

## ARCH 631. Assignment #10

**Date:** 11/12/13, due 12/3/13

Worth 20 pts.

**Problems:**

1. Sketch, with the appropriate angles, the load distribution on a simply supported lintel over a masonry wall opening that has sufficient width of wall on both sides of the opening and a solid story of masonry above (arching action present).
2. For a 12' tall concrete masonry unit shear wall with vertical reinforcement and #3 single leg stirrups at 28 inches of grade 50 steel, determine the maximum shear allowed if the ratio of  $M/Vd$  is 1.26. Assume  $f'_m = 2500$  psi,  $b = 7.63$  in, and  $d = 114$  in. The bearing pressure on the wall is 150 psi, while the net area per foot length is  $51.3 \text{ in}^2/\text{ft}$  for the 10 ft wide wall.

Answer:  $V_{max} = 46.7 \text{ k}$  and  $F_v = 91.1 \text{ psi} < F_{max} = 100 \text{ psi}$

3. A 12 in. x 18 in. brick column is reinforced with 3-#9 bars. The allowable steel stress is 20 ksi. Assume that the column height is 16 ft. What is the maximum vertical load if there is no eccentricity and  $f'_m = 1500$  psi?

*Partial Answer:*  $h/r = 55.5$

4. A steel column supports a dead load of 180 kips and a live load of 200 kips to be transferred to a square footing. The net allowable soil bearing value is 3200 pounds per square foot. What is the smallest pad footing that may be used?

*Partial Answer:*  $A_{req'd} = 118.75 \text{ ft}^2$

5. A 24 in.-thick 10 ft.-square reinforced concrete footing carries 200 kips of dead load and 130 kips of live load on a 24 in. square column. Is the footing adequate for shear if the concrete strength is 3000 psi and  $d = 19$  in.? What is the maximum moment for design?

*Partial Answer:*  $V_{u1} = 10.8 \text{ k/ft width}$ ,  $V_{u2} = 390.5 \text{ k}$ ,  $M_u = 35.8 \text{ k-ft/ft width}$

6. What is the total lateral force exerted by the earth against the retaining wall shown, per lineal foot of wall and at what point is it considered to be acting for design purposes? Assume the pressure of the retained earth to be equivalent to a fluid weighing 30 pounds per cubic foot and that the base height is 12 inches.

Answer:  $P_H = 1,215 \text{ lbs}$  at 3 ft above the base.

