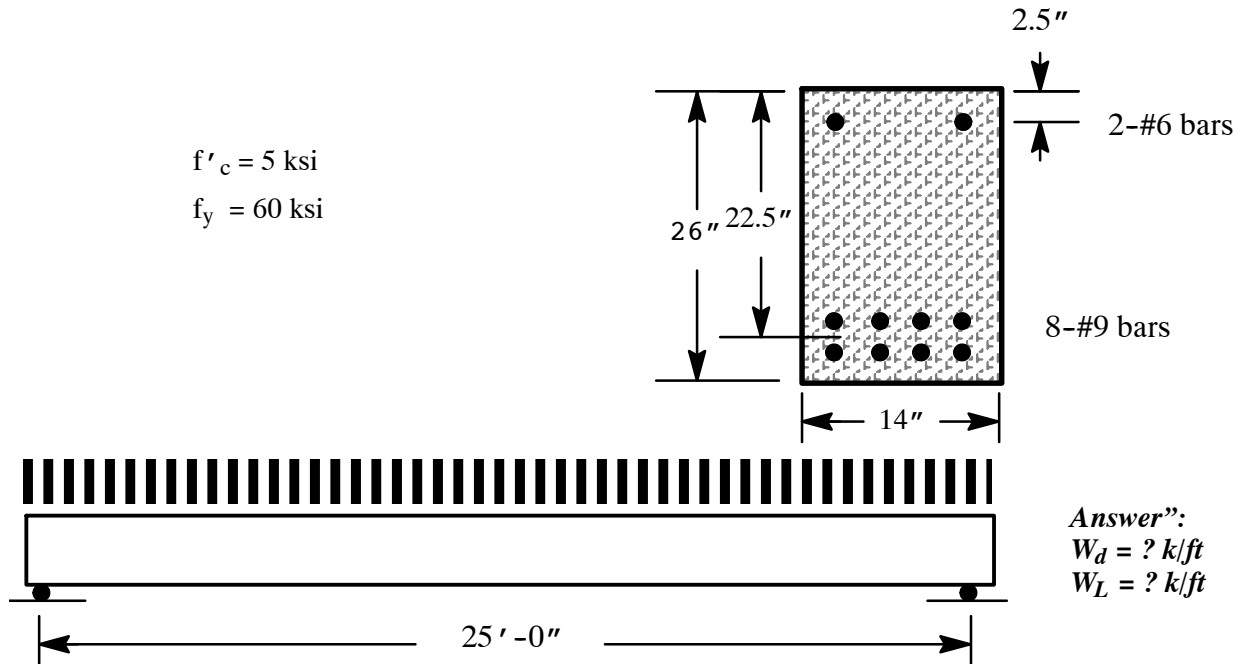
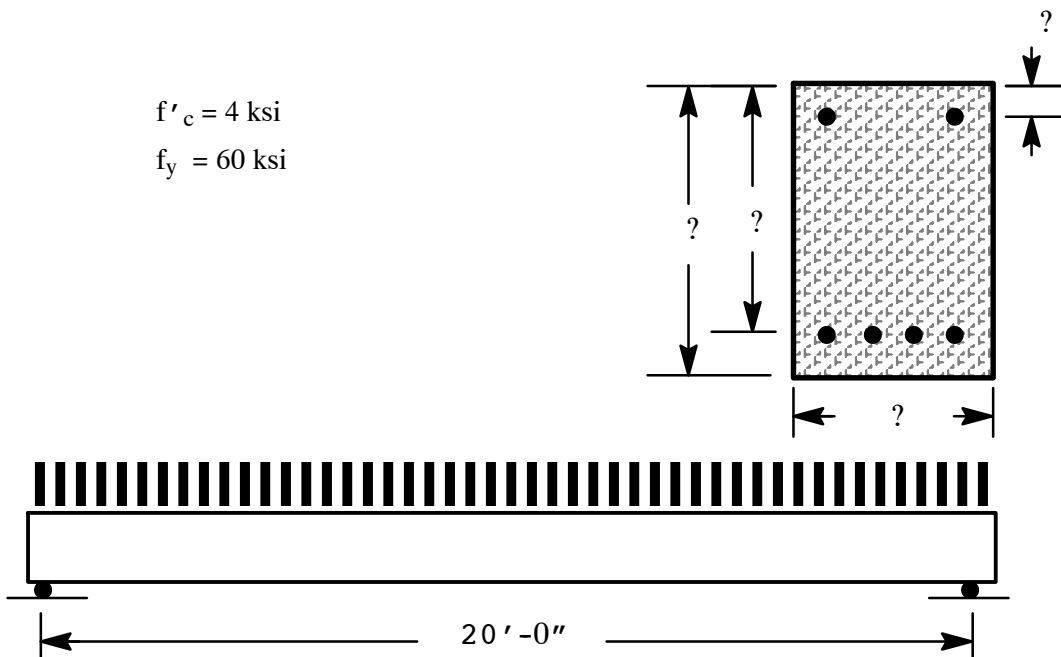


**CIVL 4135
HOMEWORK SET 6**

- A. Consider the uniformly loaded reinforced concrete beam shown below. Assume a rectangular cross-section with $b = 14''$, $h = 26''$, and $d = 22.5''$. Determine the maximum uniform dead and live loads under service conditions permitted by the ACI Code for the reinforcement shown. Assume that the ratio of the service live load to service dead load is 1.5.



- B. A rectangular beam which must carry service live load of 2.5 kips/ft and a calculated dead load of 1.1 kips/ft on an 18 ft simple span is limited in cross section for architectural reasons to 10 inches in width and 20 inches in total depth. What steel area(s) must be provided ?



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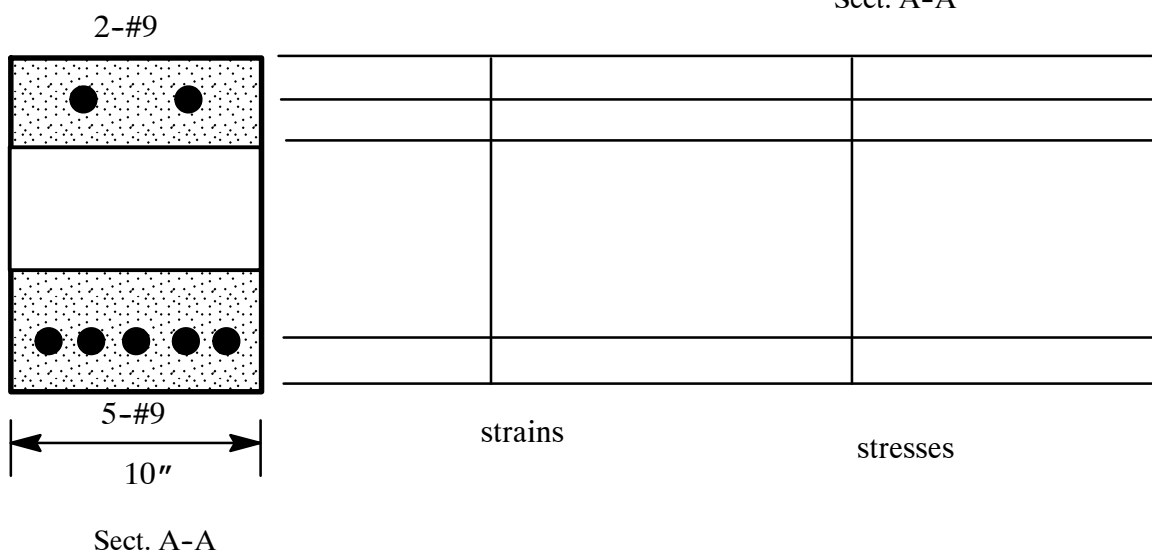
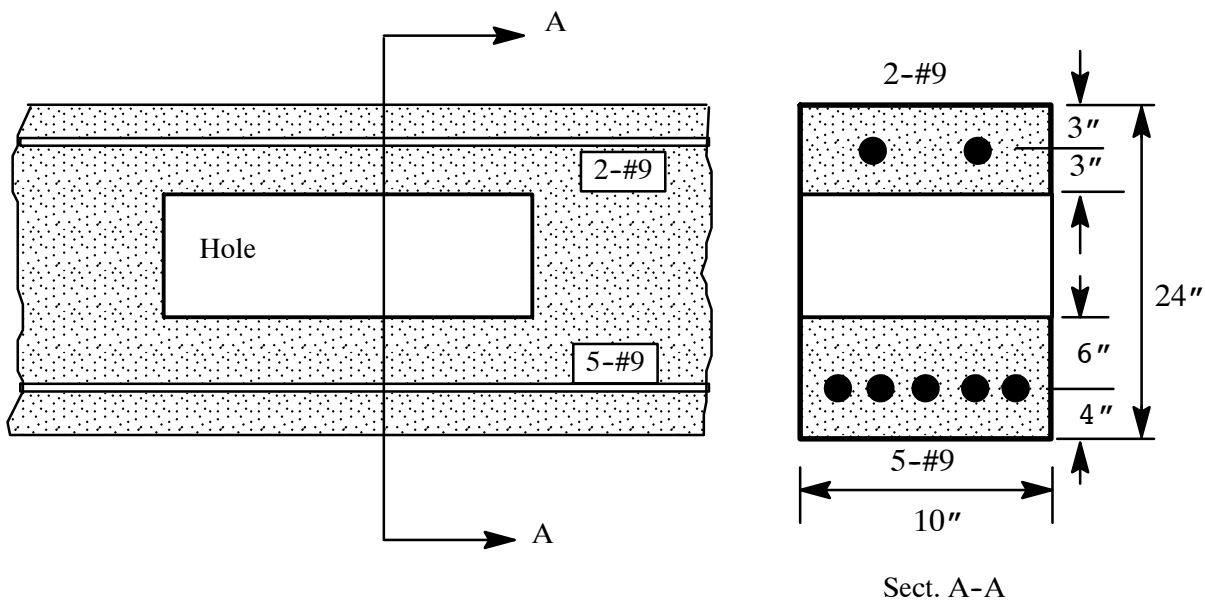
C. A hole must be cast in a beam at its mid-length to pass utility services as shown below. To compensate for loss of concrete, compression reinforcement is placed above the hole.

- I. Calculate the ultimate moment at the section through the hole using ACI assumptions. Also,
- II. Determine if this section meets the requirement for maximum allowable tension reinforcement area.

$$f'_c = 4 \text{ ksi}$$

$$f_y = 40,000 \text{ psi}$$

$$E_c = 3,600 \text{ ksi}$$



**CIVL 4135
HOMEWORK SET 6**

D. Select the reinforcement for a simply supported reinforced concrete beam given the following constraints

$M_U = 7,200$ in-kips (positive moment)	
$f'_c = 5$ ksi	$d = 24$ in.
$f_y = 60$ ksi	$b = 12$ in
Minimum Cover: 1.5 in. #4 stirrups	

E. A rectangular concrete beam of width $b = 24$ inches is limited by architectural considerations to a maximum of total depth $h = 16$ inches. It must carry a total moment of $M_u = 400$ ft-kips. Design the flexure reinforcement for this member, using compression steel if necessary. Allow 3 inches to the center of the bars from the compression or tension face of the beam. Material strength of $f'_c = 4,000$ psi and $f_y = 60,000$ psi. Select rebars to provide the needed areas and show a sketch of your final design, including provisions for No. 4 stirrups.