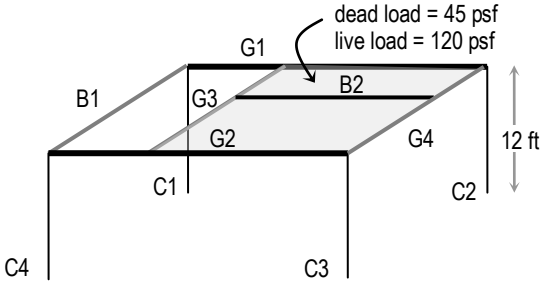
ARCH 614. Assignment #6

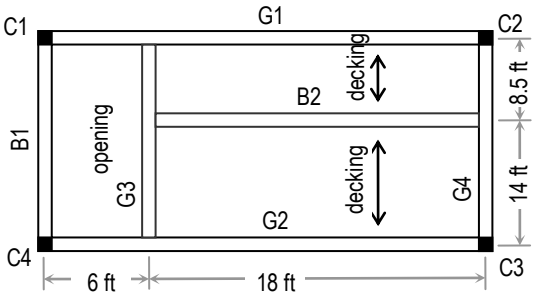
Date: 2/26/13, *due 3/5/13* *Pass-fail work*

Problems: all but 6A, B & C from Ambrose & Tripeny, Chapter 5, pgs 207, 208, 213.
*Note: Problems marked with a * have been altered with respect to the problem stated in the text.*

(20%) 6A) The floor framing plan is subject to uniform distributed loads of: dead load = 45 psf, live load = 120 psf. Determine the resulting reactions by the beams & load on the columns. *(load tracing)*

Partial answer to check with: R_{B2} = 16706.25 lb, $R_{G3@G1}$ = 10395 lb, $R_{G1@C1}$ =12529.7 lb, P_{onC2} =20,822.8 lb.





(5%) 6B) For the frame of problem 6A, use Multiframe software to find the column loads to verify your work from load tracing by constructing a 3D model (View 3D). Use the standard steel section you have been assigned which is posted in My Grades on e-Learning. . Submit the data file (.mfd) on e-Learning (under Contents-Assignments) and provide a print of the bending moment (M) and axial force (P) diagrams. Be careful to make joints on all the girders at the location of beam supports. Model the column bases as fixed. **Do not use panels,** but put on linearly distributed loads on **G1, B2 and G2 *only*.** Model the beam ends only as a pin-type *releases* using the member restraint menu and release (check) the major moment resistance, $M_{z'}$, for each end.

(12%) 6C) The compressive force in a column to each service (unfactored) load are: D = 465 kN, L = 290 kN, L_r = 65 kN, W = 110 kN, E = 245 kN. Determine the design load for the column based on LRFD using ASCE-7 load combinations (Note Set 12.1). *(load factors)*

Partial answer to check with:
max{651, 1054.5, max{952, 717}, 990.5, 1093, 528.5, 663.5} kN.

(15%) ***Problem 5.4.B.*** **USE US UNITS.** A simple beam of Douglas fir-larch, select structural grade, has a span of 18 ft [5.49 m] with two concentrated loads of 4 kips [13.34 kN] each placed at the third points of the span. Neglecting its own weight, determine the size of the beam with the least cross-sectional area based on bending stress. *(bending stress and design)*

Partial answers to check with: $S_{req'd} \geq 192\ in^3$ (or 180 in^3 if < 4" wide)

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(10%) ***Problem 5.5.B***. **USE US UNITS.** A 10 x 14 beam of dense select structural grade is loaded symmetrically with three concentrated loads of 4300 lb [19.13 kN], each placed at the quarter points of the span. Is the beam safe for shear? *(shear stress)*

Partial answers to check with: f_v = 75.4 psi < picked allowable (be careful picking because it is not a 2x!)

(15%) ***Problem 5.7.B****. **USE US UNITS.** *For this problem, include the beam weight and consider deflection to be limited to L/240 of the beam span. Wood is Douglas fir-larch with density of 32 lb/ft^3.* An 8 x 12 beam of dense No. 1 grade is 12 ft [3.66 m] in length and has a concentrated load of 5 kips [22.2 kN] at the center of the span. Investigate the deflection *using superpositioning*. *(beam diagrams and formulas)*

Partial answers to check with: $\Delta_{midspan}$ = 0.192 in+ 0.006 in < 0.6, in OK
(Be careful to only convert enough feet$^{some\ power}$ to inches$^{some\ power}$!)

(15%) ***Problem 5.7.D***.* **USE METRIC UNITS (1 in^4 = 416 x 10^{-9} m^4)** *For this problem, neglect the beam weight and consider deflection to be limited to L/240 of the beam span. Wood is Douglas fir-larch.* An 8 x 14 beam of select structural grade has a span of 16 ft [4.88 m] and a total uniformly distributed load of 8 kips [35.6 kN]. Investigate the deflection. (E = 11,721,500 kPa) *(beam diagrams and formulas and design)*

Partial answers to check with: $\Delta_{midspan}$ = 7.2 mm < 20.3 mm, OK

(7%) ***Problem 5.9.C***. Using Douglas fir-larch, No. 2 grade, pick the joist size required from Table 5.10 for the stated conditions. Live load is 40 psf; dead load is 10 psf; deflection is limited to L/360 of the span under live load only. *(beam diagrams and formulas and design)*

Joist Spacing (in.)	*Joist Span (ft)*
16	16