

FINAL EXAMINATION

Problem #1 CONCEPTS AND DETAILING (30 pts.)

The cross-section of a water reservoir, half buried in the ground, is shown in Figure 1. The water level in the reservoir may vary between empty to full. Without performing any computations, show:

- The deflected shape of reservoir's walls for the cases when, the reservoir is empty and full. (Use left wall to show one case and the other to show the second).
- Show the approximated moment diagrams for each of the two conditions.
- Show schematically where is reinforcement required to satisfy both cases. (Do not detail here the reinforcement).
- Show the expected details of the bars, lengths, anchorage, lap splices, and try to satisfy construction needs.

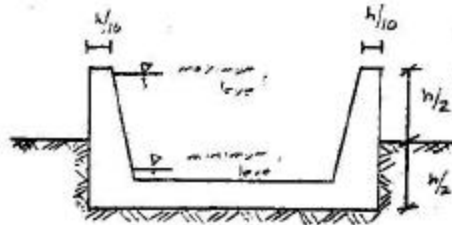


Fig. 1

Problem #2 (30 pts.)

- Determine the axial force and moment capacity (nominal) pair in respect to the center axis of the column shown in Fig. 2, if the column will have half of the section compressed at time of failure. The column is made of 4000 psi concrete and reinforced by eight #12 GR60 steel.
- Determine the design capacity pair for the same case.
- Determine the maximum possible axial capacity of the column and the maximum possible design axial capacity.

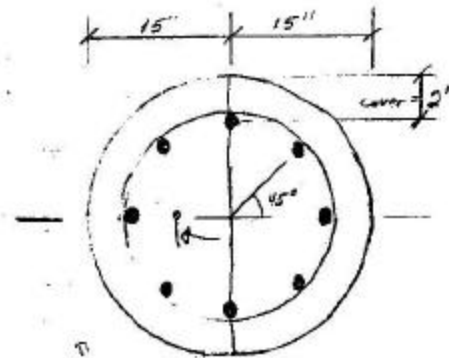
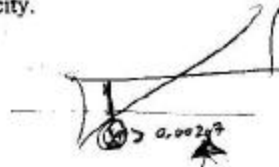


Fig. 2



Problem #3 DEFLECTIONS (30 pts.)

- 15
- Determine what should be the initial camber of the forms for the beam shown in Fig. 3, so that under $\frac{1}{2}$ of the live load the beams will have no deflection in respect to a straight horizontal line. (i.e., the beam will be perfectly straight). The beam is made of 3500 psi concrete and reinforced with a reinforcement ratio of 1% GR60 steel. The beam is loaded by 600 lbs/ft dead load, self weight included, and 2000 lbs/ft. live load.
 - Determine what would be the deflection without the live load. Indicate the direction of such deflection.
 - Determine what would be the deflection with the entire live load. Indicate direction.
 - Is the beam designed properly according to ACI code from point of view of deflections?

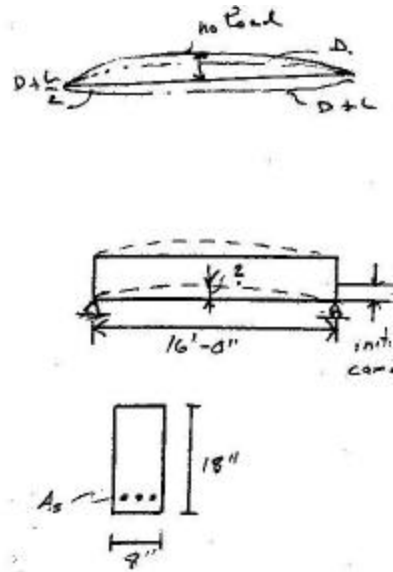


Fig. 3

Problem #4 FOOTINGS (30 pts.)

- 5
- Determine the required size and reinforcement for footing a masonry wall (infinitely long) which supports a dead load of 500 lbs/ft and a live load of 1000 lbs/ft. The foundation will be made of 2500 psi concrete and GR40 steel. The soil is a combination of sand and stiff clay $q_{allowable} = 2.5K/ft^2$. $1.0 k/ft^2$.
- Show all dimension in a cross-section of the wall (to scale). Show the required reinforcement. Assume that the masonry wall will not be reinforced but only grouted to the foundation.
 - Show all necessary computations for service and strengths.

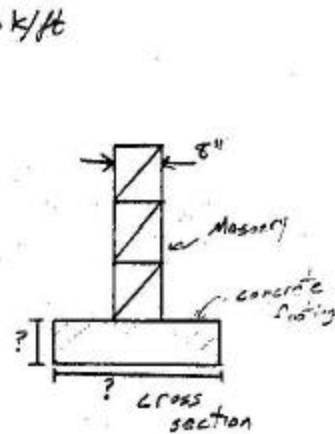


Fig. 4