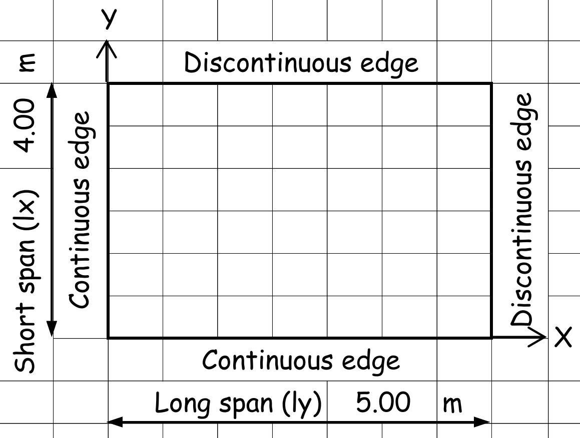
SLAB DESIGN (as per Limit State Design of IS 456:2000)

[A] DESIGN INPUT:

(a) Materials:

Slab thk. (D) = 130 mm
Floor finish thk. (ff) = 75 mm
Concrete cover (cc) = 15 mm
Main bar dia. (Dmain) = 10 mm
Distn. bar dia. (Dsec) = 8 mm
Limiting basic 'span/ eff. depth' value = 23
Concrete grade (fcu) = 25 MPa
Reinf't. type: HYSD Bars
Reinf't. grade (fy) = 500 MPa



Slab dimensions/ Edge conditions

(b) Loads:

[i] Dead Load (DL):
Self weight of slab = 25 x D = 3.25 kN/sq.m
Floor finish load = 20 x ff = 1.5 kN/sq.m
Ceiling load @ 0.5 kN/sq.m
Services @ 0.5 kN/sq.m
Other loads (if any) @ 0.25 kN/sq.m
i.e. Total DL = 6 kN/sq.m

[ii] Live Load (LL):
Live Load @ 3 kN/sq.m
Other loads (if any) @ 0.5 kN/sq.m
i.e. Total LL = 3.5 kN/sq.m

[iii] Factored Load (w):
Total factored load, w = 1.5 x DL + 1.5 x LL = 14.25 kN/sq.m

[B] FLEXURE:

Aspect ratio = ly/lx = 1.25
Effective depth, d1 = D - cc - 0.5 x Dmain = 110 mm
Effective depth, d2 = D - cc - Dmain - 0.5 Dsec = 101 mm

(a) Short span moments:

Mx (-ve) = 0.063 x w x lx^2 = 14.37 kNm/m => M/ (b x d1^2) = 1.19 => pt = 0.29%
Mx (+ve) = 0.047 x w x lx^2 = 10.72 kNm/m => M/ (b x d1^2) = 0.89 => pt = 0.22%

(b) Long span moments:

My (-ve) = 0.047 x w x lx^2 = 10.72 kNm/m => M/ (b x d2^2) = 1.06 => pt = 0.26%
My (+ve) = 0.036 x w x lx^2 = 8.21 kNm/m => M/ (b x d2^2) = 0.81 => pt = 0.2%

SLAB REINFORCEMENT:

Limiting values:

Distn. steel in each dirn @ 0.12% = 156 sq.mm/ m

Max. spg. of main bars = Min (3d, 300 mm) = 300 mm

Max. spg. of distn. bars = Min (5d, 450 mm) = 450 mm

Edge strips (Distn. steel):

Steel in edge strips @ Lx (2 nos. 0.6m wide) & @ Ly (2 nos. 0.5m wide):

Provide T8 @ 300 c/c (T&B)

Steel @ short span:

Middle strip 3.75m wide:

Top steel = 318.8 sq.mm/ m

Spacing of top bars = 246.3 mm

Provide T10 @ 200 mm c/c => Steel ratio (As,prov/ As,reqd) = 1.23

Bottom steel = 234 sq.mm/ m

Spacing of bottom bars = 246.3 mm

Provide T10 @ 200 mm c/c => Steel ratio (As,prov/ As,reqd) = 1.67

Steel @ long span:

Middle strip 3m wide:

Top steel = 257.1 sq.mm/ m

Spacing of top bars = 305.5 mm

Provide T10 @ 200 mm c/c => Steel ratio (As,prov/ As,reqd) = 1.52

Bottom steel = 194.4 sq.mm/ m

Spacing of bottom bars = 404.1 mm

Provide T10 @ 200 mm c/c => Steel ratio (As,prov/ As,reqd) = 2.02

[C] SHEAR:

Shear force, V = 0.45 x w x lx = 25.65 kN/m

Nominal shear stress, vu = V / (b x d1) = 0.24 MPa

(Note: b = slab width = 1000 mm in above equation)

Slab reinforcement actually provided, pt,act = 0.17%

Maximum shear stress, Tc,max (Table 20) = 3.1 MPa

Design shear strength of concrete, vc (Table 19) = 0.3 MPa

Modification factor for shear strength of slab, k (Table:Clause 40.2.1.1) = 1.29

Modified shear strength of slab, k x vc (Clause 40.2.1.1) = 0.4

Since vu < k.vc, slab is safe in shear (OK)

[D] DEFLECTION:

fs = 0.58 x fy x (As,req/ As,prov) = 300 MPa

MF (Tension reinf't), MFt = 1.91; MF (Compr. reinf't), MFc = 1

Span/ (d1 x MFt x MFc) = 19.2 <= 23 (OK)

epicenter Consulting Engineers Pvt. Ltd.	Client:				Element:
	Project:		Doc. No.:		Location/ Grids:
	Rev.	Ppd. by	Date	Chd. by	Date
Project:	2				Designation:
Structure:	1				
Type:	0				Sht. 2 of 2