Modeling ⇒ FWP , Analysis ⇒ VecTorS , Results ⇒ Janus

pre-processor processor post-processor

10.8. Consider the five-span continuous reinforced concrete beam shown in the figure below. The beam is subjected to a total factored load (w_f) of 120 kN/m. Ignore the effects of the support width.

a) Develop the factored bending moment diagram for this beam by performing a linear elastic analysis using a computer structural analysis program. Consider the load pattern with total factored load applied on all spans.

b) Determine the required amount of tension reinforcement corresponding to the positive and negative bending moments determined in part a).

c) Consider the three alternative reinforcement arrangements for this beam shown in the figure below. Which solution is most suitable for this design based on your design calculations in part b)?

d) Are the other two reinforcement arrangements safe, considering the required amount of reinforcement obtained in part b)?

e) If the answer to part d) is negative, redistribute the bending moments in the beam in accordance with the CSA A23.3 provisions by using the bending moment diagram from part a). Develop the diagrams for the redistributed bending moments corresponding to these two reinforcement arrangements. Is it possible to redistribute the bending moments so that these two reinforcement arrangements become acceptable from a strength (moment resis perspective?

Load stage

1 → 0 kN/m
2 → 12
3 → 24
4 → 36
5 → 48
6 → 60
7 → 72
8 → 84
9 → 96
10 → 108
11 → 120 ULS

Given:

$f_c' = 30$ MPa × 0.65 = 19.5 MPa
$f_y = 400$ MPa × 0.85 = 340
$\phi_c = 0.65$
$\phi_s = 0.85$

10.9. Consider the continuous reinforced concrete discussed in Problem 10.8.

a) Determine the factored bending mome gram corresponding to each reinfor arrangement (1, 2, and 3) by perfor computer-aided iterative analysis. Use 5 long beam segments to develop the mode

b) Based on the analysis performed in which reinforcement arrangement best the effect of cracking in the beam?

c) What conclusions can you draw on the ability of the two reinforcement arrang not chosen in part b) from the strength a iceability perspectives?

Use the following assumptions in the de

1. The columns are dimensionless and resist bending moments.
2. The top reinforcement extends beyo inflection points.