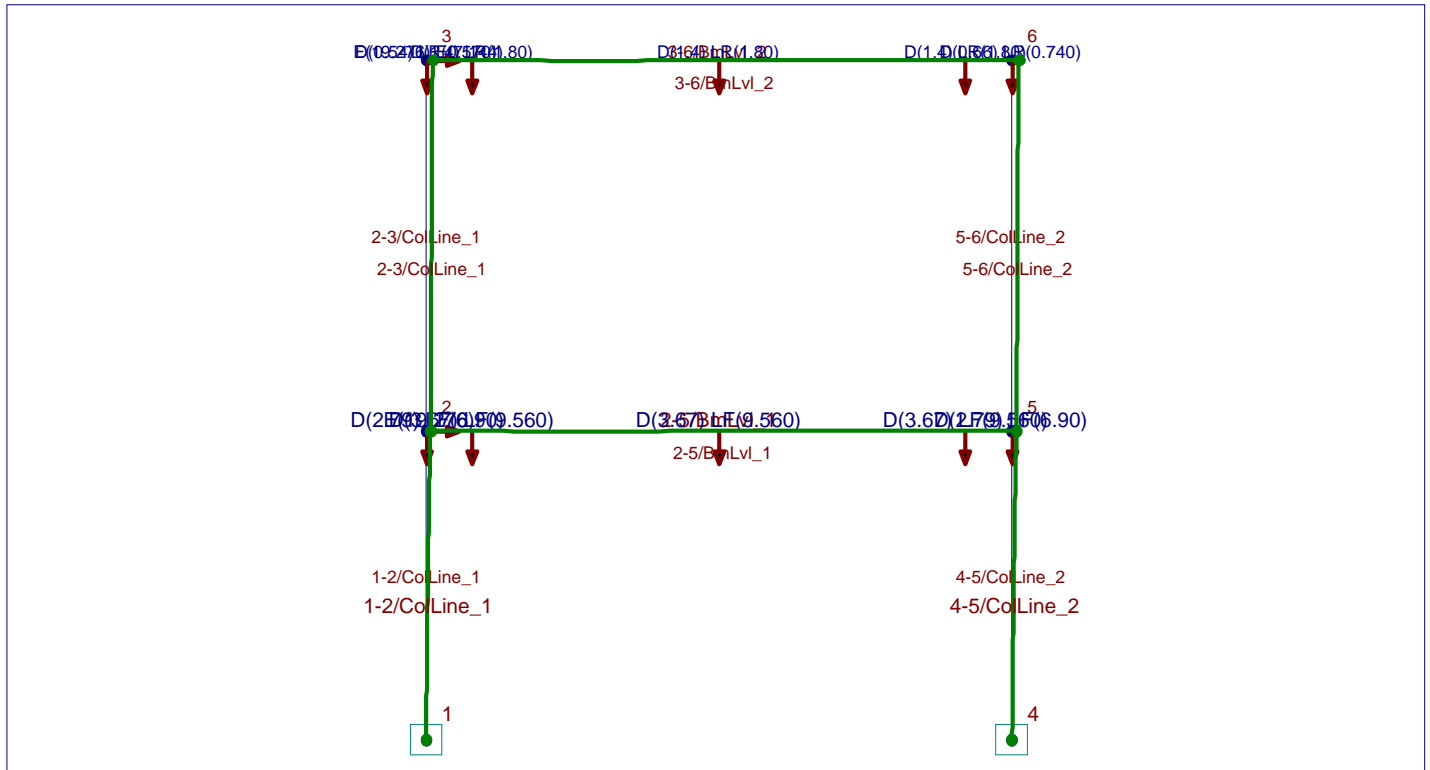
2-D Frame Analysis

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 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Frame Design-Line 1



Joints...

Joint Label	Joint Coordinates X ft Y ft		X Restraint	Y Restraint	Z Restraint	Joint Temp deg F
1	0.0	0.0	Fixed	Fixed		0
2	0.0	10.0				0
3	0.0	22.0				0
4	19.0	0.0	Fixed	Fixed		0
5	19.0	10.0				0
6	19.0	22.0				0

Members...

Member Label	Property Label	Endpoint Joints		Member Length ft	I End Releases			J End Releases		
		I Joint	J Joint		X	Y	Z	X	Y	Z
1-2	ColLine 1	1	2	10.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
2-3	ColLine 1	2	3	12.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
2-5	BmLvl 1	2	5	19.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
3-6	BmLvl 2	3	6	19.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
4-5	ColLine 2	4	5	10.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
5-6	ColLine 2	5	6	12.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

Materials...

Member Label	Youngs ksi	Density kcf	Thermal in/deg	Yield ksi
Default Steel	1.00 29,000.00	0.000 0.490	0.000000 0.000650	1.00 50.00

Member Sections...

Prop Label	Group Tag	Material	Area	Depth	Width	Ixx	Iyy
Default	Group	Default	1.0 in ²	0.0 in	0.0 in	1.0 in ⁴	1.0 in ⁴
W14X43	ColLine 1	Steel	12.60 in ²	13.70 in	8.0 in	428.0 in ⁴	45.20 in ⁴
W14X43	ColLine 2	Steel	12.60 in ²	13.70 in	8.0 in	428.0 in ⁴	45.20 in ⁴

Project Notes :

Printed: 22 MAR 2011, 11:40AM

2-D Frame Analysis

\\NS-SERV\shared\NS PROJECTS\JUN 10642 Colusa Casino-Keystone Engineering\Frame Analysis & Design.ecf
 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Frame Design-Line 1

Member Sections...

Prop Label	Group Tag	Material	Area	Depth	Width	Ixx	Iyy
W18X60	BmLvl 1	Steel	17.60 in ²	18.20 in	7.560 in	984.0 in ⁴	50.10 in ⁴
W10X30	BmLvl 2	Steel	8.840 in ²	10.50 in	5.810 in	170.0 in ⁴	16.70 in ⁴

Joint Loads....

Joint Label	Load Direction	Load Magnitude						
		Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
2	Global X					19.276		k
3	Global X					7.144		k

Member Point Loads....

Member Label	Load Direction	Distance from "I" Joint	Load Magnitude						
			Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
3-6	Global Y	1.5 ft	1.40	1.80					k
3-6	Global Y	9.5 ft	1.40	1.80					k
3-6	Global Y	17.5 ft	1.40	1.80					k
3-6	Global Y	0 ft	0.540	0.570					k
3-6	Global Y	19 ft	0.660	0.740					k
2-5	Global Y	1.5 ft	3.670		9.560				k
2-5	Global Y	9.5 ft	3.670		9.560				k
2-5	Global Y	17.5 ft	3.670		9.560				k
2-5	Global Y	0 ft	2.790		6.90				k
2-5	Global Y	19 ft	2.790		6.90				k

Load Combinations...

Load Combination Description	Group Multiplier	Self Weight Factors		Load Combination Factors						
		X	Y	Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
+D	1.0	-1.0	-1.0	1.0						
+D+L+H	1.0	-1.0	-1.0	1.0		1.0				1.0
+D+Lr+H	1.0	-1.0	-1.0	1.0	1.0					1.0
+D+S+H	1.0	-1.0	-1.0	1.0			1.0			1.0
+D+0.750Lr+0.750L+H	1.0	-1.0	-1.0	1.0	0.750	0.750				1.0
+D+0.750L+0.750S+H	1.0	-1.0	-1.0	1.0		0.750	0.750			1.0
+D+W+H	1.0	-1.0	-1.0	1.0					1.0	1.0
+D+0.70E+H	1.0	-1.0	-1.0	1.0				0.70		1.0
+D+0.750Lr+0.750L+0.750W+H	1.0	-1.0	-1.0	1.0	0.750	0.750			0.750	1.0
+D+0.750L+0.750S+0.750W+H	1.0	-1.0	-1.0	1.0		0.750	0.750		0.750	1.0
+D+0.750Lr+0.750L+0.5250E+H	1.0	-1.0	-1.0	1.0	0.750	0.750		0.5250		1.0
+D+0.750L+0.750S+0.5250E+H	1.0	-1.0	-1.0	1.0		0.750	0.750	0.5250		1.0
+0.60D+W+H	1.0	-1.0	-1.0	0.60					1.0	1.0
+0.60D+0.70E+H	1.0	-1.0	-1.0	0.60				0.70		1.0
+1.40D	1.0	-1.0	-1.0	1.40						
+1.20D+0.50Lr+1.60L+1.60H	1.0	-1.0	-1.0	1.20	0.50	1.60				1.60
+1.20D+1.60L+0.50S+1.60H	1.0	-1.0	-1.0	1.20		1.60	0.50			1.60
+1.20D+1.60Lr+0.50L	1.0	-1.0	-1.0	1.20	1.60	0.50				
+1.20D+1.60Lr+0.80W	1.0	-1.0	-1.0	1.20	1.60				0.80	
+1.20D+0.50L+1.60S	1.0	-1.0	-1.0	1.20		0.50	1.60			
+1.20D+1.60S+0.80W	1.0	-1.0	-1.0	1.20			1.60		0.80	
+1.20D+0.50Lr+0.50L+1.60W	1.0	-1.0	-1.0	1.20	0.50	0.50			1.60	
+1.20D+0.50L+0.50S+1.60W	1.0	-1.0	-1.0	1.20		0.50	0.50		1.60	
+1.20D+0.50L+0.20S+E	1.0	-1.0	-1.0	1.20		0.50	0.20	1.0		
+0.90D+1.60W+1.60H	1.0	-1.0	-1.0	0.90					1.60	1.60
+0.90D+E+1.60H	1.0	-1.0	-1.0	0.90				1.0		1.60

Extreme Joint Displacements & Reactions

Only Load Combinations giving maximum values are listed

Joint Label	Joint Displacements			Joint Reactions		
	X in	Y in	Z Radians	X k	Y k	Z k-ft
1						
Max	.0000	.0000	0.000527	2.727	50.539	
	+0.90D+E+1.60H	+0.90D+E+1.60H	+0.90D+E+1.60H	+0.90D+E+1.60H	+0.90D+E+1.60H	+0.90D+E+1.60H
Min	.0000	.0000	-0.01008	-12.799	-6.778	
	1.20D+1.60L+0.50S+1.60H	1.20D+0.50Lr+1.60L+1.60	+0.90D+E+1.60H	+0.90D+E+1.60H	+0.90D+E+1.60H	+0.90D+E+1.60H

2-D Frame Analysis

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 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Frame Design-Line 1

Extreme Joint Displacements & Reactions				Only Load Combinations giving maximum values are listed			
Joint Label	Joint Displacements			Joint Reactions			
	X in	Y in	Z Radians	X k	Y k	Z k-ft	
2	Max	0.9123 <i>+1.20D+0.50L+0.20S+E</i>	0.002296 <i>+0.90D+E+1.60H</i>	-0.000121 <i>+0.60D+W+H</i>			
	Min	-0.000343 <i>+1.20D+1.60Lr+0.80W</i>	-0.01653 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-0.002963 <i>+1.20D+0.50L+0.20S+E</i>			
3	Max	1.322 <i>+1.20D+0.50L+0.20S+E</i>	0.002112 <i>+0.90D+E+1.60H</i>	0.000233 <i>1.20D+1.60L+0.50S+1.60H</i>			
	Min	0.000339 <i>+0.60D+W+H</i>	-0.01863 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-0.002313 <i>+0.90D+E+1.60H</i>			
4	Max	.0000 <i>+1.20D+0.50L+0.20S+E</i>	.0000 <i>+0.60D+W+H</i>	-0.000610 <i>+0.60D+W+H</i>	-0.3131 <i>+0.60D+W+H</i>	50.768 <i>1.20D+0.50Lr+1.60L+1.60</i>	
	Min	.0000 <i>+0.60D+W+H</i>	.0000 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-0.01036 <i>+1.20D+0.50L+0.20S+E</i>	-14.424 <i>+1.20D+0.50L+0.20S+E</i>	8.431 <i>+0.60D+W+H</i>	
5	Max	0.9082 <i>+1.20D+0.50L+0.20S+E</i>	-0.002698 <i>+0.60D+W+H</i>	0.001054 <i>1.20D+1.60L+0.50S+1.60H</i>			
	Min	.0000620 <i>1.20D+1.60L+0.50S+1.60H</i>	-0.01660 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-0.002301 <i>+0.90D+E+1.60H</i>			
6	Max	1.318 <i>+0.90D+E+1.60H</i>	-0.003565 <i>+0.60D+W+H</i>	0.000503 <i>+1.20D+1.60Lr+0.80W</i>			
	Min	-0.001319 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-0.01880 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-0.002207 <i>+1.20D+0.50L+0.20S+E</i>			

Extreme Member End Forces				Only Load Combinations giving maximum values are listed			
Member Label	Member " I " End Forces			Member " J " End Forces			
	Axial k	Shear k	Moment k-ft	Axial k	Shear k	Moment k-ft	
1-2	50.539 <i>+1.20D+0.50Lr+1.60L+1.60</i>	12.799 <i>+0.90D+E+1.60H</i>	25.999 <i>+0.90D+E+1.60H</i>	7.207 <i>+0.90D+E+1.60H</i>	2.727 <i>1.20D+1.60L+0.50S+1.60H</i>	127.99 <i>+0.90D+E+1.60H</i>	
1-2	-6.778 <i>+0.90D+E+1.60H</i>	-2.727 <i>1.20D+1.60L+0.50S+1.60H</i>	.0000 <i>+D+0.70E+H</i>	-50.110 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-12.799 <i>+0.90D+E+1.60H</i>	-27.268 <i>1.20D+1.60L+0.50S+1.60H</i>	
2-3	9.201 <i>+1.20D+1.60Lr+0.50L</i>	4.549 <i>+0.90D+E+1.60H</i>	25.999 <i>+0.90D+E+1.60H</i>	-0.1530 <i>+0.60D+0.70E+H</i>	3.212 <i>+1.20D+0.50Lr+1.60L+1.60</i>	28.590 <i>+0.90D+E+1.60H</i>	
2-3	0.6675 <i>+0.60D+0.70E+H</i>	-3.212 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-27.530 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-8.686 <i>+1.20D+1.60Lr+0.50L</i>	-4.549 <i>+0.90D+E+1.60H</i>	-16.634 <i>+1.20D+1.60Lr+0.50L</i>	
2-5	9.085 <i>+1.20D+0.50L+0.20S+E</i>	44.507 <i>1.20D+1.60L+0.50S+1.60H</i>	54.262 <i>+1.20D+0.50Lr+1.60L+1.60</i>	1.881 <i>+1.20D+1.60Lr+0.80W</i>	44.507 <i>+1.20D+0.50Lr+1.60L+1.60</i>	28.590 <i>+0.90D+E+1.60H</i>	
2-5	-1.881 <i>+1.20D+1.60Lr+0.80W</i>	-7.930 <i>+0.90D+E+1.60H</i>	-141.12 <i>+0.90D+E+1.60H</i>	-9.085 <i>+1.20D+0.50L+0.20S+E</i>	-4.549 <i>+0.90D+E+1.60H</i>	-177.82 <i>+1.20D+0.50L+0.20S+E</i>	
3-6	5.737 <i>+0.90D+E+1.60H</i>	8.686 <i>+1.20D+1.60Lr+0.50L</i>	25.999 <i>+0.90D+E+1.60H</i>	-0.6849 <i>+0.60D+W+H</i>	9.101 <i>+1.20D+1.60Lr+0.50L</i>	28.590 <i>+0.90D+E+1.60H</i>	
3-6	0.6849 <i>+0.60D+W+H</i>	0.1530 <i>+0.60D+0.70E+H</i>	-18.007 <i>+0.90D+E+1.60H</i>	-5.338 <i>+1.20D+0.50L+0.20S+E</i>	-4.549 <i>+0.90D+E+1.60H</i>	-30.477 <i>+1.20D+0.50L+0.20S+E</i>	
4-5	50.768 <i>+1.20D+0.50Lr+1.60L+1.60</i>	14.424 <i>+1.20D+0.50L+0.20S+E</i>	25.999 <i>+0.90D+E+1.60H</i>	-5.222 <i>+0.90D+E+1.60H</i>	-0.3131 <i>+0.60D+W+H</i>	144.24 <i>+1.20D+0.50L+0.20S+E</i>	
4-5	5.737 <i>+0.90D+E+1.60H</i>	0.3131 <i>+0.60D+W+H</i>	.0000 <i>+D+0.70E+H</i>	-50.339 <i>+1.20D+0.50Lr+1.60L+1.60</i>	-14.424 <i>+1.20D+0.50L+0.20S+E</i>	3.131 <i>+0.60D+W+H</i>	
5-6	9.616 <i>+1.20D+1.60Lr+0.50L</i>	5.338 <i>+1.20D+0.50L+0.20S+E</i>	33.584 <i>+1.20D+0.50L+0.20S+E</i>	-1.942 <i>+0.60D+W+H</i>	-0.6849 <i>+0.60D+W+H</i>	30.477 <i>+1.20D+0.50L+0.20S+E</i>	
5-6	2.456 <i>+0.60D+W+H</i>	0.6849 <i>+0.60D+W+H</i>	4.431 <i>+0.60D+W+H</i>	-9.101 <i>+1.20D+1.60Lr+0.50L</i>	-5.338 <i>+1.20D+0.50L+0.20S+E</i>	3.787 <i>+0.60D+W+H</i>	

Extreme Member Forces				Only Load Combinations giving maximum values are listed			
Member Label	Axial	Distance from "I" Joint	Moment	Distance from "I" Joint	Shear	Distance from "I" Joint	
	1-2	50.539k <i>+1.20D+0.50Lr+1.60L+1.60</i>	0.0 ft	27.268 k-ft <i>1.20D+1.60L+0.50S+1.60H</i>	10.0 ft	12.799 k <i>+0.90D+E+1.60H</i>	0.0 ft
1-2	-7.207k <i>+0.90D+E+1.60H</i>	10.0 ft	-127.99 k-ft <i>+0.90D+E+1.60H</i>	10.0 ft	-2.727 k <i>1.20D+1.60L+0.50S+1.60H</i>	0.0 ft	
2-3	9.201k <i>+1.20D+1.60Lr+0.50L</i>	0.0 ft	16.634 k-ft <i>+1.20D+1.60Lr+0.50L</i>	12.0 ft	2.595 k <i>+0.90D+E+1.60H</i>	0.0 ft	
2-3	0.1530k <i>+0.60D+0.70E+H</i>	12.0 ft	-27.530 k-ft <i>+1.20D+0.50Lr+1.60L+1.60</i>	0.0 ft	-3.212 k <i>+D+0.50Lr+1.60L+1.60H</i>	0.0 ft	

2-D Frame Analysis

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Description : Frame Design-Line 1

Extreme Member Forces

Only Load Combinations giving maximum values are listed

Member Label	Axial	Distance from "I" Joint	Moment	Distance from "I" Joint	Shear	Distance from "I" Joint
2-5	9.085k	0.0 ft	177.82 k-ft	19.0 ft	30.119 k	0.0 ft
<i>Max</i>	$+1.20D+0.50L+0.20S+E$		$+1.20D+0.50L+0.20S+E$		$1.20D+1.60L+0.50S+1.60H$	
	-1.881k	0.0 ft	-141.12 k-ft	0.0 ft	-30.310 k	19.0 ft
<i>Min</i>	$+1.20D+1.60Lr+0.80W$		$+0.90D+E+1.60H$		$+1.20D+0.50L+0.20S+E$	
3-6	5.338k	0.0 ft	30.477 k-ft	19.0 ft	7.126 k	0.0 ft
<i>Max</i>	$+1.20D+0.50L+0.20S+E$		$+1.20D+0.50L+0.20S+E$		$+1.20D+1.60Lr+0.50L$	
	0.6849k	0.0 ft	-18.007 k-ft	0.0 ft	-7.125 k	19.0 ft
<i>Min</i>	$+0.60D+W+H$		$+0.90D+E+1.60H$		$+1.20D+1.60Lr+0.50L$	
4-5	50.768k	0.0 ft	0.0 k-ft	0.0 ft	14.424 k	0.0 ft
<i>Max</i>	$+1.20D+0.50Lr+1.60L+1.60H$		$+D$		$+1.20D+0.50L+0.20S+E$	
	8.002k	10.0 ft	-144.24 k-ft	10.0 ft	0.3131 k	0.0 ft
<i>Min</i>	$+0.60D+W+H$		$+1.20D+0.50L+0.20S+E$		$+0.60D+W+H$	
5-6	9.616k	0.0 ft	33.584 k-ft	0.0 ft	5.338 k	0.0 ft
<i>Max</i>	$+1.20D+1.60Lr+0.50L$		$+1.20D+0.50L+0.20S+E$		$+1.20D+0.50L+0.20S+E$	
	1.942k	12.0 ft	-30.477 k-ft	12.0 ft	0.6849 k	0.0 ft
<i>Min</i>	$+0.60D+W+H$		$+1.20D+0.50L+0.20S+E$		$+0.60D+W+H$	

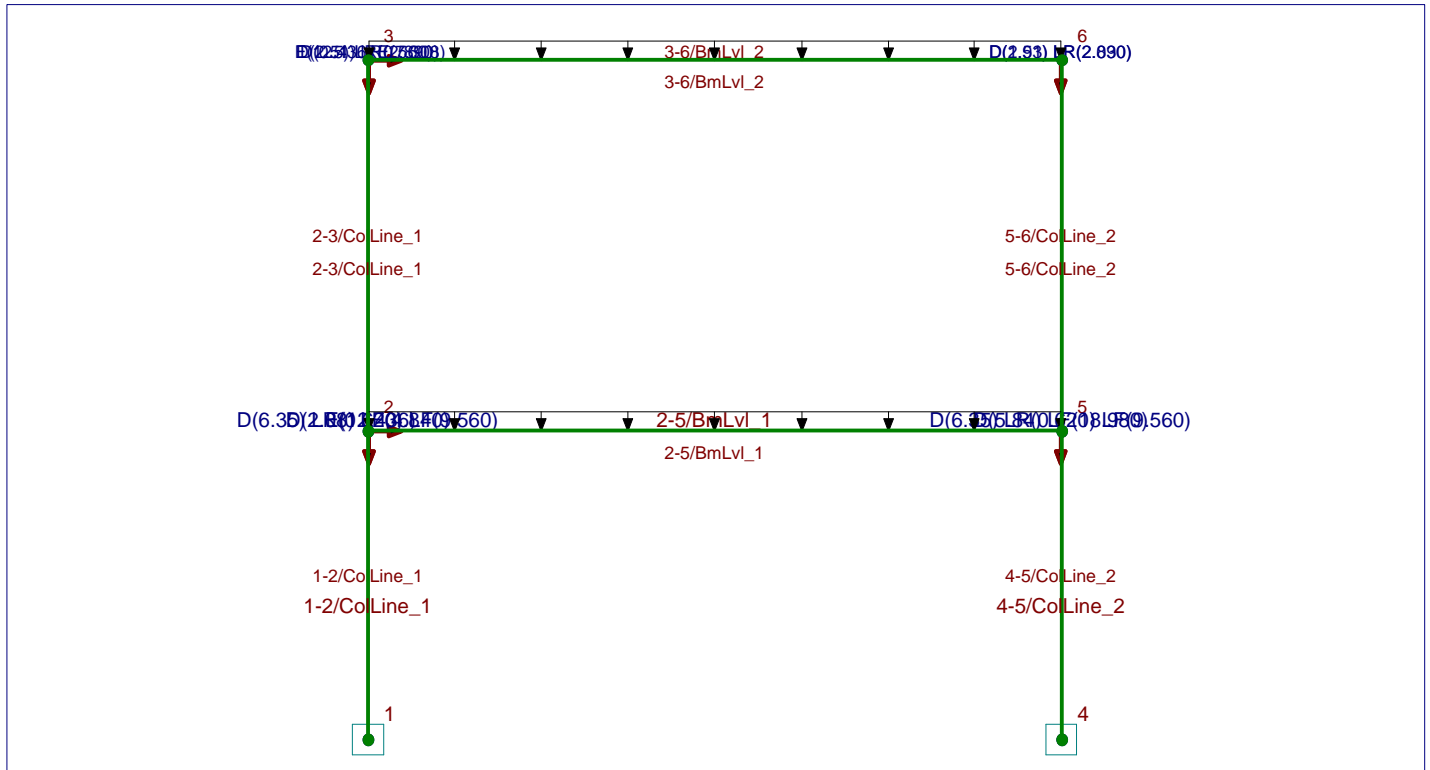
2-D Frame Analysis

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Description : Frame Design-Line B



Joints...

Joint Label	Joint Coordinates X ft Y ft		X Restraint	Y Restraint	Z Restraint	Joint Temp deg F
1	0.0	0.0	Fixed	Fixed		0
2	0.0	10.0				0
3	0.0	22.0				0
4	22.50	0.0	Fixed	Fixed		0
5	22.50	10.0				0
6	22.50	22.0				0

Members...

Member Label	Property Label	Endpoint Joints		Member Length ft	I End Releases			J End Releases		
		I Joint	J Joint		X	Y	Z	X	Y	Z
1-2	ColLine 1	1	2	10.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
2-3	ColLine 1	2	3	12.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
2-5	BmLvl 1	2	5	22.500	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
3-6	BmLvl 2	3	6	22.500	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
4-5	ColLine 2	4	5	10.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
5-6	ColLine 2	5	6	12.000	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

Materials...

Member Label	Youngs ksi	Density kcf	Thermal in/deg	Yield ksi
Default Steel	1.00 29,000.00	0.000 0.490	0.000000 0.000650	1.00 50.00

Member Sections...

Prop Label	Group Tag	Material	Area	Depth	Width	Ixx	Iyy
Default	Group	Default	1.0 in ²	0.0 in	0.0 in	1.0 in ⁴	1.0 in ⁴
W14X53	ColLine 1	Steel	15.60 in ²	13.90 in	8.060 in	541.0 in ⁴	57.70 in ⁴
W14X53	ColLine 2	Steel	15.60 in ²	13.90 in	8.060 in	541.0 in ⁴	57.70 in ⁴

2-D Frame Analysis

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Description : Frame Design-Line B

Member Sections...

Prop Label	Group Tag	Material	Area	Depth	Width	Ixx	Iyy
W18X60	BmLvl 1	Steel	17.60 in ²	18.20 in	7.560 in	984.0 in ⁴	50.10 in ⁴
W10X30	BmLvl 2	Steel	8.840 in ²	10.50 in	5.810 in	170.0 in ⁴	16.70 in ⁴

Joint Loads....

Joint Label	Load Direction	Load Magnitude						
		Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
2	Global X					12.436		k
3	Global X					7.308		k

Member Point Loads....

Member Label	Load Direction	Distance from "I" Joint	Load Magnitude						
			Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
3-6	Global Y	0 ft	2.510	2.890					k
3-6	Global Y	22.5 ft	2.510	2.890					k
3-6	Global Y	0 ft	0.50	0.560					k
3-6	Global Y	22.5 ft	1.930	2.030					k
2-5	Global Y	22.5 ft	6.350	0.620	9.560				k
2-5	Global Y	0 ft	6.350	0.620	9.560				k
2-5	Global Y	0 ft	2.080		4.840				k
2-5	Global Y	22.5 ft	5.840		18.980				k

Member Distributed Loads....

Member Label	Load Direction	Load Extents		Load Magnitude						
		Start	End	Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
3-6	Global Y	0.0	Start Mag :	0.030	0.050					k/ft
		20.0	End Mag :	0.030	0.050					k/ft
2-5	Global Y	0.0	Start Mag :	0.090		0.430				k/ft
		22.50	End Mag :	0.150		0.430				k/ft

Load Combinations...

Load Combination Description	Group Multiplier	Self Weight Factors		Load Combination Factors						
		X	Y	Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
+D	1.0	-1.0		1.0						
+D+L+H	1.0	-1.0		1.0		1.0				1.0
+D+Lr+H	1.0	-1.0		1.0	1.0					1.0
+D+S+H	1.0	-1.0		1.0			1.0			1.0
+D+0.750Lr+0.750L+H	1.0	-1.0		1.0	0.750	0.750				1.0
+D+0.750L+0.750S+H	1.0	-1.0		1.0		0.750	0.750			1.0
+D+W+H	1.0	-1.0		1.0					1.0	1.0
+D+0.70E+H	1.0	-1.0		1.0				0.70		1.0
+D+0.750Lr+0.750L+0.750W+H	1.0	-1.0		1.0	0.750	0.750			0.750	1.0
+D+0.750L+0.750S+0.750W+H	1.0	-1.0		1.0		0.750	0.750		0.750	1.0
+D+0.750Lr+0.750L+0.5250E+H	1.0	-1.0		1.0	0.750	0.750		0.5250		1.0
+D+0.750L+0.750S+0.5250E+H	1.0	-1.0		1.0		0.750	0.750	0.5250		1.0
+0.60D+W+H	1.0	-1.0		0.60					1.0	1.0
+0.60D+0.70E+H	1.0	-1.0		0.60				0.70		1.0
+1.40D	1.0	-1.0		1.40						
+1.20D+0.50Lr+1.60L+1.60H	1.0	-1.0		1.20	0.50	1.60				1.60
+1.20D+1.60L+0.50S+1.60H	1.0	-1.0		1.20		1.60	0.50			1.60
+1.20D+1.60Lr+0.50L	1.0	-1.0		1.20	1.60	0.50				
+1.20D+1.60Lr+0.80W	1.0	-1.0		1.20	1.60				0.80	
+1.20D+0.50L+1.60S	1.0	-1.0		1.20		0.50	1.60			
+1.20D+1.60S+0.80W	1.0	-1.0		1.20			1.60		0.80	
+1.20D+0.50Lr+0.50L+1.60W	1.0	-1.0		1.20	0.50	0.50			1.60	
+1.20D+0.50L+0.50S+1.60W	1.0	-1.0		1.20		0.50	0.50		1.60	
+1.20D+0.50L+0.20S+E	1.0	-1.0		1.20		0.50	0.20	1.0		
+0.90D+1.60W+1.60H	1.0	-1.0		0.90					1.60	1.60
+0.90D+E+1.60H	1.0	-1.0		0.90				1.0		1.60

2-D Frame Analysis

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 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

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Description : Frame Design-Line B

Extreme Joint Displacements & Reactions				Only Load Combinations giving maximum values are listed		
Joint Label	Joint Displacements			Joint Reactions		
	X in	Y in	Z Radians	X k	Y k	Z k-ft
1 Max	.0000	.0000	0.000209	1.525	50.886	
	<i>+0.90D+E+1.60H</i>	<i>+0.60D+0.70E+H</i>	<i>1.20D+1.60L+0.50S+1.60H</i>	<i>1.20D+1.60L+0.50S+1.60H+1.20D+0.50Lr+1.60L+1.60</i>	<i>1.20D+1.60L+0.50S+1.60H</i>	<i>1.20D+0.50Lr+1.60L+1.60</i>
1 Min	.0000	.0000	-0.006827	-9.642	1.116	
	<i>1.20D+1.60L+0.50S+1.60H+1.20D+0.50Lr+1.60L+1.60</i>	<i>+0.90D+E+1.60H</i>	<i>+0.90D+E+1.60H</i>	<i>+0.90D+E+1.60H</i>	<i>+0.60D+0.70E+H</i>	
2 Max	0.6432	-0.000226	-0.000610			
	<i>+1.20D+0.50L+0.20S+E</i>	<i>+0.60D+0.70E+H</i>	<i>+0.60D+W+H</i>			
2 Min	.0000470	-0.01343	-0.002543			
	<i>+0.60D+W+H+1.20D+0.50Lr+1.60L+1.60</i>	<i>+1.20D+0.50L+0.20S+E</i>				
3 Max	1.041	-0.000650	0.000109			
	<i>+1.20D+0.50L+0.20S+E</i>	<i>+0.60D+0.70E+H</i>	<i>1.20D+1.60L+0.50S+1.60H</i>			
3 Min	0.000609	-0.01555	-0.002407			
	<i>+0.60D+W+H+1.20D+0.50Lr+1.60L+1.60</i>	<i>+0.90D+E+1.60H</i>				
4 Max	.0000	.0000	-0.000310	-0.1967	80.607	
	<i>+1.20D+0.50L+0.20S+E</i>	<i>+0.60D+W+H</i>	<i>+0.60D+W+H</i>	<i>+0.60D+W+H+1.20D+0.50Lr+1.60L+1.60</i>		
4 Min	.0000	.0000	-0.006945	-10.539	13.195	
	<i>+0.60D+W+H+1.20D+0.50Lr+1.60L+1.60</i>	<i>+1.20D+0.50L+0.20S+E</i>	<i>+1.20D+0.50L+0.20S+E</i>	<i>+0.60D+W+H</i>		
5 Max	0.640	-0.003430	0.000443			
	<i>+1.20D+0.50L+0.20S+E</i>	<i>+0.60D+W+H</i>	<i>1.20D+1.60L+0.50S+1.60H</i>			
5 Min	0.000140	-0.02131	-0.002235			
	<i>+0.60D+W+H+1.20D+0.50Lr+1.60L+1.60</i>	<i>+0.90D+E+1.60H</i>				
6 Max	1.037	-0.004537	0.000107			
	<i>+1.20D+0.50L+0.20S+E</i>	<i>+0.60D+W+H</i>	<i>+1.20D+1.60Lr+0.80W</i>			
6 Min	0.000217	-0.02417	-0.002412			
	<i>+0.60D+W+H+1.20D+0.50Lr+1.60L+1.60</i>	<i>+1.20D+0.50L+0.20S+E</i>				

Extreme Member End Forces				Only Load Combinations giving maximum values are listed		
Member Label	Member " I " End Forces			Member " J " End Forces		
	Axial k	Shear k	Moment k-ft	Axial k	Shear k	Moment k-ft
1-2 Max	50.886	9.642	25.787	-0.5848	1.525	96.419
1-2 Min	1.116	-1.525	.0000	-50.355	-9.642	-15.251
2-3 Max	11.406	4.120	25.787	-1.015	1.544	23.656
2-3 Min	1.652	-1.544	-14.371	-10.769	-4.120	-5.888
2-5 Max	7.111	43.359	29.438	0.6128	70.777	23.656
2-5 Min	-0.6128	-1.399	-115.59	-6.474	-4.120	-135.06
3-6 Max	7.111	10.769	25.787	-0.3724	14.560	23.656
3-6 Min	0.3724	1.015	-19.083	-6.474	-4.120	-24.163
4-5 Max	80.607	10.539	25.787	-6.474	-0.1967	105.39
4-5 Min	7.111	0.1967	.0000	-80.076	-10.539	1.967
5-6 Max	15.197	4.486	29.670	-3.160	-0.3724	24.163
5-6 Min	3.797	0.3724	2.571	-14.560	-4.486	1.898

Extreme Member Forces				Only Load Combinations giving maximum values are listed			
Member Label	Axial	Distance from "I" Joint	Moment	Distance from "I" Joint	Shear	Distance from "I" Joint	
	1-2 Max	50.886k	0.0 ft	15.251 k-ft	10.0 ft	9.642 k	0.0 ft
1-2 Min	0.5848k	10.0 ft	-96.419 k-ft	10.0 ft	-1.525 k	0.0 ft	

2-D Frame Analysis

NS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Frame Analysis & Design.ec6
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Frame Design-Line B

Extreme Member Forces

Only Load Combinations giving maximum values are listed

Member Label	Axial	Distance from "I" Joint	Moment	Distance from "I" Joint	Shear	Distance from "I" Joint
2-3	11.406k	0.0 ft	19.170 k-ft	0.0 ft	3.188 k	0.0 ft
<i>Max</i>	$+1.20D+1.60Lr+0.80W$		$+0.90D+E+1.60H$		$+0.90D+E+1.60H$	
	1.015k	12.0 ft	-19.083 k-ft	12.0 ft	-1.544 k	0.0 ft
<i>Min</i>	$+0.60D+0.70E+H$		$+0.90D+E+1.60H$		$1D+0.50Lr+1.60L+1.60H$	
2-5	6.053k	0.0 ft	135.06 k-ft	22.50 ft	9.894 k	0.0 ft
<i>Max</i>	$+1.20D+0.50L+0.20S+E$		$+1.20D+0.50L+0.20S+E$		$1D+1.60L+0.50S+1.60H$	
	-0.6128k	0.0 ft	-115.59 k-ft	0.0 ft	-15.622 k	22.50 ft
<i>Min</i>	$+1.20D+1.60Lr+0.80W$		$+0.90D+E+1.60H$		$+1.20D+0.50L+0.20S+E$	
3-6	4.486k	0.0 ft	24.163 k-ft	22.50 ft	1.637 k	0.0 ft
<i>Max</i>	$+1.20D+0.50L+0.20S+E$		$+1.20D+0.50L+0.20S+E$		$+1.20D+1.60Lr+0.50L$	
	0.3724k	0.0 ft	-19.083 k-ft	0.0 ft	-2.557 k	22.50 ft
<i>Min</i>	$+0.60D+W+H$		$+0.90D+E+1.60H$		$+1.20D+0.50L+0.20S+E$	
4-5	80.607k	0.0 ft	0.0 k-ft	0.0 ft	10.539 k	0.0 ft
<i>Max</i>	$1.20D+0.50Lr+1.60L+1.60H$		$+D$		$+1.20D+0.50L+0.20S+E$	
	12.665k	10.0 ft	-105.39 k-ft	10.0 ft	0.1967 k	0.0 ft
<i>Min</i>	$+0.60D+W+H$		$+1.20D+0.50L+0.20S+E$		$+0.60D+W+H$	
5-6	15.197k	0.0 ft	29.670 k-ft	0.0 ft	4.486 k	0.0 ft
<i>Max</i>	$+1.20D+1.60Lr+0.80W$		$+1.20D+0.50L+0.20S+E$		$+1.20D+0.50L+0.20S+E$	
	3.160k	12.0 ft	-24.163 k-ft	12.0 ft	0.3724 k	0.0 ft
<i>Min</i>	$+0.60D+W+H$		$+1.20D+0.50L+0.20S+E$		$+0.60D+W+H$	

Steel Stress Checks...

Using 13th Edition AISC Code

Member Label	Section Label	Material	Max. Axial + Bending Stress Ratios				Max. Shear Stress Ratios			
			Load Combination	Ratio	Status	Dist (ft)	Load Combination	Ratio	Status	Dist (ft)
1-2	ColLine 1	Steel	+0.90D+E+1.60H	0.321	PASS	10.00	+0.90D+E+1.60H	0.062	PASS	0.00
2-3	ColLine 1	Steel	+0.90D+E+1.60H	0.069	PASS	0.00	+0.90D+E+1.60H	0.021	PASS	0.00
2-5	BmLvl 1	Steel	+1.20D+0.50L+0.20S+E	0.667	PASS	22.50	+1.20D+0.50L+0.20S+E	0.069	PASS	22.50
3-6	BmLvl 2	Steel	+1.20D+0.50L+0.20S+E	0.474	PASS	22.50	+1.20D+0.50L+0.20S+E	0.027	PASS	22.50
4-5	ColLine 2	Steel	+1.20D+0.50L+0.20S+E	0.400	PASS	10.00	+1.20D+0.50L+0.20S+E	0.068	PASS	0.00
5-6	ColLine 2	Steel	+1.20D+0.50L+0.20S+E	0.113	PASS	0.00	+1.20D+0.50L+0.20S+E	0.029	PASS	0.00

Concrete Slender Wall

File: WNS-SERV\shared\NS PROJECTS\SUN 10642 Colusa Casino-Keystone Engineering\Tilt Up Wall Check.ecf
ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Slender Wall at Line E (& LINE 5) - beam 4 Support

General Information

Calculations per ACI 318-08 Sec 14.8, IBC 2009, CBC 2010, ASCE 7-05

fc : Concrete 28 day strength = 3.0 ksi	Wall Thickness = 8.0 in	Temp Diff across thickness = deg F
Fy : Rebar Yield = 60.0 ksi	Rebar at each face	Min Allow Out-of-Plane Defl Ratio = L / 150.0
Ec : Concrete Elastic Modulus = 3,122.0 ksi	Rebar "d" distance = 1.250 in	Minimum Vertical Steel % = 0.0020
Fr : Rupture Modulus = 273.86 psi	Lower Level Rebar . . .	
Max % of ρ balanced = 0.60	Bar Size # = 5	
Max Pu/Ag = f'c * = 0.060	Bar Spacing = 6.0 in	
Concrete Density = 144.0 pcf		
Width of Design Strip = 24.0 in		

One-Story Wall Dimensions

A Clear Height = 23.0 ft
B Parapet height = 3.0 ft
Wall Support Condition Top & Bottom Pinned
Initial Lateral Disp. @ Top Support = 0.750 in



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)

Ledger Load Eccentricity = 6.750 in	DL : Dead Load = 0.030	Lr : Roof Live Load = 0.050	Lf : Floor Live Load	S : Snow Load	k/ft
Concentric Load					k/ft

Vertical Concentrated Loads . . . (Applied to full "Strip Width")

Beam Load #1 Eccentricity = 6.750 in	DL : Dead Load = 6.330	Lr : Roof Live Load = 5.380	Lf : Floor Live Load	S : Snow Load	k
Dist. from Base = 23.0 ft	Bearing Width	6.0 in	Base Width		1.0 ft

Lateral Loads

Full area WIND load = 20.0 psf	Wall Weight Seismic Load Input Method : ASCE seismic factors entered
Fp = Wall Wt. * 0.2360 = 22.656 psf	SDS Value per ASCE 12.11.1
	S _{DS} = 0.590

DESIGN SUMMARY

Results reported for "Strip Width" of 24.0 in

	Governing Load Combination . . .	Actual Values . . .	Allowable Values . . .
PASS	Moment Capacity Check +1.20D+1.60Lr+0.80W	Maximum Bending Stress Ratio = 0.3104	
		Max Mu = 9.110 k-ft	Phi * Mn = 29.353 k-ft
PASS	Service Deflection Check D + 0.5(L+Lr)+ 0.7E	Min. Defl. Ratio = 2,031.91	Max Allow Ratio = 150.0
		Max. Deflection = 0.1358 in	Max. Allow. Defl. = 1.840 in
PASS	Axial Load Check +1.20D+1.60Lr+0.50L at 20.70 to 21.47	Max Pu / Ag = 91.969 psi	0.06 * f'c = 180.0 psi
PASS	Reinforcing Limit Check +1.40D	Controlling As/bd = 0.007654	As/bd = 0.50 rho bal = 0.01283
PASS	Minimum Moment Check +1.20D+1.60Lr+0.50L	Mcracking = 6.729 k-ft	Minimum Phi Mn = 28.588 k-ft
		Maximum Reactions . . . for Load Combination...	
		Top Horizontal E Only	661.36 lbs
		Base Horizontal D + L + W + S/2	608.86 lbs
		Vertical Reaction D + L + Lr	16.862 k



Title : Colusa Casino - Building extension

Job # 10642

Dsgnr:

Project Desc.: Tilt Up Wall Design

Project Notes :

Printed: 22 MAR 2011, 1:28PM

Concrete Slender Wall

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Slender Wall at Line E (& LINE 5) - beam 4 Support

Design Maximum Combinations - Moments

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Moment Values			As in ²	As Eff in ²	As Ratio	0.6 * rho bal
	Pu k	0.06*fc*b*t k			Phi	Phi Mn k-ft	As				

Design Maximum Combinations - Deflections

Load Combination	Axial Load	Moment Values		Stiffness			Deflections	
	Pu k	Mcr k-ft	Mactual k-ft	I gross in ⁴	I cracked in ⁴	I effective in ⁴	Deflection in	Defl. Ratio

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
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Concrete Slender Wall

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 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Slender Wall at Line 7 (& LINE B) - beam 8 Support

General Information

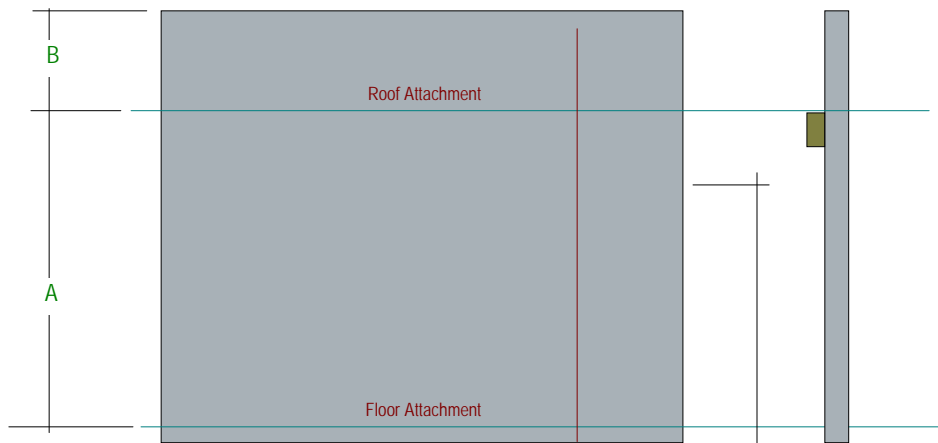
Calculations per ACI 318-08 Sec 14.8, IBC 2009, CBC 2010, ASCE 7-05

fc : Concrete 28 day strength = 3.0 ksi	Wall Thickness = 8.0 in	Temp Diff across thickness = deg F
Fy : Rebar Yield = 60.0 ksi	Rebar at each face	Min Allow Out-of-Plane Defl Ratio = L / 150.0
Ec : Concrete Elastic Modulus = 3,122.0 ksi	Rebar "d" distance = 1.250 in	Minimum Vertical Steel % = 0.0020
Fr : Rupture Modulus = 273.86 psi	Lower Level Rebar . . .	
Max % of ρ balanced = 0.60	Bar Size # = 5	
Max Pu/Ag = fc * = 0.060	Bar Spacing = 6.0 in	
Concrete Density = 144.0 pcf		
Width of Design Strip = 24.0 in		

One-Story Wall Dimensions

A Clear Height = 23.0 ft
B Parapet height = 3.0 ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)

Ledger Load Eccentricity = 6.750 in	DL : Dead Load = 0.030	Lr : Roof Live Load = 0.050	Lf : Floor Live Load	S : Snow Load	k/ft
Concentric Load					k/ft

Vertical Concentrated Loads . . . (Applied to full "Strip Width")

Beam Load #1 Eccentricity = 6.750 in	DL : Dead Load = 10.678	Lr : Roof Live Load = 8.215	Lf : Floor Live Load	S : Snow Load	k
Dist. from Base = 23.0 ft	Bearing Width	6.0 in	Base Width	1.0 ft	

Lateral Loads

Full area WIND load = 20.0 psf
Fp = Wall Wt. * 0.2360 = 22.656 psf

Wall Weight Seismic Load Input Method : ASCE seismic factors entered
 SDS Value per ASCE 12.11.1
 S_{DS} = 0.590

DESIGN SUMMARY

Results reported for "Strip Width" of 24.0 in

	Governing Load Combination . . .	Actual Values . . .	Allowable Values . . .
PASS	Moment Capacity Check +1.20D+1.60Lr+0.80W	Maximum Bending Stress Ratio = 0.5211 Max Mu = 14.462 k-ft	Phi * Mn = 27.750 k-ft
PASS	Service Deflection Check D + 0.5(L+Lr)+ 0.7E	Min. Defl. Ratio = 1,112.88 Max. Deflection = 0.2480 in	Max Allow Ratio = 150.0 Max. Allow. Defl. = 1.840 in
PASS	Axial Load Check +1.20D+1.60Lr+0.50L at 20.70 to 21.47	Max Pu / Ag = 142.79 psi	0.06 * fc = 180.0 psi
PASS	Reinforcing Limit Check +1.40D	Controlling As/bd = 0.007654	As/bd = 0.50 rho bal = 0.01283
PASS	Minimum Moment Check +1.20D+1.60Lr+0.50L	Mcracking = 6.729 k-ft	Minimum Phi Mn = 27.025 k-ft
		Maximum Reactions . . . for Load Combination...	
		Top Horizontal E Only	661.36 lbs
		Base Horizontal D + L + W + S/2	716.19 lbs
		Vertical Reaction D + L + Lr	24.045 k



Title : Colusa Casino - Building extension
 Dsgnr:
 Project Desc.: Tilt Up Wall Design

Job # 10642

Project Notes :

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Concrete Slender Wall

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 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Slender Wall at Line 7 (& LINE B) - beam 8 Support

Design Maximum Combinations - Moments

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Moment Values			As in ²	As Eff in ²	As Ratio	0.6 * rho bal
	Pu k	0.06*fc*b*t k			Phi	Phi Mn k-ft	As				

Design Maximum Combinations - Deflections

Load Combination	Axial Load	Moment Values		Stiffness			Deflections	
	Pu k	Mcr k-ft	Mactual k-ft	I gross in ⁴	I cracked in ⁴	I effective in ⁴	Deflection in	Defl. Ratio

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
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Concrete Slender Wall

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Slender Wall at Line 7 - Typical (one story tilt up wall)

General Information

Calculations per ACI 318-08 Sec 14.8, IBC 2009, CBC 2010, ASCE 7-05

fc : Concrete 28 day strength = 3.0 ksi	Wall Thickness = 8.0 in	Temp Diff across thickness = deg F
Fy : Rebar Yield = 60.0 ksi	Rebar at wall center	Min Allow Out-of-Plane Defl Ratio = L / 150.0
Ec : Concrete Elastic Modulus = 3,122.0 ksi	Rebar "d" distance = 4.0 in	Minimum Vertical Steel % = 0.0020
Fr : Rupture Modulus = 273.86 psi	Lower Level Rebar . . .	
Max % of ρ balanced = 0.60	Bar Size # = 5	
Max Pu/Ag = f'c * = 0.060	Bar Spacing = 16.0 in	
Concrete Density = 144.0 pcf		
Width of Design Strip = 12.0 in		

One-Story Wall Dimensions

A Clear Height = 23.0 ft
B Parapet height = 3.0 ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)

Ledger Load Eccentricity = 6.750 in
Concentric Load

DL : Dead Load = 0.130	Lr : Roof Live Load = 0.210	Lf : Floor Live Load	S : Snow Load	k/ft
				k/ft

Lateral Loads

Full area WIND load = 20.0 psf
Fp = Wall Wt. * 0.2360 = 22.656 psf

Wall Weight Seismic Load Input Method : ASCE seismic factors entered
SDS Value per ASCE 12.11.1
S_{DS} = 0.590

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

Governing Load Combination . . .	Actual Values . . .	Allowable Values . . .
PASS Moment Capacity Check +0.90D+1.60W	Maximum Bending Stress Ratio = 0.4994	
	Max Mu = 2.123 k-ft	Phi * Mn = 4.251 k-ft
PASS Service Deflection Check D + L + W + S/2	Min. Defl. Ratio = 3,439.62	Max Allow Ratio = 150.0
	Max. Deflection = 0.08024 in	Max. Allow. Defl. = 1.840 in
PASS Axial Load Check +1.20D+1.60Lr+0.80W at 11.50 to 12.27	Max Pu / Ag = 22.525 psi	0.06 * f'c = 180.0 psi
PASS Reinforcing Limit Check +1.40D	Controlling As/bd = 0.004844	As/bd = 0.50 rho bal = 0.01283
PASS Minimum Moment Check +1.40D	Mcracking = 2.921 k-ft	Minimum Phi Mn = 3.947 k-ft
	Maximum Reactions . . . for Load Combination . . .	
	Top Horizontal = E Only	330.68 lbs
	Base Horizontal = E Only	258.38 lbs
	Vertical Reaction = D + L + Lr	2.836 k



Title : Colusa Casino - Building extension

Job # 10642

Dsgnr:

Project Desc.: Tilt Up Wall Design

Project Notes :

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Concrete Slender Wall

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Slender Wall at Line 7 - Typical (one story tilt up wall)

Design Maximum Combinations - Moments

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Moment Values			As Eff in ²	As Ratio	0.6 * rho bal
	Pu k	0.06*fc*b*t k			Phi	Phi Mn k-ft	As in ²			

Design Maximum Combinations - Deflections

Load Combination	Axial Load	Moment Values		Stiffness			Deflections	
	Pu k	Mcr k-ft	Mactual k-ft	I gross in ⁴	I cracked in ⁴	I effective in ⁴	Deflection in	Defl. Ratio

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
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Concrete Slender Wall

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Slender Wall at Line 4 - Typical (2- story tilt up wall)

General Information

Calculations per ACI 318-08 Sec 14.8, IBC 2009, CBC 2010, ASCE 7-05

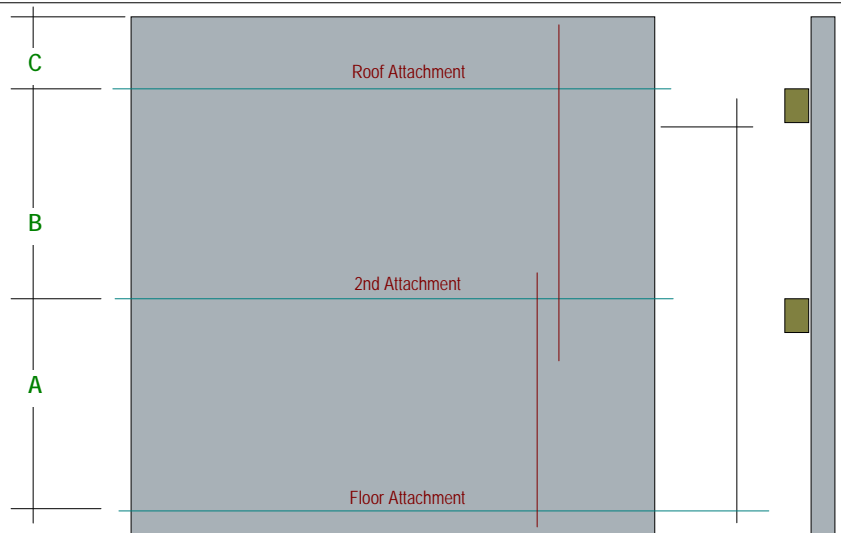
f _c : Concrete 28 day strength = 3.0 ksi	Wall Thickness = 8.0 in	Temp Diff across thickness = deg F
F _y : Rebar Yield = 60.0 ksi	Rebar at wall center	Min Allow Out-of-Plane Defl Ratio = L / 150.0
E _c : Concrete Elastic Modulus = 3,122.0 ksi	Rebar "d" distance = 4.0 in	Minimum Vertical Steel % = 0.0020
F _r : Rupture Modulus = 273.86 psi	Lower Level Rebar . . .	
Max % of ρ balanced = 0.60	Bar Size # = 5	
Max Pu/Ag = f _c * = 0.060	Bar Spacing = 16.0 in	
Concrete Density = 144.0 pcf	Upper Level Rebar . . .	
Width of Design Strip = 12.0 in	Bar Size # = 5	
	Bar Spacing = 16.0 in	

Two-Story Wall Dimensions

A 1st Story Height = 12.0 ft
B 2nd Story Height = 11.0 ft
C Parapet height = 3.0 ft

Wall Support Condition Top & Bottom Pinned

Initial Lateral Disp. @ Top Support 0.0 in



Vertical Loads

<u>Vertical Uniform Loads . . . (Applied per foot of Strip Width)</u>		<u>DL : Dead Load</u>	<u>Lr : Roof Live Load</u>	<u>Lf : Floor Live Load</u>	<u>S : Snow Load</u>
Ledger Load Eccentricity	6.750 in	0.240	0.40	0.0	0.0 k/ft
Concentric Load		0.0	0.0	0.0	0.0 k/ft
<u>Mid-Height Vertical Uniform Loads . . . (Applied per foot of Strip Width)</u>		<u>DL : Dead Load</u>	<u>Lr : Roof Live Load</u>	<u>Lf : Floor Live Load</u>	<u>S : Snow Load</u>
Ledger Load Eccentricity	6.75 in	0.40	0.0	1.113	0.0 k/ft
Concentric Load		0.0	0.0	0.0	0.0 k/ft

Lateral Loads

Full area WIND load = 20.0 psf	Wall Weight Seismic Load Input Method : ASCE seismic factors entered
F _p = Wall Wt. * 0.2360 = 22.656 psf	SDS Value per ASCE 12.11.1
	S _{DS} = 0.590

Concrete Slender Wall

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Slender Wall at Line 4 - Typical (2- story tilt up wall)

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

Governing Load Combination . . .		Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50Lr+0.50L+1.60W	Maximum Bending Stress Ratio =	0.1879	Phi * Mn	4.408 k-ft
PASS	Service Deflection Check D + L + W + S/2	Max Mu	0.8285 k-ft	Max Allow Ratio	150.0
PASS	Axial Load Check +1.20D+1.60Lr+0.80W at 12.00 to 12.37	Min. Defl. Ratio	22,430.5	Max. Allow. Defl.	0.960 in
PASS	Reinforcing Limit Check +1.40D	Max. Deflection	0.006420 in	0.06 * f'c	180.0 psi
PASS	Minimum Moment Check +1.40D	Max Pu / Ag	26.467 psi	Controlling As/bd	0.004844
				As/bd = 0.50 rho bal	0.01283
		Mcracking	2.921 k-ft	Minimum Phi Mn	3.947 k-ft
		Maximum Reactions . . .	<i>for Load Combination...</i>		
		Top Horizontal	E Only		166.99 lbs
		Base Horizontal	D + L + W + S/2		124.76 lbs
		Mid-Ht Horizontal	E Only		316.0 lbs
		Vertical Reaction	D + L + Lr		4.649 k

Design Maximum Combinations - Moments

Load Combination	Axial Load		Mcr	Mu	Moment Values			As	As Eff	As Ratio	0.6 * rho bal
	Pu	0.06*f'c*b*t			Phi	Phi Mn	As				
	k	k	k-ft	k-ft		k-ft	in^2	in^2			

Design Maximum Combinations - Deflections

Load Combination	Axial Load	Moment Values		I gross	Stiffness		Deflections	
	Pu	Mcr	Mactual		I cracked	I effective	Deflection	Defl. Ratio
	k	k-ft	k-ft	in^4	in^4	in^4	in	

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Mid Horizontal	Top Horizontal	Vertical @ Wall Base

General Footing

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Check Footing Under Bm 15 middle support

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9304	Soil Bearing	2.326 ksf	2.50 ksf	+D+L+H
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.2530	Z Flexure (+X)	13.643 k-ft	53.922 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2530	Z Flexure (-X)	13.643 k-ft	53.922 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2530	X Flexure (+Z)	13.643 k-ft	53.922 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2530	X Flexure (-Z)	13.643 k-ft	53.922 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1875	1-way Shear (+X)	15.402 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1875	1-way Shear (-X)	15.402 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1875	1-way Shear (+Z)	15.402 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1875	1-way Shear (-Z)	15.402 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3471	2-way Punching	57.031 psi	164.32 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	+Z	Actual Soil Bearing Stress			Actual / Allowable Ratio
					+Z	-X	-X	
X-X, +D	2.50	n/a	0.0	1.203	1.203	n/a	n/a	0.481
X-X, +D+L+H	2.50	n/a	0.0	2.326	2.326	n/a	n/a	0.930
X-X, +D+Lr+H	2.50	n/a	0.0	1.481	1.481	n/a	n/a	0.592
X-X, +D+0.750Lr+0.750L+H	2.50	n/a	0.0	2.254	2.254	n/a	n/a	0.902
X-X, +D+0.750L+0.750S+H	2.50	n/a	0.0	2.045	2.045	n/a	n/a	0.818
X-X, +D+0.750Lr+0.750L+0.750W+H	2.50	n/a	0.0	2.254	2.254	n/a	n/a	0.902
X-X, +D+0.750L+0.750S+0.750W+H	2.50	n/a	0.0	2.045	2.045	n/a	n/a	0.818
X-X, +D+0.750Lr+0.750L+0.5250E+H	2.50	n/a	0.0	2.254	2.254	n/a	n/a	0.902
X-X, +D+0.750L+0.750S+0.5250E+H	2.50	n/a	0.0	2.045	2.045	n/a	n/a	0.818
Z-Z, +D	2.50	0.0	n/a	n/a	n/a	1.203	1.203	0.481
Z-Z, +D+L+H	2.50	0.0	n/a	n/a	n/a	2.326	2.326	0.930
Z-Z, +D+Lr+H	2.50	0.0	n/a	n/a	n/a	1.481	1.481	0.592
Z-Z, +D+0.750Lr+0.750L+H	2.50	0.0	n/a	n/a	n/a	2.254	2.254	0.902
Z-Z, +D+0.750L+0.750S+H	2.50	0.0	n/a	n/a	n/a	2.045	2.045	0.818
Z-Z, +D+0.750Lr+0.750L+0.750W+H	2.50	0.0	n/a	n/a	n/a	2.254	2.254	0.902
Z-Z, +D+0.750L+0.750S+0.750W+H	2.50	0.0	n/a	n/a	n/a	2.045	2.045	0.818
Z-Z, +D+0.750Lr+0.750L+0.5250E+H	2.50	0.0	n/a	n/a	n/a	2.254	2.254	0.902
Z-Z, +D+0.750L+0.750S+0.5250E+H	2.50	0.0	n/a	n/a	n/a	2.045	2.045	0.818

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
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Footing Has NO Overturing

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status
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Footing Has NO Sliding

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	5.748	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.40D	5.748	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	13.643	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	13.643	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+1.60L+0.50S+1.60H	13.015	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+1.60L+0.50S+1.60H	13.015	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+1.60Lr+0.50L	9.462	+Z	Bottom	0.52	Bending	0.59	53.922	OK



Title : Colusa Casino - Building Expansion
 Dsgnr:
 Project Desc.: | Pad Design

Job # 10642

Project Notes :

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General Footing

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Description : Check Footing Under Bm 15 middle support

X-X, +1.20D+1.60Lr+0.50L	9.462	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+1.60Lr+0.80W	6.934	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+1.60Lr+0.80W	6.934	-Z	Bottom	0.52	Bending	0.59	53.922	OK

Project Notes :

Printed: 22 MAR 2011, 2:39PM

General Footing

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 ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

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Licensee :

Description : Check Footing Under Bm 15 middle support

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in ²	Gvrn. As in ²	Actual As in ²	Phi*Mn k-ft	Status
X-X, +1.20D+0.50L+1.60S	7.454	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+1.60S	7.454	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	8.082	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	8.082	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+0.50S+1.60W	7.454	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+0.50S+1.60W	7.454	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+0.20S+E	7.454	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+0.20S+E	7.454	-Z	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.40D	5.748	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.40D	5.748	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	13.643	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	13.643	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	13.015	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	13.015	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+1.60Lr+0.50L	9.462	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+1.60Lr+0.50L	9.462	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+1.60Lr+0.80W	6.934	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+1.60Lr+0.80W	6.934	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+1.60S	7.454	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+1.60S	7.454	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	8.082	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	8.082	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	7.454	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	7.454	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+0.20S+E	7.454	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+0.20S+E	7.454	+X	Bottom	0.52	Bending	0.59	53.922	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	6.489 psi	6.489 psi	6.489 psi	6.489 psi	6.489 psi	82.158 psi	0.07898	OK
+1.20D+0.50Lr+1.60L+1.60H	15.402 psi	15.402 psi	15.402 psi	15.402 psi	15.402 psi	82.158 psi	0.1875	OK
+1.20D+1.60L+0.50S+1.60H	14.693 psi	14.693 psi	14.693 psi	14.693 psi	14.693 psi	82.158 psi	0.1788	OK
+1.20D+1.60Lr+0.50L	10.682 psi	10.682 psi	10.682 psi	10.682 psi	10.682 psi	82.158 psi	0.13	OK
+1.20D+1.60Lr+0.80W	7.828 psi	7.828 psi	7.828 psi	7.828 psi	7.828 psi	82.158 psi	0.09529	OK
+1.20D+0.50L+1.60S	8.416 psi	8.416 psi	8.416 psi	8.416 psi	8.416 psi	82.158 psi	0.1024	OK
+1.20D+0.50Lr+0.50L+1.60W	9.124 psi	9.124 psi	9.124 psi	9.124 psi	9.124 psi	82.158 psi	0.1111	OK
+1.20D+0.50L+0.50S+1.60W	8.416 psi	8.416 psi	8.416 psi	8.416 psi	8.416 psi	82.158 psi	0.1024	OK
+1.20D+0.50L+0.20S+E	8.416 psi	8.416 psi	8.416 psi	8.416 psi	8.416 psi	82.158 psi	0.1024	OK

All units k

Punching Shear

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	24.027 psi	164.32psi	0.1462	OK
+1.20D+0.50Lr+1.60L+1.60H	57.031 psi	164.32psi	0.3471	OK
+1.20D+1.60L+0.50S+1.60H	54.408 psi	164.32psi	0.3311	OK
+1.20D+1.60Lr+0.50L	39.554 psi	164.32psi	0.2407	OK
+1.20D+1.60Lr+0.80W	28.988 psi	164.32psi	0.1764	OK
+1.20D+0.50L+1.60S	31.161 psi	164.32psi	0.1896	OK
+1.20D+0.50Lr+0.50L+1.60W	33.784 psi	164.32psi	0.2056	OK
+1.20D+0.50L+0.50S+1.60W	31.161 psi	164.32psi	0.1896	OK
+1.20D+0.50L+0.20S+E	31.161 psi	164.32psi	0.1896	OK

General Footing

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Pad Footing Under Frame 1 Column

General Information

Calculations per ACI 318-08, IBC 2009, CBC 2010, ASCE 7-05

Material Properties

f_c : Concrete 28 day strength	=	3.0	ksi
f_y : Rebar Yield	=	60.0	ksi
E_c : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
ϕ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	0.00140
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Sliding Safety Factor	=	1.50 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears :	:	Yes
Include Pedestal Weight as DL	:	No

Soil Design Values

Allowable Soil Bearing	=	3.30	ksf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

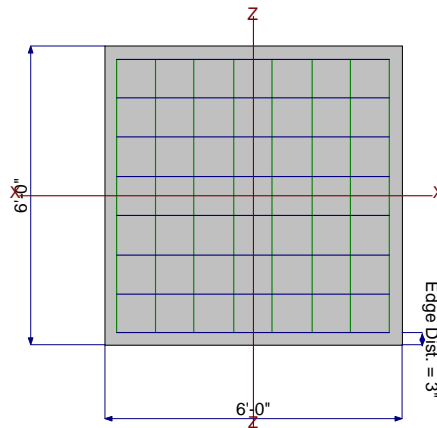
Footing base depth below soil surface	=	1.50	ft
Allowable pressure increase per foot of dept=	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

Allowable pressure increase per foot of dept=	=		ksf
when maximum length or width is greater=	=		ft

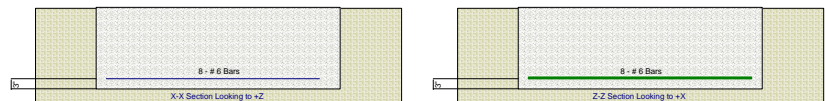
Dimensions

Width along X-X Axis	=	6.0	ft
Length along Z-Z Axis	=	6.0	ft
Footing Thicknes	=	24.0	in
Load location offset from footing center...			
ex : Along X-X Axis	=	0	in
ez : Along Z-Z Axis	=	0	in
Pedestal dimensions...			
px : Along X-X Axis	=		in
pz : Along Z-Z Axis	=		in
Height	=		in
Rebar Centerline to Edge of Concrete.			
at Bottom of footing	=	3.0	in



Reinforcing

Bars along X-X Axis	=	8.0
Number of Bars	=	# 6
Reinforcing Bar Size	=	# 6
Bars along Z-Z Axis	=	8.0
Number of Bars	=	# 6
Reinforcing Bar Size	=	# 6



Bandwidth Distribution Check (ACI 15.4.4.2)

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

Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	50.770					k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=					14.420	k
V-z	=						k

General Footing

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Pad Footing Under Frame 1 Column

DESIGN SUMMARY

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.6830	Soil Bearing	2.254 ksf	3.30 ksf	+D+0.70E+H
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	5.458	Overturing - Z-Z	20.188 k-ft	110.18 k-ft	0.6D+0.7E
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1858	Z Flexure (+X)	10.017 k-ft	53.922 k-ft	+1.20D+0.50L+0.20S+E
PASS	0.1647	Z Flexure (-X)	8.883 k-ft	53.922 k-ft	+1.40D
PASS	0.1647	X Flexure (+Z)	8.883 k-ft	53.922 k-ft	+1.40D
PASS	0.1647	X Flexure (-Z)	8.883 k-ft	53.922 k-ft	+1.40D
PASS	0.1221	1-way Shear (+X)	10.029 psi	82.158 psi	+1.40D
PASS	0.1221	1-way Shear (-X)	10.029 psi	82.158 psi	+1.40D
PASS	0.1221	1-way Shear (+Z)	10.029 psi	82.158 psi	+1.40D
PASS	0.1221	1-way Shear (-Z)	10.029 psi	82.158 psi	+1.40D
PASS	0.2260	2-way Punching	37.135 psi	164.32 psi	+1.40D

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xeccc	Zeccc	+Z	Actual Soil Bearing Stress			Actual / Allowable Ratio
					+Z	-X	-X	
X-X, +D	3.30	n/a	0.0	1.70	1.70	n/a	n/a	0.515
X-X, +D+0.70E+H	3.30	n/a	0.0	1.70	1.70	n/a	n/a	0.515
X-X, +D+0.750Lr+0.750L+0.5250E+H	3.30	n/a	0.0	1.70	1.70	n/a	n/a	0.515
X-X, +D+0.750L+0.750S+0.5250E+H	3.30	n/a	0.0	1.70	1.70	n/a	n/a	0.515
X-X, +0.60D+0.70E+H	3.30	n/a	0.0	1.020	1.020	n/a	n/a	0.309
Z-Z, +D	3.30	0.0	n/a	n/a	n/a	1.70	1.70	0.515
Z-Z, +D+0.70E+H	3.30	3.958	n/a	n/a	n/a	1.147	2.254	0.683
Z-Z, +D+0.750Lr+0.750L+0.5250E+H	3.30	2.968	n/a	n/a	n/a	1.285	2.115	0.641
Z-Z, +D+0.750L+0.750S+0.5250E+H	3.30	2.968	n/a	n/a	n/a	1.285	2.115	0.641
Z-Z, +0.60D+0.70E+H	3.30	6.596	n/a	n/a	n/a	0.4669	1.573	0.477

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
X-X, D	None	0.0 k-ft	Infinity	OK
X-X, 0.6D+0.7E	None	0.0 k-ft	Infinity	OK
Z-Z, D	None	0.0 k-ft	Infinity	OK
Z-Z, 0.6D+0.7E	20.188 k-ft	110.18 k-ft	5.458	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	8.883	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.40D	8.883	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+0.20S+E	7.614	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+0.20S+E	7.614	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +0.90D+E+1.60H	5.711	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +0.90D+E+1.60H	5.711	-Z	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.40D	8.883	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.40D	8.883	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+0.20S+E	5.211	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+0.20S+E	10.017	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +0.90D+E+1.60H	3.308	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +0.90D+E+1.60H	8.114	+X	Bottom	0.52	Bending	0.59	53.922	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	10.029 psi	10.029 psi	10.029 psi	10.029 psi	10.029 psi	82.158 psi	0.1221	OK
+1.20D+0.50L+0.20S+E	8.596 psi	8.596 psi	8.596 psi	8.596 psi	8.596 psi	82.158 psi	0.1046	OK
+0.90D+E+1.60H	6.447 psi	6.447 psi	6.447 psi	6.447 psi	6.447 psi	82.158 psi	0.07847	OK



Title : Colusa Casino - Building extension

Job # 10642

Dsgnr:

Project Desc.: Pad Design

Project Notes :

Printed: 22 MAR 2011, 2:45PM

General Footing

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Lic. # : KW-06008291

Licensee :

Description : Pad Footing Under Frame 1 Column

Punching Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	37.135 psi	164.32psi	0.226	OK
+1.20D+0.50L+0.20S+E	31.83 psi	164.32psi	0.1937	OK
+0.90D+E+1.60H	23.872 psi	164.32psi	0.1453	OK

General Footing

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Licensee :

Description : Pad Footing Under Frame B Column

General Information

Calculations per ACI 318-08, IBC 2009, CBC 2010, ASCE 7-05

Material Properties

f _c : Concrete 28 day strength	=	3.0	ksi
f _y : Rebar Yield	=	60.0	ksi
E _c : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	0.00140	
Min Allow % Temp Reinf.	=	0.00180	
Min. Overturning Safety Factor	=	1.50	: 1
Min. Sliding Safety Factor	=	1.50	: 1
Add Ftg Wt for Soil Pressure	:	Yes	
Use ftg wt for stability, moments & shears :		Yes	
Include Pedestal Weight as DL	:	No	

Soil Design Values

Allowable Soil Bearing	=	3.30	ksf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

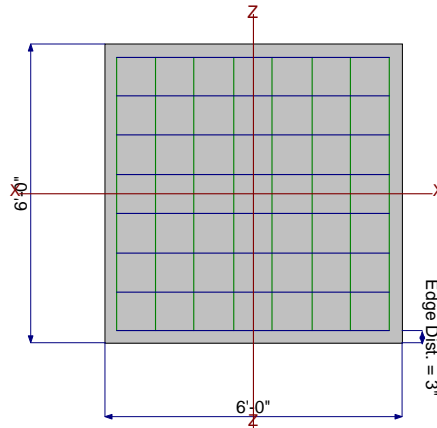
Footing base depth below soil surface	=	1.50	ft
Allowable pressure increase per foot of dept=			ksf
when footing base is below	=		ft

Increases based on footing plan dimension

Allowable pressure increase per foot of dept=			ksf
when maximum length or width is greater=			ft

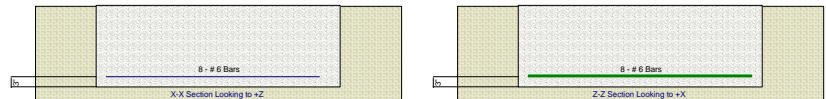
Dimensions

Width along X-X Axis	=	6.0	ft
Length along Z-Z Axis	=	6.0	ft
Footing Thicknes	=	24.0	in
Load location offset from footing center...			
ex : Along X-X Axis	=	0	in
ez : Along Z-Z Axis	=	0	in
Pedestal dimensions...			
px : Along X-X Axis	=		in
pz : Along Z-Z Axis	=		in
Height	=		in
Rebar Centerline to Edge of Concrete.			
at Bottom of footing	=	3.0	in



Reinforcing

Bars along X-X Axis	=	8.0	
Number of Bars	=	# 6	
Reinforcing Bar Size	=	# 6	
Bars along Z-Z Axis	=	8.0	
Number of Bars	=	# 6	
Reinforcing Bar Size	=	# 6	



Bandwidth Distribution Check (ACI 15.4.4.2)

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

Applied Loads

	D	L _r	L	S	W	E	H
P : Column Load	=	80.610					k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=					10.540	k
V-z	=						k

General Footing

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Licensee :

Description : Pad Footing Under Frame B Column

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8891	Soil Bearing	2.934 ksf	3.30 ksf	+D+0.70E+H
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	11.107	Overturing - Z-Z	14.756 k-ft	163.89 k-ft	0.6D+0.7E
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.2616	Z Flexure (+X)	14.104 k-ft	53.922 k-ft	+1.40D
PASS	0.2616	Z Flexure (-X)	14.104 k-ft	53.922 k-ft	+1.40D
PASS	0.2616	X Flexure (+Z)	14.104 k-ft	53.922 k-ft	+1.40D
PASS	0.2616	X Flexure (-Z)	14.104 k-ft	53.922 k-ft	+1.40D
PASS	0.1938	1-way Shear (+X)	15.923 psi	82.158 psi	+1.40D
PASS	0.1938	1-way Shear (-X)	15.923 psi	82.158 psi	+1.40D
PASS	0.1938	1-way Shear (+Z)	15.923 psi	82.158 psi	+1.40D
PASS	0.1938	1-way Shear (-Z)	15.923 psi	82.158 psi	+1.40D
PASS	0.3588	2-way Punching	58.960 psi	164.32 psi	+1.40D

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	+Z	Actual Soil Bearing Stress		-X	Actual / Allowable Ratio
					+Z	-X		
X-X, +D	3.30	n/a	0.0	2.529	2.529	n/a	n/a	0.766
X-X, +D+0.70E+H	3.30	n/a	0.0	2.529	2.529	n/a	n/a	0.766
X-X, +D+0.750Lr+0.750L+0.5250E+H	3.30	n/a	0.0	2.529	2.529	n/a	n/a	0.766
X-X, +D+0.750L+0.750S+0.5250E+H	3.30	n/a	0.0	2.529	2.529	n/a	n/a	0.766
X-X, +0.60D+0.70E+H	3.30	n/a	0.0	1.518	1.518	n/a	n/a	0.460
Z-Z, +D	3.30	0.0	n/a	n/a	n/a	2.529	2.529	0.766
Z-Z, +D+0.70E+H	3.30	1.945	n/a	n/a	n/a	2.125	2.934	0.889
Z-Z, +D+0.750Lr+0.750L+0.5250E+H	3.30	1.459	n/a	n/a	n/a	2.226	2.832	0.858
Z-Z, +D+0.750L+0.750S+0.5250E+H	3.30	1.459	n/a	n/a	n/a	2.226	2.832	0.858
Z-Z, +0.60D+0.70E+H	3.30	3.241	n/a	n/a	n/a	1.113	1.922	0.582

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
X-X, D	None	0.0 k-ft	Infinity	OK
X-X, 0.6D+0.7E	None	0.0 k-ft	Infinity	OK
Z-Z, D	None	0.0 k-ft	Infinity	OK
Z-Z, 0.6D+0.7E	14.756 k-ft	163.89 k-ft	11.107	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	14.104	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.40D	14.104	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+0.20S+E	12.089	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +1.20D+0.50L+0.20S+E	12.089	-Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +0.90D+E+1.60H	9.067	+Z	Bottom	0.52	Bending	0.59	53.922	OK
X-X, +0.90D+E+1.60H	9.067	-Z	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.40D	14.104	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.40D	14.104	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+0.20S+E	10.333	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +1.20D+0.50L+0.20S+E	13.846	+X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +0.90D+E+1.60H	7.311	-X	Bottom	0.52	Bending	0.59	53.922	OK
Z-Z, +0.90D+E+1.60H	10.823	+X	Bottom	0.52	Bending	0.59	53.922	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	15.923 psi	15.923 psi	15.923 psi	15.923 psi	15.923 psi	82.158 psi	0.1938	OK
+1.20D+0.50L+0.20S+E	13.648 psi	13.648 psi	13.648 psi	13.648 psi	13.648 psi	82.158 psi	0.1661	OK
+0.90D+E+1.60H	10.236 psi	10.236 psi	10.236 psi	10.236 psi	10.236 psi	82.158 psi	0.1246	OK



Title : Colusa Casino - Building extension

Job # 10642

Dsgnr:

Project Desc.: Pad Design

Project Notes :

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General Footing

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ENERCALC, INC. 1983-2011, Ver: 6.2.00, N:10513

Lic. # : KW-06008291

Licensee :

Description : Pad Footing Under Frame B Column

Punching Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	58.96 psi	164.32psi	0.3588	OK
+1.20D+0.50L+0.20S+E	50.538 psi	164.32psi	0.3076	OK
+0.90D+E+1.60H	37.903 psi	164.32psi	0.2307	OK

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Cantilevered Retaining Wall Design

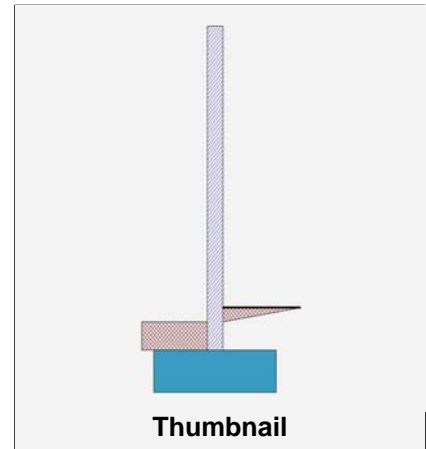
Code: CBC 2010

Criteria

Retained Height	=	1.50 ft
Wall height above soil	=	10.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	12.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	3,200.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	50.0 psf/ft
Toe Active Pressure	=	30.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.300
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 psf
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

Earth Pressure Seismic Load

Design Kh	=	0.236 g
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Using Mononobe-Okabe / Seed-Whitman procedure

Stem Weight Seismic Load

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
The above lateral load has been increased by a factor of		1.60

Wind on Exposed Stem	=	0.0 psf
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Kae for seismic earth pressure	=	0.638
Ka for static earth pressure	=	0.405
Difference: Kae - Ka	=	0.233

F_p / W_p Weight Multiplier	=	0.384 g
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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

Added seismic base force		81.8 lbs
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Added seismic base force		276.5 lbs
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Cantilevered Retaining Wall Design

Code: CBC 2010

Design Summary

Wall Stability Ratios			
Overturning	=	2.89	OK
Sliding	=	3.14	OK
Total Bearing Load	=	2,503 lbs	
...resultant ecc.	=	10.15 in	
Soil Pressure @ Toe	=	962 psf	OK
Soil Pressure @ Heel	=	8 psf	OK
Allowable	=	3,200 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,347 psf	
ACI Factored @ Heel	=	11 psf	
Footing Shear @ Toe	=	7.3 psi	OK
Footing Shear @ Heel	=	3.2 psi	OK
Allowable	=	82.2 psi	
Sliding Calcs (Vertical Component NOT Used)			
Lateral Sliding Force	=	489.6 lbs	
less 100% Passive Force	= -	787.5 lbs	
less 100% Friction Force	= -	750.9 lbs	
Added Force Req'd	=	0.0 lbs	OK
...for 1.5 : 1 Stability	=	0.0 lbs	OK

Load Factors

Building Code	CBC 2010
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Footing Dimensions & Strengths

Toe Width	=	2.25 ft
Heel Width	=	2.91
Total Footing Width	=	5.16
Footing Thickness	=	18.00 in
Key Width	=	12.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	1.92 ft
f'c =	3,000 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	3.00	@ Btm.= 3.00 in

Stem Construction

Design Height Above Ftg	ft =	0.00	Stem OK
Wall Material Above "Ht"	=	Masonry	
Thickness	=	8.00	
Rebar Size	=	# 5	
Rebar Spacing	=	16.00	
Rebar Placed at	=	Edge	

Design Data

fb/FB + fa/Fa	=	0.446
Total Force @ Section	lbs =	371.4
Moment....Actual	ft-# =	1,653.0
Moment....Allowable	=	3,708.0
Shear.....Actual	psi =	7.7
Shear.....Allowable	psi =	69.7
Wall Weight	=	63.0
Rebar Depth 'd'	in =	4.00
LAP SPLICE IF ABOVE	in =	45.00
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.39
Lap splice above base reduced by stress ratio		

Masonry Data

f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	No
Modular Ratio 'n'	=	21.48
Equiv. Solid Thick.	in =	5.80
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	LRFD

Concrete Data

f'c	psi =	
Fy	psi =	

Footing Design Results

	<u>Toe</u>	<u>Heel</u>
Factored Pressure	= 1,347	11 psf
Mu' : Upward	= 3,325	637 ft-#
Mu' : Downward	= 1,370	1,586 ft-#
Mu: Design	= 1,955	949 ft-#
Actual 1-Way Shear	= 7.30	3.15 psi
Allow 1-Way Shear	= 82.16	82.16 psi
Toe Reinforcing	=	None Spec'd
Heel Reinforcing	=	None Spec'd
Key Reinforcing	=	None Spec'd

Other Acceptable Sizes & Spacings

Toe: Not req'd, Mu < S * Fr
Heel: Not req'd, Mu < S * Fr
Key: Not req'd, Mu < S * Fr

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Cantilevered Retaining Wall Design

Code: CBC 2010

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....				
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#		
Heel Active Pressure	= 225.0	1.00	225.0	Soil Over Heel	= 370.2	4.04	1,494.8	
Surcharge over Heel	=			Sloped Soil Over Heel	=			
Toe Active Pressure	= -93.8	0.83	-78.1	Surcharge Over Heel	=			
Surcharge Over Toe	=			Adjacent Footing Load	=			
Adjacent Footing Load	=			Axial Dead Load on Stem	=			
Added Lateral Load	=			* Axial Live Load on Stem	=			
Load @ Stem Above Soil	=			Soil Over Toe	= 247.5	1.13	278.4	
Seismic Earth Load	= 81.8	1.80	147.3	Surcharge Over Toe	=			
Seismic Stem Self Wt	= 276.5	7.25	2,004.9	Stem Weight(s)	= 724.5	2.58	1,871.6	
				Earth @ Stem Transitions	=			
Total	= 489.6	O.T.M.	= 2,299.1	Footing Weight	= 1,161.0	2.58	2,995.4	
Resisting/Overturning Ratio		=	2.89	Key Weight	=	2.42		
Vertical Loads used for Soil Pressure	=	2,503.2	lbs	Vert. Component	=			
				Total =	2,503.2	lbs	R.M.=	6,640.2

If seismic included the min. OTM and sliding ratios may be 1.1 per IBC '09, 1807.2.3.

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

DESIGNER NOTES:

