

PROYECTO:
MEMORIA DESCRIPTIVA

OBRA:
CASA HABITACION
MODELO 192

DATOS GENERALES
PROPIETARIO

UBICACIÓN

REGLAMENTOS UTILIZADOS

A.- Analisis de cargas
" Reglamento de Construcción de la Cd. de Chihuahua, Chih. "

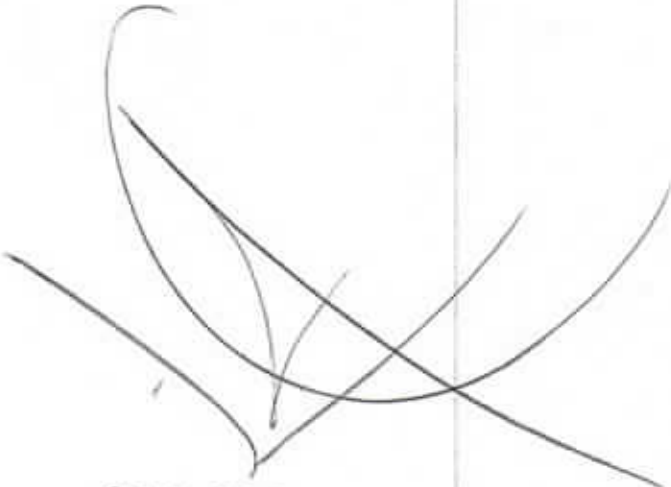
B.- Diseño de elementos de Concreto
" Reglamento de construcciones de concreto "
ACI - 318 - 11

C.- Diseño de elementos de Acero
" Manual de construccion de acero "
IMCA Quinta Edicion



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División de Arquitectura

LOSA DE AZOTEA

Espesor de losa para diseño :

$$l_n = (l_m \cdot 1.25 + l_n) / 180$$

$l_m =$	245.00	cms.
$l_n =$	650.00	cms.
$h_{\min} =$	11.19	cms.
Usar	15.00	cms.

ANALISIS DE CARGAS :

CARGAS MUERTAS :

Impermeabilización	15.00 kg/m ²
Losa aligerada	288.00 kg/m ²
Instalaciones diversas (vaseo, eléctrico, hidráulico, clima, etc.)	30.00 kg/m ²
Subtotal .-	333.00 kg/m ²

CARGAS VIVAS : 150.00 kg/m²

CARGA DE SERVICIO 483.00 kg/m²

CARGA ULTIMA 609.60 kg/m²

CARGA DE DISEÑO 650.00 kg/m²

DISEÑO DE LOSA DE AZOTEA
CARGA DE DISEÑO 650.00 kg/m²

Losas en dos direcciones.

d = 12.50 cms.
 $f_y = 4200.0 \text{ kg/cm}^2$

$M_u = coef \times W \times (a \pm b)^2$

Acero No. 3
 a cada

$A_s = M_u / f_y \times d$

1	Tablero 1		m =	Coefficiente			
	claro corto a1 =	2.45	a1/b1				
	claro largo b1 =	6.50	0.377				
	Negativo Borda interior Corto			0.106	413.572	0.789	90.129
	Largo			0.060	1647.750	3.139	22.622
	Neg Borda Discontinuo Corto			0.065	253.996	0.484	146.754
	Largo			0.033	895.278	1.705	41.635
	Positivo Corto			0.075	293.013	0.558	127.212
	Largo			0.019	624.534	0.999	71.083
2	Tablero 2		m =	Coefficiente			
	claro corto a1 =	1.95	a1/b1				
	claro largo b1 =	3.15	0.619				
	Negativo Borda interior Corto			0.053	130.996	0.250	264.550
	Largo			0.046	293.458	0.558	127.020
	Neg Borda Discontinuo Corto			0.032	79.339	0.151	469.818
	Largo			0.025	159.951	0.306	233.041
	Positivo Corto			0.031	75.632	0.144	492.849
	Largo			0.015	94.165	0.179	395.850

USAR LOSA ALIGERADA CON CASETON
 DE 12 CMS. DE ESPESOR
 CASETON DE 60 X 50 X 7 CMS.
 CON 5 CMS. DE CONCRETO SOBRE EL CASETON
 USAR NERVADURAS DE 15 CMS. DE ANCHO.
 USAR ARMADO CON 2 VRS. No. 3 EN CADA NERVADURA
 EN AMBAS DIRECCIONES.
 LECHO INFERIOR.

LOS BASTONES SERAN No. 3 A CADA 32.5 CMS.
 DE 1/5 DEL CLARO DE LONGITUD.
 LOS BASTONES SERAN No. 3 A CADA 32.50 CMS. EN VOLADOS
 PERIMETRALES, DE 1/5 DEL CLARO DE LONGITUD.

VERIFICAR DETALLES EN PLANOS.

LOSA DE ENTREPISO TIPO 1

Espesor de losa para diseño :

$$l_n = (l_m \cdot 1.25 + l_n) / 1.80$$

$l_m =$	320.00	cms.
$l_n =$	420.00	cms.
$h_{min} =$	9.25	cms.
Usar	15.00	cms.

ANALISIS DE CARGAS :

CARGAS MUERTAS :

Piso cerámico	25.00 kg/m ²
Losa aligerada	288.00 kg/m ²
Instalaciones diversas (yeso, eléctrico, hidráulico, clima, etc.)	30.00 kg/m ²
Subtotal .-	343.00 kg/m ²

CARGAS VIVAS :	250.00 kg/m ²
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CARGA DE SERVICIO	593.00 kg/m ²
CARGA ULTIMA	761.60 kg/m ²

CARGA DE DISEÑO	750.00 kg/m ²
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DISEÑO DE LOSA DE ENTREPISO
CARGA DE DISEÑO 750.00 kg/m²

Losas en dos direcciones: $d = 12.50$ cms. $M_u = \text{coef} \times W \times (a \text{ ó } b)^2$ Acero No. 3
 $f_y = 4200.0$ kg/cm² a cada:
 $A_s = M_u / f_y \times d$

1	Tablero 1		m =	Coefficiente			
	claro corto a1 =	3.00	a1/b1				
	claro largo b1 =	4.20	0.714				
	Negativo Borde interior Corto			0.045	305.775	0.582	121.803
	Largo			0.041	543.753	1.036	68.551
	Neg Borde Discontinuo Corto			0.028	191.025	0.364	195.132
	Largo						
	Positivo Corto			0.024	182.675	0.310	229.138
	Largo			0.014	182.574	0.348	204.164
2	Tablero 2		m =	Coefficiente			
	claro corto a1 =	3.20	a1/b1				
	claro largo b1 =	4.00	0.800				
	Negativo Borde Interior Corto			0.040	304.808	0.581	122.255
	Largo			0.038	454.800	0.866	81.959
	Neg Borde Discontinuo Corto			0.025	192.000	0.366	194.141
	Largo						
	Positivo Corto			0.020	155.136	0.295	240.275
	Largo			0.014	162.000	0.309	230.093

USAR LOSA ALIGERADA CON CASETON O BLOCK
 DE 15 CMS. DE ESPESOR
 CASETON O BLOCK DE 40 X 40 X 10 CMS.
 CON 5 CMS. DE CONCRETO SOBRE EL CASETON
 USAR NERVADURAS DE 15 CMS. DE ANCHO.
 USAR ARMADO CON 2 VRS. No. 3 EN CADA NERVADURA
 EN AMBAS DIRECCIONES.
 LECHO INFERIOR

LOS BASTONES SERAN No. 3 A CADA 27.50 CMS.
 DE 1/5 DEL CLARO DE LONGITUD.
 LOS BASTONES SERAN No. 3 A CADA 27.50 CMS. EN VOLADOS
 PERIMETRALES. DE 1/5 DEL CLARO DE LONGITUD.

VERIFICAR DETALLES EN PLANOS.

LOSA DE ENTREPISO TIPO 2

Espesor de losa para diseño:

$$l_n = (l_m \cdot 1.25 + l_n) / 180$$

$l_m =$	320.00	cms.
$l_n =$	530.00	cms.
$h_{min} =$	10.63	cms.
Usar	18.00	cms.

ANALISIS DE CARGAS :

CARGAS MUERTAS :

Piso cerámico	25.00 kg/m ²
Losa aligerada	288.00 kg/m ²
Instalaciones diversas (yeso, eléctrico, hidráulico, clima, etc.)	30.00 kg/m ²
Subtotal .-	343.00 kg/m ²

CARGAS VIVAS :

250.00 kg/m²

CARGA DE SERVICIO

593.00 kg/m²

CARGA ULTIMA

781.60 kg/m²

CARGA DE DISEÑO

750.00 kg/m²

DISEÑO DE LOSA DE ENTREPISO
CARGA DE DISEÑO 750.00 kg/m²

Losas en dos direcciones.

d= 15.50 cms.
 $f_y = 4200.0 \text{ kg/cm}^2$

$M_u = \text{coef} \times W \times (a \text{ ó } b)^2$

Acero No.3

a cada :

$A_s = M_u / f_y \times d$

1	Tablero 1	m =	Coeficiente			
	claro corto a1 =	3.20	a1/b1			
	claro largo b1 =	5.30	0.604			
	Negativo Borde Interior Corto		0.053	407.040	0.625	113.554
	Largo		0.046	958.571	1.472	48.219
	Neg Borde Discontinuo Corto		0.032	245.528	0.379	187.488
	Largo		0.025	522.474	0.803	88.486
	Positivo Corto		0.031	235.008	0.381	195.678
	Largo		0.015	307.586	0.472	150.270
2	Tablero 2	m =	Coeficiente			
	claro corto a1 =	3.80	a1/b1			
	claro largo b1 =	4.80	0.750			
	Negativo Borde Interior Corto		0.047	457.812	0.703	100.981
	Largo		0.043	741.312	1.138	82.350
	Neg Borde Discontinuo Corto		0.028	289.244	0.414	171.670
	Largo		0.024	407.808	0.626	113.340
	Positivo Corto		0.026	251.748	0.387	183.600
	Largo		0.014	245.376	0.377	188.368

USAR LOSA ALIGERADA CON CASETON O BLOCK
 DE 15 CMS. DE ESPESOR + AISLANTE 1"
 CASETON O BLOCK DE 40 X 40 X 10 CMS.
 CON 5 CMS. DE CONCRETO SOBRE EL CASETON
 USAR NERVADURAS DE 15 CMS. DE ANCHO.
 USAR ARMADO CON 2 VRS. No. 3 EN CADA NERVADURA
 EN AMBAS DIRECCIONES.
 LECHO INFERIOR

LOS BASTONES SERAN No. 3 A CADA 27.50 CMS.
 DE 1/5 DEL CLARO DE LONGITUD.
 LOS BASTONES SERAN No. 3 A CADA 27.50 CMS. EN VOLADOS
 PERIMETRALES, DE 1/5 DEL CLARO DE LONGITUD.

VERIFICAR DETALLES EN PLANOS.

DISEÑO DE TRABES.

TRABE T-1

W=	2975.00 kg-mi	b=	20.00
Long. =	4.00 mi	h=	45.00
		d=	42.50

Flexion

M (+) = $wl^2/8$	5950.0 kg-mi
M (-) = $wl^2/12$	3966.7 kg-mi

$M_u / f'_c b d^2$	ρ	$A_s \text{ (cm}^2\text{)} =$
18.301	0.00330	2.805
12.200	0.00330	2.805

Usar 2 Vrs. No. 5 en lecho superior
Usar 3 Vrs. No. 6 en lecho inferior

Revision de flecha

Delta = $5 \cdot w \cdot l^4 / 384 \cdot E \cdot I$	
Delta =	0.031
L/180 =	2.222
L/300 =	1.333
L/220 + 0.5 =	2.318

o.k.

Cortante

$V_u = w \cdot l / 2$	5950.00 kgs
$f'_c V_c = 0.53 \cdot 0.85 \cdot 14 \cdot b \cdot d$	5415.36 kgs
$V_u - f'_c V_c =$	534.64 kgs.
$V_s = V_u - f'_c V_c / 0.85 =$	626.98 kgs.
$S = f_y \cdot d \cdot A_s / V_s =$	482.44 cms.
$S = d/2$	21.25 cms.

con vrs. No 3

Usar estribos No. 3 a cada 20 cms.



TRABE T-2

W= 1700.00 kg-m
Long. = 4.50 m

b= 20.00
h= 40.00
d= 37.50

Flexion

M (+) = $wl^2 / 8$ 4303.1 kg-m
M (-) = $wl^2 / 12$ 2868.8 kg-m

$M_u / f_i b d^2$
17.000
11.333

ρ
0.00330
0.00330

$A_s (cm^2) =$
2.475
2.475

Usar 2 Vrs. No. 5 en lecho superior
Usar 2 Vrs. No. 6 en lecho inferior

Revision de flecha

$\Delta = 5 w l^4 / 384 E I$

$\Delta =$ 0.041
 $L/180 =$ 2.500
 $L/300 =$ 1.500
 $L/220 + 0.5 =$ 2.545

o.k.

Cortante

$V_u = w l / 2$
 $f_v V_c = 0.53 \cdot 0.85 \cdot 14.14 \cdot b \cdot d$
 $V_u - f_v V_c =$
 $V_s = V_u - f_v V_c / 0.65 =$
 $S = f_y \cdot d \cdot A_s / V_s =$
 $S = d/2$

3825.00 kgs
4778.26 kgs
-953.26 kgs.
-1121.48 kgs.
-238.75 cms.
16.75 cms.

con vrs. No. 3

Usar estribos No. 3 a cada 20 cms.

TRABE T-3

W= 1530.00 kg-mi
 Long. = 3.00 mi
 b= 15.00
 h= 40.00
 d= 37.50

Flexion
 $M (+) = w l^2 / 8$ 1721.3 kg-mi
 $M (-) = w l^2 / 12$ 1147.5 kg-mi

$M_u / f_i b d^2$ 9.087
 6.044
 ρ 0.00330
 0.00330
 $A_s (cm^2) =$ 1.856
 1.856

Usar 2 Vrs. No. 4 en lecho superior
 Usar 2 Vrs. No. 5 en lecho inferior

Revision de flecha

$\Delta = 5 w l^4 / 384 E I$
 $\Delta =$ 0.010
 $L/180 =$ 1.667
 $L/300 =$ 1.000
 $L/220 + 0.5 =$ 1.864

a.k.

Cortante

$V_u = w l / 2$ 2295.00 kgs
 $f_i V_c = 0.53 \cdot 0.85 \cdot 14.14 \cdot b \cdot d$ 3583.70 kgs
 $V_u - f_i V_c =$ -1288.70 kgs
 $V_s = V_u - f_i V_c / 0.85 =$ -1516.11 kgs.
 $S = f_y \cdot d \cdot A_s / V_s =$ -176.60 cms.
 $S = d/2$ 18.75 cms.

con vrs. No. 3

Usar estribos No. 2 a cada 15 cms.

TRABE T-4

W= 2040.00 kg-mi
Long.= 3.40 mi

b= 60.00
h= 15.00
d= 12.50

Flexion

M (+) = $wl^2/8$ 2947.8 kg-mi
M (-) = $wl^2/12$ 1965.2 kg-mi

$Mu / fi * b * d^2$
34.937
23.291

ρ
0.00700
0.00400

As (cm²) =
5.250
3.000

Usar 4 Vrs. No. 3 en lecho superior
Usar 4 Vrs. No. 4 en lecho inferior

Revision de flecha

Delta = $5 * w * l^4 / 384 * E * I$
Delta = 0.100
L/180 = 1.889
L/300 = 1.133
L/220 + 0.5 = 2.045

o.k.

Cortante

$Vu = w * l / 2$
 $fi * Vc = 0.53 * 0.85 * 14.14 * b * d$
 $Vu - fi * Vc =$
 $Vs = Vu - fi * Vc / 0.85 =$
 $S = fy * d * As / Vs =$
 $S = d/2$

3468.00 kgs
4778.26 kgs
-1310.26 kgs.
-1541.48 kgs.
-57.90 cms.
6.25 cms.

con vrs. No. 3

Usar estribos No. 2 a cada 15 cms.

TRABE T-5

W= 1300.00 kg-mi
 Long. = 2.70 mi
 b= 40.00
 h= 15.00
 d= 12.50

Flexion
 $M (+) = w l^2 / 8$ 1184.6 kg-mi
 $M (-) = w l^2 / 12$ 789.6 kg-mi

$M_u / f_i b d^2$
 21.060
 14.040
 ρ
 0.00400
 0.00330
 $A_s (cm^2) =$
 2.000
 1.650

Usar 3 Vrs. No. 3 en lecho superior
 Usar 3 Vrs. No. 4 en lecho inferior

Revision de flecha

$\Delta = 5 w l^4 / 384 E I$
 $\Delta =$ 0.038
 $L/180 =$ 1.500
 $L/300 =$ 0.900
 $L/220 + 0.5 =$ 1.727

o.k.

Cortante

$V_u = w l / 2$ 1755.00 kgs
 $f_i V_c = 0.53 \cdot 0.85 \cdot 14.14 \cdot b \cdot d$ 3185.51 kgs
 $V_u - f_i V_c =$ -1430.51 kgs
 $V_s = V_u - f_i V_c / 0.85 =$ -1682.95 kgs
 $S = f_y \cdot d \cdot A_s / V_s =$ -53.03 cms
 $S = d/2$ 6.25 cms

Usar estribos No. 2 a cada 15 cms.

con vrs. No. 3

TRABE T-6

W= 2550.00 kg-mi
Long. = 1.50 mi

b= 15.00
h= 40.00
d= 37.50

Flexion

M (+) = $wl^2/2$ 2868.8 kg-mi
M (-) = $wl^2/12$ 478.1 kg-mi

$Mu / fi * b * d^2$

15.111

2.519

ro

0.00330

0.00330

As (cm2) =

1.856

1.856

Usar 3 Vrs. No. 5 en lecho superior
Usar 2 Vrs. No. 4 en lecho inferior

Revision de flecha

Delta = $5 * w * l^4 / 384 * E * I$

Delta = 0.001

L/180 = 0.833

L/300 = 0.500

L/220 + 0.5 = 1.182

o.k.

Cortante

$Vu = w * l / 2$

$fi * Vc = 0.53 * 0.85 * 14.14 * b * d$

$Vu - fi * Vc =$

$Vs = Vu - fi * Vc / 0.85 =$

$S = fy * d * As / Vs =$

$S = d/2$

1912.50 kgs

3583.70 kgs

-1671.20 kgs.

-1968.11 kgs

-136.18 cms.

18.75 cms.

con vrs. No. 3

Usar estribos No. 2 a cada 15 cms.

TRABE T-7

W= 1275.00 kg-m
 Long. = 6.30 m
 b= 15.00
 h= 40.00
 d= 37.50

Flexion
 M (+) = $wl^2 / 8$ 8325.6 kg-m
 M (-) = $wl^2 / 12$ 4217.1 kg-m

$M_u / f_i b d^2$ 33.320
 22.213
 ρ 0.00600
 0.00400
 $A_s (cm^2) =$ 3.375
 2.250

Usar 2 Vrs. No. 5 en lecho superior
 Usar 2 Vrs. No. 6 en lecho inferior

Revisión de flecha

Delta = $5 \cdot w \cdot l^4 / 384 \cdot E \cdot I$
 Delta = 0.156 o.k.
 L/180 = 3.500
 L/300 = 2.100
 L/220 + 0.5 = 3.364

Cortante

$V_u = w \cdot l / 2$ 4016.25 kgs
 $f_i V_c = 0.53 \cdot 0.85 \cdot 14.14 \cdot b \cdot d$ 3583.70 kgs
 $V_u - f_i V_c$ 432.55 kgs
 $V_s = V_u - f_i V_c / 0.65 =$ 508.89 kgs
 $S = f_y \cdot d \cdot A_s / V_s$ 526.15 cms.
 $S = d/2$ 18.75 cms.

con vrs. No. 3

Usar estribos No. 2 a cada 15 cms.

CASTIILLO C-1

PROPIEDADES DE SECCION

Base	15.00
Peralte	15.00
Recubrimiento	2.00
Concreto	200.00
Acero	4200.00
Modulo	800.10
Inercia	13335.00
Bd	1.00
Lx	1.00
Area	225.00
Ix	13335.00
Radio	8.46
Esbeltes	35.00 mayor 22

DATOS DE COLUMNA

Columna	c-1		
Pu		3000.00 kg	
Mu		450.00 kg-mi	
Momentos	Minimos ACI		
exentricidad minima	2.500		
	M2 min		11.430 k-cm
	M2 min		0.114 k-mi
M2	9881.250 mayor O.K.		
CARGA Po	4050.000 K		
Cmx	1.000	0.750	3037.50 k
Delta	1.300 mayor a 1		
MOMENTO AMPLIFICADO			
Mc	12.573 real		1.500
e/u	0.19884		

FACTORES

Phi Pn / Ag x e/H
0,2223225678 x 0,112994932 0,0288765 x Phi Mn / Ag x H

Phi x Pn / Ag

Phi x Mn / Ag x H

Valor 0,140
Area gruesa 2.8400

Area de refuerzo transversal
Separacion maxima d/2 7.487

USAR 15 x 15 CMS , ARMADO CON 4 No. 3 Y Estribos No. 2 a cada 20.0 cms.

CASTILLO K-1

PROPIEDADES DE SECCION

Base	15.00
Peralte	15.00
Recubrimiento	2.00
Concreto	200.00
Acero	4200.00
Modulo	800.10
Inercia	13335.00
Bd	1.00
Lx	1.00
Area	225.00
Ix	13335.00
Radio	8.46
Esbeltes	35.00 mayor 22

DATOS DE COLUMNA

Columna	k-1		
Pu		3000.00 kg	
Mu		450.00 kg-mi	
Momentos	Minimos ACI		
exentricidad minima	2.500		
	M2 min		11.430 k-cm
	M2 min		0.114 k-mi
M2	9881.250 mayor O.K.		
CARGA Po	4050.000 K		
Cmx	1.000	0.750	3037.50 k
Delta	1.300 mayor a 1		
MOMENTO AMPLIFICADO			
Mc	12.573 real		1.500
e/u	0.19884		

FACTORES

Phi Pn / Ag x e/H
0,2223225678 x 0,112994932 0,0288765 x Phi Mn / Ag x H

Phi x Pn / Ag

Phi x Mn / Ag x H

Valor 0.140
Area gruesa 2.8400

Area de refuerzo transversal
Separacion maxima d/2 7.487

USAR 15 x 15 CMS , CON ARMEX 15-15/4

CASTILLO K-2

PROPIEDADES DE SECCION

Base	35.00
Peralte	35.00
Recubrimiento	2.00
Concreto	200.00
Acero	4200.00
Modulo	800.10
Inercia	13335.00
Bd	1.00
Lx	1.00
Area	1225.00
ix	13335.00
Radio	8.46
Esbeltes	35.00 mayor 22

DATOS DE COLUMNA

Columna	k-2		
Pu		3000.00 kg	
Mu		450.00 kg-mi	
Momentos	Minimos ACI		
excentricidad minima	2.500		
	M2 min		11.430 k-cm
	M2 min		0.114 k-mi
M2	9881.250 mayor O.K.		
CARGA Po	4050.000 K		
Cmx	1.000	0.750	3037.50 k
Delta	1.300 mayor a 1		

MOMENTO AMPLIFICADO

Mc	12.573 real	1.500
e/u	0.19884	

FACTORES

Phi Pn / Ag x e/H	
0,2223225678 x 0,112994932	0,0288765 x Phi Mn / Ag x H

Phi x Pn / Ag

Phi x Mn / Ag x H

Valor	0.140
Area gruesa	2.8400

Area de refuerzo transversal
Separacion maxima d/2

17.457

USAR 35 x 35 CMS , ARMADO CON 8 No. 4 Y Estribos No. 3 a cada 20.0 cms.

PROCEDIMIENTO DE ANALISIS Y DISEÑO :

LOSA DE PISO

Espesor de losa para diseño :

$$l_n = (l_m \cdot 1.25 + l_n) / 180$$

$l_m =$	330.0	cms.
$l_n =$	450.0	cms.
$h_{min} =$	8.67	cms.
Usar	13.00	cms.

ANALISIS DE CARGAS :

CARGAS MUERTAS :

Peso propio 286.00 kg/m²

CARGAS VIVAS :

Habitacionales 250.00 kg/m²

CARGA DE SERVICIO

538.00 kg/m²

CARGA ULTIMA

695.60 kg/m²

CARGA DE DISEÑO

700.00 kg/m²

DISEÑO DE LOSA DE PISO

CARGA DE DISEÑO 700.00 kg/m²

Losa en dos direcciones

$d = 10.50$ cms.
 $f_y = 4200.0$ kg/cm²

$$M_u = \text{coef} \times W \times (a \text{ ó } b)^2$$

Acero No.3
a cada :

$$A_s = M_u / f_y \times d$$

losa tipo		$m =$	Coficiente
claro corto $a_1 =$	3.30	a_1/b_1	
claro largo $a_2 =$	4.50	0.733333	

Positivo Corto	0.07500	571.73	1.30	54.77
Largo	0.03500	496.13	1.13	63.11

USAR LOSA SOLIDA DE 13 CMS. DE ESPESOR

USAR ACERO CON MALLA SOLDADA 66-8/8

EN AMBOS LECHOS

VERIFICAR DETALLES EN PLANOS.

$f_y = 5000.00$ kg/cm²

$f_c = 200.00$ kg/cm²

CONTRATRABE CT-I INTERIOR

W= 2280.00 kg-m
 Long. = 3.85 m
 b= 20.00
 h= 25.00
 d= 22.50

Flexion

M (+) = $wl^2 / 8$ 4224.4125 kg-m
 M (-) = $wl^2 / 12$ 2816.28 kg-m

$Mu / fi * b * d^2$ rho $As (cm^2) =$
 46.3584 0.00380 1.710
 30.9056 0.00330 1.485

Usar Armex 15-20/4
 mas 2 vrs #3 en lecho superior
 $fy = 6,000.00 \text{ kg/cm}^2$, en armex
 $fc = 200.00 \text{ kg/cm}^2$

Revision de flecha

Delta = $5 * w * l^4 / 384 * E * I$
 Delta = 0.119
 L/180 = 2.139
 L/300 = 1.283
 L/220 + 0.5 = 2.250

o.k.

Cortante

$Vu = w * l / 2$ 4389.00 kgs
 $fi * Vc = 0.53 * 0.85 * 14.14 * b * d$ 2886.96 kgs
 $Vu - fi * Vc =$ 1522.04 kgs
 $Vs = Vu - fi * Vc / 0.85 =$ 1790.64 kgs
 $S = fy * d * As / Vs =$ 89.72 cms.
 $S = d / 2$ 11.25 cms.

con vrs. No. 3

Usar contratrabe de 20 x 25 cms
 Usar Armex 15-20/4
 mas 2 vrs #3 en lecho superior
 $fy = 6,000.00 \text{ kg/cm}^2$, en armex
 $fc = 200.00 \text{ kg/cm}^2$

CONTRATRABE CT-E EXTERIOR

W=	1140.00 kg-m	b=	20.00
Long. =	4.50 m	h=	25.00
		d=	22.50

Flexion

M (+) = $wl^2 / 8$	2665.625 kg-m
M (-) = $wl^2 / 12$	1923.75 kg-m

$M_u / f_i b d^2$	ρ	$A_s (cm^2) =$
31.6687	0.00380	1.710
21.1111	0.00330	1.485

Usar Armex 15-20/4
mas 1 vr #3 en lecho superior
 $f_y = 6,000.00 \text{ kg/cm}^2$, en armex
 $f_c = 200.00 \text{ kg/cm}^2$

Revisión de flecha

Delta = $5 \cdot w \cdot l^4 / 384 \cdot E \cdot I$	
Delta =	0.111
L/180 =	2.500
L/300 =	1.500
L/220 + 0.5 =	2.545

o.k.

Cortante

$V_u = w \cdot l / 2$	2565.00 kgs
$f_i V_c = 0.53 \cdot 0.85 \cdot 14.14 \cdot b \cdot d$	2866.96 kgs
$V_u - f_i V_c =$	-301.96 kgs.
$V_s = V_u - f_i V_c / 0.85 =$	-355.24 kgs.
$S = f_y \cdot d \cdot A_s / V_s =$	-452.22 cms.
$S = d/2$	11.25 cms.

con vrs. No. 3

Usar contratrabe de 20 x 25 cms
Usar Armex 15-20/4
Área de acero = 1.28 cm²
 $f_y = 6,000.00 \text{ kg/cm}^2$, en armex
 $f_c = 200.00 \text{ kg/cm}^2$

CONCRETE FOOTING DESIGN

FOOTING ID : zapata aislada ZA-1 COLINDANTE Code: ACI 318-08

SOIL DATA

Max. Vert. Press. = 12000.000 kgf/M²
 Max. Flexural Press. = 120000.000 kgf/M²
 Density = 1441.662 kgf/M³
 Phi Angle = 0.524 Rad
 Coeff. of Friction = 0.333
 Cohesion = 0.000 kgf/M²

CONCRETE DATA

F_c = 210.921 kgf/cm²
 Density = 2402.770 kgf/M³
 F_y = 4218.419 kgf/cm²

COLUMN DATA

F_c = 281.228 kgf/cm²
 X Dim. = 15.000 cm
 Z Dim. = 15.000 cm
 X Offset = 0.000 M
 Z Offset = 0.000 M

SURCHARGE DATA

Fig. Depth = 0.400 M
 FS Uplift = 1.000
 +X,+Z Quadrant = 0.000 kgf/M²
 +X,-Z Quadrant = 0.000 kgf/M²

BASE PLATE DATA

FS Overturning = 1.000
 FS Sliding = 1.000
 -X,-Z Quadrant = 0.000 kgf/M²
 -X,+Z Quadrant = 0.000 kgf/M²
 X Dim. = 0.000 cm
 Z Dim. = 0.000 cm

FACTORED LOADS INPUT

LOAD CASE	VERTICAL LOAD	DL/TOTAL RATIO	MX	MZ	HX	HZ
1	-8950.000 kgf	0.00	0.000 M -kgf	0.000 M -kgf	0.000 kgf	0.000 kgf

FOOTING DESIGN

SHEAR STRESSES (ONE WAY)
 X Dimension = 0.96 M
 Z Dimension = 0.96 M
 Thickness = 18.000 cm
 Max. Press. = 4702.999 kgf/M²
 Allow. = 6.546 kgf/cm²
 Design Controlled by Soil Pressures

SHEAR STRESSES (TWO WAY)
 +X Area = 3.106 kgf/cm²
 -X Area = 3.106 kgf/cm²
 +Z Area = 5.868 kgf/cm²
 -Z Area = 5.868 kgf/cm²
 +X Area = 10.925 kgf/cm²
 -X Area = 10.925 kgf/cm²
 +Z Area = 10.925 kgf/cm²
 -Z Area = 10.925 kgf/cm²
 Allow. = 13.093 kgf/cm²

BOTTOM STEEL DESIGN (Parallel to X Axis)

Moment (+X Area) = 276.484 M -kgf
 (-X Area) = 276.484 M -kgf
 Steel Required = 2.057 cm² (Min)
 Dist. to Centroid = 8.890 cm

BOTTOM STEEL DESIGN (Parallel to Z Axis)

Moment (+Z Area) = 276.484 M -kgf
 (-Z Area) = 276.484 M -kgf
 Steel Required = 2.261 cm²
 Dist. to Centroid = 11.430 cm

Typical Spacings

3 #3 Bars at 30.480 cm. Centers (Anchor)
 3 #4 Bars at 30.480 cm. Centers (Anchor)

Typical Spacings

4 #3 Bars at 20.320 cm. Centers (Anchor)

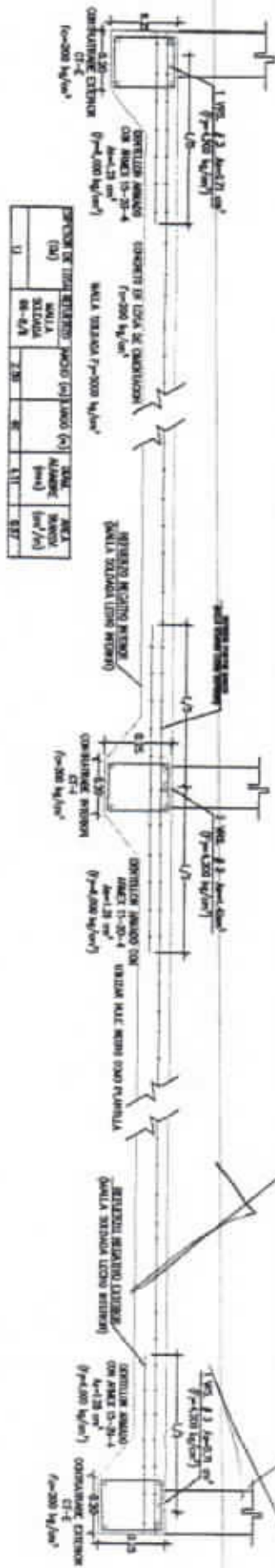
QUANTITIES : 2.066 kgfs of Steel and 0.087 M³ of Concrete.

USAR ZAPATA DE 1.00 x 1.00 x 0.20 ml.

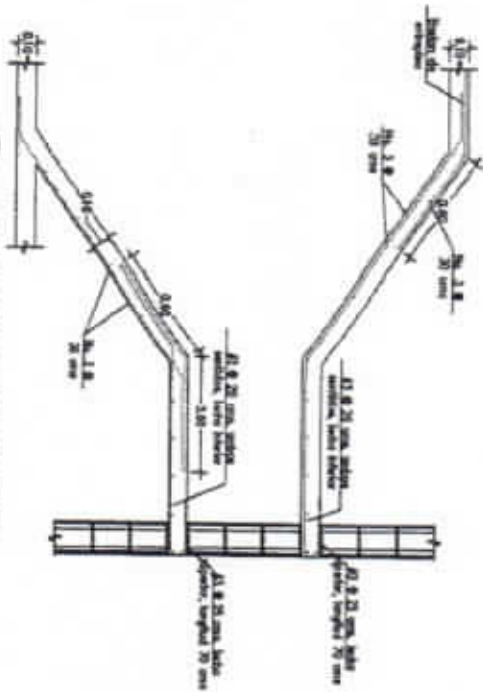
ARMAR CON VRS. No. 4 @ 20 CMS.

AMBOS SENTIDOS

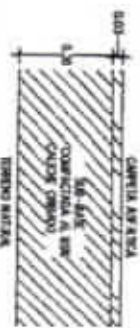
AMBOS LECHOS



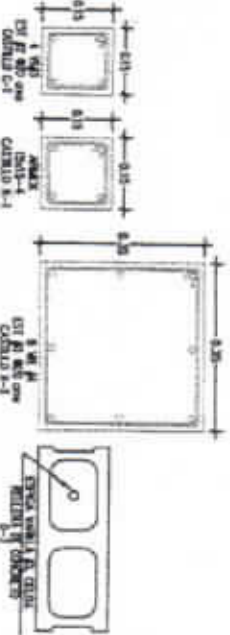
06 CORTE TRANSVERSAL LOSA DE CIMENTACION



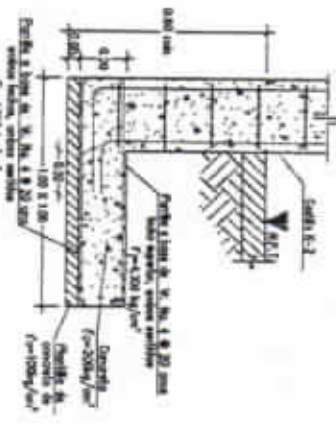
07 DETALLE DE ESCALERA



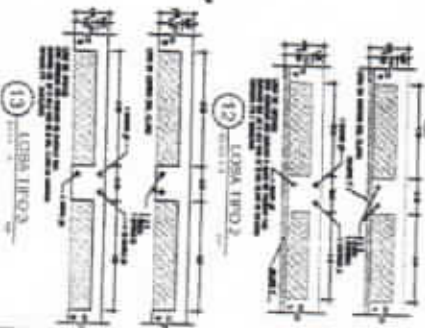
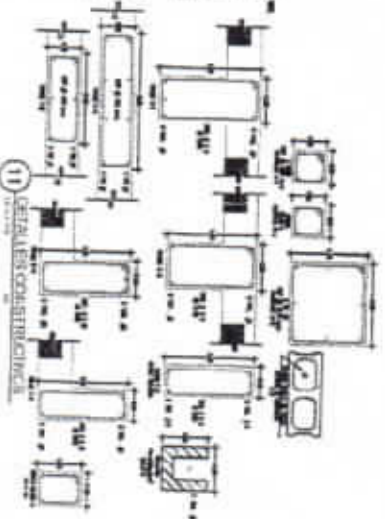
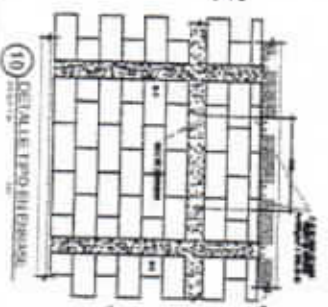
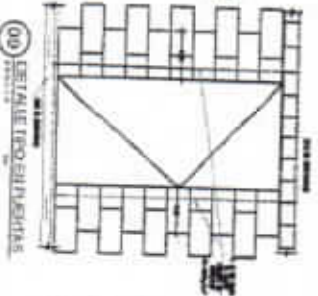
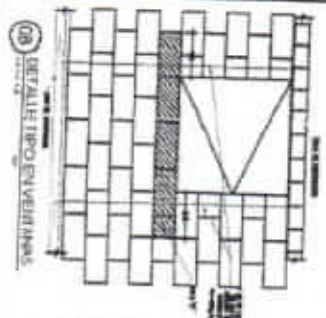
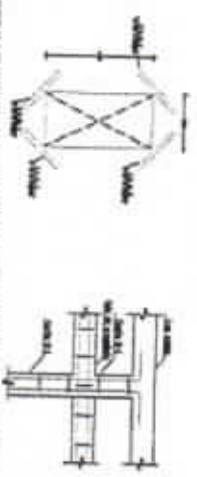
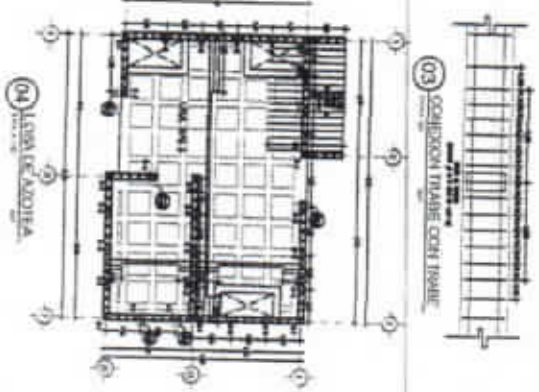
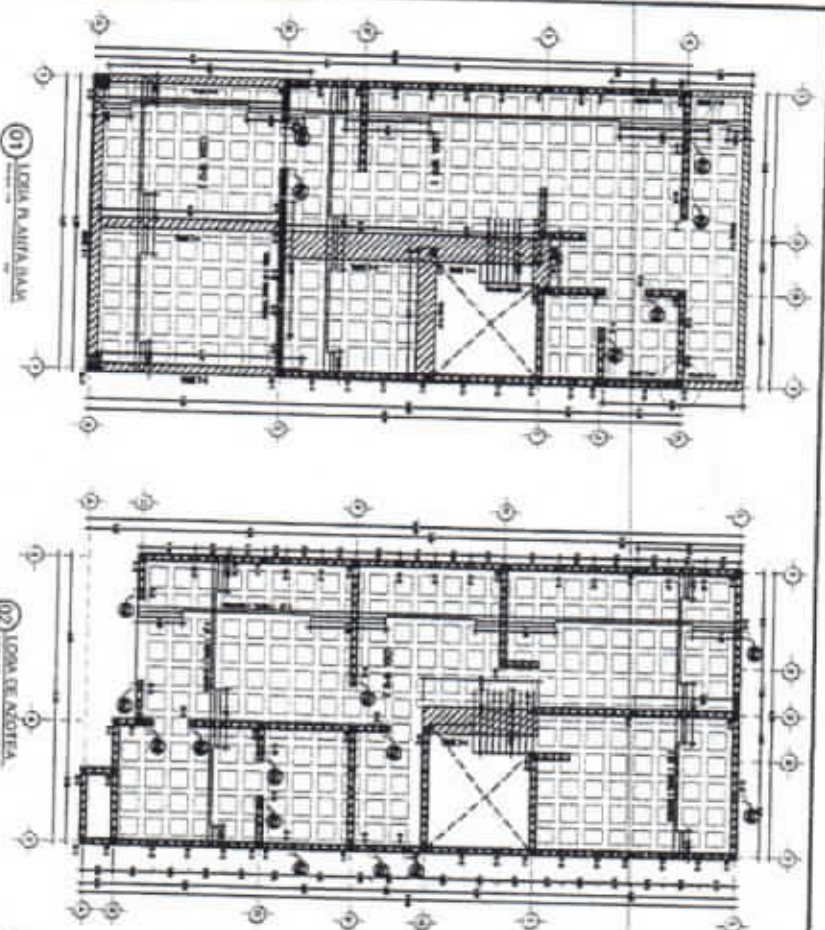
05 DETALLE DE TERRACERIA



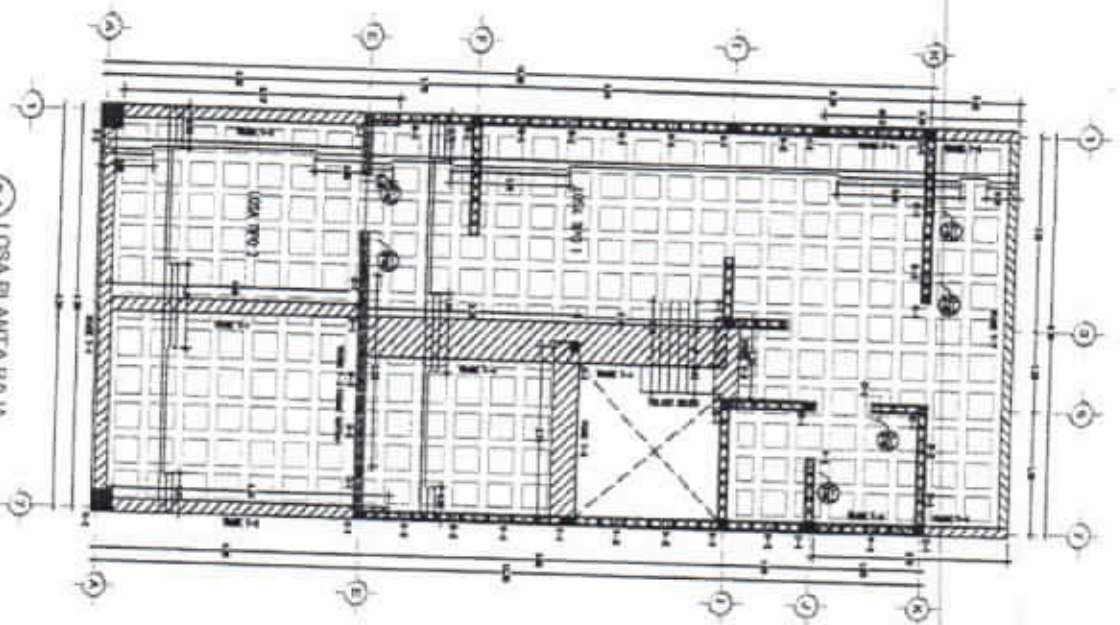
08 DETALLES CONSTRUCTIVOS



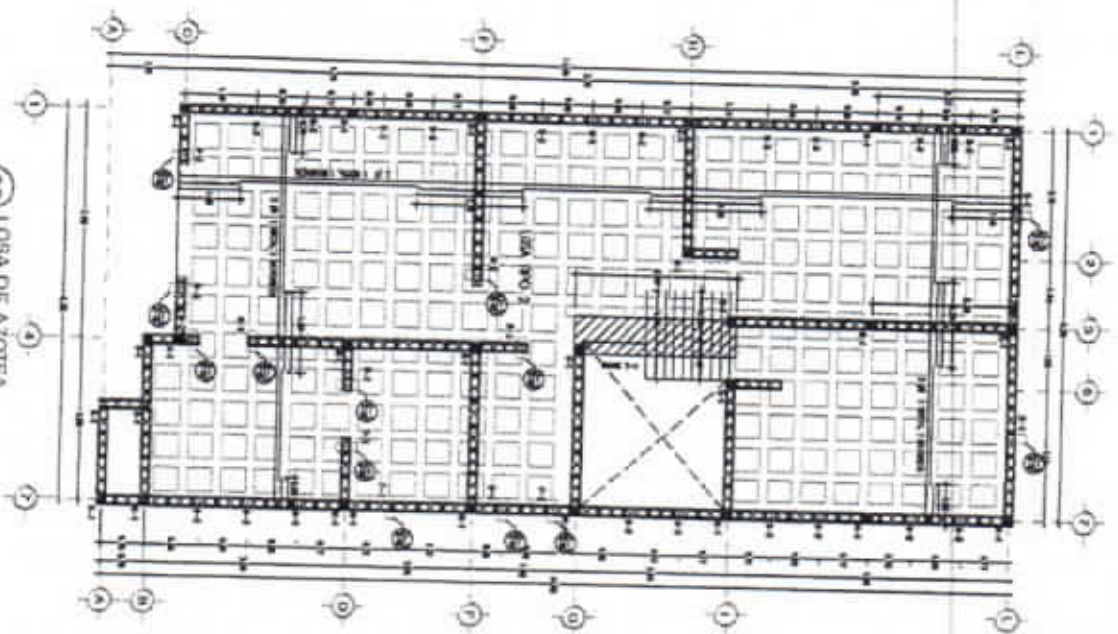
04 ZAPATA AISLADA ZA-1

[illegible]

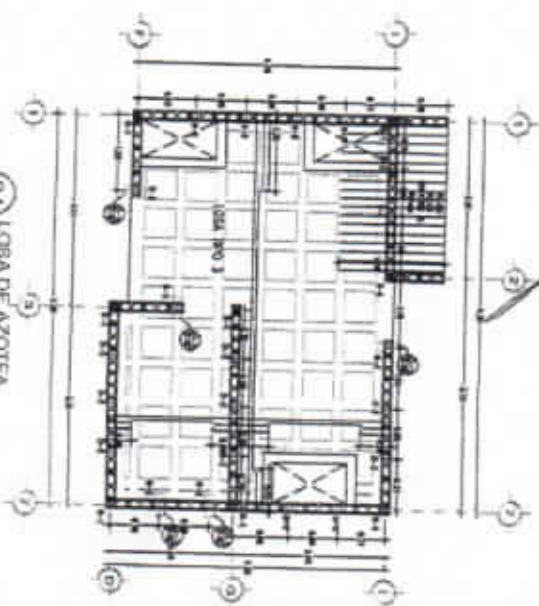
01 LOSA PLANTA BAJA

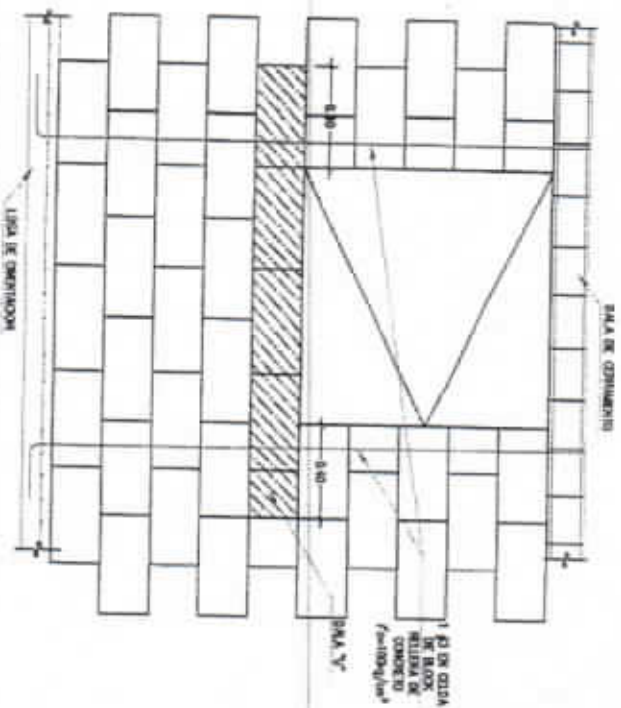


02 LOSA DE AZOTEA

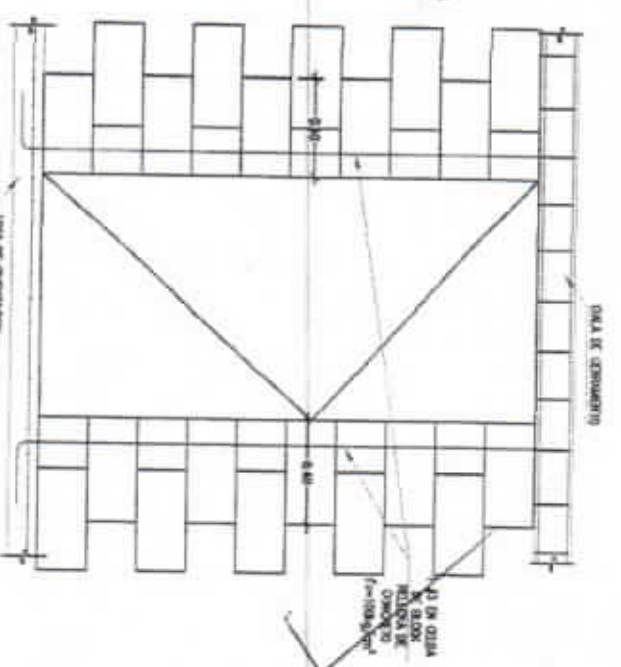


04 LOSA DE AZOTEA

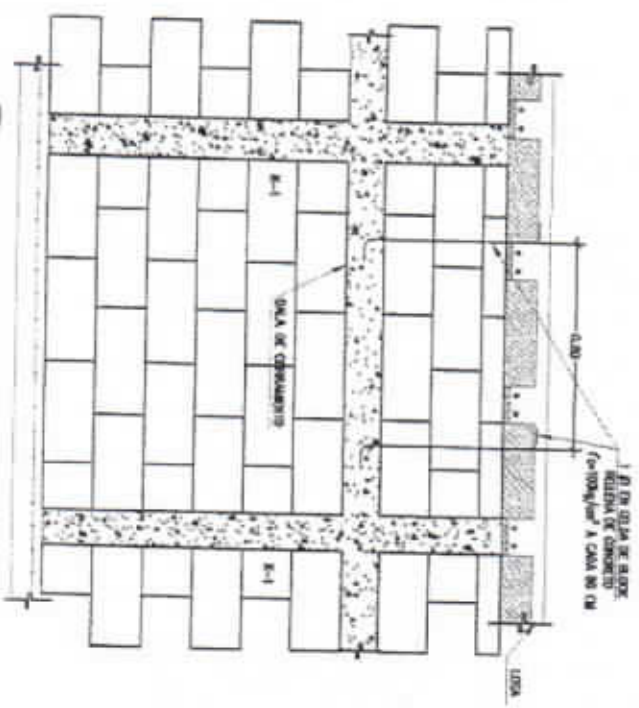




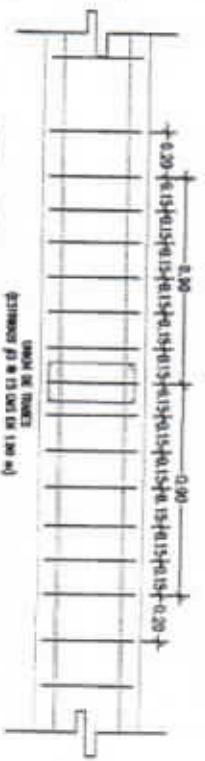
08 DETALLE TIPO EN VENTANAS
ESCALA 1:20
REV.



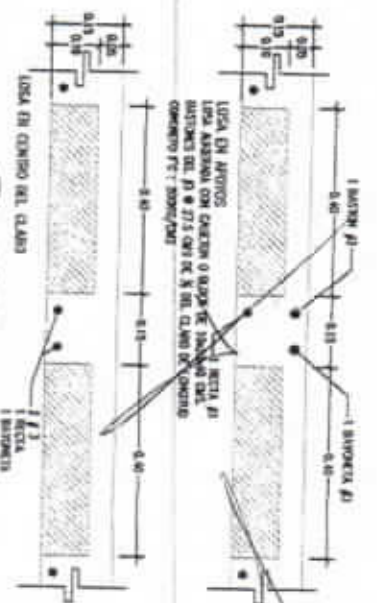
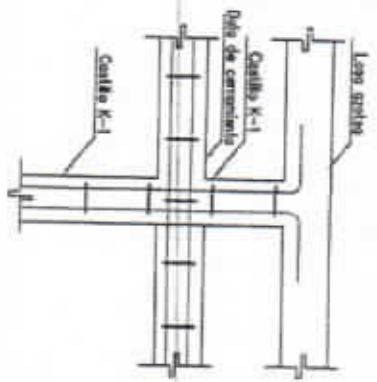
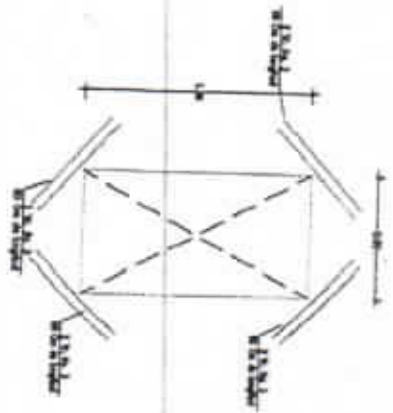
09 DETALLE TIPO EN PUERTAS
ESCALA 1:20
REV.



10 DETALLE TIPO EN ENRASE
ESCALA 1:20
REV.



03 CONEXION TRABE CON TRABE
ESCALA 2:5
REV.

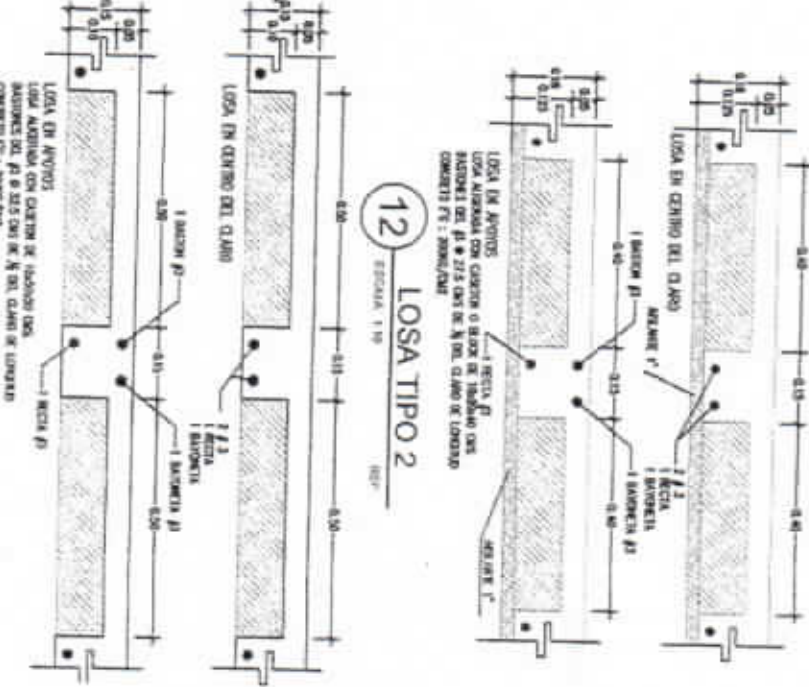
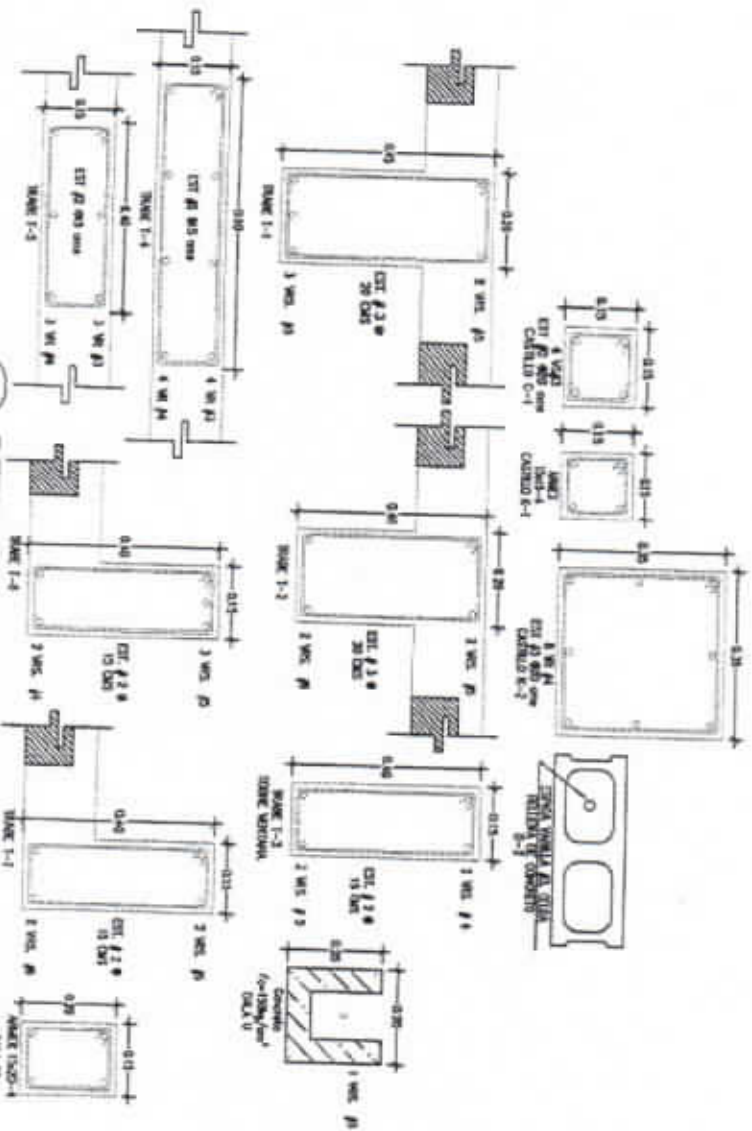


05 DETALLE REFUERZO PARA DOMO
ESCALA 1/20
REF.

06 DETALLE TIPO CASTILLO EN ENRASE
ESCALA 1/10
REF.

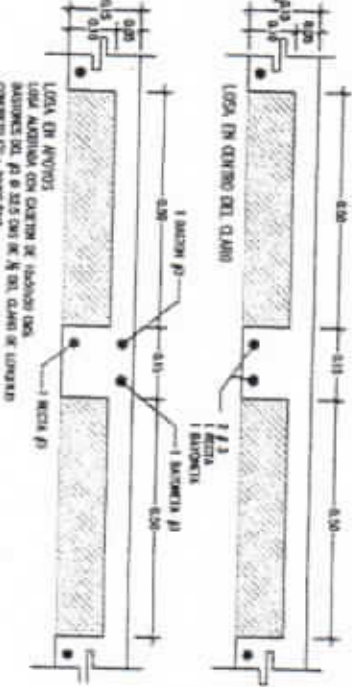
07 LOSA TIPO 1
ESCALA 1/10
REF.

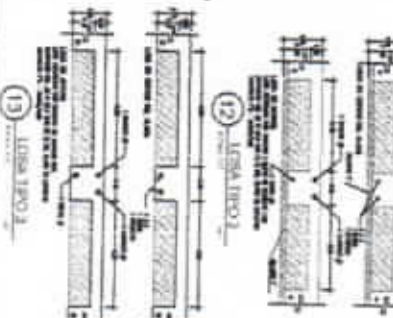
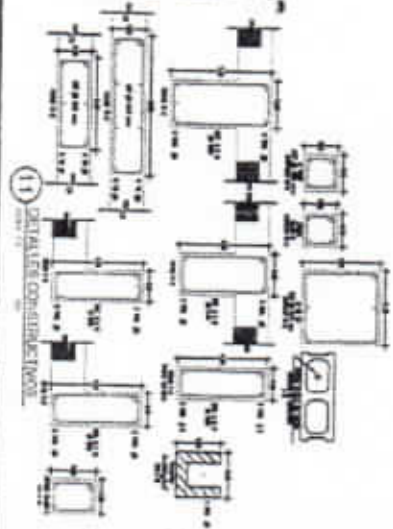
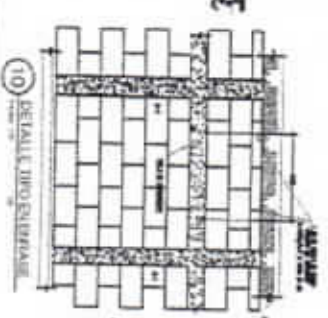
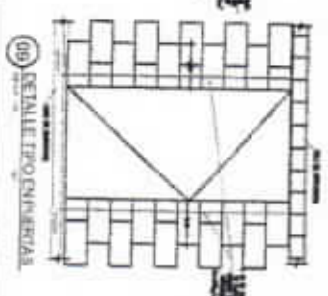
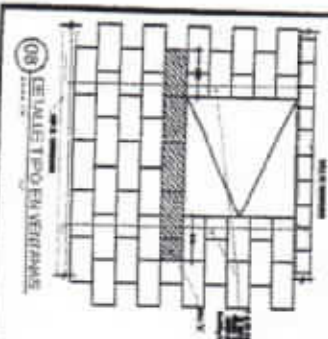
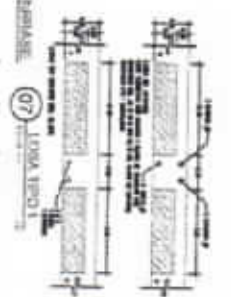
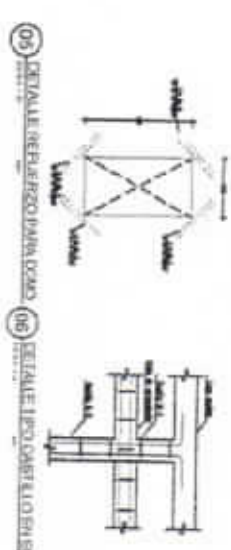
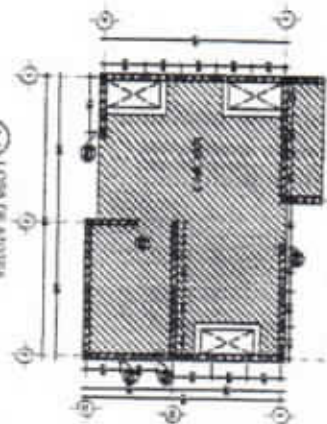
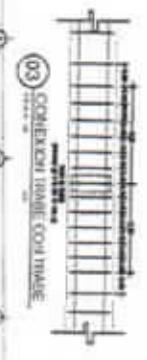
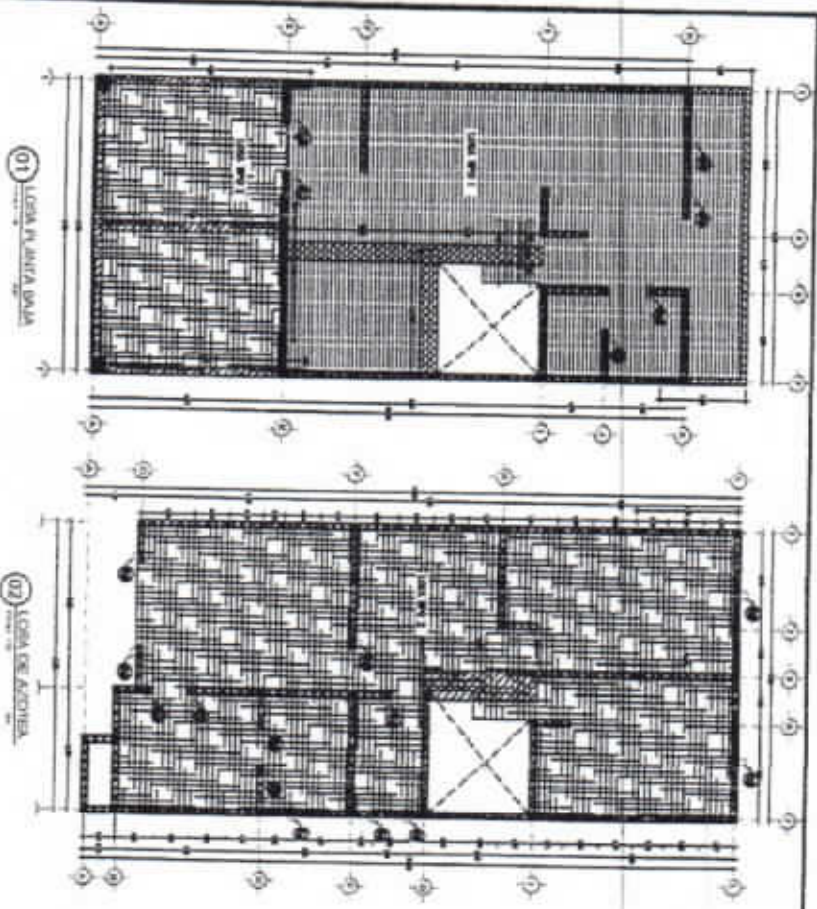
12 LOSA TIPO 2
ESCALA 1/10
REF.



11 DETALLES CONSTRUCTIVOS
ESCALA 1/10
REF.

13 LOSA TIPO 3
ESCALA 1/10
REF.





SPECIFICAȚII	
1	1.1. LUNA ÎNȚOȘ
2	2.1. LUNA ÎNȚOȘ
3	3.1. LUNA ÎNȚOȘ
4	4.1. LUNA ÎNȚOȘ
5	5.1. LUNA ÎNȚOȘ
6	6.1. LUNA ÎNȚOȘ
7	7.1. LUNA ÎNȚOȘ
8	8.1. LUNA ÎNȚOȘ
9	9.1. LUNA ÎNȚOȘ
10	10.1. LUNA ÎNȚOȘ
11	11.1. LUNA ÎNȚOȘ
12	12.1. LUNA ÎNȚOȘ
13	13.1. LUNA ÎNȚOȘ