

DEPARTMENT OF CIVIL ENGINEERING

ITER, SoA University

Reinforced Concrete Design (CVL4121)

Minor Assignment 6

Deadline - 4 March 2017 Midnight

Part-1

Design 2-legged shear reinforcement for beam given in [Minor Assignment 5](#)

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

- Refer Clause 40 for complete reference on shear reinforcement for limit state of collapse.
- Calculate τ_v according to figure 2.
Note- You can also over-design by taking shear at supports.
- Check if this case requires shear reinforcement design or minimum shear reinforcement or redesign of the section.
- Based on above point, use clause 40.3 or 40.4.
- Refer section 6.7 of textbook on 2-legged area calculation.
- Provide spacing of stirrups according to clause 26.5.1.5.
- Recheck for above shear reinforcement to be above minimum limit as given in 26.5.1.6.
- Draw and detail your design for shear reinforcement.

Part-2

Design one way slab simply supported on 230mm thick walls having 5m clear distance between them, exposed to moderate condition. The slab will carry self weight and a distributed dead load of $5kN/m^2$. Assume Fe415 steel.

Go according to points given below. Use IS456:2000 for given points. Also refer Example 5.2 of textbook.

- 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 main bar reinforcements 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 $M_u = k f_{ck} b d^2$. 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 $\frac{M_u}{b d^2} = 0.87 f_y \frac{p_t}{100} [1 - \frac{p_t f_y}{100 f_{ck}}]$. Provide A_{st} a little more than required. Choose main and distribution steel bars from $\phi 5, \phi 6, \phi 7, \phi 8, \phi 10, \phi 12, \phi 16, \phi 18, \phi 20, \phi 22, \phi 25, \phi 28, \phi 32, \phi 36, \phi 40, \phi 45, \phi 50$.
- Provide distribution bars according to clause 26.5.2.1.
- Provide spacing based on clause 26.3.3.
- Check maximum diameter of bar from 26.5.2.2.
- 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.
- Refer Clause 40 for complete reference on shear reinforcement of slab for limit state of collapse and provide shear reinforcement accordingly.
- Draw and detail your section according to above points and clause D-1.6 (Annex-D).

[Submission Link](#)