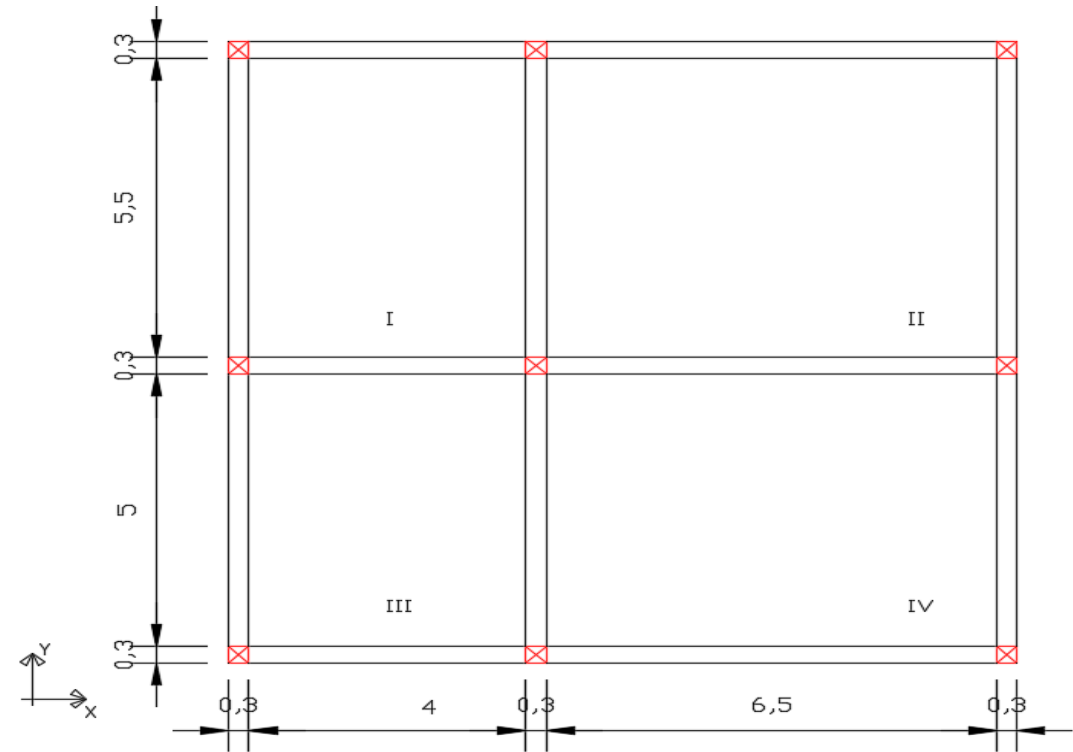


DISEÑO DE LOSAS EN DOS SENTIDOS

Diseñe el refuerzo para el siguiente sistema



Planta

Datos:

	$f'c =$	210.00	kg/cm2	$WS/C =$	200.00	kg/m2
40000 psi	$Fy =$	2810.00	kg/cm2	$WC.V.=$	300.00	kg/m2
	$Rec =$	3.00	cm	$Wconc =$	2400.00	kg/m3

3 Calculo de Momentos:

Losas en dos sentidos

MOMENTOS NEGATIVOS

$M(-)A = C(-)A * W * A^2$

$M(-)B = C(-)B * W * B^2$

MOMENTOS POSITIVOS

$M(+)A = (C(+)cmA * CMUL + C(+)cvA * CVUL) * A^2$

$M(+)B = (C(+)cmB * CMUL + C(+)cvB * CVUL) * B^2$

MOMENTOS NEGATIVOS

$M(-)A = C(-)A * W * A^2$

$M(-)B = C(-)B * W * B^2$

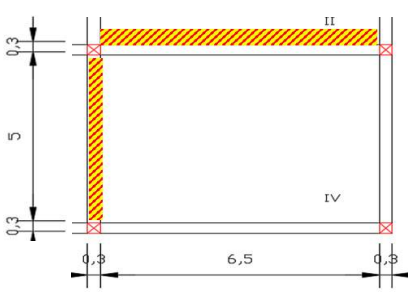
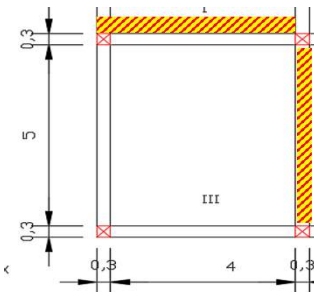
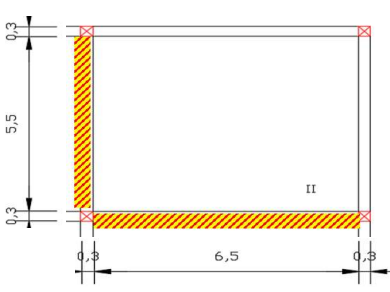
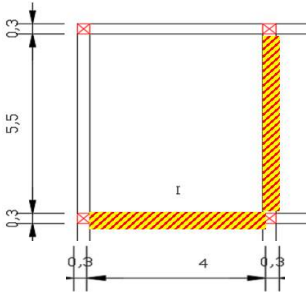
MOMENTOS POSITIVOS

$M(+)A = (C(+)cmA * CMUL + C(+)cvA * CVUL) * A^2$

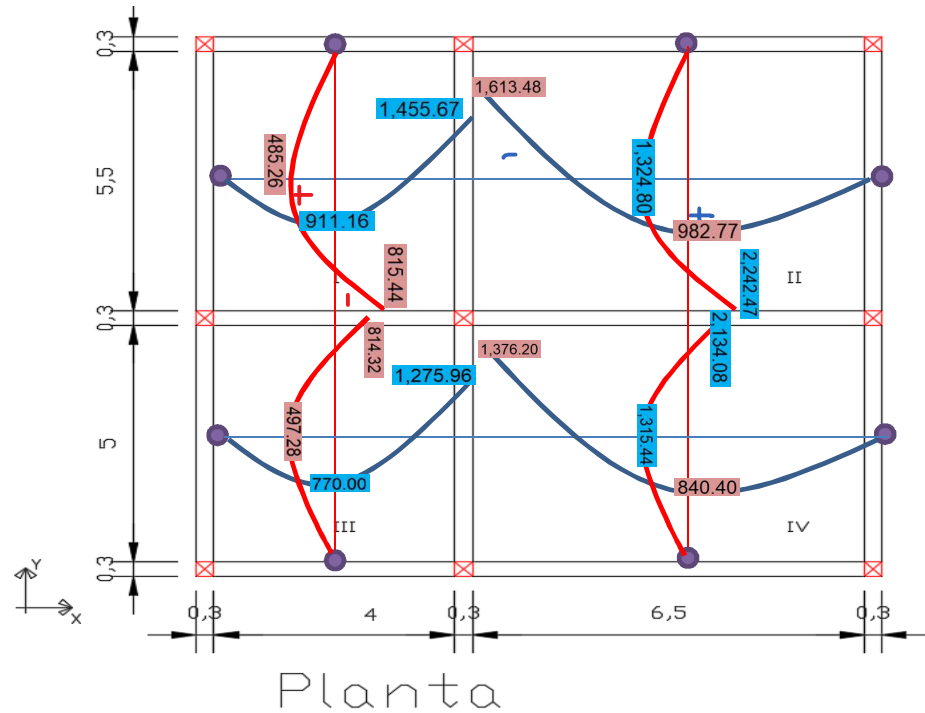
$M(+)B = (C(+)cmB * CMUL + C(+)cvB * CVUL) * B^2$

			TABLA 1	TABLA 2	TABLA 3							
Losas			COEFICIENTES			Caso	M (-)		M (-)		M (-)	
I			C(-)	Ccm(+)	Ccv(+)		kg-m	kg-m	kg-m	kg-m	kg-m	kg-m
R	A	4.00	0.081	0.046	0.057	4	1,455.67	911.16	$M(-)A = 0.081 * 1123.20 * 4^2$		$M(+)A = (0.046 * 643.20 + 0.057 * 480) * 4^2$	
	B	5.50	0.024	0.013	0.016		815.44	485.26	$M(-)B = 0.024 * 1123.20 * 5.5^2$		$M(+)B = (0.013 * 643.20 + 0.016 * 480) * 5.5^2$	
Losas			COEFICIENTES			Caso	M (-)		M (-)		M (-)	
II			C(-)	Ccm(+)	Ccv(+)		kg-m	kg-m	kg-m	kg-m	kg-m	kg-m
R	A	5.50	0.066	0.036	0.043	4	2,242.47	1,324.80				
	B	6.50	0.034	0.019	0.023		1,613.48	982.77				
Losas			COEFICIENTES			Caso	M (-)		M (-)		M (-)	
III			C(-)	Ccm(+)	Ccv(+)		kg-m	kg-m	kg-m	kg-m	kg-m	kg-m
R	A	4.00	0.071	0.039	0.048	4	1,275.96	770.00				
	B	5.00	0.029	0.016	0.02		814.32	497.28				
Losas			COEFICIENTES			Caso	M (-)		M (-)		M (-)	
IV			C(-)	Ccm(+)	Ccv(+)		kg-m	kg-m	kg-m	kg-m	kg-m	kg-m
R	A	5.00	0.076	0.043	0.052	4	2,134.08	1,315.44				
	B	6.50	0.029	0.016	0.02		1,376.20	840.40				

CASOS:



4 Diagrama de momentos NO balanceados



5 Balance de momentos

Entre losas I y II (eje X)

$M_p = 1,455.67$ Caso I
 $M_g = 1,613.48$
 $M_b = 1534.57$

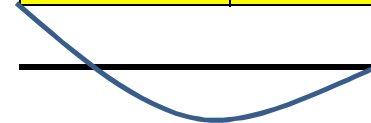
Entre losas III y IV (eje X)

$M_p = 1,275.96$ Caso I
 $M_g = 1,376.20$
 $M_b = 1326.08$

Momentos positivos corregidos

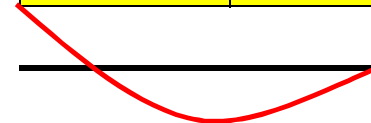
Losa II
 Eje x
 $M(+)\text{ant} = 982.77$
 $M(+)\text{corr} = 1,022.22$

$M_g = 1,613.48$ = M_g
 $M_b = 1534.57$ = M_b



Losa II
 Eje Y
 $M(+)\text{ant} = 1,324.80$
 $M(+)\text{corr} = 1,351.90$

$M_g = 2,242.47$ = M_g
 $M_b = 2188.27$ = M_b



Entre losas I y III (eje Y)

Mp =	814.32	Caso I
Mg =	815.44	
Mb =	814.88	

Losa	I
Eje	Y
M(+) _{ant}	485.26
M(+) _{corr}	485.54

Mg=	815.44	=Mg
Mb =	814.88	=Mb



Entre losas II y IV (eje Y)

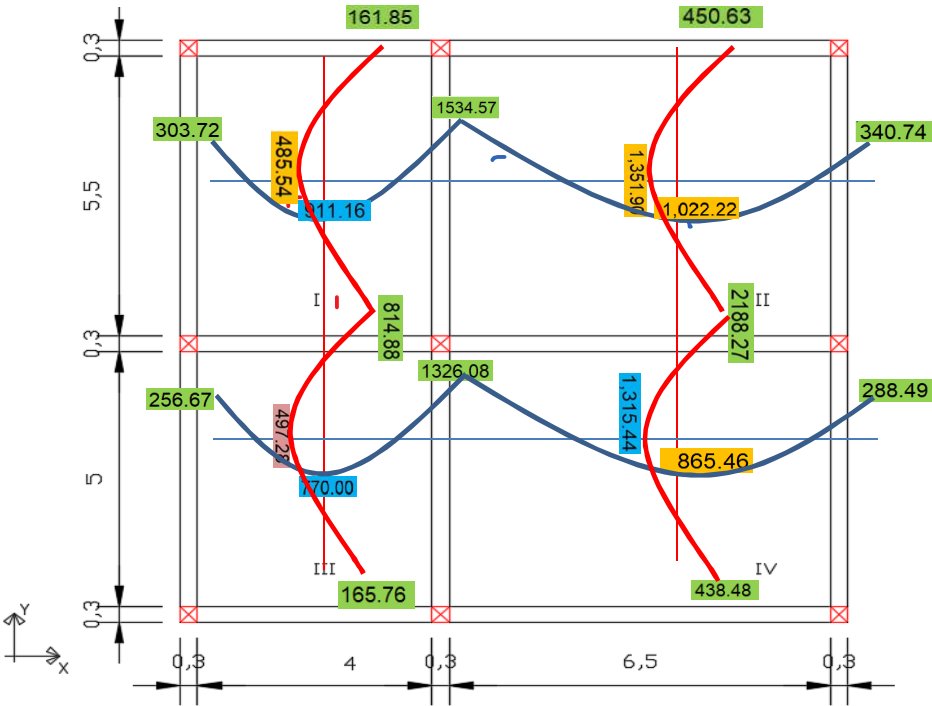
Mp =	2,134.08	Caso I
Mg =	2,242.47	
Mb =	2188.27	

Losa	IV
Eje	x
M(+) _{ant}	840.40
M(+) _{corr}	865.46

Mg=	1,376.20	=Mg
Mb =	1326.08	=Mb



Diagrama de momentos balanceados



Planta

Momento de extremo

$M_{ext} \geq M(+)/3$

Losa	I
Eje	x
Mactual	0
M(+)/3	303.718
Mext =	303.72

Losa	III
Eje	x
Mactual	0
M(+)/3	256.6656
Mext =	256.67

Losa	II
Eje	x
Mactual	0
M(+)/3	340.74
Mext =	340.74

Losa	IV
Eje	x
Mactual	0
M(+)/3	288.4882
Mext =	288.49

Losa	I
Eje	y
Mactual	0
M(+)/3	161.846
Mext =	161.85

Losa	III
Eje	y
Mactual	0
M(+)/3	165.76
Mext =	165.76

Losa	II
Eje	y
Mactual	0
M(+)/3	450.634
Mext =	450.63

Losa	IV
Eje	y
Mactual	0
M(+)/3	438.48
Mext =	438.48

7 CALCULO DE REFUERZO

7.1 Peralte d =

d = 10.53 cm

$d = t - rec - \phi/2$

DIAMETROS

No 3 = 0.95 cm

No. 4 = 1.27 cm

7.2 Acero minimo Asmin = 0.0018*t*b

Asmin = 2.52 cm²

7.3 Separacion Smax:

Smax = 3*14

Smax = 42 cm

Smax = 45 cm

Toma el menor

Smax = 42 cm

7.4 Refuerzo

Losa	Signo	M (kg-m)	As (cm²)	Asmin (cm²)	Ascolocar (cm²)	S (cm)	Smax	Scolocar (m)	ARMADO	Armado de campo
I	-	303.72	1.15	2.52	2.52	50.27	42.0	42.00	#4 @ 0.42	#4 @ 0.14
	+	911.16	3.52		3.52	36.03		36.03	#4 @ 0.36	#4 @ 0.14
	-	161.85	0.61		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
	+	485.54	1.85		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
I y II	-	1,534.57	6.04		6.04	20.98		20.98	#4 @ 0.20	#4 @ 0.14
II	+	1,022.22	3.96		3.96	32.01		32.01	#4 @ 0.32	#4 @ 0.14
	-	340.74	1.29		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
	-	450.63	1.71		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
	+	1,351.90	5.29		5.29	23.96		23.96	#4 @ 0.23	#4 @ 0.14
III	-	256.67	0.97		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
	+	770.00	2.96		2.96	42.82		42.00	#4 @ 0.42	#4 @ 0.14
	-	165.76	0.63		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
	+	497.28	1.90		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
I y III	-	814.88	3.13		3.13	40.41		40.41	#4 @ 0.40	#4 @ 0.14
III y IV	-	1,326.08	5.18		5.18	24.44		24.44	#4 @ 0.24	#4 @ 0.14
IV	+	865.46	3.33		3.33	37.99		37.99	#4 @ 0.37	#4 @ 0.14
	-	288.49	1.09		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
	-	438.48	1.67		2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
	+	1,315.44	5.14		5.14	24.65		24.65	#4 @ 0.24	#4 @ 0.14
II y IV	-	2,188.27	8.80		8.80	14.39		14.39	#4 @ 0.14	#4 @ 0.14

$$As = \frac{0.85f'c b}{fy} (d - \sqrt{d^2 - \frac{Mu}{0.425 \phi f'c b}})$$

Proponiendo usar varilla No

SEPARACION

cm²	cm
2.52	100
1.267	S = ?

ARMADO

