CIVL 4135
HOMEWORK SET 5B

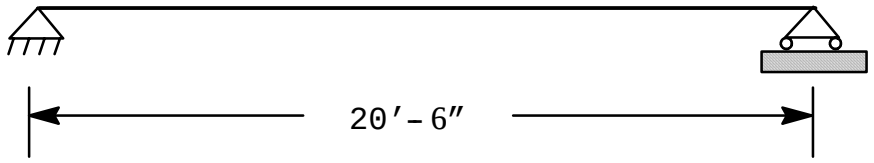
I. Consider the three statically determinate beams shown below. All are subjected to uniform loading. Assume that w_D=2.1 k/ft and w_L=1.6 k/ft.

Select material properties, cross–sectional dimensions, and amount of reinforcement for each beam. The cross sectional dimensions may not change along the length of the beam, however, the reinforcement may vary. Select the reinforcement to satisfy the maximum moments. You may treat each section as a singly reinforced beam.

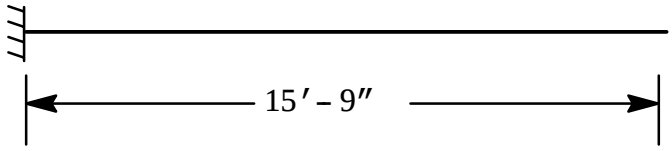
Demonstrate that each cross section satisfies the provision in ACI 318 for maximum and minimum reinforcement, bar spacing, and reinforcement cover. Assume that #4 bars are used for stirrups and that the beams are not exposed to weather or in contact with ground. *Draw the final design cross section with all the details shown on the figure*.

f'_c = 5 ksi
f_y = 60 ksi

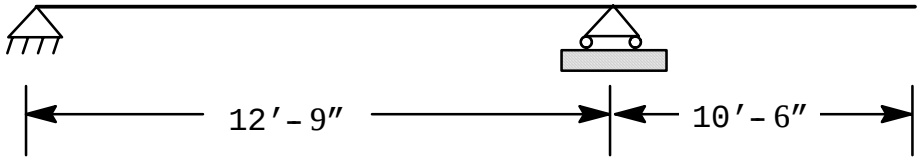
Beam 1



Beam 2



Beam 3



CIVL 4135
HOMEWORK SET 5B

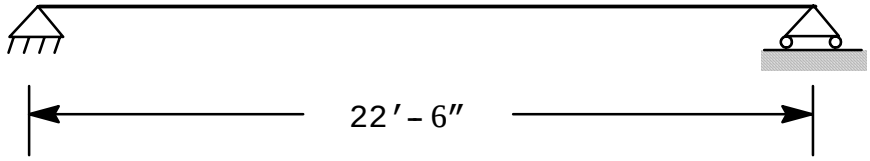
II. Consider the three statically determinate beams shown below. All are subjected to uniform loading. Assume that w_D=2 k/ft and w_L=1.5 k/ft.

Select material properties, cross–sectional dimensions, and amount of reinforcement for each beam. The cross sectional dimensions may not change along the length of the beam, however, the reinforcement may vary. Select the reinforcement to satisfy the maximum moments. You may treat each section as a singly reinforced beam.

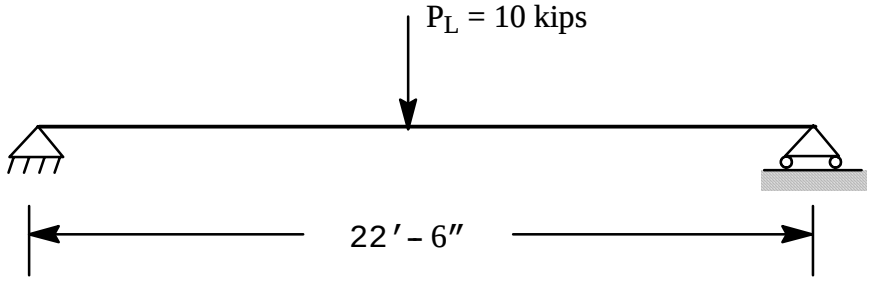
Demonstrate that each cross section satisfies the provision in ACI 318–89 for maximum and minimum reinforcement, bar spacing, and reinforcement cover. Assume that #4 bars are used for stirrups and that the beams are not exposed to weather or in contact with ground. *Draw the final design cross section with all the details shown on the figure*.

f'_c = 5 ksi
f_y = 60 ksi

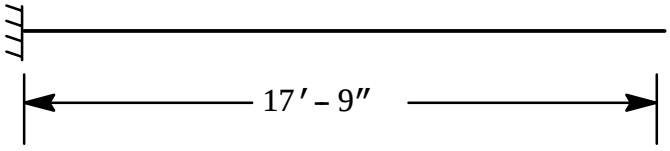
Beam 1



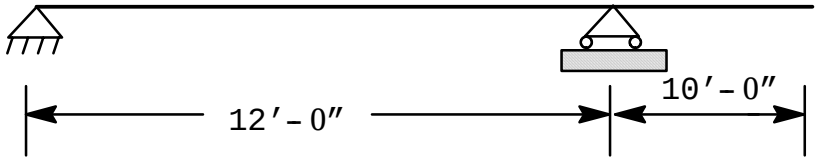
Beam 2



Beam 3



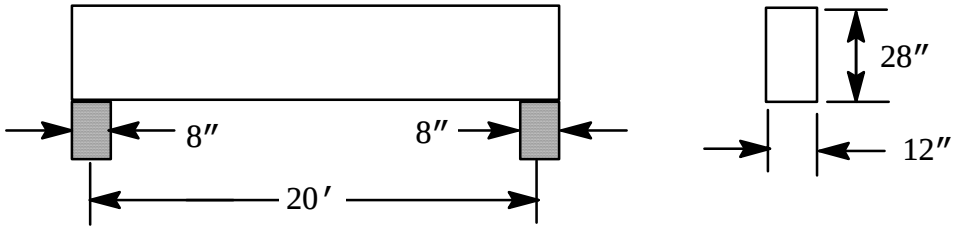
Beam 4



CIVL 4135
HOMEWORK SET 5B

III. A simply supported reinforced concrete beam spans 20 ft as shown. The beam is subjected to a uniform service dead load equal to 2.0 kips/ft (exlusive of beam weight) and to a uniform service live load of 2.4 kips/ft. The depth to reinforcing is 25.5 in.

$f'_c = 3$ ksi
$f_y = 40$ ksi



(i) The factored uniform load is most nearly
(a) 6.9 kips/ft
(b) 7.4 kips/ft
(c) 8.0 kips/ft
(d) 9.2 kips/ft

(ii) The tension steel required at the section of maximum moment is most nearly
(a) 4.5 in^2
(b) 5.0 in^2
(c) 5.6 in^2
(d) 6.1 in^2

(iii) The maximum area of tension steel permitted (based on flexure requirements) is most nearly
(a) 5.6 in^2
(b) 7.7 in^2
(c) 8.5 in^2
(d) 9.2 in^2

(iv) The minimum area of tension steel permitted is most nearly
(a) 1.0 in^2
(b) 1.3 in^2
(c) 1.5 in^2
(d) 1.8 in^2

(v) The maximum uniform factored load that the beam can sustain if no compression steel is used is most nearly
(a) 8.8 kips/ft
(b) 9.0 kips/ft
(c) 10.0 kips/ft
(d) 13.0 kips/ft