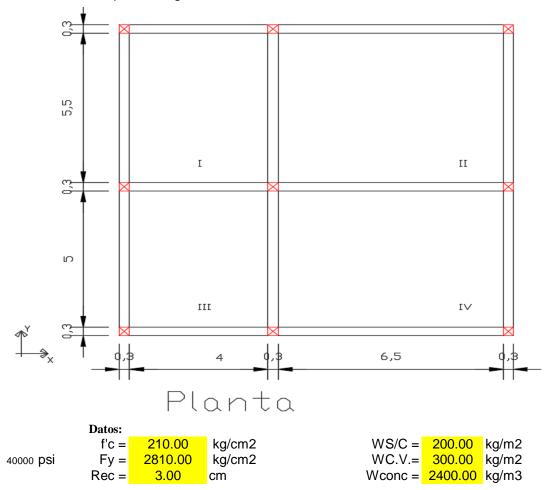
# DISEÑO DE LOSAS EN DOS SENTIDOS

Diseñe el refuerzo para el siguiente sistema



# 1) Sentido de trabajo y espesor de losas

 $R = A/B \ge 0.5$ 

	$\ell_n \left( 0.8 + \frac{f_y}{200,000} \right)$	
= B/A	36+9β	
1.38	0.114	
1.18	0.139	
1.25	0.106	

									200,000)	
LOSA	A (m)	B (m)	Sentido	Sentido (R = A/B)		Espesor de losa (m)		fy (psi)	<b>β</b> = B/A	$36+9\beta$
I	4.00	5.50	0.73	DOS	0.106	etro 0	5.500	40000	1.38	0.114
П	5.50	6.50	0.85	DOS	0.133	im 18	6.500	40000	1.18	0.139
III	4.00	5.00	0.80	DOS	0.100	= ber	5.000	40000	1.25	0.106
IV	5.00	6.50	0.77	DOS	0.128	t:	6.500	40000	1.30	0.136
•	•	•		-	•	•	•	•	tlosa =	0.14

# 2 Integracion de cargas

# **CARGA MUERTA**

Wlosa = 0.14 Ws/c =

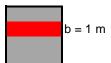
2400.00 = 336.00 kg/m² 200.00 kg/m²  $W_{losa} = t_{losa} * W_{conc}$ 

CM = 536.00 kg/m² 536.00 kg/m CMI = CM\*1m

CM= Wlosa+Ws/c

### **CARGA VIVA**

CV = 300.00 kg/m² 300.00 kg/m CVI = CV\*1m



#### **CARGA ULTIMA**

W = Wu = CU = 1.2CMI+1.6CVI

W = 1123.20 Carga ultima lineal kg/m 643.20 Carga muerta ultima lineal CMUL=1.2cml = kg/m Carga viva ultima lineal CVUL=1.6cvl = 480.00 kg/m 8.3.2 — Carga de gravedad

1.4 M  $1.2 M + 1.6 V + 0.5 (V_t o bien P_L o bien A_R)$  (CR1) (CR2)

 $1.\,2\,M\,+\,V\,+\,1.\,6\,(V_t\,o\,bien\,P_L\,o\,bien\,A_R)$ 

(CR3)

### 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 (-)

kg-m

 $M(-)A = 0.081*1123.20*4^{2}$ 

M(-)B = 0.024\*1123.20\*5.5<sup>2</sup>

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

#### MOMENTOS POSITIVOS

$$\begin{split} M(+) & A = (C(+) cmA * CMUL + C(+)_{cvA} * CVUL) * A^2 \\ M(+) & B = (C(+) cmB * CMUL + C(+)_{cv}B * CVUL) * B^2 \\ \\ \hline & \textbf{M (+)} \end{split}$$

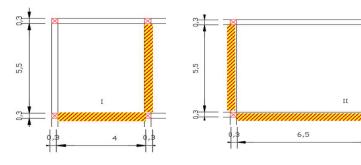
kg-m

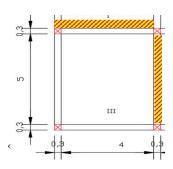
 $M(+)A = (0.046*643.20+0.057*480)*4^{\circ}$ 

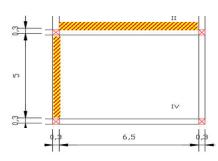
M(+)B= (0.013\*643.20+0.016\*480)\*5.5<sup>2</sup>

			TABLA 1	TABLA 2	TABLA 3			
	Losas		(	COEFICIENTE	Caso	M (-)	M (+)	
	I		C(-) Ccm(+) Ccv(+)		င်ဒ	kg-m	kg-m	
R	Α	4.00	0.081	0.046	0.057	4	1,455.67	911.16
0.73	В	5.50	0.024	0.013	0.016	4	815.44	485.26
	Los	as	(	COEFICIENTES			M (-)	M (+)
_	II		C(-)	Ccm(+)	Ccv(+)	Caso	kg-m	kg-m
R	<b>A</b> 5.50		0.066	0.036	0.043	4	2,242.47	1,324.80
0.85	В	6.50	0.034	0.019	0.023	4	1,613.48	982.77
	Losas III		(	COEFICIENTE	SO	M (-)	M (+)	
_			III C(-) Ccm(+)		Ccv(+)	Caso	kg-m	kg-m
R	Α	4.00	0.071	0.039	0.048	4	1,275.96	770.00
0.80	В	5.00	0.029	0.016	0.02	4	814.32	497.28
	Losas IV					SO	M (-)	M (+)
_			C(-)	Ccm(+)	Ccv(+)	Caso	kg-m	kg-m
R	Α	5.00	0.076	0.043	0.052	4	2,134.08	1,315.44
0.77	В	6.50	0.029	0.016	0.02	4	1,376.20	840.40

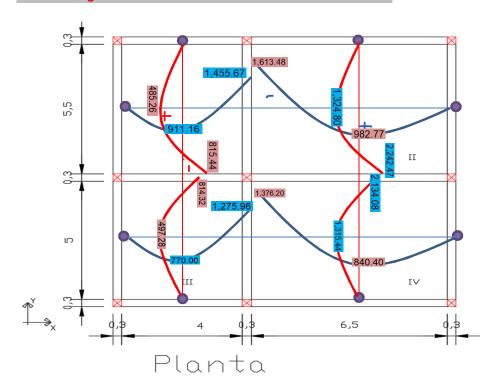
# CASOS:







# 4 Diagrama de momentos NO balanceados



# 5 Balance de momentos

# Entre losas I y II (eje X)

Mp = 1,455.67 Caso I Mg = 1,613.48

Mb = 1534.57

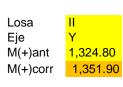
Mb =

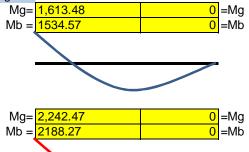
# Entre losas III y IV (eje X)

1326.08

Mp = 1,275.96 Caso I Mg = 1,376.20 Momentos positivos corregidos

Losa II x M(+)ant 982.77 M(+)corr 1,022.22





#### Entre losas I y III (eje Y) Mg= 815.44 0 =Mg Mb = 814.880 =Mb Mp =814.32 Caso I Losa Mg = 815.44 Eje M(+)ant Mb = 814.88485.26 M(+)corr 485.54 Entre losas II y IV (eje Y) Caso I Mg= 1,376.20 0 =Mg Mp =2,134.08 2,242.47 Mb = 1326.080 =Mb Mg =Losa 2188.27 Eje M(+)ant 840.40 Diagrama de momentos balanceados M(+)corr 865.46 161.85 450.63 6,3 Momento de extremo $Mext \ge M(+)/3$ 303.72 340.74 III x 0 Losa Losa 5,5 Eje Eje Mactual Mactual 256.6656 M(+)/3M(+)/3**303.718** 911.16/3 Mext = 303.72 Mext = 256.67 <u>قر</u> Losa Losa Х Eje Eje 256.67 0 Mactual Mactual 288.4882 M(+)/3340.74 M(+)/31022.22/3 340.74 Mext = Mext = 288.49 Ŋ Ш Losa Losa у О Eje Eje

ΙV

6,5

165.76

Planta

Mactual

M(+)/3

Mext =

Losa

Mactual

M(+)/3

Mext =

Eje

161.846

161.85

450.634

450.63

Mactual

M(+)/3

Mext =

Losa

Mactual

M(+)/3

Mext =

Eje

165.76

165.76

438.48

438.48

IV

у О

### 7 CALCULO DE REFUERZO

7.1 Peralte d =

d = 10.53 cm

d=t-10c-0/2

DIAMETROS No 3 = 0.95 cm No. 4 = 1.27 cm

7.2 Acero minimo Asmin = 0.0018\*t\*b

Asmin =  $2.52 \text{ cm}^2$ 

# 7.3 Separacion Smax:

Smax = 3\*14

 Smax =
 42
 cm

 Smax =
 45
 cm

 Smax =
 42

Toma el menor
Smax =
42

### 7.4 Refuerzo

Toma valor mayor

Toma
menor

					Tollia valoi illayol			Inenor		
Losa	Signo	M (kg-m)	As (cm²)	Asmin (cm²)	Ascolocar (cm²)	S (cm)	Smax	Scolocar (m)	ARMADO	Armado de campo
	-	303.72	1.15		2.52	50.27		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
l y II	-	1,534.57	6.04		6.04	20.98		20.98	#4 @ 0.20	#4 @ 0.14
	+	1,022.22	3.96		3.96	32.01		32.01	#4 @ 0.32	#4 @ 0.14
l II	-	340.74	1.29		2.52	50.27	42.0	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
	-	256.67	0.97	52	2.52	50.27		42.00	#4 @ 0.42	#4 @ 0.14
III	+	770.00	2.96	2.52	2.96	42.82		42.00	#4 @ 0.42	#4 @ 0.14
111	-	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
l 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

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

SEPARACION

		cm <sup>2</sup>	cm
Proponiendo	usar varilla No	2.52	100
	4	1.267	S = ?

# ARMADO

