

**ACTUALIZACIÓN DE LOS ESTUDIOS
EXISTENTES DE VULNERABILIDAD
SÍSMICA ESTRUCTURAL Y DISEÑO DE
REFUERZO DE LAS INSTALACIONES DEL
HOSPITAL INCLUYENDO EL
PARQUEADERO, UBICADAS EN LA
CARRERA 8 N° 0-55 SUR BOGOTÁ D.C., DE
ACUERDO A LA NORMATIVIDAD
VIGENTE PERTINENTE**

CONTRATO DE CONSULTORÍA N° 312 DE 2012

**BLOQUE 3
DISEÑO ESTRUCTURAL DETALLADO DEL
REFORZAMIENTO**

Proyecto PCA No. 4653

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1. CAPITULO 1

DISEÑO ESTRUCTURAL DETALLADO DEL REFORZAMIENTO

Una vez conocidos los índices de vulnerabilidad y de sobreesfuerzo, se procede a evaluar alternativas de reforzamiento que permitan el cumplimiento de los requerimientos del NSR-10. Finalmente para el Bloque 3 se presenta la siguiente propuesta.

PROPUESTA DE REFORZAMIENTO: Reforzamiento con pantallas de concreto desde cimentación hasta cubierta, distribuidas de la siguiente manera:

Pantalla $e=0.20$ m, sobre el eje M, entre ejes 13 y 10 (Muro Tipo T11)

Pantalla $e=0.20$ m, sobre eje P, entre ejes 21'' y 21' (Muro Tipo T12)

Pantalla $e=0.20$ m, sobre eje R, entre ejes 10 y 6' (Muro Tipo T9)

Pantalla $e=0.20$ m, sobre eje 6', entre ejes P y R (Muro Tipo T8)

Pantalla $e=0.20$ m, sobre eje 21, entre ejes Q y R (Muro Tipo T10)

1.1. JUSTIFICACIÓN PARA LA ESCOGENCIA DE LA SOLUCIÓN FINAL

Para definir las pantallas de reforzamiento fue necesario tener en cuenta varias consideraciones propias para el proyecto, así:

1. Las pantallas que se definieron para reforzar los edificios, fueron previamente coordinadas con la arquitectura para evitar daños en la distribución arquitectónica de la edificación, además se coordinó con el Hospital para garantizar que no se presenten afectaciones funcionales.
2. Para la modelación de las estructuras se asignó al concreto de toda la estructura existente un 20% del módulo de elasticidad y a las pantallas de reforzamiento se asignó un 100% del módulo de elasticidad para así garantizar una mayor responsabilidad a la estructura nueva de reforzamiento.
3. Para el chequeo del índice de vulnerabilidad se utilizó el coeficiente de Importancia $I=1.0$, teniendo en cuenta el numeral A.6.2.1.2 del NSR-10.
4. El concreto de las pantallas de reforzamiento deberá tener un $f'c=280 \text{ kg/cm}^2$.
5. A continuación se presenta la evaluación del índice de vulnerabilidad para la estructura reforzada y de ésta manera verificar que dicho índice no esté sobrepasando el 1%.

1.1.1. DATOS DE ENTRADA

ETABS v9.7.2 File:MODELO B3-ER(20E) Units:kgf-m noviembre 22, 2012 14:43 PAGE 1

S T O R Y D A T A

STORY	SIMILAR TO	HEIGHT	ELEVATION
CUBIERTA	None	4.000	23.300
PISO 5	None	4.000	19.300
PISO 4	None	4.000	15.300
PISO 3	None	4.100	11.300
PISO 2	None	4.100	7.200
PISO 1	PISO 2	3.100	3.100
BASE	None		0.000

M A S S S O U R C E D A T A

MASS FROM LATERAL MASS ONLY LUMP MASS AT STORIES

Masses Yes Yes

D I A P H R A G M M A S S D A T A

STORY	DIAPHRAGM	MASS-X	MASS-Y	MMI	X-M	Y-M
PISO 5	D1	3.375E+04	3.375E+04	3.614E+06	11.193	13.366
PISO 4	D1	4.453E+04	4.453E+04	5.486E+06	13.733	14.547
PISO 3	D1	4.667E+04	4.667E+04	5.951E+06	14.111	14.834
PISO 2	D1	5.224E+04	5.224E+04	7.201E+06	12.863	14.407
PISO 1	D1	4.998E+03	4.998E+03	8.737E+05	14.944	15.900

A S S E M B L E D P O I N T M A S S E S

STORY	POINT	UX	UY	UZ	RX	RY	RZ
CUBIERTA	3	2.723E+02	2.723E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	4	3.748E+02	3.748E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	5	3.554E+02	3.554E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	7	2.924E+02	2.924E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	8	3.240E+02	3.240E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	9	1.075E+02	1.075E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	10	1.150E+02	1.150E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	15	6.400E+02	6.400E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	20	1.356E+02	1.356E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	21	1.654E+02	1.654E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	22	5.025E+02	5.025E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	24	3.695E+02	3.695E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	28	3.171E+02	3.171E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	29	4.070E+02	4.070E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	30	3.087E+02	3.087E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	32	4.930E+02	4.930E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	35	7.342E+02	7.342E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	36	8.248E+02	8.248E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	38	8.219E+02	8.219E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	40	6.095E+02	6.095E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	41	6.058E+02	6.058E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	42	6.455E+02	6.455E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	43	4.970E+02	4.970E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	44	5.094E+02	5.094E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	48	3.091E+01	3.091E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	49	1.172E+02	1.172E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	50	2.526E+02	2.526E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	51	5.663E+02	5.663E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	52	3.102E+02	3.102E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	54	4.138E+01	4.138E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	55	9.024E+01	9.024E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	80	2.157E+02	2.157E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	81	1.072E+02	1.072E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CUBIERTA	82	1.657E+02	1.657E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 5	591	3.375E+04	3.375E+04	0.000E+00	0.000E+00	0.000E+00	3.614E+06

PISO 5	(302)	4.354E+02	4.354E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 5	(303)	5.954E+02	5.954E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 5	(304)	2.465E+02	2.465E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 5	(305)	3.544E+02	3.544E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 5	(306)	4.127E+02	4.127E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 4	592	4.453E+04	4.453E+04	0.000E+00	0.000E+00	0.000E+00	5.486E+06
PISO 4	(307)	4.354E+02	4.354E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 4	(308)	5.954E+02	5.954E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 4	(309)	2.465E+02	2.465E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 4	(310)	3.544E+02	3.544E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 4	(311)	4.127E+02	4.127E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 3	593	4.667E+04	4.667E+04	0.000E+00	0.000E+00	0.000E+00	5.951E+06
PISO 3	(312)	4.354E+02	4.354E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 3	(313)	5.954E+02	5.954E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 3	(314)	2.465E+02	2.465E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 3	(315)	3.544E+02	3.544E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 3	(316)	4.127E+02	4.127E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 2	594	5.224E+04	5.224E+04	0.000E+00	0.000E+00	0.000E+00	7.201E+06
PISO 2	(317)	4.354E+02	4.354E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 2	(318)	5.954E+02	5.954E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 2	(319)	2.465E+02	2.465E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 2	(320)	3.544E+02	3.544E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 2	(321)	4.127E+02	4.127E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 1	595	4.998E+03	4.998E+03	0.000E+00	0.000E+00	0.000E+00	8.737E+05
CUBIERTA	All	1.233E+04	1.233E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PISO 5	All	3.580E+04	3.580E+04	0.000E+00	0.000E+00	0.000E+00	3.614E+06
PISO 4	All	4.657E+04	4.657E+04	0.000E+00	0.000E+00	0.000E+00	5.486E+06
PISO 3	All	4.871E+04	4.871E+04	0.000E+00	0.000E+00	0.000E+00	5.951E+06
PISO 2	All	5.428E+04	5.428E+04	0.000E+00	0.000E+00	0.000E+00	7.201E+06
PISO 1	All	4.998E+03	4.998E+03	0.000E+00	0.000E+00	0.000E+00	8.737E+05
BASE	All	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Totals	All	2.027E+05	2.027E+05	0.000E+00	0.000E+00	0.000E+00	2.313E+07

M A T E R I A L L I S T B Y E L E M E N T T Y P E

ELEMENT TYPE	MATERIAL	TOTAL MASS tons	NUMBER PIECES	NUMBER STUDS
Column	C200	202.52	158	
Column	0C200	36.09	36	
Beam	C200	429.51	255	0
Beam	0C200	101.92	63	0
wall	C200	3.13		
wall	C280	189.40		
wall	0C280	35.61		
Floor	C200	1180.87		
Floor	0C200	343.47		

M A T E R I A L L I S T B Y S E C T I O N

SECTION	ELEMENT TYPE	NUMBER PIECES	TOTAL LENGTH meters	TOTAL MASS tons	NUMBER STUDS
C55X40	Column	1	4.100	2.16	
C45X35	Column	1	4.100	1.55	
C35X25	Column	10	40.400	8.48	
C40X35	Column	15	60.600	20.36	
C40X25	Column	5	20.200	4.85	
C30X30	Column	30	93.823	20.58	
C30X20	Column	10	40.400	5.82	
C35X30	Column	27	109.400	27.57	
C45X20	Column	5	20.200	4.36	
C35X35	Column	5	20.200	5.94	
C30X25	Column	5	20.200	3.64	
C80X30	Column	5	20.200	11.64	
C45X30	Column	6	24.300	7.87	
C35	Column	5	20.200	4.66	
C55X30	Column	5	20.200	8.00	
C50X50	Column	3	12.200	7.32	
C45X40	Column	10	40.400	17.45	
C40X30	Column	5	20.200	5.82	
C45X25	Column	5	20.200	5.45	

V40X40	Beam	255	1204.351	429.51	0
0c30x20	Column	2	6.200	0.89	
0c30x25	Column	1	3.100	0.56	
0c30x30	Column	4	12.400	2.68	
C55x55	Column	5	20.200	14.67	
C60x60	Column	5	20.200	17.45	
0c35	Column	1	3.100	0.72	
0c35x25	Column	2	6.200	1.30	
0c35x30	Column	7	21.700	5.47	
0c35x35	Column	1	3.100	0.91	
0c40x25	Column	1	3.100	0.74	
0c40x30	Column	1	3.100	0.89	
0c40x35	Column	3	9.300	3.12	
0c45x20	Column	1	3.100	0.67	
0c45x25	Column	1	3.100	0.84	
0c45x30	Column	2	6.200	2.01	
0c45x35	Column	1	3.100	1.17	
0c45x40	Column	2	6.200	2.68	
0c50x50	Column	1	3.100	1.86	
0c55x30	Column	1	3.100	1.23	
0c55x40	Column	1	3.100	1.64	
0c55x55	Column	1	3.100	2.25	
0c60x60	Column	1	3.100	2.68	
0c80x30	Column	1	3.100	1.79	
0v40x40	Beam	63	285.604	101.92	0
PL26	Floor			1180.87	
M20	Wall			189.40	
0PL23	Floor			343.47	
0M20	Wall			35.61	

M A T E R I A L L I S T B Y S T O R Y

STORY	ELEMENT TYPE	MATERIAL	TOTAL WEIGHT tons	FLOOR AREA m2	UNIT WEIGHT kg/m2	NUMBER PIECES	NUMBER STUDS
CUBIERTA	Column	C200	35.22	0.000	28		
CUBIERTA	Beam	C200	72.58	0.000	44	0	
CUBIERTA	Wall	C280	16.99	0.000			
PISO 5	Column	C200	35.22	421.522	83.5535	28	
PISO 5	Beam	C200	73.06	421.522	173.3218	46	0
PISO 5	Wall	C280	16.99	421.522	40.3111		
PISO 5	Floor	C200	232.68	421.522	552.0000		
PISO 4	Column	C200	41.65	547.754	76.0408	33	
PISO 4	Beam	C200	90.97	547.754	166.0864	53	0
PISO 4	Wall	C280	50.96	547.754	93.0287		
PISO 4	Floor	C200	302.36	547.754	552.0000		
PISO 3	Column	C200	42.69	547.754	77.9418	33	
PISO 3	Beam	C200	90.97	547.754	166.0864	53	0
PISO 3	Wall	C280	52.23	547.754	95.3544		
PISO 3	Floor	C200	302.36	547.754	552.0000		
PISO 2	Column	C200	47.74	622.230	76.7175	36	
PISO 2	Beam	C200	101.92	622.230	163.7939	59	0
PISO 2	Wall	C280	52.23	622.230	83.9412		
PISO 2	Floor	C200	343.47	622.230	552.0000		
PISO 1	Column	0c200	36.09	622.230	58.0059	36	
PISO 1	Beam	0c200	101.92	622.230	163.7939	63	0
PISO 1	Wall	0c280	35.61	622.230	57.2308		
PISO 1	Floor	0c200	343.47	622.230	552.0000		
SUM	Column	C200	202.52	2761.490	73.3371	158	
SUM	Column	0c200	36.09	2761.490	13.0701	36	
SUM	Beam	C200	429.51	2761.490	155.5342	255	0
SUM	Beam	0c200	101.92	2761.490	36.9067	63	0
SUM	Wall	C280	189.40	2761.490	68.5870		
SUM	Wall	0c280	35.61	2761.490	12.8955		
SUM	Floor	C200	1180.87	2761.490	427.6211		
SUM	Floor	0c200	343.47	2761.490	124.3789		

TOTAL	All	All	2519.39	2761.490	912.3306	512	0
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M A T E R I A L P R O P E R T Y D A T A

MATERIAL NAME	MATERIAL TYPE	DESIGN TYPE	MATERIAL DIR/PLANE	MODULUS OF ELASTICITY	POISSON'S RATIO	THERMAL COEFF	SHEAR MODULUS
STEEL	Iso	Steel	All	2.039E+10	0.3000	1.1700E-05	7842307692
C200	Iso	Concrete	All	427000000.0	0.2000	9.9000E-06	177916666.67
C280	Iso	Concrete	All	2530000000.0	0.2000	9.9000E-06	1054166666.7
0C200	Iso	Concrete	All	2135000000.0	0.2000	9.9000E-06	889583333.3
0C280	Iso	Concrete	All	2530000000.0	0.2000	9.9000E-06	1054166666.7

M A T E R I A L P R O P E R T Y M A S S A N D W E I G H T

MATERIAL NAME	MASS PER UNIT VOL	WEIGHT PER UNIT VOL
STEEL	7.9814E+02	7.8334E+03
C200	2.4000E+02	2.4000E+03
C280	2.4000E+02	2.4000E+03
0C200	0.0000E+00	2.4000E+03
0C280	0.0000E+00	2.4000E+03

M A T E R I A L D E S I G N D A T A F O R S T E E L M A T E R I A L S

MATERIAL NAME	STEEL FY	STEEL FU	STEEL COST (\$)
STEEL	35153481.00	45699526.00	27679906.50

M A T E R I A L D E S I G N D A T A F O R C O N C R E T E M A T E R I A L S

MATERIAL NAME	LIGHTWEIGHT CONCRETE	CONCRETE FC	REBAR FY	REBAR FYS	LIGHTWT REDUC FACT
C200	No	2000000.000	42184178.00	42184178.00	N/A
C280	No	2800000.000	42184178.00	42184178.00	N/A
0C200	No	2000000.000	42184178.00	42184178.00	N/A
0C280	No	2800000.000	42184178.00	42184178.00	N/A

F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	MATERIAL NAME	SECTION SHAPE NAME OR NAME IN SECTION DATABASE FILE	CONC COL	CONC BEAM
C55x40	C200	Rectangular	Yes	
C45x35	C200	Rectangular	Yes	
C35x25	C200	Rectangular	Yes	
C40x35	C200	Rectangular	Yes	
C40x25	C200	Rectangular	Yes	
C30x30	C200	Rectangular	Yes	
C30x20	C200	Rectangular	Yes	
C35x30	C200	Rectangular	Yes	
C45x20	C200	Rectangular	Yes	
C35x35	C200	Rectangular	Yes	
C30x25	C200	Rectangular	Yes	
C80x30	C200	Rectangular	Yes	
C45x30	C200	Rectangular	Yes	
C35	C200	Circle	Yes	
C55x30	C200	Rectangular	Yes	
C50x50	C200	Rectangular	Yes	
C45x40	C200	Rectangular	Yes	
C40x30	C200	Rectangular	Yes	
C45x25	C200	Rectangular	Yes	
V40x40	C200	Rectangular		Yes
0C30x20	0C200	Rectangular	Yes	
0C30x25	0C200	Rectangular	Yes	
0C30x30	0C200	Rectangular	Yes	
C55x55	C200	Rectangular	Yes	
C60x60	C200	Rectangular	Yes	

0c35	0c200	Circle	Yes
0c35x25	0c200	Rectangular	Yes
0c35x30	0c200	Rectangular	Yes
0c35x35	0c200	Rectangular	Yes
0c40x25	0c200	Rectangular	Yes
0c40x30	0c200	Rectangular	Yes
0c40x35	0c200	Rectangular	Yes
0c45x20	0c200	Rectangular	Yes
0c45x25	0c200	Rectangular	Yes
0c45x30	0c200	Rectangular	Yes
0c45x35	0c200	Rectangular	Yes
0c45x40	0c200	Rectangular	Yes
0c50x50	0c200	Rectangular	Yes
0c55x30	0c200	Rectangular	Yes
0c55x40	0c200	Rectangular	Yes
0c55x55	0c200	Rectangular	Yes
0c60x60	0c200	Rectangular	Yes
0c80x30	0c200	Rectangular	Yes
0v40x40	0c200	Rectangular	Yes

Yes

FRAME SECTION PROPERTY DATA

FRAME SECTION NAME	SECTION DEPTH	FLANGE WIDTH TOP	FLANGE THICK TOP	WEB THICK	FLANGE WIDTH BOT	FLANGE THICK BOT
C55X40	0.5500	0.4000	0.0000	0.0000	0.0000	0.0000
C45X35	0.4500	0.3500	0.0000	0.0000	0.0000	0.0000
C35X25	0.3500	0.2500	0.0000	0.0000	0.0000	0.0000
C40X35	0.4000	0.3500	0.0000	0.0000	0.0000	0.0000
C40X25	0.4000	0.2500	0.0000	0.0000	0.0000	0.0000
C30X30	0.3000	0.3000	0.0000	0.0000	0.0000	0.0000
C30X20	0.3000	0.2000	0.0000	0.0000	0.0000	0.0000
C35X30	0.3500	0.3000	0.0000	0.0000	0.0000	0.0000
C45X20	0.4500	0.2000	0.0000	0.0000	0.0000	0.0000
C35X35	0.3500	0.3500	0.0000	0.0000	0.0000	0.0000
C30X25	0.3000	0.2500	0.0000	0.0000	0.0000	0.0000
C80X30	0.8000	0.3000	0.0000	0.0000	0.0000	0.0000
C45X30	0.4500	0.3000	0.0000	0.0000	0.0000	0.0000
C35	0.3500	0.3500	0.0000	0.0000	0.3500	0.0000
C55X30	0.5500	0.3000	0.0000	0.0000	0.0000	0.0000
C50X50	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000
C45X40	0.4500	0.4000	0.0000	0.0000	0.0000	0.0000
C40X30	0.4000	0.3000	0.0000	0.0000	0.0000	0.0000
C45X25	0.4500	0.2500	0.0000	0.0000	0.0000	0.0000
V40X40	0.4000	0.4000	0.0000	0.0000	0.0000	0.0000
0c30x20	0.3000	0.2000	0.0000	0.0000	0.0000	0.0000
0c30x25	0.3000	0.2500	0.0000	0.0000	0.0000	0.0000
0c30x30	0.3000	0.3000	0.0000	0.0000	0.0000	0.0000
C55X55	0.5500	0.5500	0.0000	0.0000	0.0000	0.0000
C60X60	0.6000	0.6000	0.0000	0.0000	0.0000	0.0000
0c35	0.3500	0.3500	0.0000	0.0000	0.3500	0.0000
0c35x25	0.3500	0.2500	0.0000	0.0000	0.0000	0.0000
0c35x30	0.3500	0.3000	0.0000	0.0000	0.0000	0.0000
0c35x35	0.3500	0.3500	0.0000	0.0000	0.0000	0.0000
0c40x25	0.4000	0.2500	0.0000	0.0000	0.0000	0.0000
0c40x30	0.4000	0.3000	0.0000	0.0000	0.0000	0.0000
0c40x35	0.4000	0.3500	0.0000	0.0000	0.0000	0.0000
0c45x20	0.4500	0.2000	0.0000	0.0000	0.0000	0.0000
0c45x25	0.4500	0.2500	0.0000	0.0000	0.0000	0.0000
0c45x30	0.4500	0.3000	0.0000	0.0000	0.0000	0.0000
0c45x35	0.4500	0.3500	0.0000	0.0000	0.0000	0.0000
0c45x40	0.4500	0.4000	0.0000	0.0000	0.0000	0.0000
0c50x50	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000
0c55x30	0.5500	0.3000	0.0000	0.0000	0.0000	0.0000
0c55x40	0.5500	0.4000	0.0000	0.0000	0.0000	0.0000
0c55x55	0.5500	0.5500	0.0000	0.0000	0.0000	0.0000
0c60x60	0.6000	0.6000	0.0000	0.0000	0.0000	0.0000
0c80x30	0.8000	0.3000	0.0000	0.0000	0.0000	0.0000
0v40x40	0.4000	0.4000	0.0000	0.0000	0.0000	0.0000

FRAME SECTION PROPERTY DATA

FRAME SECTION NAME	SECTION AREA	TORSIONAL CONSTANT	MOMENTS OF INERTIA		SHEAR AREAS	
			I33	I22	A2	A3
C55X40	0.2200	0.0065	0.0055	0.0029	0.1833	0.1833
C45X35	0.1575	0.0034	0.0027	0.0016	0.1313	0.1313
C35X25	0.0875	0.0010	0.0009	0.0005	0.0729	0.0729
C40X35	0.1400	0.0027	0.0019	0.0014	0.1167	0.1167
C40X25	0.1000	0.0013	0.0013	0.0005	0.0833	0.0833
C30X30	0.0900	0.0011	0.0007	0.0007	0.0750	0.0750
C30X20	0.0600	0.0005	0.0005	0.0002	0.0500	0.0500
C35X30	0.1050	0.0015	0.0011	0.0008	0.0875	0.0875
C45X20	0.0900	0.0009	0.0015	0.0003	0.0750	0.0750
C35X35	0.1225	0.0021	0.0013	0.0013	0.1021	0.1021
C30X25	0.0750	0.0008	0.0006	0.0004	0.0625	0.0625
C80X30	0.2400	0.0055	0.0128	0.0018	0.2000	0.2000
C45X30	0.1350	0.0024	0.0023	0.0010	0.1125	0.1125
C35	0.0962	0.0015	0.0007	0.0007	0.0866	0.0866
C55X30	0.1650	0.0033	0.0042	0.0012	0.1375	0.1375
C50X50	0.2500	0.0088	0.0052	0.0052	0.2083	0.2083
C45X40	0.1800	0.0045	0.0030	0.0024	0.1500	0.1500
C40X30	0.1200	0.0019	0.0016	0.0009	0.1000	0.1000
C45X25	0.1125	0.0015	0.0019	0.0006	0.0938	0.0938
V40X40	0.1600	0.0036	0.0021	0.0021	0.1333	0.1333
0C30X20	0.0600	0.0005	0.0005	0.0002	0.0500	0.0500
0C30X25	0.0750	0.0008	0.0006	0.0004	0.0625	0.0625
0C30X30	0.0900	0.0011	0.0007	0.0007	0.0750	0.0750
C55X55	0.3025	0.0129	0.0076	0.0076	0.2521	0.2521
C60X60	0.3600	0.0183	0.0108	0.0108	0.3000	0.3000
0C35	0.0962	0.0015	0.0007	0.0007	0.0866	0.0866
0C35X25	0.0875	0.0010	0.0009	0.0005	0.0729	0.0729
0C35X30	0.1050	0.0015	0.0011	0.0008	0.0875	0.0875
0C35X35	0.1225	0.0021	0.0013	0.0013	0.1021	0.1021
0C40X25	0.1000	0.0013	0.0013	0.0005	0.0833	0.0833
0C40X30	0.1200	0.0019	0.0016	0.0009	0.1000	0.1000
0C40X35	0.1400	0.0027	0.0019	0.0014	0.1167	0.1167
0C45X20	0.0900	0.0009	0.0015	0.0003	0.0750	0.0750
0C45X25	0.1125	0.0015	0.0019	0.0006	0.0938	0.0938
0C45X30	0.1350	0.0024	0.0023	0.0010	0.1125	0.1125
0C45X35	0.1575	0.0034	0.0027	0.0016	0.1313	0.1313
0C45X40	0.1800	0.0045	0.0030	0.0024	0.1500	0.1500
0C50X50	0.2500	0.0088	0.0052	0.0052	0.2083	0.2083
0C55X30	0.1650	0.0033	0.0042	0.0012	0.1375	0.1375
0C55X40	0.2200	0.0065	0.0055	0.0029	0.1833	0.1833
0C55X55	0.3025	0.0129	0.0076	0.0076	0.2521	0.2521
0C60X60	0.3600	0.0183	0.0108	0.0108	0.3000	0.3000
0C80X30	0.2400	0.0055	0.0128	0.0018	0.2000	0.2000
0V40X40	0.1600	0.0036	0.0021	0.0021	0.1333	0.1333

FRAME SECTION PROPERTY DATA

FRAME SECTION NAME	SECTION MODULI S33	SECTION MODULI S22	PLASTIC MODULI Z33	PLASTIC MODULI Z22	RADIUS OF GYRATION R33	RADIUS OF GYRATION R22
C55X40	0.0202	0.0147	0.0303	0.0220	0.1588	0.1155
C45X35	0.0118	0.0092	0.0177	0.0138	0.1299	0.1010
C35X25	0.0051	0.0036	0.0077	0.0055	0.1010	0.0722
C40X35	0.0093	0.0082	0.0140	0.0123	0.1155	0.1010
C40X25	0.0067	0.0042	0.0100	0.0063	0.1155	0.0722
C30X30	0.0045	0.0045	0.0068	0.0068	0.0866	0.0866
C30X20	0.0030	0.0020	0.0045	0.0030	0.0866	0.0577
C35X30	0.0061	0.0053	0.0092	0.0079	0.1010	0.0866
C45X20	0.0068	0.0030	0.0101	0.0045	0.1299	0.0577
C35X35	0.0071	0.0071	0.0107	0.0107	0.1010	0.1010
C30X25	0.0038	0.0031	0.0056	0.0047	0.0866	0.0722
C80X30	0.0320	0.0120	0.0480	0.0180	0.2309	0.0866
C45X30	0.0101	0.0068	0.0152	0.0101	0.1299	0.0866
C35	0.0042	0.0042	0.0071	0.0071	0.0875	0.0875
C55X30	0.0151	0.0083	0.0227	0.0124	0.1588	0.0866
C50X50	0.0208	0.0208	0.0313	0.0313	0.1443	0.1443
C45X40	0.0135	0.0120	0.0203	0.0180	0.1299	0.1155
C40X30	0.0080	0.0060	0.0120	0.0090	0.1155	0.0866
C45X25	0.0084	0.0047	0.0127	0.0070	0.1299	0.0722
V40X40	0.0107	0.0107	0.0160	0.0160	0.1155	0.1155

0c30x20	0.0030	0.0020	0.0045	0.0030	0.0866	0.0577
0c30x25	0.0038	0.0031	0.0056	0.0047	0.0866	0.0722
0c30x30	0.0045	0.0045	0.0068	0.0068	0.0866	0.0866
C55x55	0.0277	0.0277	0.0416	0.0416	0.1588	0.1588
C60x60	0.0360	0.0360	0.0540	0.0540	0.1732	0.1732
0c35	0.0042	0.0042	0.0071	0.0071	0.0875	0.0875
0c35x25	0.0051	0.0036	0.0077	0.0055	0.1010	0.0722
0c35x30	0.0061	0.0053	0.0092	0.0079	0.1010	0.0866
0c35x35	0.0071	0.0071	0.0107	0.0107	0.1010	0.1010
0c40x25	0.0067	0.0042	0.0100	0.0063	0.1155	0.0722
0c40x30	0.0080	0.0060	0.0120	0.0090	0.1155	0.0866
0c40x35	0.0093	0.0082	0.0140	0.0123	0.1155	0.1010
0c45x20	0.0068	0.0030	0.0101	0.0045	0.1299	0.0577
0c45x25	0.0084	0.0047	0.0127	0.0070	0.1299	0.0722
0c45x30	0.0101	0.0068	0.0152	0.0101	0.1299	0.0866
0c45x35	0.0118	0.0092	0.0177	0.0138	0.1299	0.1010
0c45x40	0.0135	0.0120	0.0203	0.0180	0.1299	0.1155
0c50x50	0.0208	0.0208	0.0313	0.0313	0.1443	0.1443
0c55x30	0.0151	0.0083	0.0227	0.0124	0.1588	0.0866
0c55x40	0.0202	0.0147	0.0303	0.0220	0.1588	0.1155
0c55x55	0.0277	0.0277	0.0416	0.0416	0.1588	0.1588
0c60x60	0.0360	0.0360	0.0540	0.0540	0.1732	0.1732
0c80x30	0.0320	0.0120	0.0480	0.0180	0.2309	0.0866
0v40x40	0.0107	0.0107	0.0160	0.0160	0.1155	0.1155

FRAME SECTION WEIGHTS AND MASSES

FRAME SECTION NAME	TOTAL WEIGHT	TOTAL MASS
C55X40	2164.8000	216.4800
C45X35	1549.8000	154.9800
C35X25	8484.0000	848.4000
C40X35	20361.6000	2036.1600
C40X25	7973.4583	797.3458
C30X30	17452.8000	1745.2800
C30X20	5817.6000	581.7600
C35X30	27568.8000	2756.8800
C45X20	4363.2000	436.3200
C35X35	5938.8000	593.8800
C30X25	3636.0000	363.6000
C80X30	11635.2000	1163.5200
C45X30	7873.2000	787.3200
C35	4664.3226	466.4323
C55X30	7999.2000	799.9200
C50X50	7320.0000	732.0000
C45X40	17452.8000	1745.2800
C40X30	5817.6000	581.7600
C45X25	5454.0000	545.4000
V40X40	429506.1574	42950.6157
0c30x20	892.8000	0.0000
0c30x25	558.0000	0.0000
0c30x30	2678.4000	0.0000
C55x55	14665.2000	1466.5200
C60x60	17452.8000	1745.2800
0c35	715.8119	0.0000
0c35x25	1302.0000	0.0000
0c35x30	5468.4000	0.0000
0c35x35	911.4000	0.0000
0c40x25	744.0000	0.0000
0c40x30	892.8000	0.0000
0c40x35	3124.8000	0.0000
0c45x20	669.6000	0.0000
0c45x25	837.0000	0.0000
0c45x30	2008.8000	0.0000
0c45x35	1171.8000	0.0000
0c45x40	2678.4000	0.0000
0c50x50	1860.0000	0.0000
0c55x30	1227.6000	0.0000
0c55x40	1636.8000	0.0000
0c55x55	2250.6000	0.0000
0c60x60	2678.4000	0.0000
0c80x30	1785.6000	0.0000
0v40x40	101917.4830	0.0000

CONCRETE COLUMN DATA

FRAME SECTION NAME	REINF CONFIGURATION LONGIT LATERAL	REINF SIZE/TYPE	NUM BARS 3DIR/2DIR	NUM BARS CIRCULAR	BAR COVER
C55X40	Rectangular Ties	#8/Design	4/6	N/A	0.0400
C45X35	Rectangular Ties	#8/Design	4/5	N/A	0.0450
C35X25	Rectangular Ties	#8/Design	3/4	N/A	0.0457
C40X35	Rectangular Ties	#8/Design	4/4	N/A	0.0400
C40X25	Rectangular Ties	#8/Design	3/4	N/A	0.0400
C30X30	Rectangular Ties	#8/Design	3/3	N/A	0.0457
C30X20	Rectangular Ties	#8/Design	2/3	N/A	0.0457
C35X30	Rectangular Ties	#8/Design	3/4	N/A	0.0457
C45X20	Rectangular Ties	#8/Design	2/5	N/A	0.0450
C35X35	Rectangular Ties	#8/Design	4/4	N/A	0.0457
C30X25	Rectangular Ties	#8/Design	3/3	N/A	0.0457
C80X30	Rectangular Ties	#8/Design	3/8	N/A	0.0800
C45X30	Rectangular Ties	#8/Design	3/5	N/A	0.0450
C35	Circular Ties	#9/Design	N/A	8	0.0305
C55X30	Rectangular Ties	#8/Design	3/6	N/A	0.0457
C50X50	Rectangular Ties	#8/Design	5/5	N/A	0.0457
C45X40	Rectangular Ties	#8/Design	4/5	N/A	0.0450
C40X30	Rectangular Ties	#8/Design	3/4	N/A	0.0457
C45X25	Rectangular Ties	#8/Design	3/5	N/A	0.0457
0C30X20	Rectangular Ties	#9/Design	2/3	N/A	0.0400
0C30X25	Rectangular Ties	#9/Design	3/3	N/A	0.0457
0C30X30	Rectangular Ties	#9/Design	3/3	N/A	0.0400
C55X55	Rectangular Ties	#9/Design	6/6	N/A	0.0400
C60X60	Rectangular Ties	#9/Design	6/6	N/A	0.0457
0C35	Circular Ties	#9/Design	N/A	8	0.0305
0C35X25	Rectangular Ties	#9/Design	3/4	N/A	0.0457
0C35X30	Rectangular Ties	#9/Design	3/4	N/A	0.0457
0C35X35	Rectangular Ties	#9/Design	4/4	N/A	0.0457
0C40X25	Rectangular Ties	#9/Design	3/4	N/A	0.0400
0C40X30	Rectangular Ties	#9/Design	3/4	N/A	0.0457
0C40X35	Rectangular Ties	#9/Design	4/4	N/A	0.0400
0C45X20	Rectangular Ties	#9/Design	2/5	N/A	0.0450
0C45X25	Rectangular Ties	#9/Design	3/5	N/A	0.0400
0C45X30	Rectangular Ties	#9/Design	3/5	N/A	0.0450
0C45X35	Rectangular Ties	#9/Design	4/5	N/A	0.0450
0C45X40	Rectangular Ties	#9/Design	4/5	N/A	0.0400
0C50X50	Rectangular Ties	#9/Design	5/5	N/A	0.0400
0C55X30	Rectangular Ties	#9/Design	3/6	N/A	0.0550
0C55X40	Rectangular Ties	#9/Design	4/6	N/A	0.0400
0C55X55	Rectangular Ties	#9/Design	6/6	N/A	0.0400
0C60X60	Rectangular Ties	#9/Design	6/6	N/A	0.0600
0C80X30	Rectangular Ties	#9/Design	3/8	N/A	0.0457

CONCRETE BEAM DATA

FRAME SECTION NAME	TOP COVER	BOT COVER	TOP LEFT AREA	TOP RIGHT AREA	BOT LEFT AREA	BOT RIGHT AREA
V40X40	0.0450	0.0450	0.000	0.000	0.000	0.000
0V40X40	0.0400	0.0400	0.000	0.000	0.000	0.000

SHELL SECTION PROPERTY DATA

SHELL SECTION	MATERIAL NAME	SHELL TYPE	LOAD DIST ONE WAY	MEMBRANE THICK	BENDING THICK	TOTAL WEIGHT	TOTAL MASS
PL26	C200	Membrane	No	0.2300	0.2300	118087.2992	118087.1299
M20	C280	Shell-Thin	No	0.2000	0.2000	189402.2400	18940.2240
0PL23	0C200	Membrane	No	0.2300	0.2300	343471.0152	0.0000
0M20	0C280	Shell-Thin	No	0.2000	0.2000	35610.7200	0.0000

STATIC LOAD CASES

STATIC CASE	CASE TYPE	AUTO LOAD	LAT	SELF WT MULTIPLIER	NOTIONAL FACTOR	NOTIONAL DIRECTION
DEAD	DEAD	N/A		1.0000		
LIVE	LIVE	N/A		0.0000		

RESPONSE SPECTRUM CASES

RESP SPEC CASE: EX

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
CQC	SRSS	0.0500	0.0000	0.0000

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	10PIEMB	9.8100
U2	----	N/A
UZ	----	N/A

RESP SPEC CASE: EY

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
CQC	SRSS	0.0500	0.0000	0.0000

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	----	N/A
U2	10PIEMB	9.8100
UZ	----	N/A

LOADING COMBINATIONS

COMBO	COMBO TYPE	CASE	CASE TYPE	SCALE FACTOR
1	ADD	DEAD	Static	1.4000
2	ADD	DEAD	Static	1.2000
		LIVE	Static	1.6000
3	ADD	DEAD	Static	1.2000
		LIVE	Static	1.0000
		EX	Spectra	1.2000
5	ADD	DEAD	Static	1.2000
		LIVE	Static	1.0000
		EY	Spectra	1.3700
7	ADD	DEAD	Static	0.9000
		EX	Spectra	1.2000
9	ADD	DEAD	Static	0.9000
		EY	Spectra	1.3700

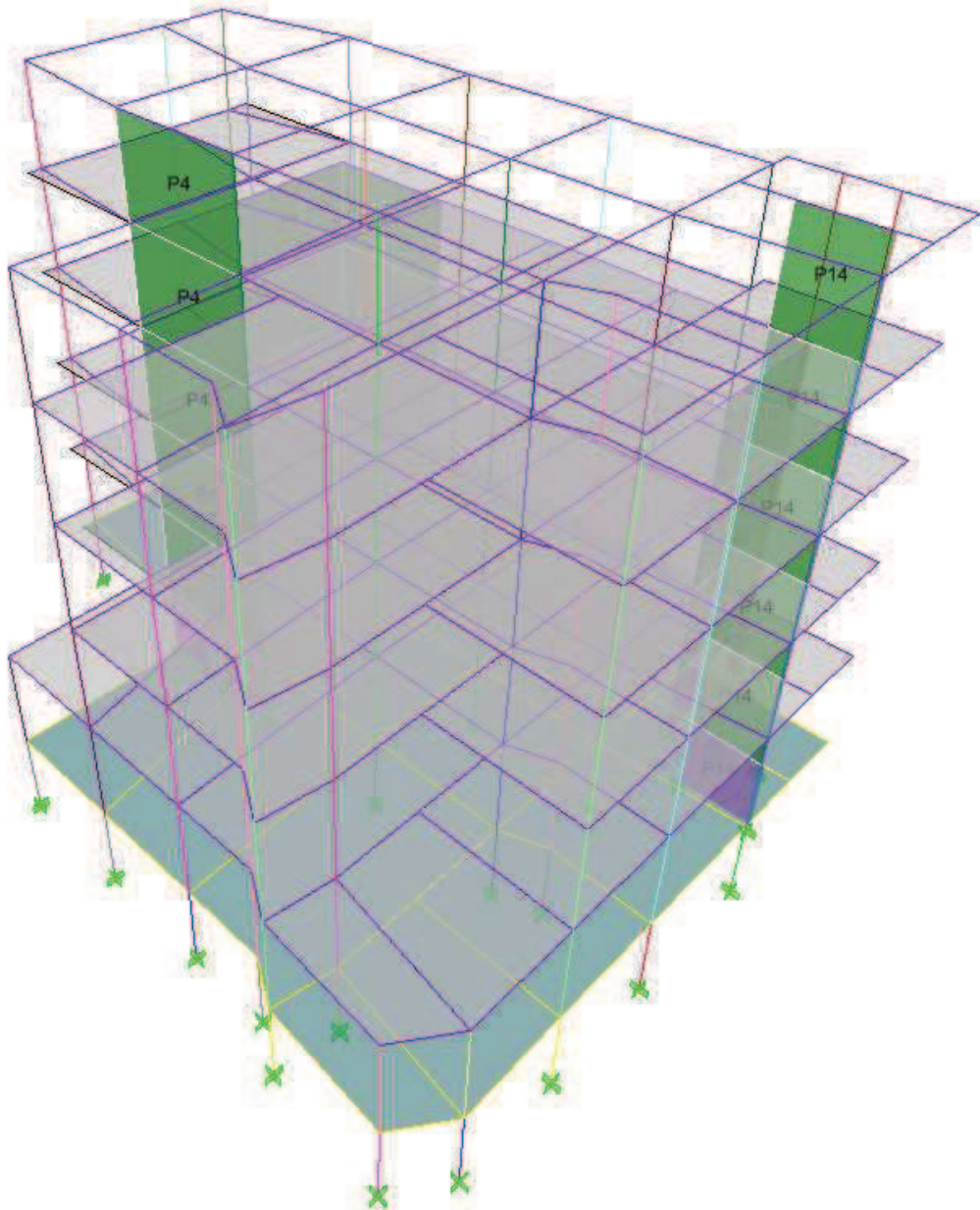
R E S P O N S E S P E C T R U M F U N C T I O N - U S E R

FUNCTION NAME: 10PIEMB

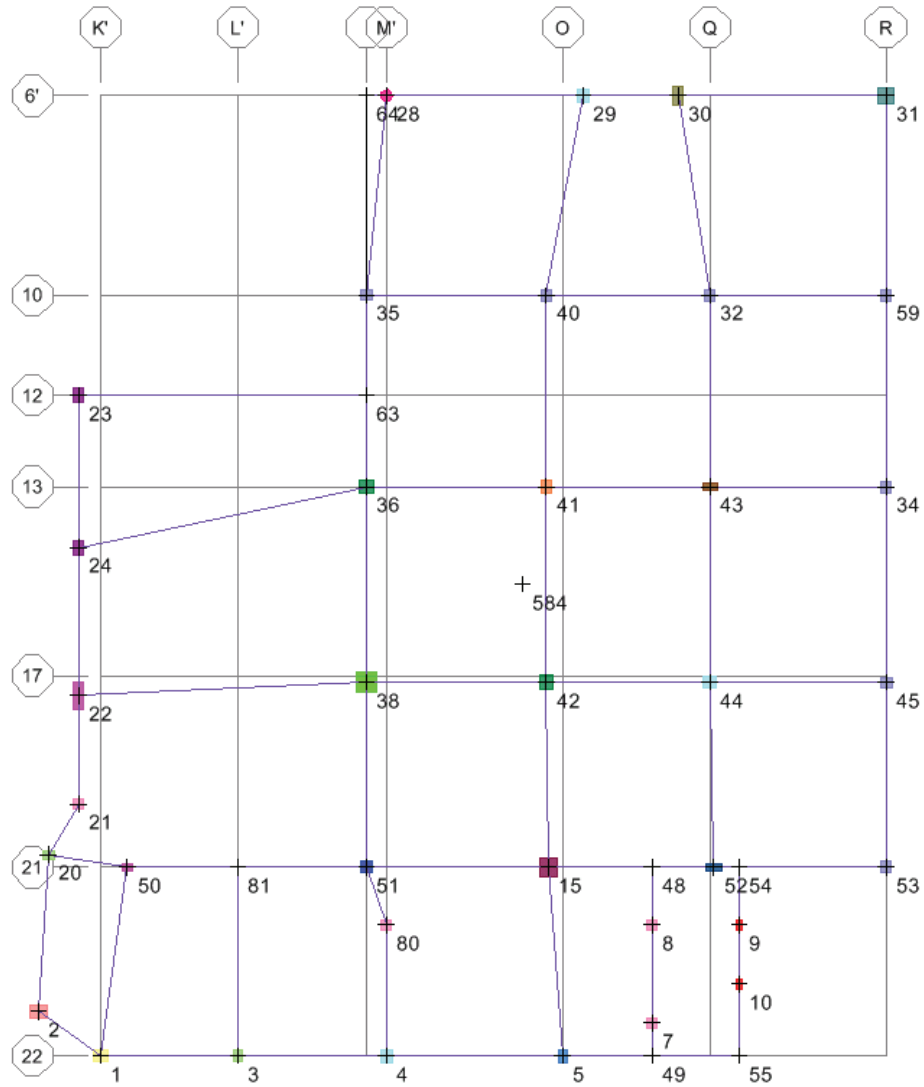
PERIOD	ACCEL	PERIOD	ACCEL
0.0000	0.7310		
0.0500	0.7310		
0.1000	0.7310		
0.1500	0.7310		
0.2000	0.7310		
0.2500	0.7310		
0.3000	0.7310		
0.3500	0.7310		
0.4000	0.7310		
0.4500	0.7310		
0.5000	0.7310		
0.5500	0.7310		
0.6000	0.6800		
0.6500	0.6280		
0.7000	0.5830		
0.7500	0.5440		
0.8000	0.5100		
0.8500	0.4800		
0.9000	0.4530		
0.9500	0.4290		
1.0000	0.4080		
1.0500	0.3890		
1.1000	0.3710		
1.1500	0.3550		
1.2000	0.3400		
1.2500	0.3260		
1.3000	0.3140		
1.3500	0.3020		
1.4000	0.2910		
1.4500	0.2810		
1.5000	0.2720		
1.5500	0.2630		
1.6000	0.2550		
1.6500	0.2470		
1.7000	0.2400		
1.7500	0.2330		
1.8000	0.2270		
1.8500	0.2210		
1.9000	0.2150		
1.9500	0.2090		
2.0000	0.2040		
2.0500	0.1990		
2.1000	0.1940		
2.1500	0.1900		
2.2000	0.1850		
2.2500	0.1810		
2.3000	0.1770		
2.3500	0.1740		
2.4000	0.1700		
2.4500	0.1670		
2.5000	0.1630		
2.5500	0.1600		
2.6000	0.1570		
2.6500	0.1540		
2.7000	0.1510		
2.7500	0.1480		
2.8000	0.1460		
2.8500	0.1430		
2.9000	0.1410		
2.9500	0.1380		
3.0000	0.1360		
3.0500	0.1320		
3.1000	0.1270		
3.1500	0.1230		
3.2000	0.1200		
3.2500	0.1160		
3.3000	0.1120		
		3.3500	0.1090
		3.4000	0.1060
		3.4500	0.1030
		3.5000	0.1000
		3.5500	0.0970
		3.6000	0.0940
		3.6500	0.0920
		3.7000	0.0890
		3.7500	0.0870
		3.8000	0.0850
		3.8500	0.0830
		3.9000	0.0800
		3.9500	0.0780
		4.0000	0.0770

1.1.2. IDENTIFICACIÓN DE ELEMENTOS ETABS

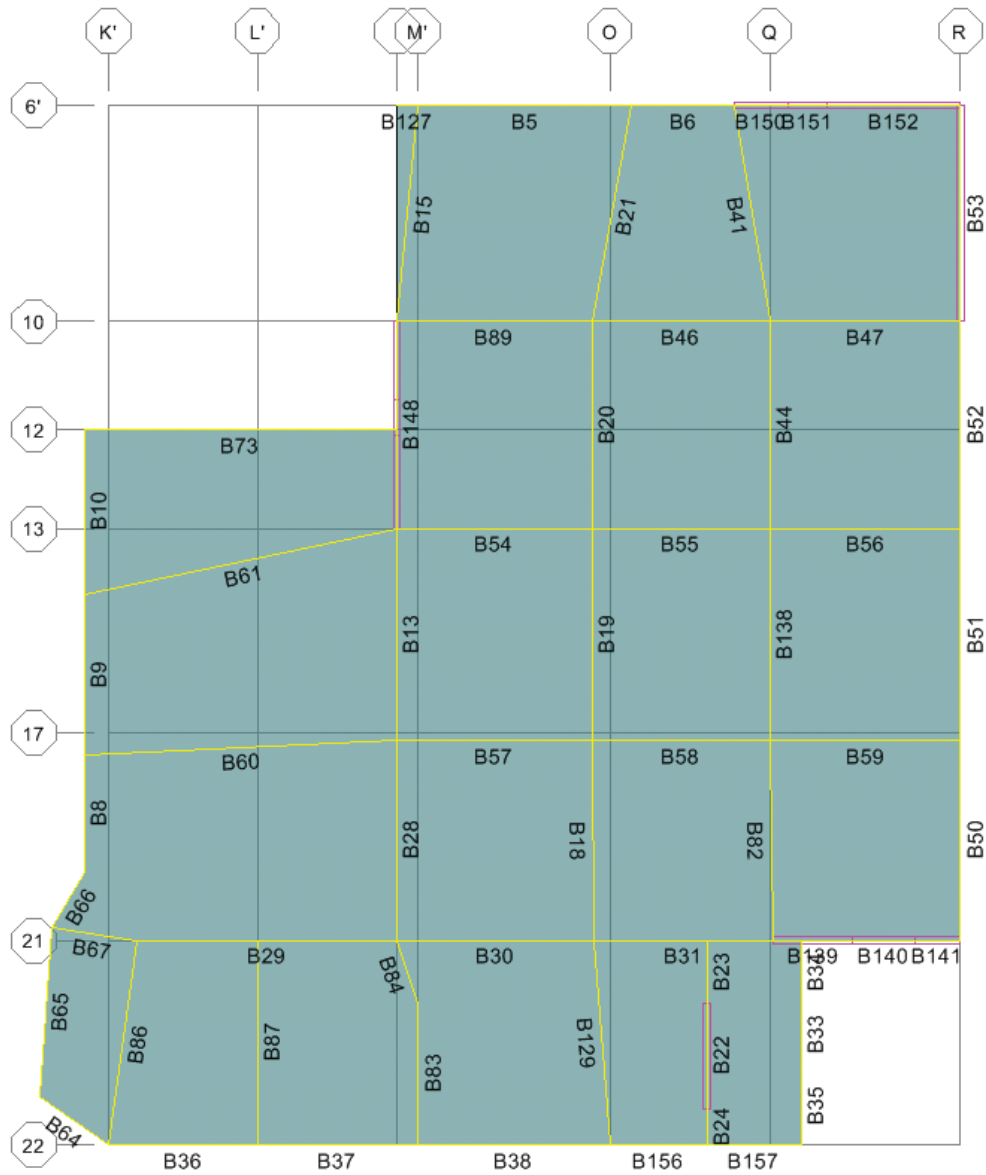
MODELO TRIDIMENSIONAL



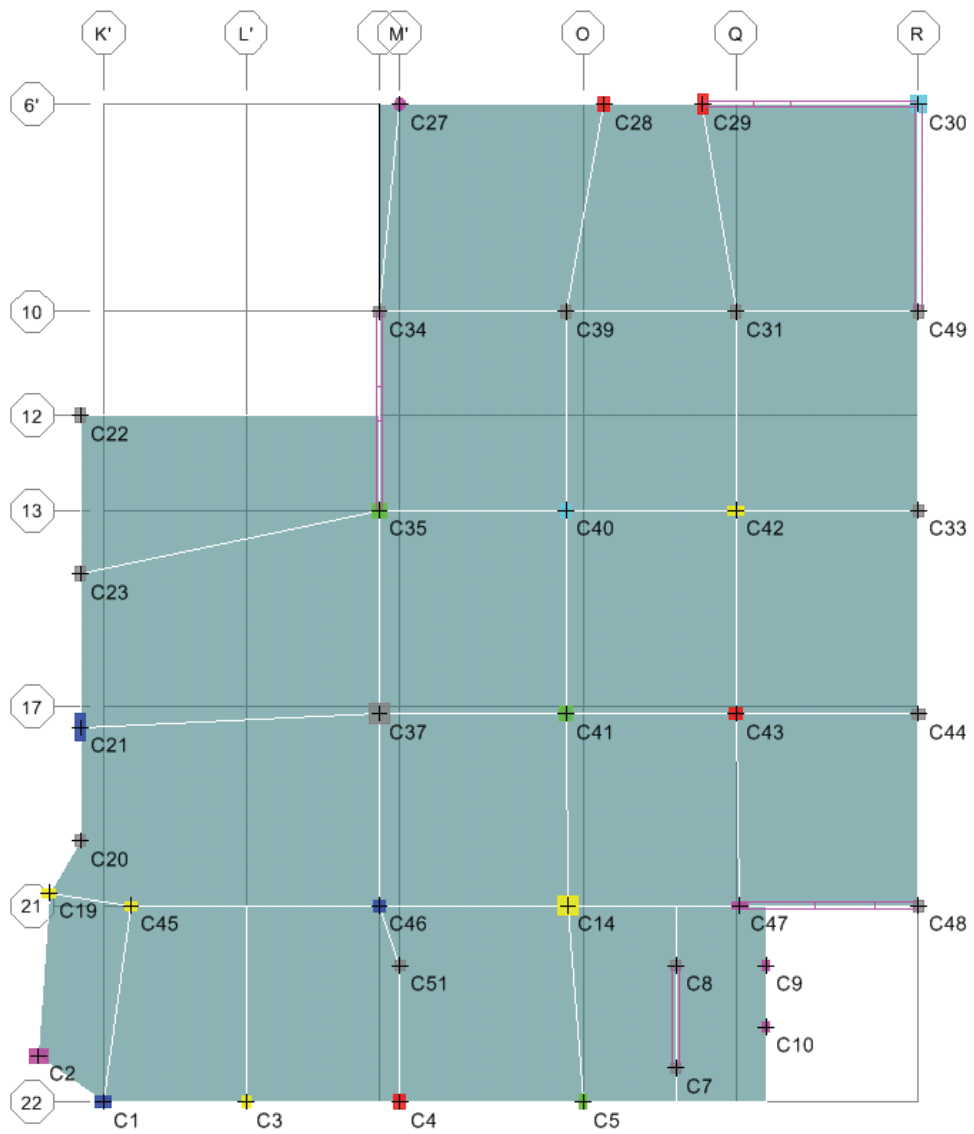
IDENTIFICACIÓN DE PUNTOS



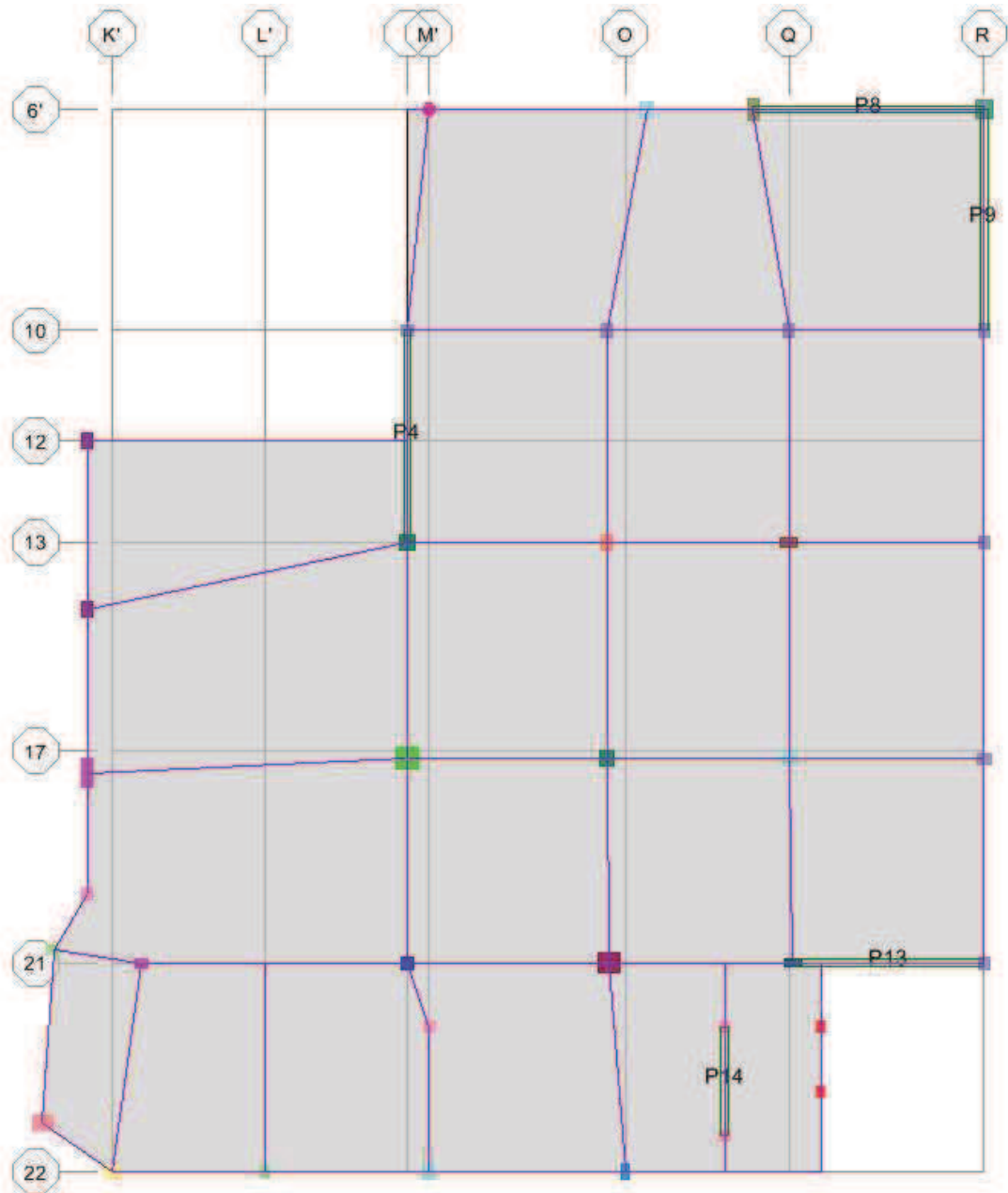
IDENTIFICACIÓN DE VIGAS PISO 1 A CUBIERTA



IDENTIFICACIÓN DE COLUMNAS

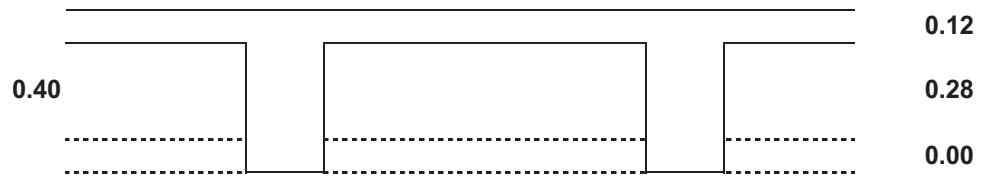


IDENTIFICACIÓN DE PANTALLAS DE REFORZAMIENTO



AVALUO DE CARGAS

PISO 2



Placa	0.120	x	2.40 Ton/m³	=	0.288 Ton/m²
Acabados	0.05	x	2.00 Ton/m³	=	0.100 Ton/m²
Muros no estructurales				=	0.150 Ton/m²
Viguetas				=	0.075 Ton/m²
Otros				=	0.000 Ton/m²
					C.M.= 0.613 Ton/m²
(Carga Viva - Residencial)					C.V.= 0.400 Ton/m²

C.U. = 1.2 C.M. + 1.6 C.V.

C.U. = 1.38 Ton/m² (Carga Ultima)

El peso propio de las vigas lo asigna directamente ETABS

Altura equivalente placa (No incluye carga de vigas) = **0.255 m**

Area = **622.2 m²**

PROYECTO : 4653 - REFORZAMIENTO HOSPITAL UNIVERSITARIO LA SAMARITANA - ESTRUCTURA REFORZADA - BLOQUE :

El Análisis Sísmico se realizará por el método del Análisis Dinámico.

El programa de análisis estructural ETABS realiza directamente el análisis dinámico utilizando el Espectro Elástico de Diseño (según la microzonificación sísmica de Bogotá D.C.) construido con los siguientes parámetros:

ZONA : **PIEDEMONTA B**

Grupo de Uso : **I**

Aa = 0.15

Fa = 1.95

T_C = 0.56

A₀ = 0.26

Av = 0.20

Fv = 1.70

T_L = 3.00

I = 1.00

El espectro se encuentra en el archivo: **10PIEMB**

Zona de Amenaza Sísmica : **Intermedia**

Sistema Estructural: **Pórticos de concreto - DMO**

Datos para el Análisis Sísmico:	Area (m ²)	Alt. Piso (m)	Elevación (h) h(m)	W (ton)	W / A ton/m ²	Masa (kg-s/m)
CUBIERTA	422	4.00	20.20	26.7	0.06	2726
PISO 5	422	4.00	16.20	331.1	0.79	33751
PISO 4	548	4.00	12.20	436.8	0.80	44530
PISO 3	548	4.10	8.20	457.8	0.84	46666
PISO 2	622	4.10	4.10	512.5	0.82	52239
				Σ 1764.9		

Análisis Sísmico por Fuerza Horizontal Equivalente:

Análisis por el método de la Fuerza Horizontal Equivalente para ajustar el valor del cortante dinámico en la base (según A.5.4.5 -- NSR - 10)

$$\begin{aligned} A_a &= 0.15 & F_a &= 1.95 & I &= 1.00 \\ A_v &= 0.20 & F_v &= 1.70 \end{aligned}$$

Periodo fundamental aproximado (según A.4.2.2 -- NSR - 10)

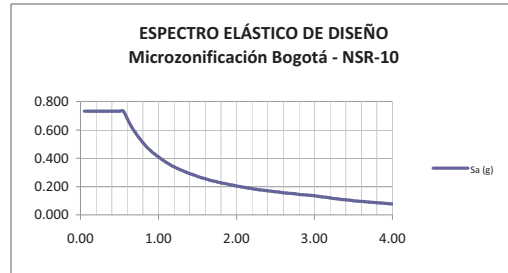
$$\begin{aligned} C_u &= 1.342 & C_u &= 1.75 - 1.2A_vF_v \\ C_t &= \mathbf{0.047} & \text{Pórticos de concreto - DMO} \\ \alpha &= \mathbf{0.90} \end{aligned}$$

$T_a = C_t h^\alpha = 0.70 \text{ seg}$
$C_u * T_a = 0.94 \text{ seg}$

$$\begin{aligned} T_x &= 1.01 \text{ seg (obtenido del análisis dinámico de la estructura)} \\ T_y &= 0.64 \text{ seg (obtenido del análisis dinámico de la estructura)} \end{aligned}$$

$$\begin{aligned} T_x &= \mathbf{0.94 \text{ seg (definitivo)}} \\ T_y &= \mathbf{0.64 \text{ seg (definitivo)}} \end{aligned}$$

$S_a = 1.2 A_v F_v I / T$	$S_a = 2.5 A_a F_a I$	$S_a = 1.2 A_v F_v T_L I / T^2$	$S_{ax} = \mathbf{0.43 \text{ (Definitivo)}}$
$S_{ax} = 0.43$	$S_a = 0.73$	$S_{ax} = 1.38$	$S_{ay} = \mathbf{0.64 \text{ (Definitivo)}}$
$S_{ay} = 0.64$		$S_{ay} = 2.97$	$V_{sx} = \mathbf{763.3 \text{ Ton}}$
			$V_{sy} = \mathbf{1121.4 \text{ Ton}}$



Cortantes Dinámicos en la Base. (V_{tj}):

$$\begin{aligned} V_{tx} &= \mathbf{570.9 \text{ ton}} & \text{(Ver página siguiente)} \\ V_{ty} &= \mathbf{737.1 \text{ ton}} \end{aligned}$$

Regularidad de la Estructura: **2** (1: Regular, 2: Irregular)

- Si la estructura es regular, el cortante dinámico en la base no puede ser menor que el 80 % del cortante calculado por Fuerza Horizontal Equivalente (V_s) - (según A.5.4.5 -- NSR - 10)

- Si la estructura es irregular, el cortante dinámico en la base no puede ser menor que el 90 % del cortante calculado por Fuerza Horizontal Equivalente (V_s) - (según A.5.4.5 -- NSR - 10)

Factores de Ajuste :

$$\begin{aligned} F_x &= 687.0 / 570.9 = 1.20 \\ F_y &= 1009.3 / 737.1 = 1.37 \end{aligned}$$

$$\begin{aligned} F_x &= 1.20 \text{ (Definitivo)} \\ F_y &= 1.37 \text{ (Definitivo)} \end{aligned}$$

PROYECTISTAS CIVILES ASOCIADOS

4653 - REFORZAMIENTO HOSPITAL UNIVERSITARIO LA SAMARITANA - ESTRUCTURA REFORZADA - BLOQUE 3

ARCHIVO:ETABS,4653MODELO.OUT

ANALISIS SISMICO

COORDINATES OF CENTERS OF CUMULATIVE MASS & CENTERS OF RIGIDITY

STORY LEVEL	DIAPHRAGM NUMBER	MASS		/----CENTER OF MASS----/ ORDINATE-X ORDINATE-Y		/--CENTER OF RIGIDITY--/ ORDINATE-X ORDINATE-Y					
		MassX	MassY	XCM	YCM	CumMassX	CumMassY	XCCM	YCCM	XCR	YCR
CUBIERTA	D1	2726.0	2726.0			2726.0	2726.0				
PISO 5	D1	33750.6	33750.6	11.19	13.37	33750.6	33750.6	11.19	13.37	14.40	17.23
PISO 4	D1	44530.0	44530.0	13.73	14.55	78280.6	78280.6	12.64	14.04	19.70	24.59
PISO 3	D1	46665.6	46665.6	14.11	14.83	124946.1	124946.1	13.19	14.34	19.20	23.86
PISO 2	D1	52238.9	52238.9	12.86	14.41	177185.0	177185.0	13.09	14.36	18.19	22.31
PISO 1	D1	4998.3	4998.3	14.94	15.90	182183.4	182183.4	13.14	14.40	16.81	20.01

PROYECTISTAS CIVILES ASOCIADOS
4653 - REFORZAMIENTO HOSPITAL UNIVERSITARIO LA SAMARITANA - ESTRUCTURA REFORZADA - BLOQUE 3
ARCHIVO:ETABS/4653MODELO.OUT
ANALISIS SISMICO

MODAL PARTICIPATING MASS RATIOS

MODE NUMBER Mode	Period	TRASLATION			< % SUM>			ROTATION			< % SUM>		
		% MASS UX	% MASS UY	% MASS UZ	SumUX	SumUY	SumUZ	% MASS RX	% MASS RY	% MASS RZ	SumRX	SumRY	SumRZ
1	1.01	38.06	0.35	0.00	38.06	0.35	0.00	0.5	67.0	2.8	0.5	67.0	2.8
2	0.64	0.26	46.70	0.00	38.32	47.05	0.00	63.8	0.0	17.6	64.3	67.0	20.4
3	0.51	4.12	18.41	0.00	42.44	65.45	0.00	25.9	2.3	12.0	90.2	69.3	32.4
4	0.40	28.14	0.73	0.00	70.58	66.18	0.00	0.7	18.8	0.2	91.0	88.1	32.6
5	0.35	0.11	0.03	0.00	70.69	66.22	0.00	0.0	0.1	0.0	91.0	88.2	32.6
6	0.32	0.62	0.17	0.00	71.31	66.38	0.00	0.4	0.7	3.8	91.4	88.9	36.5
7	0.29	0.89	0.12	0.00	72.19	66.51	0.00	0.2	0.6	1.1	91.6	89.5	37.5
8	0.28	3.09	0.08	0.00	75.28	66.58	0.00	0.1	1.6	0.8	91.7	91.1	38.3
9	0.26	2.36	1.38	0.00	77.65	67.96	0.00	0.2	1.6	2.3	91.9	92.7	40.6
10	0.25	0.10	1.10	0.00	77.74	69.06	0.00	0.3	0.1	0.0	92.2	92.7	40.7
11	0.24	0.02	0.08	0.00	77.76	69.14	0.00	0.0	0.0	0.0	92.2	92.8	40.7
12	0.23	1.24	1.59	0.00	79.00	70.73	0.00	0.8	0.8	1.9	93.0	93.6	42.6
13	0.21	4.22	4.57	0.00	83.22	75.30	0.00	2.8	2.9	9.3	95.8	96.5	51.9
14	0.21	0.48	0.07	0.00	83.71	75.37	0.00	0.1	0.3	1.3	95.9	96.8	53.2
15	0.15	2.83	1.59	0.00	86.54	76.96	0.00	1.6	2.4	35.4	97.5	99.2	88.5
16	0.13	0.32	14.45	0.00	86.86	91.42	0.00	2.0	0.0	0.5	99.5	99.3	89.1
17	0.12	0.00	0.01	0.00	86.86	91.42	0.00	0.0	0.0	0.0	99.5	99.3	89.1
18	0.11	0.01	0.02	0.00	86.87	91.45	0.00	0.0	0.0	0.0	99.5	99.3	89.1
19	0.10	0.63	1.35	0.00	87.50	92.80	0.00	0.1	0.0	0.6	99.6	99.3	89.7
20	0.10	0.13	0.09	0.00	87.63	92.89	0.00	0.0	0.0	0.1	99.6	99.3	89.8
21	0.09	9.02	1.01	0.00	96.64	93.90	0.00	0.1	0.6	0.6	99.7	99.9	90.3
22	0.09	0.47	0.39	0.00	97.11	94.29	0.00	0.0	0.0	0.0	99.8	99.9	90.3
23	0.08	0.04	0.10	0.00	97.15	94.39	0.00	0.0	0.0	0.0	99.8	99.9	90.4
24	0.07	0.13	0.53	0.00	97.28	94.92	0.00	0.0	0.0	0.0	99.8	100.0	90.4
25	0.07	0.00	0.00	0.00	97.28	94.92	0.00	0.0	0.0	0.0	99.8	100.0	90.4
26	0.07	0.00	0.00	0.00	97.28	94.93	0.00	0.0	0.0	0.0	99.8	100.0	90.4
27	0.06	0.00	0.00	0.00	97.28	94.93	0.00	0.0	0.0	0.0	99.8	100.0	90.4
28	0.05	0.11	2.46	0.00	97.39	97.38	0.00	0.1	0.0	0.5	99.9	100.0	90.9
29	0.05	0.00	0.01	0.00	97.39	97.39	0.00	0.0	0.0	0.0	99.9	100.0	90.9
30	0.04	1.08	1.16	0.00	98.47	98.54	0.00	0.0	0.0	7.3	100.0	100.0	98.2

PROYECTISTAS CIVILES ASOCIADOS
4653 - REFORZAMIENTO HOSPITAL UNIVERSITARIO LA SAMARITANA - ESTRUCTURA REFORZADA - BLOQUE 3
ARCHIVO:ETABS/4653MODELO.OUT
ANALISIS SISMICO

DYNAMIC RESPONSE SPECTRUM BASE SHEARS REACTIONS

Spec	Mode	Dir	F1	F2	F3	M1	M2	M3
EX	1	U1	305693	-29337	0	498827	5697477	-4320982
EX	2	U1	3350	-44484	0	730576	-1195	-541675
EX	3	U1	59817	126511	0	-2109535	627969	1221106
EX	4	U1	408942	65870	0	-916732	4699855	-5935270
EX	5	U1	1620	875	0	-8909	22417	-16588
EX	6	U1	9037	-4674	0	103264	132622	-176116
EX	7	U1	12864	-4823	0	79588	147188	-236041
EX	8	U1	44882	7060	0	-117791	455429	-676865
EX	9	U1	34362	26260	0	-132377	397321	-27222
EX	10	U1	1393	4709	0	-34858	14736	54410
EX	11	U1	259	-553	0	4411	2929	-12863
EX	12	U1	17997	-20409	0	206344	206513	-505710
EX	13	U1	61395	-63835	0	698780	712590	-1555180
EX	14	U1	7039	-2673	0	46419	83348	-113696
EX	15	U1	41183	-30871	0	437822	535725	-1104744
EX	16	U1	4691	-31392	0	163626	23306	-538501
EX	17	U1	0	5	0	-22	6	73
EX	18	U1	88	-175	0	833	298	-3380
EX	19	U1	9139	-13393	0	58447	31045	-302242
EX	20	U1	1915	-1592	0	6976	7097	-48204
EX	21	U1	131039	43931	0	-189001	470314	-1216309
EX	22	U1	6821	6232	0	-25822	25098	-18452
EX	23	U1	524	860	0	-3349	1826	3014
EX	24	U1	1898	3822	0	-14704	6852	17530
EX	25	U1	63	51	0	-158	240	-752
EX	26	U1	2	-8	0	37	11	-215
EX	27	U1	0	1	0	-2	0	6
EX	28	U1	1585	7522	0	-24607	4620	53090
EX	29	U1	3	14	0	-45	10	89
EX	30	U1	15645	-16216	0	33843	27275	-445139
EX	All	All	570924	187676	0	2668829	7789118	8175011
EY	1	U2	-29337	2815	0	-47872	-546779	414678
EY	2	U2	-44484	590670	0	-9700841	15873	7192548
EY	3	U2	126511	267566	0	-4461583	1328129	2582590
EY	4	U2	65870	10610	0	-147661	757020	-956012
EY	5	U2	875	472	0	-4810	12104	-8957
EY	6	U2	-4674	2418	0	-53411	-68597	91093
EY	7	U2	-4823	1808	0	-29839	-55183	88496
EY	8	U2	7060	1111	0	-18529	71641	-106474
EY	9	U2	26260	20068	0	-101164	303636	-20803
EY	10	U2	4709	15922	0	-117849	49821	183953
EY	11	U2	-553	1180	0	-9408	-6247	27437
EY	12	U2	-20409	23144	0	-234000	-234192	573492
EY	13	U2	-63835	66372	0	-726550	-740909	1616984
EY	14	U2	-2673	1015	0	-17630	-31656	43182
EY	15	U2	-30871	23140	0	-328190	-401578	828113
EY	16	U2	-31392	210095	0	-1095089	-155976	3603998
EY	17	U2	5	107	0	-473	141	1594
EY	18	U2	-175	349	0	-1663	-594	6747
EY	19	U2	-13393	19629	0	-85658	-45499	442953
EY	20	U2	-1592	1322	0	-5796	-5897	40051
EY	21	U2	43931	14728	0	-63362	157673	-407768
EY	22	U2	6232	5695	0	-23596	22934	-16861
EY	23	U2	860	1410	0	-5495	2997	4945
EY	24	U2	3822	7697	0	-29613	13800	35305
EY	25	U2	51	41	0	-127	194	-609
EY	26	U2	-8	39	0	-174	-50	995
EY	27	U2	1	4	0	-13	2	46
EY	28	U2	7522	35696	0	-116767	21924	251929
EY	29	U2	14	73	0	-232	54	457
EY	30	U2	-16216	16809	0	-35079	-28271	461397
EY	All	All	187676	737116	0	11478266	2013824	9344664

/-----D1-----/ /-----D2-----/
DIRECTION-X DIRECTION-Y DIRECTION-X DIRECTION-Y
CQC 570923.8 187675.7 187675.7 737116.2

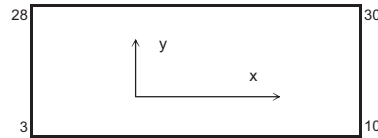
Vtx= 570.9 Ton
Vty= 737.1 Ton

PROYECTISTAS CIVILES ASOCIADOS
4653 - REFORZAMIENTO HOSPITAL UNIVERSITARIO LA SAMARITANA - ESTRUCTURA REFORZADA - BLOQUE 3
ARCHIVO:ETABS/4653MODELO.OUT
ANALISIS SISMICO

RESPONSE SPECTRUM ACCELERATIONS & TOTAL MODAL DAMPING

Spec	Mode	Period	DampRatio	SpecFactor	SPEC-ACC	SPEC-ACC	SPEC-ACC	Sa
					U1	U2	U3	
EX	1	1.01	0.05	1.00	3.96	0.00	0.00	0.404
EX	2	0.64	0.05	1.00	6.24	0.00	0.00	0.636
EX	3	0.51	0.05	1.00	7.17	0.00	0.00	0.731
EX	4	0.40	0.05	1.00	7.17	0.00	0.00	0.731
EX	5	0.35	0.05	1.00	7.17	0.00	0.00	0.731
EX	6	0.32	0.05	1.00	7.17	0.00	0.00	0.731
EX	7	0.29	0.05	1.00	7.17	0.00	0.00	0.731
EX	8	0.28	0.05	1.00	7.17	0.00	0.00	0.731
EX	9	0.26	0.05	1.00	7.17	0.00	0.00	0.731
EX	10	0.25	0.05	1.00	7.17	0.00	0.00	0.731
EX	11	0.24	0.05	1.00	7.17	0.00	0.00	0.731
EX	12	0.23	0.05	1.00	7.17	0.00	0.00	0.731
EX	13	0.21	0.05	1.00	7.17	0.00	0.00	0.731
EX	14	0.21	0.05	1.00	7.17	0.00	0.00	0.731
EX	15	0.15	0.05	1.00	7.17	0.00	0.00	0.731
EX	16	0.13	0.05	1.00	7.17	0.00	0.00	0.731
EX	17	0.12	0.05	1.00	7.17	0.00	0.00	0.731
EX	18	0.11	0.05	1.00	7.17	0.00	0.00	0.731
EX	19	0.10	0.05	1.00	7.17	0.00	0.00	0.731
EX	20	0.10	0.05	1.00	7.17	0.00	0.00	0.731
EX	21	0.09	0.05	1.00	7.17	0.00	0.00	0.731
EX	22	0.09	0.05	1.00	7.17	0.00	0.00	0.731
EX	23	0.08	0.05	1.00	7.17	0.00	0.00	0.731
EX	24	0.07	0.05	1.00	7.17	0.00	0.00	0.731
EX	25	0.07	0.05	1.00	7.17	0.00	0.00	0.731
EX	26	0.07	0.05	1.00	7.17	0.00	0.00	0.731
EX	27	0.06	0.05	1.00	7.17	0.00	0.00	0.731
EX	28	0.05	0.05	1.00	7.17	0.00	0.00	0.731
EX	29	0.05	0.05	1.00	7.17	0.00	0.00	0.731
EX	30	0.04	0.05	1.00	7.17	0.00	0.00	0.731
EY	1	1.01	0.05	1.00	0.00	3.96	0.00	0.404
EY	2	0.64	0.05	1.00	0.00	6.24	0.00	0.636
EY	3	0.51	0.05	1.00	0.00	7.17	0.00	0.731
EY	4	0.40	0.05	1.00	0.00	7.17	0.00	0.731
EY	5	0.35	0.05	1.00	0.00	7.17	0.00	0.731
EY	6	0.32	0.05	1.00	0.00	7.17	0.00	0.731
EY	7	0.29	0.05	1.00	0.00	7.17	0.00	0.731
EY	8	0.28	0.05	1.00	0.00	7.17	0.00	0.731
EY	9	0.26	0.05	1.00	0.00	7.17	0.00	0.731
EY	10	0.25	0.05	1.00	0.00	7.17	0.00	0.731
EY	11	0.24	0.05	1.00	0.00	7.17	0.00	0.731
EY	12	0.23	0.05	1.00	0.00	7.17	0.00	0.731
EY	13	0.21	0.05	1.00	0.00	7.17	0.00	0.731
EY	14	0.21	0.05	1.00	0.00	7.17	0.00	0.731
EY	15	0.15	0.05	1.00	0.00	7.17	0.00	0.731
EY	16	0.13	0.05	1.00	0.00	7.17	0.00	0.731
EY	17	0.12	0.05	1.00	0.00	7.17	0.00	0.731
EY	18	0.11	0.05	1.00	0.00	7.17	0.00	0.731
EY	19	0.10	0.05	1.00	0.00	7.17	0.00	0.731
EY	20	0.10	0.05	1.00	0.00	7.17	0.00	0.731
EY	21	0.09	0.05	1.00	0.00	7.17	0.00	0.731
EY	22	0.09	0.05	1.00	0.00	7.17	0.00	0.731
EY	23	0.08	0.05	1.00	0.00	7.17	0.00	0.731
EY	24	0.07	0.05	1.00	0.00	7.17	0.00	0.731
EY	25	0.07	0.05	1.00	0.00	7.17	0.00	0.731
EY	26	0.07	0.05	1.00	0.00	7.17	0.00	0.731
EY	27	0.06	0.05	1.00	0.00	7.17	0.00	0.731
EY	28	0.05	0.05	1.00	0.00	7.17	0.00	0.731
EY	29	0.05	0.05	1.00	0.00	7.17	0.00	0.731
EY	30	0.04	0.05	1.00	0.00	7.17	0.00	0.731

Esquema Estructural - Identificación de Nudos Para Revisión de la Irregularidad Torsional



REVISIÓN DE LA IRREGULARIDAD TORSIONAL

Δ = Deriva del análisis.

SISMO EN X Caso de Carga: 3

Columna Eje Vertical:

	28 3					
	$\Delta 1$ (cm)	$\Delta 2$ (cm)	$\frac{1.2 \cdot (\Delta 1 + \Delta 2)}{2}$	$\frac{1.4 \cdot (\Delta 1 + \Delta 2)}{2}$	Irregularidad Torsional	Irregularidad Torsional Extrema
CUBIERTA	2.60	3.51	3.67	4.28	NO	NO
PISO 5	3.54	3.37	4.15	4.84	NO	NO
PISO 4	0.27	0.70	0.59	0.68	SI	SI
PISO 3	0.25	0.63	0.53	0.62	SI	SI
PISO 2	0.23	0.57	0.48	0.56	SI	SI

	30 10					
	$\Delta 1$ (cm)	$\Delta 2$ (cm)	$\frac{1.2 \cdot (\Delta 1 + \Delta 2)}{2}$	$\frac{1.4 \cdot (\Delta 1 + \Delta 2)}{2}$	Irregularidad Torsional	Irregularidad Torsional Extrema
CUBIERTA	2.65	3.75	3.84	4.49	NO	NO
PISO 5	3.55	3.82	4.42	5.16	NO	NO
PISO 4	0.25	0.74	0.59	0.69	SI	SI
PISO 3	0.23	0.67	0.54	0.63	SI	SI
PISO 2	0.22	0.60	0.49	0.58	SI	SI

SISMO EN Y Caso de Carga: 5

Columna Eje Vertical:

	28 30					
	$\Delta 1$ (cm)	$\Delta 2$ (cm)	$\frac{1.2 \cdot (\Delta 1 + \Delta 2)}{2}$	$\frac{1.4 \cdot (\Delta 1 + \Delta 2)}{2}$	Irregularidad Torsional	Irregularidad Torsional Extrema
CUBIERTA	3.79	3.88	4.60	5.36	NO	NO
PISO 5	2.43	2.35	2.87	3.35	NO	NO
PISO 4	0.90	0.65	0.93	1.09	NO	NO
PISO 3	0.77	0.55	0.80	0.93	NO	NO
PISO 2	0.64	0.46	0.66	0.77	NO	NO

	3 10					
	$\Delta 1$ (cm)	$\Delta 2$ (cm)	$\frac{1.2 \cdot (\Delta 1 + \Delta 2)}{2}$	$\frac{1.4 \cdot (\Delta 1 + \Delta 2)}{2}$	Irregularidad Torsional	Irregularidad Torsional Extrema
CUBIERTA	3.83	2.85	4.01	4.68	NO	NO
PISO 5	1.68	1.05	1.64	1.91	SI	NO
PISO 4	1.73	1.16	1.73	2.02	NO	NO
PISO 3	1.50	1.01	1.50	1.75	NO	NO
PISO 2	1.25	0.85	1.26	1.47	NO	NO

IRREGULARIDADES EN PLANTA - (Ver tabla A.3-6 - NSR-10)

PARAMETRO	Tipo	Si	No
Irregularidad Torsional	1aP		x
Irregularidad Torsional Extrema	1bP	X	
Retrocesos excesivos en las Esquinas	2P		x
Discontinuidades en el Diafragma	3P		x
Desplazamiento del Plano de Acción	4P		x
Sistemas no Paralelos	5P		x

Factor de Reducción
0.9
0.8
0.9
0.9
0.8
0.9

$\phi_p = 0.8$

- (Si existen varias irregularidades se escoge el menor valor de ϕ_p)
- En zonas de amenaza sísmica intermedia para edificaciones pertenecientes al grupo de uso I la revisión de irregularidad se puede limitar a las irregularidades 1aP, 1bP, 3P y 4P (Ver A.3.3.7 NSR-10);
 - En zonas de amenaza sísmica baja para edificaciones pertenecientes al grupo de uso I y II la evaluación de irregularidad se puede limitar a las irregularidades 1aP y 1bP (Ver A.3.3.6 NSR-10);

IRREGULARIDADES EN ALTURA - (Ver tabla A.3-7 - NSR-10)

PARAMETRO	Tipo	Si	No
Piso Flexible (Irregularidad en Rigidez)	1aA		x
Piso Flexible (Irregularidad extrema en Rigidez)	1bA		x
Distribución de Masas	2A		x
Geométrica	3A		x
Desplazamiento del Plano de Acción	4A		x
Piso Débil (Discontinuidad en la resistencia)	5aA		x
Piso Débil (Discontinuidad extrema en la resistencia)	5bA		x

Factor de Reducción
0.9
0.8
0.9
0.9
0.8
0.9
0.8

$\phi_a = 1.0$

- (Si existen varias irregularidades se escoge el menor valor de ϕ_a)
- Cuando la deriva de cualquier piso es menor a 1.3 veces la deriva del piso siguiente hacia arriba, puede considerarse que no existen irregularidades de los tipos 1aA, 1bA, 2A ó 3A (Ver A.3.3.5.1 NSR-10)
 - En zonas de amenaza sísmica intermedia y para edificaciones pertenecientes al grupo de uso I la evaluación de la irregularidad se puede limitar a las irregularidades de los tipos 4A, 5aA y 5bA (Ver A.3.3.7 NSR-10);
 - En zonas de amenaza sísmica baja para edificaciones pertenecientes al grupo de uso I y II la evaluación de irregularidad se puede limitar a las irregularidades 5aA y 5bA (Ver A.3.3.6 NSR-10);

AUSENCIA DE REDUNDANCIA - (Ver A.3.3.8 - NSR-10)

PARAMETRO	Si	No
Ausencia de redundancia en el sistema sismo-resistente		x

Factor de Reducción
0.75

$\phi_r = 1.00$

Factores - Resultado **F_x = 1.20**
Análisis Sísmico **F_y = 1.37**

Combinaciones de Carga:

1.0. CHEQUEO DE LA DERIVA

1	1.40 C.M.		
2	1.20 C.M.	+ 1.60 C.V.	
3	1.20 C.M.	+ 1.00 C.V.	+ 1.20 S.X.
4	1.20 C.M.	+ 1.00 C.V.	- 1.20 S.X.
5	1.20 C.M.	+ 1.00 C.V.	+ 1.37 S.Y.
6	1.20 C.M.	+ 1.00 C.V.	- 1.37 S.Y.
7	0.90 C.M.		+ 1.20 S.X.
8	0.90 C.M.		- 1.20 S.X.
9	0.90 C.M.		+ 1.37 S.Y.
10	0.90 C.M.		- 1.37 S.Y.

C.M. = Carga Muerta
C.V. = Carga Viva
S.X. = Fuerzas Sísmicas Elásticas en X
S.Y. = Fuerzas Sísmicas Elásticas en Y

$R_o = 5.00$ Pórticos de concreto - DMO
 $\Omega_0 = 3.00$

$\phi_a = 1.00$
 $\phi_p = 0.80$
 $\phi_r = 1.00$

DERIVA PÓRTICOS

$$\Delta_a = \sqrt{(\delta_{x1} - \delta_{x2})^2 + (\delta_{y1} - \delta_{y2})^2}$$

$\Delta\alpha$ = Deriva del análisis.

Δp = Deriva permitida.
(0.01 h)

<u>SISMO EN X</u>		Columna Eje Vertical:		28			
		Caso de Carga:		3			
Alt. piso		δx (m)	δy (m)	$\Delta\alpha$ (cm)	Δp (cm)	OK	%
CUBIERTA	4.00	0.0676	0.0071	2.60	4.00	OK	0.65
PISO 5	4.00	0.0416	0.0058	3.54	4.00	OK	0.89
PISO 4	4.00	0.0062	0.0041	0.27	4.00	OK	0.07
PISO 3	4.10	0.0040	0.0025	0.25	4.10	OK	0.06
PISO 2	4.10	0.0020	0.0012	0.23	4.10	OK	0.06
<u>SISMO EN Y</u>		Columna Eje Vertical:		28			
		Caso de Carga:		5			
Alt. piso		δx (m)	δy (m)	$\Delta\alpha$ (cm)	Δp (cm)	OK	%
CUBIERTA	4.00	0.0666	0.0415	3.79	4.00	OK	0.95
PISO 5	4.00	0.0301	0.0313	2.43	4.00	OK	0.61
PISO 4	4.00	0.0078	0.0218	0.90	4.00	OK	0.23
PISO 3	4.10	0.0047	0.0133	0.77	4.10	OK	0.19
PISO 2	4.10	0.0021	0.0060	0.64	4.10	OK	0.15
<u>SISMO EN X</u>		Columna Eje Vertical:		30			
		Caso de Carga:		3			
Alt. piso		δx (m)	δy (m)	$\Delta\alpha$ (cm)	Δp (cm)	OK	%
CUBIERTA	4.00	0.0675	0.0112	2.65	4.00	OK	0.66
PISO 5	4.00	0.0416	0.0052	3.55	4.00	OK	0.89
PISO 4	4.00	0.0062	0.0032	0.25	4.00	OK	0.06
PISO 3	4.10	0.0040	0.0020	0.23	4.10	OK	0.06
PISO 2	4.10	0.0020	0.0010	0.22	4.10	OK	0.05
<u>SISMO EN Y</u>		Columna Eje Vertical:		30			
		Caso de Carga:		5			
Alt. piso		δx (m)	δy (m)	$\Delta\alpha$ (cm)	Δp (cm)	OK	%
CUBIERTA	4.00	0.0665	0.0355	3.88	4.00	OK	0.97
PISO 5	4.00	0.0301	0.0219	2.35	4.00	OK	0.59
PISO 4	4.00	0.0078	0.0148	0.65	4.00	OK	0.16
PISO 3	4.10	0.0047	0.0090	0.55	4.10	OK	0.14
PISO 2	4.10	0.0021	0.0041	0.46	4.10	OK	0.11

1. El análisis se realizó con la inercia de las vigas y las columnas completa.
% Indica INDICE DE FLEXIBILIDAD = $\Delta\alpha/\Delta p$

$$\Delta_{\alpha} = \sqrt{(\delta_{x1} - \delta_{x2})^2 + (\delta_{y1} - \delta_{y2})^2}$$

$\Delta\alpha$ = Deriva del análisis.

$\Delta\rho$ = Deriva permitida.
(0.01 h)

<u>SISMO EN X</u>		Columna Eje Vertical: Caso de Carga:		3			
	Alt. piso	δx (m)	δy (m)	$\Delta\alpha$ (cm)	$\Delta\rho$ (cm)		%
CUBIERTA	4.00	0.0859	0.0162	3.51	4.00	OK	0.88
PISO 5	4.00	0.0519	0.0075	3.37	4.00	OK	0.84
PISO 4	4.00	0.0183	0.0053	0.70	4.00	OK	0.18
PISO 3	4.10	0.0116	0.0033	0.63	4.10	OK	0.15
PISO 2	4.10	0.0055	0.0015	0.57	4.10	OK	0.14

<u>SISMO EN Y</u>		Columna Eje Vertical: Caso de Carga:		3			
	Alt. piso	δx (m)	δy (m)	$\Delta\alpha$ (cm)	$\Delta\rho$ (cm)		%
CUBIERTA	4.00	0.0484	0.0850	3.83	4.00	OK	0.96
PISO 5	4.00	0.0269	0.0533	1.68	4.00	OK	0.42
PISO 4	4.00	0.0260	0.0365	1.73	4.00	OK	0.43
PISO 3	4.10	0.0161	0.0223	1.50	4.10	OK	0.37
PISO 2	4.10	0.0074	0.0101	1.25	4.10	OK	0.30

<u>SISMO EN X</u>		Columna Eje Vertical: Caso de Carga:		10			
	Alt. piso	δx (m)	δy (m)	$\Delta\alpha$ (cm)	$\Delta\rho$ (cm)		%
CUBIERTA	4.00	0.0944	0.0148	3.75	4.00	OK	0.94
PISO 5	4.00	0.0579	0.0060	3.82	4.00	OK	0.96
PISO 4	4.00	0.0198	0.0036	0.74	4.00	OK	0.18
PISO 3	4.10	0.0125	0.0023	0.67	4.10	OK	0.16
PISO 2	4.10	0.0059	0.0011	0.60	4.10	OK	0.15

<u>SISMO EN Y</u>		Columna Eje Vertical: Caso de Carga:		10			
	Alt. piso	δx (m)	δy (m)	$\Delta\alpha$ (cm)	$\Delta\rho$ (cm)		%
CUBIERTA	4.00	0.0388	0.0529	2.85	4.00	OK	0.71
PISO 5	4.00	0.0222	0.0296	1.05	4.00	OK	0.26
PISO 4	4.00	0.0233	0.0192	1.16	4.00	OK	0.29
PISO 3	4.10	0.0145	0.0117	1.01	4.10	OK	0.25
PISO 2	4.10	0.0067	0.0053	0.85	4.10	OK	0.21

1. El análisis se realizó con la inercia de las vigas y las columnas completa.
% Indica INDICE DE FLEXIBILIDAD = $\Delta\alpha/\Delta\rho$

				<u>Max en X</u>	0.96			
				<u>Max en Y</u>	0.97			
Max en x=	0.89	<table style="width: 100%; text-align: center;"> <tr> <td>28</td> <td>30</td> </tr> <tr> <td>3</td> <td>10</td> </tr> </table>	28	30	3	10	Max en x=	0.89
28	30							
3	10							
Max en y=	0.95		Max en y=	0.97				
Max en x=	0.88		Max en x=	0.96				
Max en y=	0.96		Max en y=	0.71				

1.2. CONSIDERACIONES PARA EL DISEÑO DE ELEMENTOS DE REFORZAMIENTO

Además de las consideraciones que se tuvieron en cuenta para definir las pantallas de reforzamiento en cuanto a dimensiones y localización, también se tienen en cuenta los siguientes parámetros para el diseño de dichos elementos:

- Coeficiente de Importancia $I=IV$ (1.5)
- Concreto $f'c=280$ kg/cm² para pantallas de reforzamiento
- Concreto $f'c=200$ kg/cm² para estructura existente
- 20%E para concreto de estructura existente
- 100%E para concreto de pantallas de reforzamiento

Teniendo en cuenta las anteriores consideraciones, y luego de realizar el correspondiente análisis de la estructura, se tienen las siguientes combinaciones de carga para el diseño de las pantallas:

DISEÑO DE MUROS

M1	1.40 C.M.		
M2	1.20 C.M.	+ 1.60 C.V.	
M3	1.20 C.M.	+ 1.00 C.V.	+ 0.30 S.X.
M4	1.20 C.M.	+ 1.00 C.V.	-0.30 S.X.
M5	1.20 C.M.	+ 1.00 C.V.	+ 0.34 S.Y.
M6	1.20 C.M.	+ 1.00 C.V.	-0.34 S.Y.
M7	0.90 C.M.		+ 0.30 S.X.
M8	0.90 C.M.		-0.30 S.X.
M9	0.90 C.M.		+ 0.34 S.Y.
M10	0.90 C.M.		-0.34 S.Y.

DISEÑO DE PANTALLAS BLOQUE 3

PISO	PANTALLA	CUANTÍA A FLEXIÓN	As CORTANTE cm ²	ESPESOR (cm)	REFUERZO LONGITUDINAL					REFUERZO TRANSVERSAL			
					#	As LONG cm ²	CANT.	CADA (cm)	REF. LONGITUDINAL	#	CANT.	CADA (cm)	REF. TRANSVERSAL
PISO 1	P5	0.0103	5.38	20	6	20.6	4	30	# 6 C/.30	4	3	45	# 4 C/.30
		0.0149	10.29	20	6	29.8	6	15	# 6 C/.15	4	5	20	# 4 C/.20
PISO 1	P6	0.0054	6.83	20	6	10.8	2	90	# 6 C/.30	4	3	45	# 4 C/.30
		0.0091	5.97	20	6	18.2	4	30	# 6 C/.30	4	3	45	# 4 C/.30
PISO 1	P7	0.0047	5.00	20	6	9.4	2	90	# 6 C/.30	4	2	90	# 4 C/.30
		0.0049	5.00	20	6	9.8	2	90	# 6 C/.30	4	2	90	# 4 C/.30
PISO 4	P8	0.0031	5.00	20	3	6.2	5	20	# 3 C/.20	3	4	30	# 3 C/.30
		0.0029	5.00	20	3	5.8	5	20	# 3 C/.20	3	4	30	# 3 C/.30
PISO 3	P8	0.0025	5.00	20	3	5	4	30	# 3 C/.30	3	4	30	# 3 C/.30
		0.0048	5.00	20	3	9.6	7	15	# 3 C/.15	3	4	30	# 3 C/.30
PISO 2	P8	0.004	5.00	20	4	8	4	30	# 4 C/.30	3	4	30	# 3 C/.30
		0.007	5.00	20	4	14	6	15	# 4 C/.15	3	4	30	# 3 C/.30
PISO 1	P10	0.0166	16.80	20	8	33.2	4	30	# 8 C/.30	5	5	20	# 5 C/.20
		0.023	18.36	20	8	46	5	20	# 8 C/.20	5	5	20	# 5 C/.20
PISO 1	P11	0.0239	11.88	20	8	47.8	5	20	# 8 C/.20	5	4	30	# 5 C/.30
		0.0279	19.75	20	8	55.8	6	15	# 8 C/.15	5	5	20	# 5 C/.20
PISO 1	P12	0.0044	6.71	20	5	8.8	3	45	# 5 C/.30	5	2	90	# 5 C/.30
		0.008	6.69	20	5	16	5	20	# 5 C/.20	5	2	90	# 5 C/.30
PISO 4	P13	0.0053	5.00	20	4	10.6	5	20	# 4 C/.20	3	4	30	# 3 C/.30
		0.0069	5.00	20	4	13.8	6	15	# 4 C/.15	3	4	30	# 3 C/.30
PISO 3	P13	0.0042	5.00	20	5	8.4	3	45	# 5 C/.30	3	4	30	# 3 C/.30
		0.0095	6.01	20	5	19	5	20	# 5 C/.20	3	5	20	# 3 C/.20
PISO 2	P13	0.0082	6.24	20	6	16.4	3	45	# 6 C/.30	3	5	20	# 3 C/.20
		0.0158	9.79	20	6	31.6	6	15	# 6 C/.15	3	7	15	# 3 C/.15

DISEÑO DE PANTALLAS BLOQUE 3

PISO	PANTALLA	CUANTÍA A FLEXIÓN	As CORTANTE cm ²	ESPESOR (cm)	REFUERZO LONGITUDINAL					REFUERZO TRANSVERSAL			
					#	As LONG cm ²	CANT.	CADA (cm)	REF. LONGITUDINAL	#	CANT.	CADA (cm)	REF. TRANSVERSAL
PISO 1	P1	0.0252	18.84	20	8	50.4	5	20	# 8 C/.20	5	5	20	# 5 C/.20
		0.0277	22.00	20	8	55.4	6	15	# 8 C/.15	5	6	15	# 5 C/.15
PISO 1	P2	0.0196	22.13	20	8	39.2	4	30	# 8 C/.30	5	6	15	# 5 C/.15
		0.0251	25.19	20	8	50.2	5	20	# 8 C/.20	5	7	15	# 5 C/.15
PISO 1	P3	0.0051	11.34	20	8	10.2	2	90	# 8 C/.30	5	3	45	# 5 C/.30
		0.0079	11.32	20	8	15.8	2	90	# 8 C/.30	5	3	45	# 5 C/.30
CUBIETA	P4	0.0056	5.00	20	4	11.2	5	20	# 4 C/.20	3	4	30	# 3 C/.30
		0.0083	5.00	20	4	16.6	7	15	# 4 C/.15	3	4	30	# 3 C/.30
PISO 5	P4	0.0068	9.03	20	5	13.6	4	30	# 5 C/.30	4	4	30	# 4 C/.30
		0.0129	8.90	20	5	25.8	7	15	# 5 C/.15	4	4	30	# 4 C/.30
PISO 4	P4	0.0126	5.00	20	5	25.2	7	15	# 5 C/.15	4	2	90	# 4 C/.30
		0.0112	5.43	20	5	22.4	6	15	# 5 C/.15	4	3	45	# 4 C/.30
PISO 3	P4	0.0066	7.41	20	5	13.2	4	30	# 5 C/.30	4	3	45	# 4 C/.30
		0.0136	10.58	20	5	27.2	7	15	# 5 C/.15	4	5	20	# 4 C/.20
PISO 2	P4	0.0124	11.40	20	7	24.8	4	30	# 7 C/.30	4	5	20	# 4 C/.20
		0.0226	13.87	20	7	45.2	6	15	# 7 C/.15	4	6	15	# 4 C/.15
PISO 4	P9	0.0069	6.96	20	4	13.8	6	15	# 4 C/.15	3	5	20	# 3 C/.20
		0.0079	6.86	20	4	15.8	7	15	# 4 C/.15	3	5	20	# 3 C/.20
PISO 3	P9	0.0054	5.00	20	5	10.8	3	45	# 5 C/.30	3	4	30	# 3 C/.30
		0.01	5.64	20	5	20	6	15	# 5 C/.15	3	4	30	# 3 C/.30
PISO 2	P9	0.0095	5.732	20	5	19	5	20	# 5 C/.20	3	5	20	# 3 C/.20
		0.0135	8.033	20	5	27	7	15	# 5 C/.15	3	6	15	# 3 C/.15
PISO 1	P9	0.0092	5.406	20	5	18.4	5	20	# 5 C/.20	3	4	30	# 3 C/.30
		0.0122	6.458	20	5	24.4	7	15	# 5 C/.15	3	5	20	# 3 C/.20
CUBIETA	P14	0.0025	5	20	4	5	2	90	# 4 C/.30	5	2	90	# 5 C/.30
		0.007	5	20	4	14	6	15	# 4 C/.15	5	2	90	# 5 C/.30
PISO 5	P14	0.0055	16.497	20	4	11	5	20	# 4 C/.20	5	5	20	# 5 C/.20
		0.0228	17.241	20	4	45.6	18	5	# 4 C/.5	5	5	20	# 5 C/.20
PISO 4	P14	0.0211	18.218	20	4	42.2	17	5	# 4 C/.5	3	13	5	# 3 C/.5
		0.0025	18.031	20	4	5	2	90	# 4 C/.30	3	13	5	# 3 C/.5
PISO 3	P14	0.0025	5	20	4	5	2	90	# 4 C/.30	3	4	30	# 3 C/.30
		0.0025	5	20	4	5	2	90	# 4 C/.30	3	4	30	# 3 C/.30
PISO 2	P14	0.0025	5	20	4	5	2	90	# 4 C/.30	3	4	30	# 3 C/.30
		0.0053	5	20	4	10.6	5	20	# 4 C/.20	3	4	30	# 3 C/.30
PISO 1	P14	0.0025	5	20	4	5	2	90	# 4 C/.30	3	4	30	# 3 C/.30
		0.0065	5	20	4	13	6	15	# 4 C/.15	3	4	30	# 3 C/.30

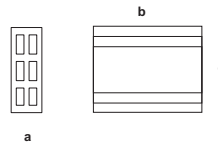
Fuerza Horizontal Equivalente

Sa = 0.95 T = 0.94
w = 1765 Ton k = 1.22
Vb = 1682 Ton

Piso	Area (m ²)	W (Ton)	ρ (Ton/m ²)	h _{piso} (m)	h (m)	W	Mh ^k	Cv	Fhi (Ton)
CUBIERTA	422	26.7	0.06	4.00	20.20	26.7	1051.7	0.04	60.73
PISO 5	422	331.1	0.79	4.00	16.20	331.1	9944.3	0.34	574.19
PISO 4	548	436.8	0.80	4.00	12.20	436.8	9278.8	0.32	535.76
PISO 3	548	457.8	0.84	4.10	8.20	457.8	5984.7	0.21	345.56
PISO 2	622	512.5	0.82	4.10	4.10	512.5	2872.6	0.10	165.87
						1764.9	29132.2	1.00	1682.1

TIPO DE LADRILLO

	a	b	c	Densidad (Ton/m ³)	W muro (Ton/m ²)
1. Bloque #3	0.07	0.23	0.33	0.98	0.069
2. Bloque #4	0.09	0.23	0.33	0.91	0.082
3. Bloque #5	0.115	0.23	0.33	0.916	0.105
4. Bloque #6	0.14	0.23	0.33	0.77	0.108
5. Bloque HV1	0.09	0.23	0.33	0.88	0.079
6. Bloque HV2	0.115	0.23	0.33	0.88	0.101
7. Tolete	0.12	0.06	0.245	1.64	0.197
8. Otro	0.24	0.06	0.25	1.64	0.394



HV = Huecos Verticales
S = Separacion entre columnetas
ap, Rp = Según NSR-10 tabla A.9-2

Columnetas:

Nota: Para el caso en que la columneta se encuentre ubicada dentro del ladrillo, las dimensiones de esta dependen de la dimensión de la celda.

Muros:

Grupo de uso: IV
Desempeño: SUPERIOR

Parámetros de diseño

hn = 20.20 m
hq = 15.15 m
As = 1.10

**MUROS SOPORTADOS EN LA BASE Y EN EL EXTREMO SUPERIOR
DIVISORIOS**

NIVEL	Fh nivel (Ton)	W nivel (Ton)	hx (m)	hx heq	ax	ap	Rp	Tipo bloque	W muro	H muro (m)	F muro (T/m ²)	S (m)	M col (T-m)	b col (cm)	h col (cm)	d col (cm)	As col (cm ²)	Refuerzo	V col (T)	Conector
CUBIERTA	60.7	26.7	20.2	1.33	1.27	1	1	3	0.105	3.60	0.13	2.5	0.54	12	25	21	0.71	1#3	0.602	revisar S
PISO 5	574.2	331.1	16.2	1.07	1.02	1	1	3	0.105	3.60	0.11	2.5	0.43	12	25	21	0.56	1#3	0.483	1#6
PISO 4	535.8	436.8	12.2	0.81	0.98	1	1	3	0.105	3.60	0.10	2.5	0.42	12	25	21	0.54	1#3	0.465	1#6
PISO 3	345.6	457.8	8.2	0.54	1.02	1	1	3	0.105	3.60	0.11	2.5	0.43	12	25	21	0.56	1#3	0.483	1#6
PISO 2	165.9	512.5	4.1	0.27	1.06	1	1	3	0.105	3.60	0.11	2.5	0.45	12	25	21	0.58	1#3	0.502	1#6

**MUROS SOPORTADOS EN LA BASE Y EN EL EXTREMO SUPERIOR
FACHADA**

NIVEL	Fh nivel (Ton)	W nivel (Ton)	hx (m)	hx heq	ax	ap	Rp	Tipo bloque	W muro	H muro (m)	F muro (T/m ²)	S (m)	M col (T-m)	b col (cm)	h col (cm)	d col (cm)	As col (cm ²)	Refuerzo	V col (T)	Conector
CUBIERTA	60.7	26.7	20.2	1.33	1.27	2.5	6	3	0.105	3.60	0.06	2.5	0.23	12	25	21	0.29	1#3	0.251	1#5
PISO 5	574.2	331.1	16.2	1.07	1.02	2.5	6	3	0.105	3.60	0.04	2.5	0.18	12	25	21	0.23	1#3	0.201	1#5
PISO 4	535.8	436.8	12.2	0.81	0.98	2.5	6	3	0.105	3.60	0.04	2.5	0.17	12	25	21	0.22	1#3	0.194	1#5
PISO 3	345.6	457.8	8.2	0.54	1.02	2.5	6	3	0.105	3.60	0.04	2.5	0.18	12	25	21	0.23	1#3	0.201	1#5
PISO 2	165.9	512.5	4.1	0.27	1.06	2.5	6	3	0.105	3.60	0.05	2.5	0.19	12	25	21	0.24	1#3	0.209	1#5

MUROS EN VOLADIZO - PARAPETOS Y ANTEPECHOS

NIVEL	Fh nivel (Ton)	W nivel (Ton)	hx (m)	hx heq	a nivel (g)	ap	Rp	Tipo bloque	W muro	H muro (m)	F muro (T/m ²)	S (m)	M col (Ton-m)	b col (cm)	h col (cm)	d col (cm)	As col (cm ²)	Refuerzo	V col (Ton)
CUBIERTA	60.7	26.7	20.2	1.33	1.27	2.5	6	3	0.105	3.60	0.06	2.5	0.90	12	25	21	1.21	1#4	0.502
PISO 5	574.2	331.1	16.2	1.07	1.02	2.5	6	3	0.105	3.60	0.04	2.5	0.72	12	25	21	0.96	1#4	0.403
PISO 4	535.8	436.8	12.2	0.81	0.98	2.5	6	3	0.105	3.60	0.04	2.5	0.70	12	25	21	0.92	1#4	0.388
PISO 3	345.6	457.8	8.2	0.54	1.02	2.5	6	3	0.105	3.60	0.04	2.5	0.72	12	25	21	0.96	1#4	0.403
PISO 2	165.9	512.5	4.1	0.27	1.06	2.5	6	3	0.105	3.60	0.05	2.5	0.75	12	25	21	0.99	1#4	0.418