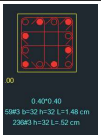
PROGRAMA DE DIAGRAMAS DE INTERACCIÓN DE COLUMNAS		
Daniel Alejandro Bravo Hernandez		
Datos de entrada		
Datos de columna		
Resistencia del concreto f'c (Mpa)	21	
Resistencia del acero fy (Mpa)	420	
Modulo de elasticidad (Mpa)	210000	
# de barras(diametro de la barra en pulgadas)	8	0.63
Geometria de la columna		
Base (mm)	350	
Altura (mm)	350	
d'(mm)	50	

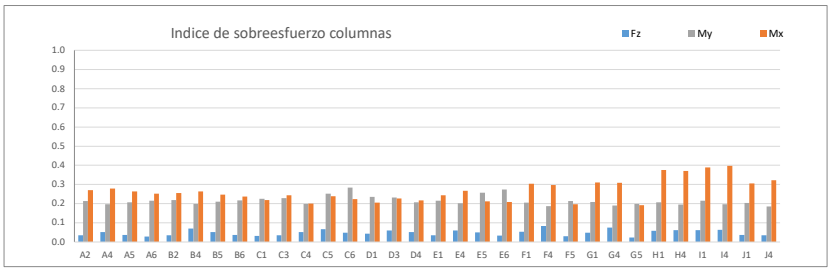


Propiedades de las barras			
Barra #	Diámetro (in)	Diámetro (cm	Área (cm^2)
3	3/8	0.95	0.71
4	1/2	1.27	1.29
5	5/8	1.59	1.99
6	3/4	1.91	2.84
7	7/8	2.22	3.87
8	1	2.54	5.1
10	1 1/8	3.23	8.19

Øc = Coeficiente por Calidad del diseño y construccion de la estructura =	1.00
Øe = Coeficiente por estado de la edificación =	0.80

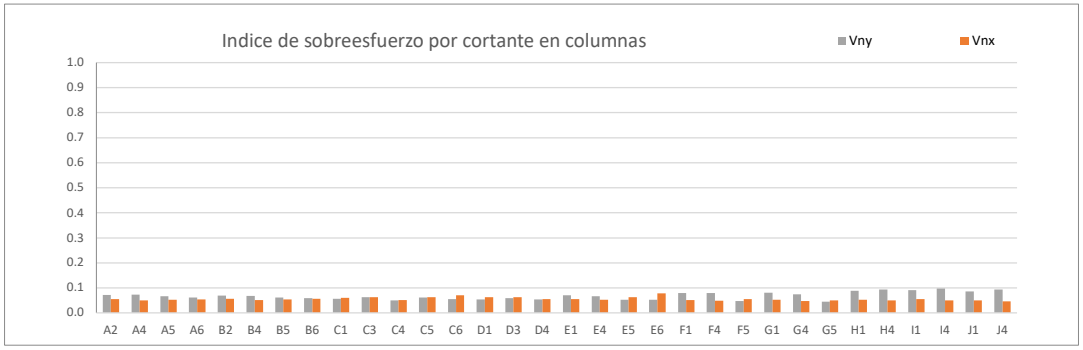
Columna	Combinación	Dimension	Acero	As(cm2)	FX(kN)	FY(kN)	FZ(kN)	ΦPn(kN)	IS	MX(kN.m)	MY(kN.m)	MZ(kN.m)	ΦMnX(kN.m)	IS	ΦMnY(kN.m)	IS
A2	Envolvente	35x35	4N5+4N5	15.92	8.1766	10.5704	49.6675	1468.1752	0.0338	21.6093	17.0702	0.2527	80	0.2701	80	0.2134
A4	Envolvente	35x35	4N5+4N5	15.92	7.3906	10.6671	74.5264	1468.1752	0.0508	22.2973	15.7089	0.2527	80	0.2787	80	0.1964
A5	Envolvente	35x35	4N5+4N5	15.92	7.69	9.7225	51.4218	1468.1752	0.0350	20.9883	16.4613	0.2527	80	0.2624	80	0.2058
A6	Envolvente	35x35	4N5+4N5	15.92	7.9812	9.1206	41.2562	1468.1752	0.0281	20.1541	17.1235	0.2527	80	0.2519	80	0.2140
B2	Envolvente	35x35	4N5+4N5	15.92	8.3699	10.127	51.2528	1468.1752	0.0349	20.4136	17.4784	0.2527	80	0.2552	80	0.2185
B4	Envolvente	35x35	4N5+4N5	15.92	7.4853	9.9755	101.4129	1468.1752	0.0691	21.0362	15.8265	0.2527	80	0.2630	80	0.1978
B5	Envolvente	35x35	4N5+4N5	15.92	7.9662	9.1458	74.3867	1468.1752	0.0507	19.7118	16.7396	0.2527	80	0.2464	80	0.2092
B6	Envolvente	35x35	4N5+4N5	15.92	8.2856	8.6102	52.6407	1468.1752	0.0359	18.9695	17.3732	0.2527	80	0.2371	80	0.2172
C1	Envolvente	35x35	4N5+4N5	15.92	8.8009	8.3705	45.6327	1468.1752	0.0311	17.4647	18.0219	0.2527	80	0.2183	80	0.2253
C3	Envolvente	35x35	4N5+4N5	15.92	9.1714	9.2541	49.7896	1468.1752	0.0339	19.4497	18.2862	0.2527	80	0.2431	80	0.2286
C4	Envolvente	35x35	4N5+4N5	15.92	7.5075	7.2977	75.4091	1468.1752	0.0514	15.978	15.8708	0.2527	80	0.1997	80	0.1984
C5	Envolvente	35x35	4N5+4N5	15.92	9.2461	8.9607	96.232	1468.1752	0.0655	19.0433	20.2157	0.2527	80	0.2380	80	0.2527
C6	Envolvente	35x35	4N5+4N5	15.92	10.209	8.0727	70.4767	1468.1752	0.0480	17.8125	22.6665	0.2527	80	0.2227	80	0.2833
D1	Envolvente	35x35	4N5+4N5	15.92	9.2055	7.9816	63.2915	1468.1752	0.0431	16.3975	18.7577	0.2527	80	0.2050	80	0.2345
D3	Envolvente	35x35	4N5+4N5	15.92	9.2503	8.6265	86.4475	1468.1752	0.0589	18.1876	18.4695	0.2527	80	0.2273	80	0.2309
D4	Envolvente	35x35	4N5+4N5	15.92	8.0284	7.9867	74.1428	1468.1752	0.0505	17.3003	16.579	0.2527	80	0.2163	80	0.2072
E1	Envolvente	35x35	4N5+4N5	15.92	8.1807	10.2691	50.5139	1468.1752	0.0344	19.4424	17.1623	0.2527	80	0.2430	80	0.2145
E4	Envolvente	35x35	4N5+4N5	15.92	7.6239	9.7696	86.6065	1468.1752	0.0590	21.3398	16.0319	0.2527	80	0.2667	80	0.2004
E5	Envolvente	35x35	4N5+4N5	15.92	9.3178	7.7813	72.6195	1468.1752	0.0495	16.9394	20.5219	0.2527	80	0.2117	80	0.2565
E6	Envolvente	35x35	4N5+4N5	15.92	11.5361	7.6001	48.9783	1468.1752	0.0334	16.6881	21.8784	0.2527	80	0.2086	80	0.2735
F1	Envolvente	35x35	4N5+4N5	15.92	7.5207	11.6669	75.8793	1468.1752	0.0517	24.2939	16.4225	0.2527	80	0.3037	80	0.2053
F4	Envolvente	35x35	4N5+4N5	15.92	7.1948	11.6669	122.9257	1468.1752	0.0837	23.7786	14.9141	0.2527	80	0.2972	80	0.1864
F5	Envolvente	35x35	4N5+4N5	15.92	8.0951	6.9829	43.2358	1468.1752	0.0294	15.7456	17.0228	0.2527	80	0.1968	80	0.2128
G1	Envolvente	35x35	4N5+4N5	15.92	7.6525	11.8108	71.1534	1468.1752	0.0485	24.809	16.6052	0.2527	80	0.3101	80	0.2076
G4	Envolvente	35x35	4N5+4N5	15.92	7.0227	10.9394	109.0314	1468.1752	0.0743	24.717	15.1853	0.2527	80	0.3090	80	0.1898
G5	Envolvente	35x35	4N5+4N5	15.92	7.3275	6.6803	33.0757	1468.1752	0.0225	15.3253	15.8543	0.2527	80	0.1916	80	0.1982
H1	Envolvente	35x35	4N5+4N5	15.92	7.7517	12.9988	84.3066	1468.1752	0.0574	30.028	16.5677	0.2527	80	0.3754	80	0.2071
H4	Envolvente	35x35	4N5+4N5	15.92	7.3016	13.7633	89.5911	1468.1752	0.0610	29.6263	15.5854	0.2527	80	0.3703	80	0.1948
I1	Envolvente	35x35	4N5+4N5	15.92	8.0639	13.4588	88.327	1468.1752	0.0602	31.0654	17.1754	0.2527	80	0.3883	80	0.2147
I4	Envolvente	35x35	4N5+4N5	15.92	7.3714	14.4108	92.8118	1468.1752	0.0632	31.8169	15.6687	0.2527	80	0.3977	80	0.1959
J1	Envolvente	35x35	4N5+4N5	15.92	7.3689	12.5336	51.6395	1468.1752	0.0352	24.3979	16.2121	0.2527	80	0.3050	80	0.2027
J4	Envolvente	35x35	4N5+4N5	15.92	6.7737	13.6985	51.0345	1468.1752	0.0348	25.7222	14.8402	0.2527	80	0.3215	80	0.1855
									0.083727					0.39771125		0.283331
									1194%					251%		353%

Propiedades de las barras			
Barra #	Diámetro (in)	Diámetro (cm	Área (cm^2)
3	3/8	0.95	0.71
4	1/2	1.27	1.29
5	5/8	1.59	1.99
6	3/4	1.91	2.84
7	7/8	2.22	3.87
8	1	2.54	5.1
10	1 1/8	3.23	8.19



Columna	Combinación	Dimension	Acero	Av(cm2)	Vc(kN)	Vs(kN)	ΦVn(kN)	FX(kN)	FY(kN)	FZ(kN)	ΦVnx(kN)	IS	ΦVny(kN)	IS
A2	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	8.1766	10.5704	49.6675	146.87	0.0557	146.8725	0.0720
A4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.3906	10.6671	74.5264	146.87	0.0503	146.8725	0.0726
A5	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.69	9.7225	51.4218	146.87	0.0524	146.8725	0.0662
A6	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.9812	9.1206	41.2562	146.87	0.0543	146.8725	0.0621
B2	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	8.3699	10.127	51.2528	146.87	0.0570	146.8725	0.0690
B4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.4853	9.9755	101.4129	146.87	0.0510	146.8725	0.0679
B5	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.9662	9.1458	74.3867	146.87	0.0542	146.8725	0.0623
B6	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	8.2856	8.6102	52.6407	146.87	0.0564	146.8725	0.0586
C1	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	8.8009	8.3705	45.6327	146.87	0.0599	146.8725	0.0570
C3	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	9.1714	9.2541	49.7896	146.87	0.0624	146.8725	0.0630
C4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.5075	7.2977	75.4091	146.87	0.0511	146.8725	0.0497
C5	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	9.2461	8.9607	96.232	146.87	0.0630	146.8725	0.0610
C6	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	10.209	8.0727	70.4767	146.87	0.0695	146.8725	0.0550
D1	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	9.2055	7.9816	63.2915	146.87	0.0627	146.8725	0.0543
D3	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	9.2503	8.6265	86.4475	146.87	0.0630	146.8725	0.0587
D4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	8.0284	7.9867	74.1428	146.87	0.0547	146.8725	0.0544
E1	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	8.1807	10.2691	50.5139	146.87	0.0557	146.8725	0.0699
E4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.6239	9.7696	86.6065	146.87	0.0519	146.8725	0.0665
E5	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	9.3178	7.7813	72.6195	146.87	0.0634	146.8725	0.0530
E6	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	11.5361	7.6001	48.9783	146.87	0.0785	146.8725	0.0517
F1	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.5207	11.6669	75.8793	146.87	0.0512	146.8725	0.0794
F4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.1948	11.6669	122.9257	146.87	0.0490	146.8725	0.0794
F5	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	8.0951	6.9829	43.2358	146.87	0.0551	146.8725	0.0475
G1	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.6525	11.8108	71.1534	146.87	0.0521	146.8725	0.0804
G4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.0227	10.9394	109.0314	146.87	0.0478	146.8725	0.0745
G5	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.3275	6.6803	33.0757	146.87	0.0499	146.8725	0.0455
H1	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.7517	12.9988	84.3066	146.87	0.0528	146.8725	0.0885
H4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.3016	13.7633	89.5911	146.87	0.0497	146.8725	0.0937
I1	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	8.0639	13.4588	88.327	146.87	0.0549	146.8725	0.0916
I4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.3714	14.4108	92.8118	146.87	0.0502	146.8725	0.0981
J1	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	7.3689	12.5336	51.6395	146.87	0.0502	146.8725	0.0853
J4	Envolvente	35x35	4N5+4N5	2.13	81.80	134.19	146.87	6.7737	13.6985	51.0345	146.87	0.0461	146.8725	0.0933
												0.07854		0.098118
								11.5361	14.4108	122.9257		1273%		1019%

Propiedades de las barras			
Barra #	Diámetro (in)	Diámetro (cm	Área (cm^2)
3	3/8	0.95	0.71
4	1/2	1.27	1.29
5	5/8	1.59	1.99
6	3/4	1.91	2.84
7	7/8	2.22	3.87
8	1	2.54	5.1
10	1 1/8	3.23	8.19

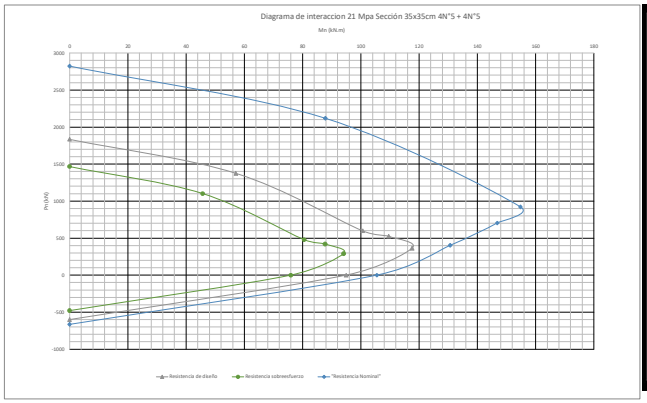


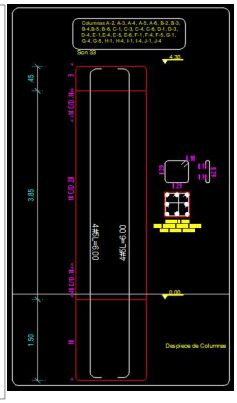
Punto	C (mm)	Pn (kN)	Mn (kN.m)	Pnd (kN)	Mnd (kN.m)	Pnd (kN)	Mnd (kN.m)
A	350	2823.41379	0	1835.21896	0	1468.17517	0
E	328.421588	2117.56039	87.8175926	1376.41426	57.0814352	1101.1314	45.6651481
B	176.470588	921.438841	154.783122	598.935246	100.609029	479.148197	80.4872235
F	146.25	704.430184	146.844722	525.613291	109.568754	420.490633	87.6550035
G	112.5	403.400345	130.621811	363.060311	117.55963	290.448249	94.0477037
C	78.887	0.00350732	105.469908	0.00315659	94.9229176	0.00252527	75.9383341
D	0	-665.05357	0	-598.54821	0	-478.83857	0

35x35 4N5+4N5

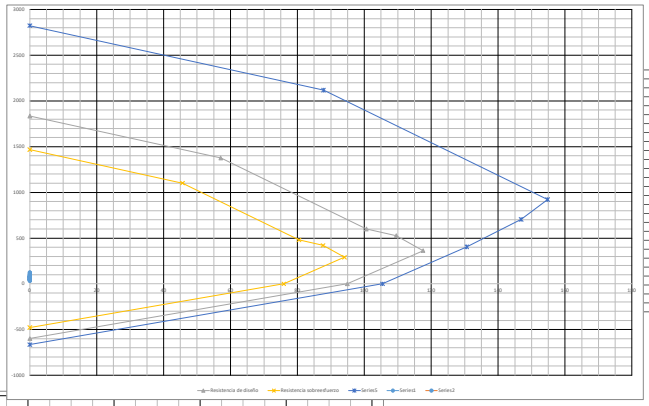
# de barras	diametro de la b	
	8	0.63
Geometria de la columna		
Base (mm)	350	
Altura (mm)	350	
d'(mm)	50	

	ØPn(kN)	ØMn(kN.m)	ØMy(kN.m)
A2	1468.17517	80	80
A4	1468.17517	80	80
A5	1468.17517	80	80
A6	1468.17517	80	80
B2	1468.17517	80	80
B4	1468.17517	80	80
B5	1468.17517	80	80
B6	1468.17517	80	80
C1	1468.17517	80	80
C3	1468.17517	80	80
C4	1468.17517	80	80
C5	1468.17517	80	80
C6	1468.17517	80	80
D1	1468.17517	80	80
D3	1468.17517	80	80
D4	1468.17517	80	80
E1	1468.17517	80	80
E4	1468.17517	80	80
E5	1468.17517	80	80
E6	1468.17517	80	80
F1	1468.17517	80	80
F4	1468.17517	80	80
F5	1468.17517	80	80
G1	1468.17517	80	80
G4	1468.17517	80	80
G5	1468.17517	80	80
H1	1468.17517	80	80
H4	1468.17517	80	80
I1	1468.17517	80	80
I4	1468.17517	80	80
J1	1468.17517	80	80
J4	1468.17517	80	80

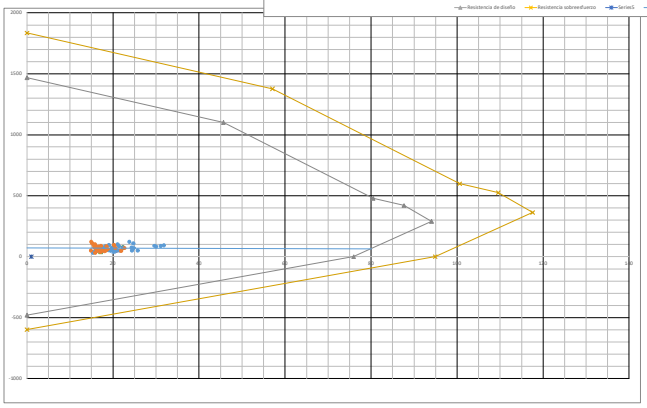

Diagrama de interaccion 21 Mpa Sección 35x35cm 4N°5 + 4N°5
Mn (kN.m)
Pn(kN)
Resistencia de diseño
Resistencia sobreesfuerzo
"Resistencia Nominal"


Columnas A-3, A-5, A-4, A-E, A-6, B-2, B-5, D-4, D-5, E-A, E-3, E-5, E-6, C-4, C-A, C-E, C-3, D-A, E-1, E-2, E-4, E-C, E-E, F-1, F-4, F-5, G-1', G-4, G-5, H-1, H-4, I-1, I-4, J-1, J-4
Sem 88
4.00
.45
3.85
1.50
4#6L=4.00
4#6L=4.00
0.00
Despiece de Columnas

	Pd(kN)	Mx(kN.m)	My(kN.m)	
A2	49.6675	21.6093	17.0702	0
A4	74.5264	22.2973	15.7089	0
A5	51.4218	20.9883	16.4613	0
A6	41.2562	20.1541	17.1235	0
B2	51.2528	20.4136	17.4784	0
B4	101.4129	21.0362	15.8265	0
B5	74.3867	19.7118	16.7396	0
B6	52.6407	18.9695	17.3732	0
C1	45.6327	17.4647	18.0219	0
C3	49.7896	19.4497	18.2862	0
C4	75.4091	15.978	15.8708	0
C5	96.232	19.0433	20.2157	0
C6	70.4767	17.8125	22.6665	0
D1	63.2915	16.3975	18.7577	0
D3	86.4475	18.1876	18.4695	0
D4	74.1428	17.3003	16.579	0
E1	50.5139	19.4424	17.1623	0
E4	86.6065	21.3398	16.0319	0
E5	72.6195	16.9394	20.5219	0
E6	48.9783	16.6881	21.8784	0
F1	75.8793	24.2939	16.4225	0
F4	122.9257	23.7786	14.9141	0
F5	63.2358	15.7456	17.0228	0
G1	71.1534	24.809	16.6052	0
G4	109.0314	24.717	15.1853	0
G5	33.0757	15.3253	15.8543	0
H1	84.3066	30.028	16.5677	0
H4	89.5911	29.6263	15.5854	0
I1	88.327	31.0654	17.1754	
I4	92.8118	31.8169	15.6687	0
J1	51.6395	24.3979	16.2121	0
J4	51.0345	25.7222	14.8402	0



	Pd(kN)	Mx(kN.m)	My(kN.m)	



DETERMINACIÓN DEL REFUERZO TRANSVERSAL

Pu =	122.95 kN	f'c =	21.00 MPa		
Vu =	54.41 kN	Ac =	1502.00 mm2		
		Ag =	122500.00 mm2		
r =	50.00 mm	Estribos	3		
ll =	3.85 m	ll =	0.50 mm		
fy =	420 MPa	A est =	71.00 mm2		
		#Varilla	4N°5+4N°5		
		ll =	15.90 mm	15.90 mm	
		A varilla	199.00 mm2	199.00 mm2	
		r =	50.00 mm		

SECCIÓN

350 mm

350 mm

$V_s < 2F_p bd\sqrt{f'_c}$

$P_s > A_g f'_c / 20$

Vu <	1122.27 kN	Ok	Pu >	128.63 kN	No aplica

Columna de entrepiso

Zona de confinamiento			Separación de Estribos		
Superior	0.4ln	0.35 m	So	hmin/2	11.67 cm
	H/6	0.64 m		8db	12.72 cm
	500	0.45 m		150 mm	15.00 cm
Central		2.86 m	Sc	6db	12.72 cm
				150 mm	15.00 cm
Inferior	H/6	0.64 m	Si	hmin/3	11.67 cm



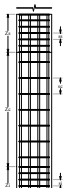
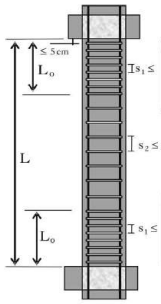


Figura 5.8 Requisitos del refuerzo transversal para columnas rectangulares en pórticos dúctiles de hormigón con demanda moderada de ductilidad, DMO

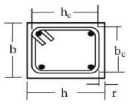


$s_1 \leq$ { ≤ b/3 ; ≤ h/3 ; ≤ 8 * d_b ; ≤ 16 * d_c ; ≤ 15cm } (NSR-10. Sec.C.21.3.5.6)

$s_2 \leq 2 * s_1$ (NSR-10. Sec.C.21.3.5.11)

$s_1 \leq$ { ≤ b/3 ; ≤ h/3 ; ≤ 8 * d_b ; ≤ 16 * d_c ; ≤ 15cm } (NSR-10. Sec.C.21.3.5.6)

$L_o \geq$ { Mayor valor de b y h ; Luz libre / 6 ; 50 cm } (NSR-10, Sec.C.21.3.5.6)



$A_g = b * h$

$A_{ch} = b_c * h_c$

$\phi \geq 3/8"$ (NSR-10, Sec.C.21.3.5.8)

$$A_{sh} \geq \begin{cases} 0.20\, s_1 h_c * (A_g / A_{ch} - 1) * f'_c / f_y \\ 0.06\, s_1 h_c * f'_c / f_y \end{cases}$$ (NSR-10, Sec.C.21.3.5.7)



Sx =	83.33 mm	OK
Sy =	83.33 mm	OK
gancho =	57.00 cm	

Ash 504.00 mm2 $A_{sh} < 0.3 \frac{s.b.f'c}{fy}\left(\frac{Ag}{Ach} - 1\right)$

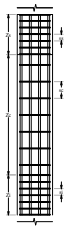
157.50 mm2 $A_{sh} < 0.09 \frac{s.b.f'c}{fy}$

81.80 kN $Vc = 0.17bd\sqrt{fc}$

154.19 kN $Vs = Av.fy.d/s$

215.99 $Vn = Vc + Vs$

146.87250318 $\emptyset$=0,85 0.85



100.00 mm

200.00 mm

100.00 mm



N° Varilla	Diámetro		Área	Peso
	pulg	cm	cm2	kg/m
2	1/4	0.64	0.32	0.248
2.5	5/16	0.79	0.49	0.388
3	3/8	0.95	0.71	0.56
4	1/2	1.27	1.27	0.994
5	5/8	1.59	1.99	1.552
6	3/4	1.91	2.85	2.235
8	1	2.54	5.07	3.973
10	1 1/4	3.18	7.94	6.225
12	1 1/2	3.81	11.40	8.938

Grado 30
Grado 42
Grado 52

Tabla 4.5 Recubrimiento mínimo requerido (mm)

N° Varilla	150	200	250	300	400	500	600	700	
A1	30	25	25	20	20	20	15	15	2
A2	50	40	35	30	25	25	20	20	3
B1	65	50	40	35	30	30	25	25	4
B2	-	-	50	45	40	35	30	30	5
c	-	-	-	-	-	70	65	60	6

Fuente: Reglamento de Construcciones para el distrito federal