

## ARCH 331. Assignment #1

**Date:** 8/28/18, due 9/4/18

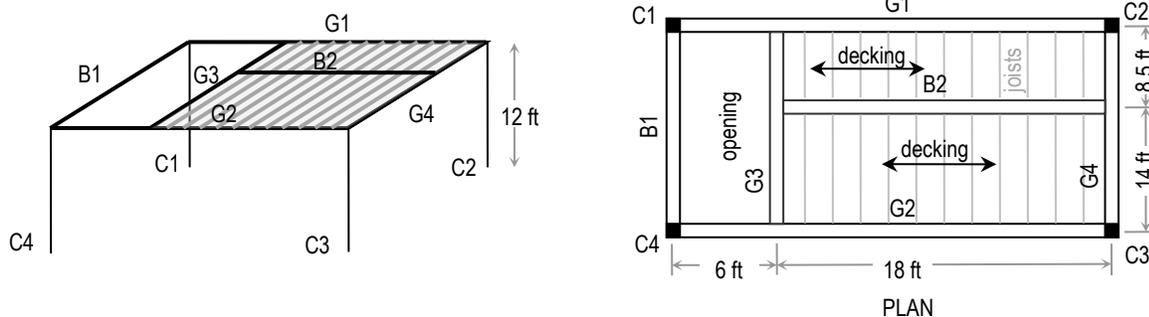
*Pass-fail work*

**Problems:** *Note: the Find, Given, Solution format is not required for this assignment.*

*Note: Do NOT submit work done on these pages. Work on other (blank) paper.*

All necessary work is required for credit.

- (9%) 1A) If the two key design criteria for a building are to minimize floor thickness and minimize shear walls or diagonal bracing, what structural system choices are available? (You must specifically identify both the vertical and all horizontal system members and materials.)  
(*structural systems*)
- (30%) 1B) For the structural framing and dimensions shown, construct a scale model to be no larger than 15 inches in any of the major axes directions. The joists that span from girder G1 to beam B2 and from beam B2 to girder G2 are at 18 inches on center (resulting in 12 spaces). All girders, beams and joists tops are to be at the same elevation (at 12 ft.) There is decking that runs between girders G3 and G4 which needs to be in the model. All plan dimensions are from the center of the beam or column width. Use realistic beam widths and depths for your scale. These can be from relative proportions that you feel look right or from the span-depth charts provided, but the depths for the members must be provided with respect to the scale chosen.  
(*structural systems*)



- (6%) 1C) A steel parallel-chord truss (open web) is to span 80 ft. With *proportions* near the shallower end of the range indicated in the Common Span Length and Depth charts, its depth would be what? With proportions near the deeper end of the range indicated, its depth would be what? (*structural planning*)
- (3%) 1D) For a steel bow truss of relatively deep proportions spanning 60 ft, what would the depth at the center of the truss be? (*structural planning*)
- (6%) 1E) A solid-sawn wood joist is spanning 16 ft. With proportions near the shallower end of the range indicated in the Common Span Length and Depth charts, its depth would be what in inches? With proportions near the deeper end of the range indicated, its depth would be what in inches? (*structural planning*)

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- (6%) 1F) A laminated arch frame is spanning 140 ft. What would be the shallowest rise (ground to peak) by the Common Span Length and Depth charts? What would be the highest rise? (*structural planning*)
- (6%) 1G) For a concrete slab spanning 25 ft in two directions and supported continuously around the boundary by beams, what is the shallowest depth by Common Span Length and Depth charts in inches? What is the maximum depth in inches? (*structural planning*)
- (6%) 1H) A parking structure is to have a clear span of 62 feet (long span). Select a structural system by identifying all vertical and horizontal members, which is likely to be practical and economical. Sketch the system chosen and justify your reasoning for choosing that system. (*structural systems and planning*)
- (14%) 1I) Determine the weight in newtons ( $N=kg \cdot m/s^2$ ) of a car whose mass is 1550 kg. Convert the mass of the car to kN and then determine its weight in pounds and kips. (*conversions*)  
**Partial answer to check with:** 15,205.5 N
- (14%) 1J) You are given two measurements off a non-dimensional ruler of  $A = 8.69$  and  $B = 1.427$  marked in  $100^{\text{ths}}$  (0.01). Knowing the accuracy of the data you are given, determine the quantities of  $A+B$ ,  $A-B$ ,  $A \times B$  and  $A/B$  with reasonable precision. (*math & precision*)  
**Partial answers to check with:**  $A+B = 10.12$ ,  $A \times B = 12.40$  (by 0.2% precision and reasonableness)