DESIGN OF SINGLY REINFORCED RCC BEAM

GIVEN DETAILS

	mm	M
CLEAR SPAN	3000	3
WIDTH OF SUPPORT	200	0.2
b	200	0.2

WORKING LOAD	6	KN/M
fck	20	N/mm^2
fy	415	N/mm^2

L/d=20

d= L/20

	mm	M
d=	150	0.15
D=	200	0.2

1. EFFECTIVE LENGTH

L1=L+d 3.15 M

L2= C/C OF SUPPORT

(.2/2)+3+(.2/2) 3.2 M

leff=	Ll

3.15 M

2.LOAD

SELF WEIGHT

b*D*25 1 KN/M

LIVE LOAD 6 KN/M

TOTAL LOAD (W)	7	KN/M

FACTORED LOAD(W*1.5)		
(Wu)	10.5	KN/M

3.BM AND SF

Mu=Wu*l^2/8	13.02	KN-M

Vu=Wu*L/2	16.54 KN

Mu lim=.138fck*b*d 22.08 KN-M

THE SECTION IS UNDER REINFORCED

4. AREA OF STEEL

Ast min=.87bd/fy 62.89

Mu=.87*fy*Ast*d(1-(Ast*415/b*d*fck))

Ast=	238.499 mm^2	ast= 113.09 mm^2

NO. OF BARS=Ast/ast 2.108931 ~3

Ast pro=	339.27 mm^2

9

PROVIDE 3-12mmdia bars

5. CHECK FOR SHEAR

NOMINAL COVER

Vu/b*d=	0.551

PT=100Ast/bd

1.1 %

TOUc	0.632	N/mm^2
TOUc max	2.8	N/mm^2

SPACING OF STIRRUPS

asv=	50.26

a.Sv=.87fyAsv/.4b		
	226.8297	mm
b.75d=	112.5	mm
c.300mm	300	mm

PROVIDE 2L-8mm@110mmC/C

q

DESIGN OF DOUBLY REINFORCED RCC BEAM

GIVEN DETAILS

	mm	M
EFFECTIVE SPAN	7000	7
d'	50	0.05
d	250	0.25
b	200	0.2
D	550	0.55
fck	20	N/mm^2
fy	415	N/mm^2
WORKING LOAD	15	KN/M

2.LOAD

SELF WEIGHT

b*D*25	2.75	KN/M
LIVE LOAD	15	KN/M
DEAD LOAD	20	KN/M
TOTAL LOAD (W)	37.75	KN/M

FACTORED LOAD(W*1.5)		
(Wu)	56.625	KN/M

3.BM AND SF

Mu=Wu*l^2/8	346.83	KN-M
Vu=Wu*L/2	198.19	KN

Mu lim=.138fck*b*d 34.5 KN-M

Mu-Mulim= 312.33

THE SECTION IS OVER REINFORCED

4. AREA OF STEEL

Ast1=Mulim/.87fy(d-.42xu)

955.5485464 mm^2

fcs 538 N/mm^2

Asc 2162.637619

Ast2=ASC*fsc/.87fy

1248.527905 mm^2

Ast=Ast1+Ast2

Ast=	2204.076451	mm^2

Astpro=5*ast	2454.35	mm^2
Ascpro=asc*4	1257	mm^2

PROVIDE 5-25mm dia as tension reinforcement and 4-20mm as compression re

5.CHECK FOR SHEAR

NOMINAL SHHEAR		
TOUv=Vu/bd	3.96375	N/mm^2
TOUc	0.78	N/mm^3
PT	1.96	%

THE SECTION IS NOTSAFE AGAINST SHEAR

BALANCED SHEAR

Vus=Vu-Tcbd 159187.5 N/mm2

SPACING OF STIRRUPS

a.Sv=.87*fyAst*d/Vus 125.4055505 mm

b.300 300 mm

C. .75d 187.5

PROVIDE 2L-8mm vs @160mm c/c

ienforcement

ONE WAY SLAB DESIGN

GIVEN

ly	=	7 m			
lx	=	3 m			
LL	=	3.5 KN/m^2			
FF	=	1.2 KN/m^2			
f_{ck}	=	20 N/mm^2			
f_y	=	415 N/mm^2			
Span	=	3000 mm	=	3 m	
b	=	1 m	=	1000 mm	

l_y/l_x = 2.333333

one way slab

a) <u>Effective Depth</u>

Span/d = 20

d = 150 mm = 0.15 m

D = d+(15+10/2)

D = 170 mm = 0.17 m

b) <u>Effective Span</u>

Span + bearing (L1) = 3.23 m

CC + Eff.Depth (L2)= 3.15 m

l = L2 3.15 m

c) <u>Calculation of Load</u>

Self Weight	=	D*25*b
	=	4.25 KN/m
Live Load	=	3.5 KN/m
Floor Finish	=	1.2 KN/m
Total Load	=	8.95 KN/m
Factored Load	=	13.425 KN/m

<u>Maximum Bending Moment</u>

M_u = $(W_u*l^2)/8$

= 16.6512 KN-m = 16651200 KN-mm

d) <u>To Find 'd'</u>

M_u = $0.138*f_{ck}*b*d^2$

d = $\mathrm{sqrt}(M_u/(0.138*f_{ck}*b))$

d = 77.67267 mm < 150mm

e) <u>A_{st} Required</u>

A_{st} = $(1.14*M_u*b*f_{ck})/f_y(b*d*f_{ck}-f_y)$

A_{st} = 304.9798 mm^2

Using 10mm dia Bars spacing required

a_{st} = 78.5 mm^2

s = $1000*a_{st}/A_{st}$

s = 257.3941 mm

s = 250 mm

Provide 10mm dia bars at 240mm C/C

A_{st} Provided = $1000*A_{st}/s$

A_{st} Provided = 314 mm^2

Percentage Steel = $100*A_{st}/(b*d)$

Percentage Steel = 0.20332 %

f) <u>Distribution Reinforcement</u>

A_{st} = 0.12 % *b*D

A_{st} = 204 mm^2

Provide 8mm Dia Bars

a_{st} = 50.24 mm^2

S_v = $1000*a_{st}/A_{st}$

S_v = 246.2745 mm

S_v = 245 mm

Provide 8mm Dia Bars at 245mm C/C

TWO WAY SLAB

Z

GIVEN	Span=	4750	mm		
	Lx=	4.75	m		
	Ly=	4.75	m		
	LL=	2.5	m		
	FF=	1	KN/m		
	Bearing=	0.15	m		
	fck=	15	N/mm^2		
	fy=	415	N/mm^2		
	b=	1	m	1000	mm
	Lx/Ly=	1			
		two way slab			
a)	Span/d=	30			
	d=	158.3333	mm		
	d=	**160**	mm	0.16	m
	D=	+(15+10/2)			
		180	mm	0.18	m
	dx=	D-(15+(10/2))			
		160	mm	0.16	**m**
	dy=	D-(15+10+(10/2))			
		150	mm	0.15	**m**
b)	<u>**effective span**</u>				
i)	C.S+bearin	4.9	mm		
ii)	C.S+eff.dep	4.91			
	L=	#REF!			
	Lx=	4.9	m		
c)	Load calculation				
	Self wt. of slab=	D*b*25			
		4.5	KN/m		
	L.L=	2.5	KN/m		
	F.F=	1	KN/m		
	Total load=	8	KN/m		
	factored load W =	12	KN/m		
	Max. bending moment				
	Mux=Muy=	αx*W*Lx^2			
		17.86344	KN-m	**17863440**	N-mm
	Mu=	0.138*fck*b*d^2			
	d=	sqrt(Mu/(0.138*fck*b))			

92.89608 mm **<160mm**

d) **A_{st} requried**

$A_{st}(Lx)=A_{st}(Ly)$

A_{st} = (1.14*Mu*b*fck)/(fy(b*d*fck-fy))

306.7446 mm^2

using 10mm dia bar spacing

S= $1000*a_{st}/A_{st}$

256.011 mm **255** mm

Ast provided= $1000*a_{st}/S$

307.9608 mm^2

provide 10mm dia bars @ 310mm c/c

e) **check for deflection**

fs= $0.58*fy*(A_{st}req/A_{st}\ pro)$

239.7495 N-mm

% of steel= 100*Ast/(b*d)

0.192475 **0.20%**

((L/d)max): 20*1.72 34.4 mm

(L/d)= 0.030625 m **30.62** mm

Hence ok