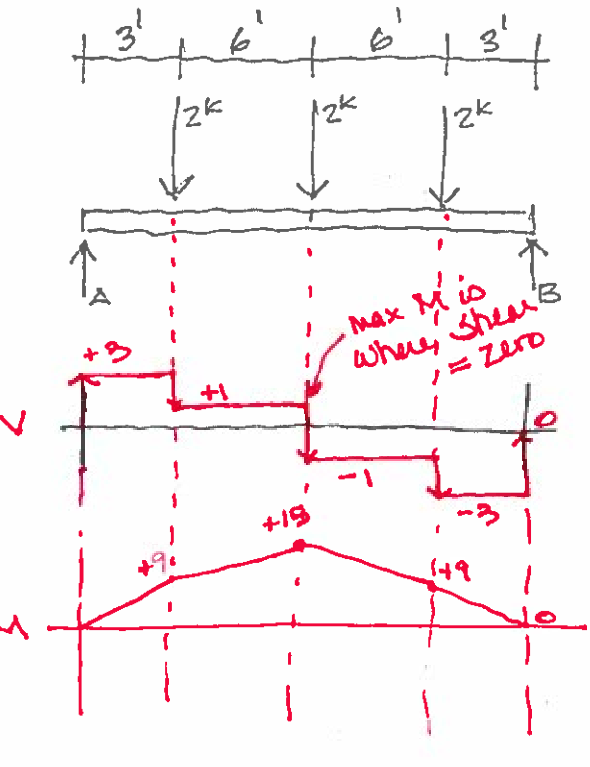
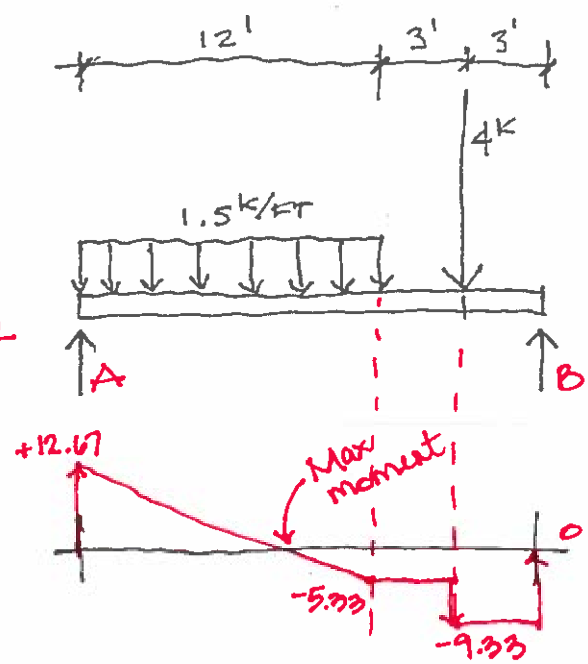
1. Where in the beam shown is the moment the highest

- by intuition, load is symmetric so Rxn at A/B = 3k each
- or by math
  $\sum M_A = 0 = B \times 18 - 2 \times 15 - 2 \times 9 - 2 \times 3$
  $B = 3$



only drew for illustration purpose

How about for this one?



find reactions:

$\sum M_A = 0 = B \times 18 - 4 \times 15 - 1.5 \times 12 \times 12/2$

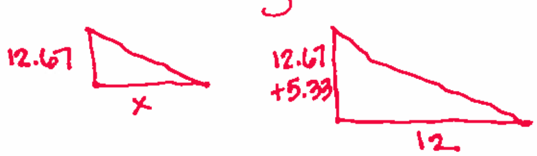
$B = 9.33^k$

$+\uparrow \sum V = 0 = A - 1.5 \times 12 - 4 + 9.33$

$A = 12.67^k$

find point where shear crosses zero

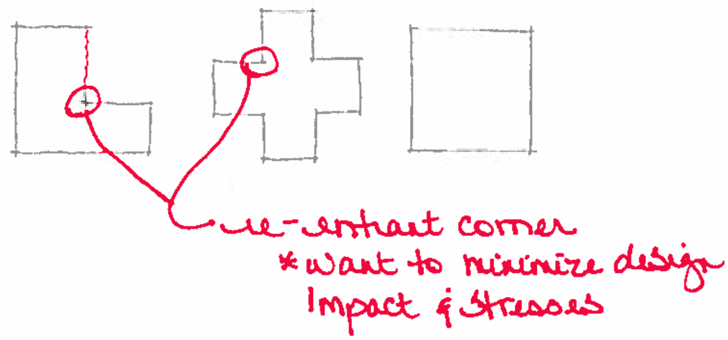
– similar triangles



$\frac{x}{12} = \frac{12.67}{18}$

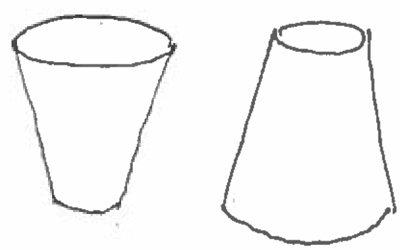
$x = 8.45'$

2. You are working on a hospital in Japan in an area of high seismic risk. At a preliminary design review there are various concepts being considered. Which is the most sensible approach?

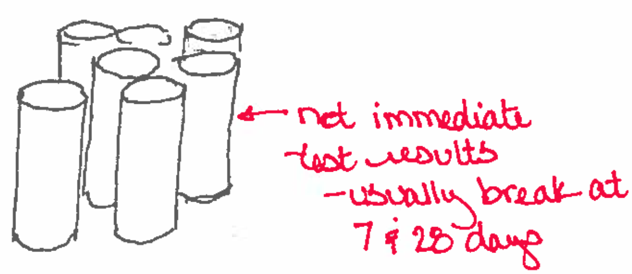


   a. 8 story "L" shaped building
   b. 6 story symmetrical "+" shaped building
   c. 5 story square building
   d. You should not build a hospital in a seismic zone

3. The contractor is about to place the concrete for a complicated but important structural wall, but something seems a bit off and you are worried. Which concrete test would you look to first for reassurance?



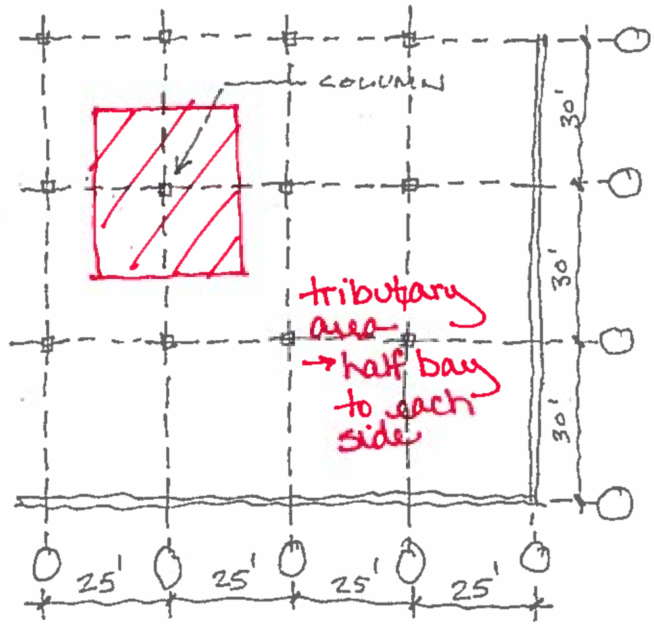
   a. Hydration Test
   b. Core Test
   c. Slump Cone
   d. Cylinder Test
   e. Penetration Test



4. The framing plan shown is for a 2 story simple light manufacturing building. If the loads are as follows (axial loads only):

Live Load of 2nd floor –	80 psf
Dead Load of 2nd floor –	20 psf
Live Load of the roof –	30 psf
Dead Load of the roof –	20 psf

Ignore the slab on grade first floor



What is the total load of the column indicated?

112.5 kips

$load = (80+20+30+20)(2 \times \frac{30}{2})(2 \times \frac{25}{2})$

$= 112{,}500$ LBS

[1 kip = 1000 lbs]

If the soil below that column is capable of 4000 psf, what is the size of the footing?

a. 4' x 7'
b. 6' x 6'
c. 29 s.f.
d. 28,125

footing size → brg pressure $= \frac{P}{A}$

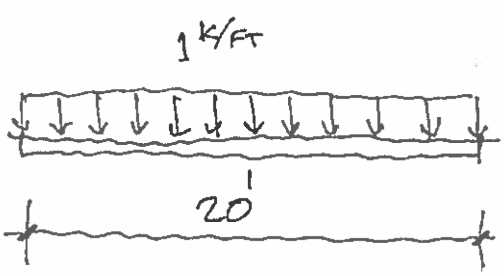
$A = \frac{P}{brg\ press} = \frac{112{,}500}{4000} = 28.1$ SF

5. During production of the SD set, the architect realizes that the zoning height limitations may be a problem and therefore must get a reasonably accurate typical floor to floor height for the design on the midrise office building. Presuming a 1kip/ft. loading, and the beams are 20' long, and you are likely to use A50 steel, what wide flange would you use? (assume braced laterally) → $L_u = 1$

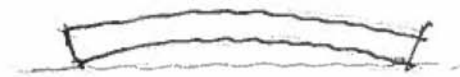
$M = \frac{wL^2}{8} = \frac{1\ K/FT \times (20\ FT)^2}{8} = 50$ K-FT

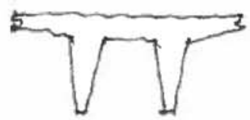
using beam chart → W12x19

allow M = 59



6. Which is most likely NOT to have camber built in?
   a. Composite deck
   b. Double T
   c. Open web steel LH joists
   d. Wood glulam





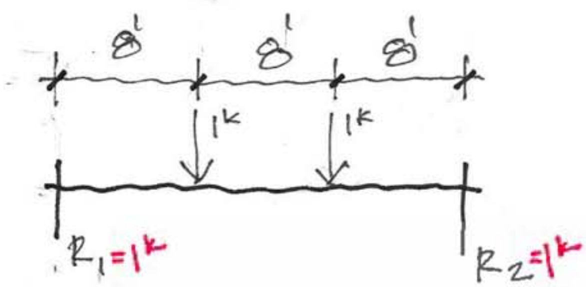
7. You have a wood structure, and the engineer says that the horizontal shear stress capacity of the 2x12's is lacking, but you don't trust her, as she has been on Facebook during the entire conversation. You decide to check for yourself. If the highest shear stress allowable for Doug. Fir-Larch is 180psi, then does this loading work? (assume adjustment factors of 1.0)

shear for wood

$$f_v = \frac{3}{2}\frac{P}{A}$$

$$= \frac{3}{2} \times \frac{1k \times 1000\ LB/k}{1.5IN \times 11.25IN}$$

= 89 PSI < 180 ok ✓



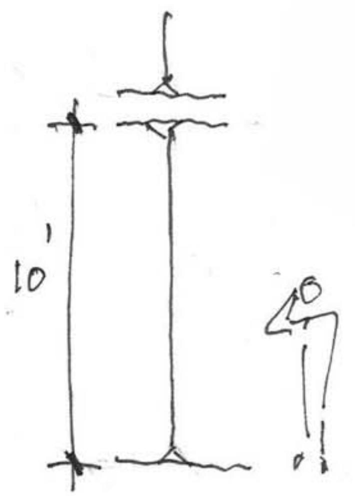
8. The current DD design calls for a 10' W10x33 column in a building you are working on. What are the most important elements for understanding what the maximum allowable load would be? (F_y = 50ksi)

discuss what is critical to column load capacity.

end conditions

$\frac{KL}{r}$ → tall versus short

↳ slenderness ratio



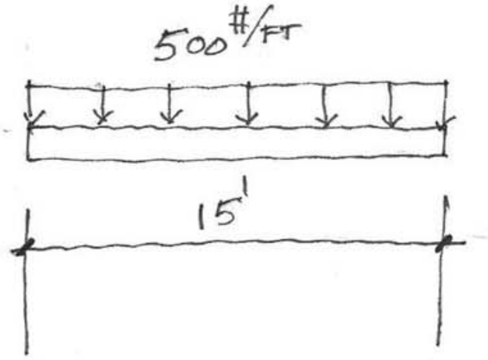
9. Does the wood 3x6 beam work for deflection with the loading shown?

E for Doug Fir = 1,900,000

Moment of Inertia = 34.66 in^4

$$\frac{5wL^4}{384EI}$$ deflection equation

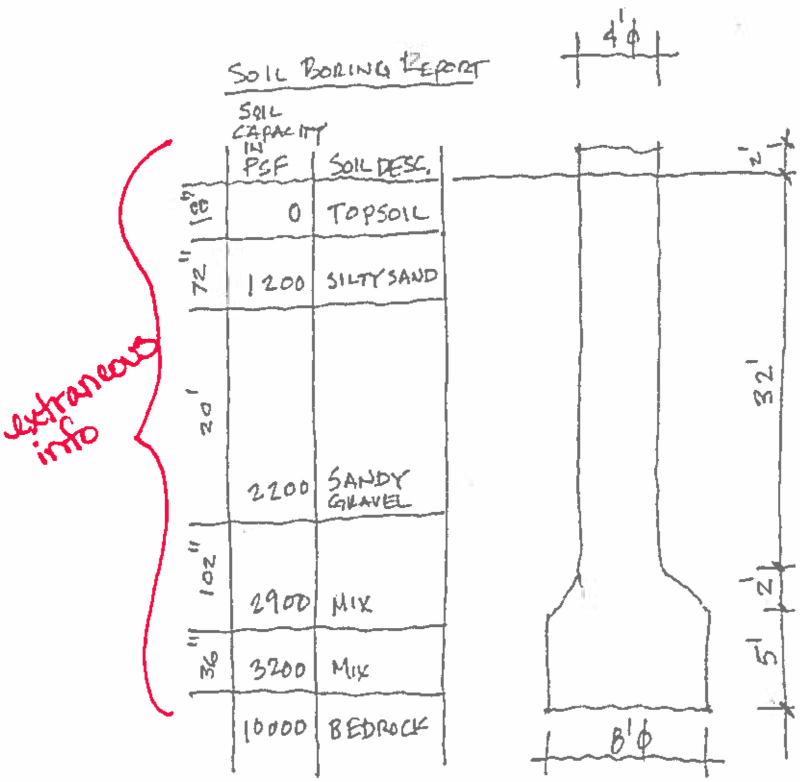
* units are critical *



$$\Delta = \frac{5 \times 500\ LB/FT \times (15\ FT)^4 \times (12\ \frac{IN}{FT})^3}{384 \times 1{,}900{,}000\ LB/IN^2 \times 34.66\ IN^4}$$

$= 8.64$ IN

10. For the belled caisson with the soil boring report shown, calculate the axial loading bearing capacity for this foundation element (assume the topsoil is organic material and provides no bearing capacity)



$$\text{brg pressure} = \frac{P}{A}$$

$$P = A \times \text{brg press} = \frac{(8\text{FT})^2 \pi}{4} \times 10000 \text{ PSF}$$

$$= 502^k$$