DEPARTMENT OF CIVIL ENGINEERING
ITER, SoA University
Reinforced Concrete Design (CVL4121)
Minor Assignment 5
Deadline - 24 February 2017 Midnight

Design a singly reinforced beam, located in a chemical factory where it is exposed to solid chemicals. Beam is simply supported and rests on $250mm$ thick walls having $12m$ clear distance between them. The beam will carry self weight, a concentrated dead load of $40kN$ and a distributed live load of $10kN/m$. Assume Fe415 steel.

Go according to points given below. Use IS456:2000 for given points.

- Specify exposure condition given in question from Table-3 and find grade of concrete from Table-5.

- Find effective span from clause 22.2.

- Find effective depth from span to depth ratio as given in clause 23.2.1.

- Find minimum clear cover from Table-16 (exposure condition) and Table-16A (fire resistance).

- Assume initial guess for reinforcements and stirrups to be used and find total depth.

- From above depth find width of beam about half of total beam depth (in multiple of $50mm$), refer paragraph 5.3.1 of textbook.

- Find design loads and moments according to Table-18.

- Find limiting effective depth (d_{lim}) of concrete based on $M_u = kf_{ck}bd^2$. find k according to grade of steel.

- Check d to be well above d_{lim} as found above and recalculate D to be a multiple of $10mm$.

- Find $(A_{st})_{reqd}$ from $M_u = 0.87f_y\frac{p_t}{100}[1 - \frac{p_t f_y}{100 f_{ck}}]$. Provide A_{st} a little more than required. Choose reinforcing and stirrup steel bars from $\phi 5, \phi 6, \phi 7, \phi 8, \phi 10, \phi 12, \phi 16, \phi 18, \phi 20, \phi 22, \phi 25, \phi 28, \phi 32, \phi 36, \phi 40, \phi 45, \phi 50$.

- Check if it is in minimum and maximum reinforcement limit from clause 26.5.1.1.

- Check if section is not over-reinforced i.e. $(A_{st})_{bal} > (A_{st})_{provided}$ (You can find$(A_{st})_{bal}$ from $C_{bal} = T_{bal}$).

- Check if the clear distances between bars and concrete surfaces is according to clause 26.3.2.

- Reconfirm the allowable moment capacity of designed section to be more than design moment.

- Check for deflection control from Figure 4 and 5 from code.

- Draw and detail your section according to above points.

Submission Link