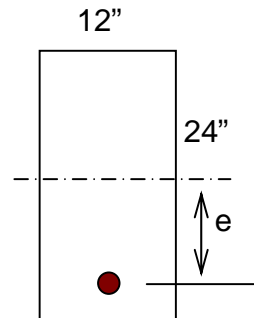


CE 435/535 – Spring 2008

Homework #3 (Due Tuesday February 12th)

A 12"X24" beam has been constructed with normal weight concrete. The beam is simple supported on a span of 44 feet.



- Assume an allowable compressive stress of 3000 psi and zero tension. What initial prestress force (P_i) and e would correspond to the full use of the allowable stresses? Show your check of top and bottom fiber stresses at support and at midspan sections. Indicate which section governs limiting P_i and e .
- Repeat part (a) assuming 300 psi of tension is allowed. Compare your results with part (a)
- Assume that the initial prestress force is $P_i = 250$ kips and $e=5.6$ in. We are willing to allow 3000 psi compression and 420 psi tension in the concrete. After losses occur, assume $P_e = 0.80 P_i$. Are the stresses in excess of the given allowable values at transfer? What uniform superimposed load, W_s , in addition to the weight of the beam would be allowed based on these stresses?

Hint: Initially, the full prestressed force (w/o losses) is used and the controlling case is tension at the top and compression in the bottom; during service, the effective prestressed force (after losses) is used and the controlling case is compression in the top while the bottom is in tension.

Homework #4 (Due Tuesday February 12th)

A floor system is constructed of 8DT24 double tees. The span is 50 feet and the beams are pretensioned with 8, 0.5-in. diameter 270-k seven-wire strands whose eccentricity varies linearly from 9.15 in. at the ends to 14.40 in. at midspan. You can obtain other section properties from page 64 of your notes. Assume the following:

$$f'_c = 6000 \text{ psi and } f'_{ci} = 4800 \text{ psi}$$

$$f_{pi} = 0.75 f_{pu} = 189 \text{ ksi and } f_{pe} = 150 \text{ ksi (after long-term losses)}$$

$$\text{allowable tension in concrete: initially, } f_t = 3\sqrt{f'_{ci}} \text{ and finally, } f_t = 12\sqrt{f'_c}$$

$$\text{allowable compression in concrete: initially, } 0.6 f'_{ci} \text{ and finally, } 0.45 f'_c.$$

- Calculate the stresses in the beam (at ends and at midspan), immediately after transfer. Assume that the elastic shortening losses are 10 ksi so you do not need to iterate and refine this number.
- Based on the allowable stresses given above, check the stresses in the beam at ends and at midspan during service and calculate the maximum uniform load that this beam can resist.