

ARCH 631. Assignment #2

Date: 8/30/12, due 9/13/12

Worth 25 pts.

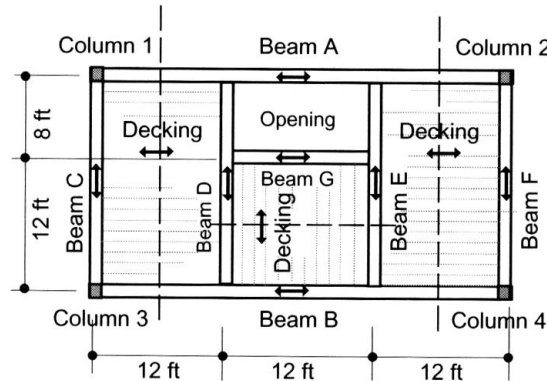
Problems:

1. Complete text problem 3.6 on page 141.

3.6 Determine the reactions to Beam D in Figure 3.22. Assume that the average dead and live load is 60 lbs/ft².

Answers: 4896 lb., 4464 lb.

Figure 3.22 Example



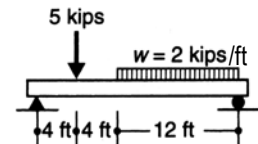
2. What is the maximum bending moment in Beam D of Figure 3.22 for the load given in Problem 1.

Answer: 27,648 lb-ft

3. Complete text problem 2.20 on page 101.

2.20 Draw shear and moment diagrams for the beam analyzed in Question 2.11 [Figure 2.59 (Q11)].

Answer: $V_{\max} = 17.8 \text{ k}$ and $M_{\max} = 79.2 \text{ ft-k}$.



(Q11)

4. Complete text problem 6.6 on page 317.

6.6 A simply supported beam 12 ft long carries a uniformly distributed load of 100 lb/ft. Assume that the beam is $1\frac{1}{2} \text{ in.} \times 9\frac{1}{2} \text{ in.}$ in cross section and is laterally braced. Assume also that the beam is made of timber that has an allowable stress in bending of 1200 lb/in.² and in shear of 150 lb/in.² Is the beam safe with respect to bending and shear stress considerations? What is the maximum deflection of the beam? Assume that $E = 1.6 \times 10^6 \text{ lb/in.}^2$ Is this deflection acceptable?

Answer: $(f_b = 959) < (F_b = 1200)$, \therefore safe in bending; $(f_v = 63.1) < (F_v = 150)$, \therefore safe in shear; and $(0.29) < (L/240 = 0.6)$, \therefore deflections are okay.

5. Complete text problem 6.8 on page 317. (See Table A.16.1 provided.)

- 6.7 A simply supported steel beam is to be used to span 30 ft and to support a uniformly distributed load of 400 lb/ft. Assume that the allowable stress in bending is $F_b = 24,000 \text{ lb/in.}^2$. Determine the most efficient wide-flange shape to be used, based on a bending stress analysis. Use one of the shapes listed in Appendix 16. Ignore dead loads.

Partial Answer: $S_{\text{req'd}} \geq 22.5 \text{ in}^3$

6. What is the SEI/ASCE 7-10 letter designation for roof live load? Provide the factored load combinations expressions for *strength design* that it is used in.

7. What is the minimum required live load for occupancy or use of a bowling alley, a cell block in a penal institution, and an operating room of a hospital? How much area dead load from weight would you design the cell block walls for if they are to be 8 in. concrete hollow block with light aggregate?

TABLE A.16.1 Member Properties^a

Shape	Area(in. ²)	Web Thickness (in.)	Axis X-X			Axis Y-Y		Axis X-X	
			I _x (in. ⁴)	S _x (in. ³)	r _x (in.)	I _y (in. ⁴)	S _y (in. ³)	r _y (in.)	S(mm ³ × 10 ³)
W 36 × 280	82.4	0.885	18,900	1030	15.1	1200	144	3.81	16862
W 36 × 201	59.1	0.715	12,800	757	14.1	840	106	3.59	12393
W 30 × 99	29.1	0.520	3990	269	11.7	128	24.5	2.1	4404
W 27 × 102	30	0.515	3620	267	11	139	27.8	2.15	4371
W 14 × 90	26.5	0.440	999	143	6.14	362	49.9	3.7	2341
W 21 × 68	20	0.430	1480	140	8.6	64.7	15.7	1.8	2292
W 14 × 82	24.1	0.510	882	123	6.05	148	29.3	2.48	2014
W 14 × 74	21.8	0.450	796	112	6.04	134	29.3	2.48	1834
W 18 × 60	17.6	0.415	984	108	7.47	50.1	13.3	1.69	1768
W 16 × 50	14.7	0.380	659	81	6.68	37.2	10.5	1.59	1326
W 12 × 26	7.65	0.230	204	33.4	5.17	17.3	5.34	1.51	547
W 8 × 31	9.13	0.285	110	27.5	3.47	37.1	9.27	2.02	450
W 10 × 22	6.49	0.240	118	23.2	4.27	11.4	3.97	1.33	380
W 8 × 24	7.08	0.245	82.8	20.9	3.42	18.3	5.63	1.61	342
W 8 × 18	5.26	0.230	61.9	15.2	3.43	7.97	3.04	1.23	249
C 9 × 15	4.41	0.285	51	11.3	3.4	1.93	1.01	0.661	185
C 6 × 13	3.83	0.437	17.4	5.8	2.13	1.05	0.642	0.525	95