

MEMORIA DE CÁLCULO

Predimensionado de Estructura

Escuela: IPEM N°340

Ubicación: Sarmiento – Totoral - Pvcia. de Córdoba

Memoria descriptiva:

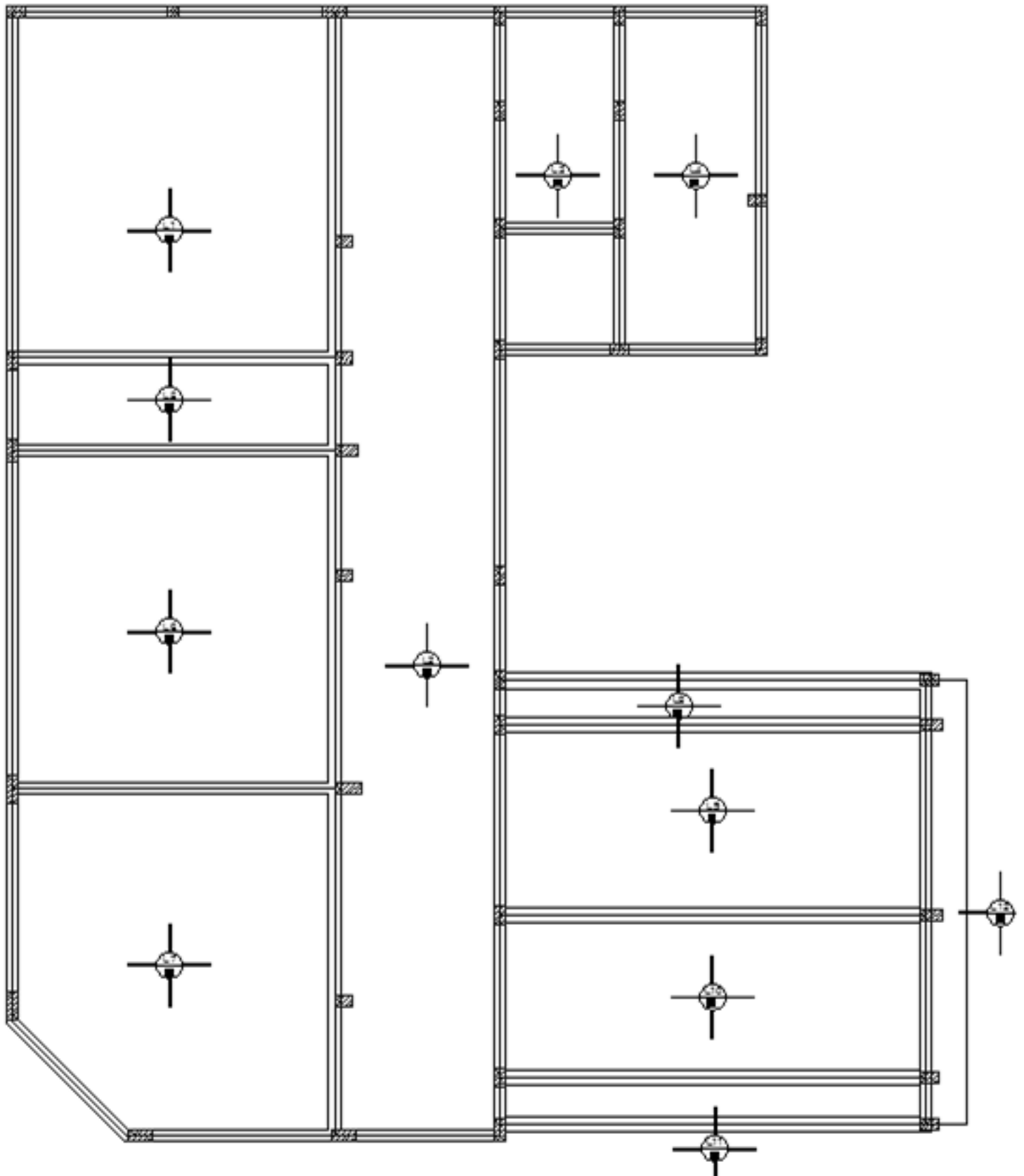
La estructura se planteó en función del proyecto arquitectónico propuesto. Se realizó el análisis de carga considerando las cargas correspondientes según el caso, haciendo uso del reglamento CIRSOC 101(Reglamento argentino de cargas permanentes y sobrecargas mínimas de diseño para edificios y otras estructuras) y CIRSOC 103 (Normas argentinas para construcciones sismorresistentes) propias al caso, el cual corresponde a una estructura en zona sísmica 1.

Para el dimensionado de la estructura se utilizó la herramienta de cálculo RAM Elements, considerando la normativa vigente, la cual corresponde a los siguientes reglamentos:

- CIRSOC 103: Normas argentinas para construcciones sismorresistentes.
- CIRSOC 201: Reglamento argentino de estructuras de hormigón.
- CIRSOC 301: Reglamento argentino de estructuras de acero para edificios.
- CIRSOC 303: Reglamento argentino de elementos estructurales de acero de sección abierta conformados en frío.

Para definir la fundación se analizó la solución más conveniente según la información relevada a través del estudio de suelo. Se optó por definir una fundación superficial a -0.8m compuesta por bases aisladas y vigas portamuro de fundación.

1- Análisis de carga:



2- Losas

- Dimensionado Losas:

Losa	Lx [m]	Ly [m]	β	Dirección de armado	Υ	Espesor [cm]	Espesor adop [cm]
L1	6.95	7.30	1.05	2 D	41.32	17.67	18
L2	3.55	24.25	6.83	X	20.00	17.75	18
L3	2.60	7.30	2.81	X	20.00	13.00	16
L4	3.05	7.30	2.39	X	20.00	15.25	16
L5	6.95	2.15	3.23	Y	20.00	10.75	18
L6	6.95	7.30	1.05	2 D	41.32	17.67	18
L7	6.95	7.50	1.08	2 D	41.56	18.04	18
L8	9.20	0.95	9.68	Y	20.00	4.75	18
L9	9.20	3.90	2.36	Y	20.00	19.48	18
L10	9.20	3.50	2.63	Y	20.00	17.50	18
L11	9.20	1.00	9.20	Y	20.00	5.00	18
L12	0.90	9.55	10.61	X	10.00	9.00	10
Lt	2.60	4.70	1.81	X	20.00	13.00	14

Losa	Sobrecarga [tn/m ²]	Cubierta [tn/m ²]	Υ	P. propio [tn/m ²]	L [tn/m ²]	D [tn/m ²]	1.2D+1.6L	1.4D	Qu [tn/m ²]
L1	0.30	0.30	41.32	0.43	0.3	0.73	1.36	1.02	1.36
L2	0.30	0.30	20.00	0.43	0.3	0.73	1.36	1.02	1.36
L3	0.30	0.30	20.00	0.38	0.3	0.68	1.30	0.96	1.30
L4	0.30	0.30	20.00	0.38	0.3	0.68	1.30	0.96	1.30
L5	0.30	0.30	20.00	0.43	0.3	0.73	1.36	1.02	1.36
L6	0.30	0.30	41.32	0.43	0.3	0.73	1.36	1.02	1.36
L7	0.30	0.30	41.56	0.43	0.3	0.73	1.36	1.02	1.36
L8	0.30	0.30	20.00	0.43	0.3	0.73	1.36	1.02	1.36
L9	0.30	0.30	20.00	0.43	0.3	0.73	1.36	1.02	1.36
L10	0.30	0.30	20.00	0.43	0.3	0.73	1.36	1.02	1.36
L11	0.30	0.30	20.00	0.43	0.3	0.73	1.36	1.02	1.36
L12	0.30	0.30	10.00	0.24	0.3	0.54	1.13	0.76	1.13

Losa	Sobrecarga [tn/m ²]	Agua [tn/m ²]	Υ	P. propio [tn/m ²]	L [tn/m ²]	D [tn/m ²]	1.2D+1.6L	1.4D	Qu [tn/m ²]
Lt	0.10	1.04	20.00	0.34	0.1	1.38	1.81	1.93	1.93

- Condiciones de borde (Método de Marcus)

Losas N°	Tipo de losa	L x	L y	e Adop	Lme/Lma	α_x	α_y	Qu	M x	M y
		[m]	[m]	[cm]				[kg/m ²]	[kgm/m]	[kgm/m]
1	L1	6.95	7.30	18	0.95	0	0	1358.4	523	2140
2	L2	3.55	24.25	18	0.15	-	-	1358.4	-	2140
3	L3	2.60	7.30	16	0.36	-	-	1300.8	-	1099
4	L4	3.05	7.30	16	0.42	-	-	1300.8	-	1513
5	L5	6.95	2.15	18	0.31	-	-	1358.4	523	-
6	L6	6.95	7.30	18	0.95	880	0	1358.4	5774	2140
7	L7	6.95	7.50	18	0.93	880	0	1358.4	5774	2140
8	L8	9.20	0.95	18	0.10	-	-	1358.4	153	-
9	L9	9.20	3.90	18	0.42	-	-	1358.4	2576	-
10	L10	9.20	3.50	18	0.38	-	-	1358.4	2080	-
11	L11	9.20	1.00	18	0.11	-	-	1358.4	170	-
12	L12	0.90	9.55	10	0.09	-	-	1128	457	-

- Armado de Losas : Calculo de momento solicitante y armadura necesaria

Losas N°	Lx	Ly	Lme/Lma	e	Qu	α_x Tramo	α_y tramo	α_x Borde	α_y borde
	[m]	[m]		[cm]	[kg/m ²]				
1	6.95	7.30	0.95	18	1358.4	446	485.5		
2	3.55	24.25	0.15	18	1358.4				
3	2.60	7.30	0.36	16	1300.8				
4	3.05	7.30	0.42	16	1300.8				
5	6.95	2.15	0.31	18	1358.4				
6	6.95	7.30	0.95	18	1358.4	403	359	880	
7	6.95	7.50	0.93	18	1358.4	403	359	880	
8	9.20	0.95	0.10	18	1358.4				
9	9.20	3.90	0.42	18	1358.4				
10	9.20	3.50	0.38	18	1358.4				
11	9.20	1.00	0.11	18	1358.4				
12	0.90	9.55	0.09	10	1128				
Lt	2.60	4.70	0.55	14	1926.27				

Losas N°					Tramo		Borde	
	Mx tramo	My tramo	Mx borde	My borde	As x adop	As y adop	As x adop	As y adop
	[kg.m/m]	[kg.m/m]	[kg.m/m]	[kg.m/m]	[cm ² /m]	[cm ² /m]	[cm ² /m]	[cm ² /m]
1	2926.39	3185.57	523.27	2139.90	5.44	4.99	3.65	2.50
2	0.00	1203.70	0.00	2139.90	3.60	3.60	3.65	1.80
3	0.00	366.39	0.00	732.78	3.20	3.20	1.60	1.60
4	0.00	850.83	0.00	1512.59	3.20	3.20	2.96	1.60
5	261.63	0.00	523.27	2139.90	3.60	3.60	3.65	1.80
6	2640.97	2355.55	5770.76	2139.90	4.02	4.51	3.65	9.85

7	2640.97	2355.55	5770.76	2139.90	4.02	4.51	3.65	9.85
8	86.20	0.00	153.24	456.84	3.60	3.60	1.80	1.80
9	1449.02	0.00	2576.04	456.84	3.60	3.60	1.80	4.40
10	1170.03	0.00	2080.05	456.84	3.60	3.60	1.80	3.55
11	95.51	0.00	169.80	456.84	3.60	3.60	1.80	1.80
12	0.00	456.84	0.00	456.84	2.00	2.00	1.61	1.00
Lt	0.00	1627.70	0.00	0.00	3.74	2.80	1.87	1.40

3- Vigas:

- Distribución de cargas en losas según dirección:

LOSA	L	D	Lx	Ly	Ly/Lx	K marcus	Lx	Ly	Dx	Dy
	[kg/m ²]	[kg/m ²]	[m]	[m]			[kg/m ²]	[kg/m ²]	[kg/m ²]	[kg/m ²]
L1	0.30	0.73	6.95	7.30	1.05	0.549	0.16	0.14	0.40	0.33
L2	0.30	0.73	3.55	24.25	6.83	-	0.30	0.03	0.73	0.07
L3	0.30	0.68	2.60	7.30	2.81	-	0.30	0.03	0.68	0.07
L4	0.30	0.68	3.05	7.30	2.39	-	0.30	0.03	0.68	0.07
L5	0.30	0.73	6.95	2.15	0.31	-	0.03	0.30	0.07	0.73
L6	0.30	0.73	6.95	7.30	1.05	0.75	0.23	0.08	0.55	0.18
L7	0.30	0.73	6.95	7.50	1.08	0.773	0.23	0.07	0.57	0.17
L8	0.30	0.73	9.20	0.95	0.10	-	0.03	0.30	0.07	0.73
L9	0.30	0.73	9.20	3.90	0.42	-	0.03	0.30	0.07	0.73
L10	0.30	0.73	9.20	3.50	0.38	-	0.03	0.30	0.07	0.73
L11	0.30	0.73	9.20	1.00	0.11	-	0.03	0.30	0.07	0.73
L12	0.30	0.54	0.90	9.55	10.61	-	0.30	0.03	0.54	0.05
LT	0.10	1.38	2.60	4.70	1.81	-	0.10	0.01	1.38	0.14

- Distribución de cargas de losas sobre Vigas:

Vigas en X		Losas					Losas					L viga	D viga
Nivel	Número	Nº	l	%	L	D	Nº	l	%	L	D		
			[m]		[kg/m ²]	[kg/m ²]		[m]		[kg/m ²]	[kg/m ²]	[kg/m]	[kg/m]
1	1	1	7.3	0.5	0.135	0.330						0.494	1.205
1	2	2	24.25	0.5	0.030	0.073						0.364	0.888
1	3	3	7.3	0.5	0.030	0.068						0.110	0.250
1	4	4	7.3	0.5	0.030	0.068						0.110	0.250
1	9	3	7.3	0.5	0.030	0.068						0.110	0.250
1	10	4	7.3	0.5	0.030	0.068						0.110	0.250
1	11	5	2.15	0.5	0.300	0.732	6	7.3	0.4	0.075	0.183	0.542	1.321
2	12	8	0.95	0.4	0.300	0.732						0.114	0.278
2	13	8	0.95	0.6	0.300	0.732	9	3.895	0.4	0.300	0.732	0.638	1.558
1	14	6	7.3	0.6	0.075	0.183	7	7.5	0.6	0.068	0.166	0.635	1.549
2	15	9	3.895	0.6	0.300	0.732	10	3.5	0.6	0.300	0.732	1.331	3.248
2	16	10	3.5	0.4	0.300	0.732	11	1	0.6	0.300	0.732	0.600	1.464
2	17	11	1	0.4	0.300	0.732						0.120	0.293

1	18	7	7.5	0.4	0.068	0.166						0.204	0.498
1	19	2	24.25	0.5	0.030	0.073						0.364	0.888
1	42	1	7.3	0.5	0.135	0.330	5	2.15	0.5	0.300	0.732	0.816	1.992
1	20	7	7.5	0.4	0.0681	0.166164						0.204	0.498
3	45Y46	13	4.7	0.5	0.01	0.13759064						0.024	0.323

Vigas en Y		Losas					Losas					L viga	D viga
Nivel	Número	N°	l	%	L	D	N°	l	%	L	D		
			[m]		[kg/m2]	[kg/m2]		[m]		[kg/m2]	[kg/m2]	[kg/m]	[kg/m]
1	20	7	6.95	0.5	0.232	0.566						0.806	1.966
1	21	7	6.95	0.5	0.232	0.566						0.806	1.966
1	22	6	6.95	0.5	0.225	0.549						0.782	1.908
1	23	1	6.95	0.5	0.165	0.402						0.572	1.396
1	24	7	6.95	0.5	0.232	0.566	2	3.55	0.6	0.300	0.732	1.445	3.525
1	25	6	6.95	0.5	0.225	0.549	2	3.55	0.6	0.300	0.732	1.421	3.467
1	26	1	6.95	0.5	0.165	0.402	2	3.55	0.6	0.300	0.732	1.211	2.956
1	30	2	3.55	0.4	0.300	0.732						0.426	1.039
1	31	2	3.55	0.4	0.300	0.732						0.426	1.039
1	32	2	3.55	0.4	0.300	0.732						0.426	1.039
1	33	2	3.55	0.4	0.300	0.732						0.426	1.039
1	34	2	3.55	0.4	0.300	0.732						0.426	1.039
1	35	2	3.55	0.4	0.300	0.732	3	2.6	0.5	0.300	0.732	0.816	1.991
1	36	3	2.6	0.5	0.300	0.684	4	3.05	0.6			0.390	0.889
1	37	4	3.05	0.4	0.300	0.684						0.366	0.834
1	43	5	6.95	0.5	0.03	0.0732						0.104	0.254
1	44	5	6.95	0.5	0.03	0.0732	2	3.55	0.6	0.300	0.684	0.743	1.711
2	30	11	9.2	0.5	0.03	0.0732						0.138	0.337
2	31	10	9.2	0.5	0.03	0.0732						0.138	0.337
2	32	9	9.2	0.5	0.03	0.0732						0.138	0.337
2	33	8	9.2	0.5	0.03	0.0732						0.138	0.337
2	38	11	9.2	0.5	0.03	0.0732						0.138	0.337
2	39	10	9.2	0.5	0.03	0.0732						0.138	0.337
2	40	9	9.2	0.5	0.03	0.0732						0.138	0.337
2	41	8	9.2	0.5	0.03	0.0732						0.138	0.337
3	47y48	13.000	2.600	0.500	0.100	1.376						0.130	1.789

- Cargas de Muro:

Y	e	Altura	q
[tn/m3]	[m]	[m]	[tn/m]
1.70	0.30	3.90	1.99
1.70	0.30	4.90	2.50
1.70	0.30	1.00	0.51
1.70	0.15	3.90	0.99
1.70	0.15	4.90	1.25

1.70	0.30	0.30	0.15
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4 - Verificación de los elementos más cargados:

Se adjuntan en forma anexa la salida del programa RAM Elements, mediante el cual se verificó la estructura. Se presenta solamente el resultado obtenido para una viga de fundación, una columna y una viga superior.

5- Dimensionamiento de Fundaciones:

Para el dimensionamiento de fundaciones, se obtuvieron las reacciones en la base de cada columna y se dividieron las cargas en 4 rangos, con el fin de definir 4 tipologías de bases que sinteticen las necesidades estructurales de todo el edificio. Cuando se producía la superposición de bases debido a las dimensiones y cercanía entre las mismas se calcularos bases combinadas. De esta manera se definió:

Grupo 1 $\sigma_{adm} =$ 20 tn/m

Dimensiones

d= 25 cm
d0= 70 cm
t= 80 cm
c1= 40 cm
c2= 25 cm
d1= 50 cm
d2= 35 cm
a1= 120 cm
a2= 75 cm

N= 15 tn

a) Verificación tensión del terreno

Ng= 1.07 tn
Nt= 0.49 tn
P= 16.56 tn

$\sigma =$ 18.40 tn/m² Verifica

b) Determinación de los esfuerzos en la zapata

M1= 100
h1= 66
Kh1= 39.05
ks= 0.44
As1= 0.67 cm²

M2= 62.5
h2= 65

Kh2= 58.14
ks= 0.44
As2= 0.42 cm2

c) Verificación al punzonado

hm= 65.50
C= 35.73
dr = 101.23
dk= 166.73
h1'= 34.62
h2' = 4.01
hm' = 19.32
p = 0.0017
Qr= -21.37
u= 317.87
tr= -34.81

Ask1= 0.93
Ask2= 0.94
Ask = 0.93
 μ = 0.000
Y1 = 0.35
t 011= 50

t comp= 10.90 Verifica, no necesita armadura de corte

Grupo 2 σ_{adm} = 20 tn/m

Dimensiones

d= 25 cm
d0= 70 cm
t= 80 cm
c1= 25 cm
c2= 40 cm
d1= 35 cm
d2= 50 cm
a1= 100 cm
a2= 140 cm

N= 24 tn

a) Verificación tensión del terreno

Ng= 1.59 tn
Nt= 0.83 tn

P= 26.41 tn
 $\sigma =$ 18.87 tn/m² Verifica

b) Determinación de los esfuerzos en la zapata

M1= 168.75
h1= 66
Kh1= 35.93
ks= 0.44
As1= 1.13 cm²

M2= 214.285714
h2= 65
Kh2= 26.27
ks= 0.44
As2= 1.45 cm²

c) Verificación al punzonado

hm= 65.50
C= 35.73
dr = 101.23
dk= 166.73
h1'= 24.33
h2' = 40.51
hm' = 32.42
p = 0.0017
Qr= -13.41
u= 317.87
tr= -13.02

Ask1= 1.88
Ask2= 1.73
Ask = 1.80
 $\mu =$ 0.000
Y1 = 0.38
t 011= 50
t comp= 11.69 Verifica, no necesita armadura de corte

Grupo 3 $\sigma_{adm} =$ 20 tn/m

Dimensiones

d= 25 cm
d0= 70 cm
t= 80 cm

c1= 25 cm
c2= 40 cm
d1= 35 cm
d2= 50 cm
a1= 150 cm
a2= 165 cm

N= 44 tn

a) Verificación tensión del terreno

Ng= 2.68 tn
Nt= 1.56 tn
P= 48.23 tn

σ = 19.49 tn/m² Verifica

b) Determinación de los esfuerzos en la zapata

M1= 572.916667
h1= 66
Kh1= 19.50
ks= 0.44
As1= 3.82 cm²

M2= 520.833333
h2= 65
Kh2= 16.85
ks= 0.44
As2= 3.53 cm²

c) Verificación al punzonado

hm= 65.50
C= 35.73
dr = 101.23
dk= 166.73
h1'= 41.00
h2' = 45.41
hm' = 43.20
p = 0.0018
Qr= 5.20
u= 317.87
tr= 3.79

Ask1= 4.25

Ask2= 3.56
 Ask = 3.90
 μ = 0.001
 Y1 = 0.48
 t 011= 50

t comp= 14.91 Verifica, no necesita armadura de corte

Grupo 4 σ_{adm} = 20 tn/m

Dimensiones

d= 25 cm
 d0= 70 cm
 t= 80 cm
 c1= 25 cm
 c2= 40 cm
 d1= 35 cm
 d2= 50 cm
 a1= 175 cm
 a2= 200 cm

N= 63 tn

a) Verificación tensión del terreno

Ng= 3.70 tn
 Nt= 2.26 tn
 P= 68.97 tn

σ = 19.70 tn/m² Verifica

b) Determinación de los esfuerzos en la zapata

M1= 1012.5
 h1= 66
 Kh1= 14.67
 ks= 0.44
 As1= 6.75 cm²

M2= 1008
 h2= 65
 Kh2= 12.11
 ks= 0.44
 As2= 6.82 cm²

c) Verificación al punzonado

hm= 65.50
C= 35.73
dr = 101.23
dk= 166.73
h1'= 45.16
h2' = 49.69
hm' = 47.43
p = 0.0018
Qr= 23.72
u= 317.87
tr= 15.73

Ask1= 6.43
Ask2= 5.69
Ask = 6.06
 μ = 0.001
Y1 = 0.58
t 011= 50

t comp= 17.73 Verifica, no necesita armadura de corte

6- Anexo:

Viga 24-25-44-26



Current Date: 03/07/2014 08:04 p.m.

Units system: Metric

File name: C:\Users\Coco\Dropbox\MC Soluciones Ingenieriles\Proyectos en Proceso\017- Sarmiento (Proyecto)\Ram\V24-25-44-26.rcb\

Design Results

Reinforced concrete beams

GENERAL INFORMATION:

Design Code : ACI 318-2005

Load conditions included in the design:

id1 = 1.4DL
id2 = 1.2DL+0.5LL+EQxpo+0.5EQzpo
id3 = 1.2DL+0.5LL+EQxpo+0.5EQzne
id4 = 1.2DL+0.5LL+EQxne+0.5EQzpo
id5 = 1.2DL+0.5LL+EQxne+0.5EQzne
id6 = 0.9DL+EQxpo+0.5EQzpo
id7 = 0.9DL+EQxpo+0.5EQzne
id8 = 0.9DL+EQxne+0.5EQzpo
id9 = 0.9DL+EQxne+0.5EQzne
id11 = 1.2DL+1.6LL
id12 = 0.9DL+1.5V
id13 = 1.2DL+0.5LL+0.5EQxpo+EQzpo
id14 = 1.2DL+0.5LL+0.5EQxpo+EQzne
id15 = 1.2DL+0.5LL+0.5EQxne+EQzpo
id16 = 1.2DL+0.5LL+0.5EQxne+EQzne
id17 = 0.9DL+0.5EQxpo+EQzpo
id18 = 0.9DL+0.5EQxpo+EQzne
id19 = 0.9DL+0.5EQxne+EQzpo
id20 = 0.9DL+0.5EQxne+EQzne

Moment frame : Ordinary

Materials

Concrete, f'c	: 0.21 [Ton/cm2]	Longitudinal reinforcement, fy	: 4.22 [Ton/cm2]
Concrete type	: Normal	Transversal reinforcement, fyt	: 4.22 [Ton/cm2]
Concrete elasticity modulus	: 219.50 [Ton/cm2]	Steel elasticity modulus	: 2038.89 [Ton/cm2]
Unit weight	: 2.40 [Ton/m3]	Epoxy coated	: No

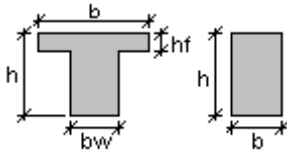
DATA AND RESULTS

Status : OK

Geometry

Axis	Col position	Bottom width [cm]	Top width [cm]	Dist x [m]
1	Center	25.00	0.00	0.00
2	Center	25.00	0.00	2.90
3	Center	25.00	0.00	7.50
4	Center	25.00	0.00	12.10

5	Center	25.00	0.00	14.80
6	Center	25.00	0.00	16.95
7	Center	25.00	0.00	19.30
8	Center	25.00	0.00	24.25

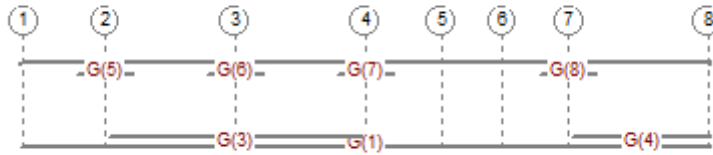


Span	Dist between axes [m]	Member No	Section	b [cm]	h [cm]	bw [cm]	hf [cm]
1-2	2.90	191	•	25.00	60.00	--	--
2-3	4.60	41	•	25.00	60.00	--	--
3-4	4.60	186	•	25.00	60.00	--	--
4-5	2.70	17	•	25.00	60.00	--	--
5-6	2.15	16	•	25.00	60.00	--	--
6-7	2.35	184	•	25.00	60.00	--	--
7-8	4.95	14	•	25.00	60.00	--	--

Rebar

Free cover : 2.00 [cm]

Longitudinal reinforcement



Group	Quantity	Diameter	Pos	Ref. Axis 1	Dist1 [m]	Ref. Axis 2	Dist2 [m]	Hook1	Hook2
1	2	16mm	Bottom	1	-0.11	8	0.11	Yes	Yes
2	2	16mm	Top	1	-0.11	8	0.11	Yes	Yes
3	1	12mm	Bottom	2	0.13	4	-0.13	No	No
4	2	12mm	Bottom	7	0.13	8	0.11	No	No
5	2	10mm	Top	2	-1.00	2	1.00	No	No
6	2	16mm	Top	3	-1.00	3	1.00	No	No
7	1	12mm	Top	4	-1.00	4	1.00	No	No
8	2	12mm	Top	7	-1.00	7	1.00	No	No

Development and splice lengths

Group	Diameter	Ld [cm]	Ldh [cm]	Splice L. [cm]	Total L [m]
1	16mm	72.00	26.00	92.00	24.90
2	16mm	92.00	26.00	120.00	24.90
3	12mm	54.00	20.00	70.00	8.96
4	12mm	54.00	20.00	70.00	4.94
5	10mm	58.00	16.00	76.00	2.00
6	16mm	92.00	26.00	120.00	2.00
7	12mm	70.00	20.00	90.00	2.00
8	12mm	70.00	20.00	90.00	2.00

Transverse reinforcement

Span	Diameter	Quantity	c/ [cm]	Legs	Closed
1-2	6mm	18	15.00	2	Yes
2-3	6mm	30	15.00	2	Yes
3-4	6mm	30	15.00	2	Yes
4-5	6mm	17	15.00	2	Yes
5-6	6mm	13	15.00	2	Yes
6-7	6mm	14	15.00	2	Yes
7-8	6mm	32	15.00	2	Yes

Initial spacing of stirrups:

Span	Initial S [cm]	Sin lim [cm]
0-1	5.00	29.00
1-2	0.00	29.00
2-3	0.00	29.00
3-4	2.50	29.00
4-5	5.00	29.00
5-6	7.50	29.00
6-7	2.50	29.00

FLEXURE

Span: 1-2

Member No: 191

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

 $\rho_{maxtop} = 1.55\%$ $\rho_{maxbot} = 1.55\%$

Limit spacing between bars for cracking control:

sb lim = 30.48 [cm]

Positive bending moments

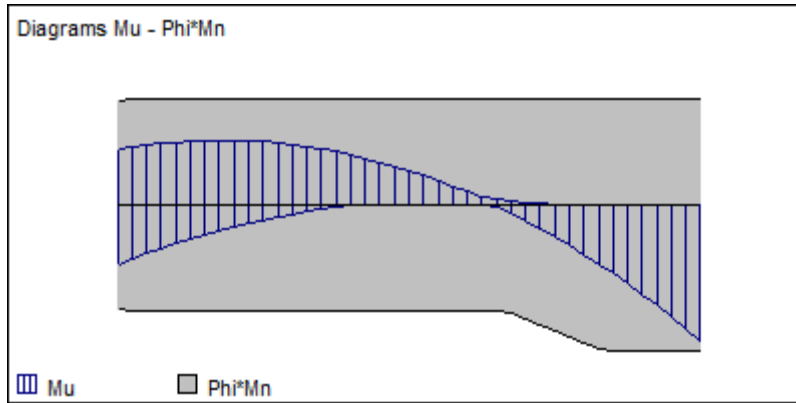
Station No. Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)	
1	0%	56.60	4.40	8.17	2.78	3.93	0.28	15.80	0.58
2	10%	56.60	4.94	8.35	3.13	4.02	0.28	15.80	0.59
3	20%	56.60	5.08	8.35	3.22	4.02	0.28	15.80	0.61
4	30%	56.60	4.75	8.35	3.00	4.02	0.28	15.80	0.57
5	40%	56.60	3.95	8.35	2.49	4.02	0.28	15.80	0.47
6	50%	56.60	2.69	8.35	1.69	4.02	0.28	15.80	0.32
7	60%	56.60	1.12	8.35	0.70	4.02	0.28	15.80	0.13
8	70%	56.60	0.23	8.35	0.14	4.02	0.28	15.80	0.14
9	80%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.36
10	90%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.61
11	100%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.93
C	100%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.93

Negative bending moments

Station No. Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)	
1	0%	56.60	-4.72	-8.17	2.99	3.93	0.28	15.80	0.58
2	10%	56.60	-3.05	-8.35	1.91	4.02	0.28	15.80	0.59
3	20%	56.60	-1.74	-8.35	1.08	4.02	0.28	15.80	0.61

4	30%	56.60	-0.73	-8.35	0.46	4.02	0.28	15.80	0.57
5	40%	56.60	-0.03	-8.35	0.02	4.02	0.28	15.80	0.47
6	50%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.32
7	60%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.13
8	70%	56.68	-1.25	-8.94	0.78	4.31	0.30	4.60	0.14
9	80%	56.68	-3.92	-10.82	2.46	5.26	0.37	4.60	0.36
10	90%	56.68	-7.05	-11.47	4.50	5.59	0.39	4.60	0.61
11	100%	56.68	-10.66	-11.47	5.18	5.59	0.39	4.60	0.93

C	100%	56.68	-10.66	-11.47	5.18	5.59	0.39	4.60	0.93



Span: 2-3

Member No: 41

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

$\rho_{maxtop} = 1.55\%$

$\rho_{maxbot} = 1.55\%$

Limit spacing between bars for cracking control:

sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton^*m]	$\phi^*\text{Mn}$ [Ton^*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/($\phi^*\text{Mn}$)
1	0%	56.60	0.00	8.35	0.00	4.02	0.28	7.30	0.91
2	10%	56.64	0.00	10.22	0.00	4.95	0.35	7.30	0.40
3	20%	56.64	1.96	10.60	1.23	5.15	0.36	7.30	0.18
4	30%	56.64	4.73	10.60	2.99	5.15	0.36	7.30	0.45
5	40%	56.64	6.74	10.60	4.30	5.15	0.36	7.30	0.64
6	50%	56.64	7.25	10.60	4.63	5.15	0.36	7.30	0.68
7	60%	56.64	6.23	10.60	3.96	5.15	0.36	7.30	0.59
8	70%	56.64	3.93	10.60	2.47	5.15	0.36	7.30	0.37
9	80%	56.64	1.33	10.60	0.83	5.15	0.36	7.30	0.20
10	90%	56.64	0.00	10.60	0.00	5.15	0.36	7.30	0.48
11	100%	56.64	0.00	10.60	0.00	5.15	0.36	7.30	0.80

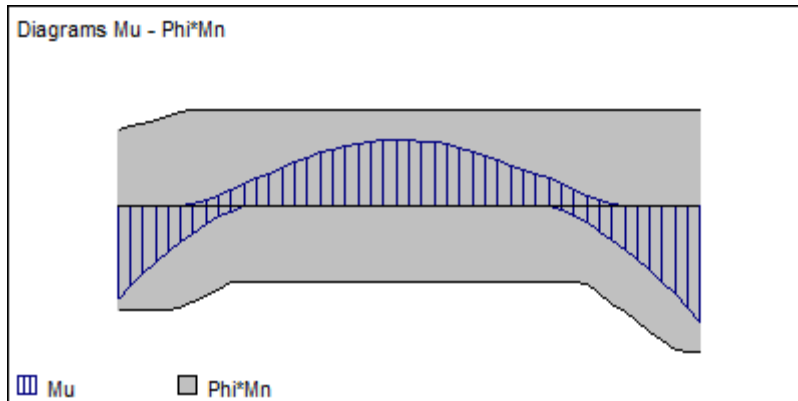
C	0%	56.60	0.00	8.35	0.00	4.02	0.28	7.30	0.91

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton^*m]	$\phi^*\text{Mn}$ [Ton^*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/($\phi^*\text{Mn}$)
1	0%	56.68	-10.39	-11.47	5.04	5.59	0.39	4.60	0.91
2	10%	56.68	-4.49	-11.32	2.83	5.51	0.39	4.60	0.40
3	20%	56.67	-0.47	-8.50	0.29	4.09	0.29	4.60	0.18
4	30%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.45
5	40%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.64
6	50%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.68
7	60%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.59
8	70%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.37

9	80%	56.60	-1.72	-8.57	1.07	4.13	0.29	4.20	0.20
10	90%	56.60	-6.42	-13.29	4.09	6.54	0.46	4.20	0.48
11	100%	56.60	-12.95	-16.12	6.36	8.04	0.57	4.20	0.80

C	0%	56.68	-10.39	-11.47	5.04	5.59	0.39	4.60	0.91



Span: 3-4

Member No: 186

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

ρ maxtop = 1.55%

ρ maxbot = 1.55%

Limit spacing between bars for cracking control:

sb lim = 30.48 [cm]

Positive bending moments

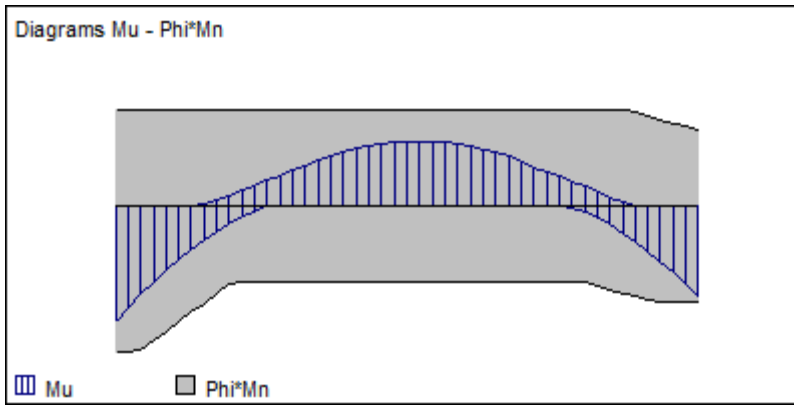
Station No.	Dist	d[cm]	Mu[Ton^*m]	$\phi^*\text{Mn}$ [Ton^*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/($\phi^*\text{Mn}$)
1	0%	56.64	0.00	10.60	0.00	5.15	0.36	7.30	0.80
2	10%	56.64	0.00	10.60	0.00	5.15	0.36	7.30	0.49
3	20%	56.64	1.25	10.60	0.78	5.15	0.36	7.30	0.21
4	30%	56.64	3.80	10.60	2.39	5.15	0.36	7.30	0.36
5	40%	56.64	6.12	10.60	3.89	5.15	0.36	7.30	0.58
6	50%	56.64	7.17	10.60	4.58	5.15	0.36	7.30	0.68
7	60%	56.64	6.72	10.60	4.28	5.15	0.36	7.30	0.63
8	70%	56.64	4.78	10.60	3.02	5.15	0.36	7.30	0.45
9	80%	56.64	2.23	10.60	1.39	5.15	0.36	7.30	0.21
10	90%	56.64	0.00	10.22	0.00	4.95	0.35	7.30	0.44
11	100%	56.60	0.00	8.35	0.00	4.02	0.28	7.30	0.94

C	100%	56.60	0.00	8.35	0.00	4.02	0.28	7.30	0.94

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton^*m]	$\phi^*\text{Mn}$ [Ton^*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/($\phi^*\text{Mn}$)
1	0%	56.60	-12.95	-16.12	6.36	8.04	0.57	4.20	0.80
2	10%	56.60	-6.48	-13.29	4.12	6.54	0.46	4.20	0.49
3	20%	56.60	-1.77	-8.57	1.11	4.13	0.29	4.20	0.21
4	30%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.36
5	40%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.58
6	50%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.68
7	60%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.63
8	70%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.45
9	80%	56.64	-0.55	-8.44	0.34	4.06	0.29	7.30	0.21
10	90%	56.64	-4.46	-10.24	2.82	4.97	0.35	7.30	0.44
11	100%	56.64	-9.98	-10.60	4.83	5.15	0.36	7.30	0.94

C	100%	56.64	-9.98	-10.60	4.83	5.15	0.36	7.30	0.94



Span: 4-5

Member No: 17

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

$\rho_{maxtop} = 1.55\%$

$\rho_{maxbot} = 1.55\%$

Limit spacing between bars for cracking control:

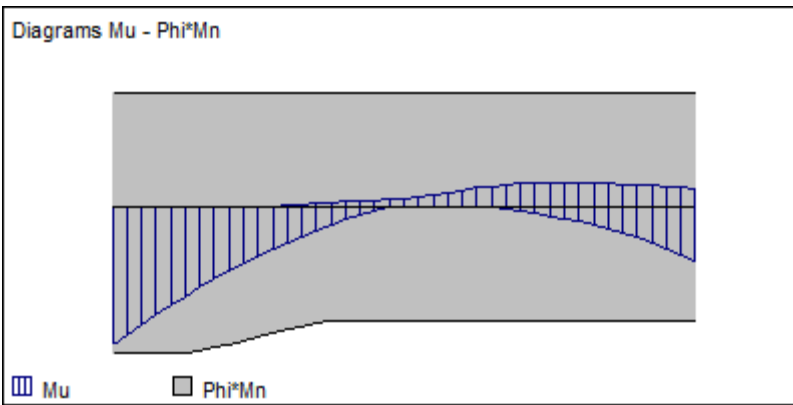
sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.95
2	10%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.68
3	20%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.47
4	30%	56.60	0.12	8.35	0.08	4.02	0.28	15.80	0.29
5	40%	56.60	0.41	8.35	0.25	4.02	0.28	15.80	0.11
6	50%	56.60	0.60	8.35	0.37	4.02	0.28	15.80	0.07
7	60%	56.60	1.23	8.35	0.77	4.02	0.28	15.80	0.15
8	70%	56.60	1.71	8.35	1.07	4.02	0.28	15.80	0.21
9	80%	56.60	1.80	8.35	1.12	4.02	0.28	15.80	0.22
10	90%	56.60	1.62	8.35	1.01	4.02	0.28	15.80	0.27
11	100%	56.60	1.33	8.35	0.83	4.02	0.28	15.80	0.47
C	0%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.95

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	56.64	-10.07	-10.60	4.88	5.15	0.36	7.30	0.95
2	10%	56.64	-7.19	-10.60	4.59	5.15	0.36	7.30	0.68
3	20%	56.64	-4.71	-10.00	2.97	4.85	0.34	7.30	0.47
4	30%	56.64	-2.62	-8.96	1.64	4.32	0.31	7.30	0.29
5	40%	56.60	-0.94	-8.35	0.59	4.02	0.28	15.80	0.11
6	50%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.07
7	60%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.15
8	70%	56.60	-0.31	-8.35	0.19	4.02	0.28	15.80	0.21
9	80%	56.60	-1.07	-8.35	0.67	4.02	0.28	15.80	0.22
10	90%	56.60	-2.23	-8.35	1.40	4.02	0.28	15.80	0.27
11	100%	56.60	-3.94	-8.35	2.48	4.02	0.28	15.80	0.47
C	0%	56.64	-10.07	-10.60	4.88	5.15	0.36	7.30	0.95



Span: 5-6

Member No: 16

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

$\rho_{maxtop} = 1.55\%$

$\rho_{maxbot} = 1.55\%$

Limit spacing between bars for cracking control:

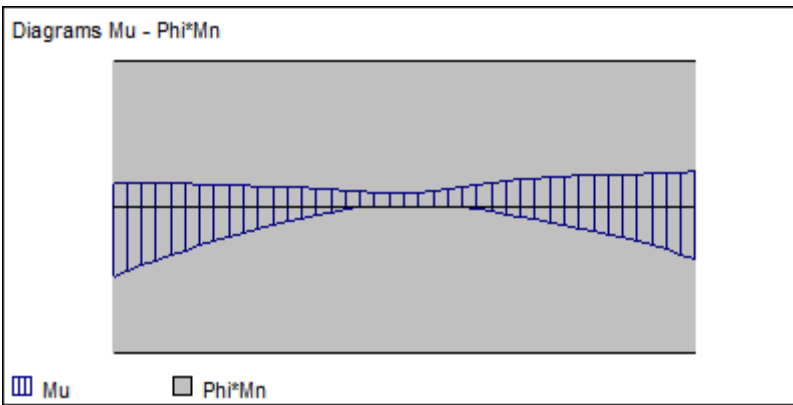
sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton^*m]	ϕ^*M_n [Ton^*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/(ϕ^*M_n)
1	0%	56.60	1.35	8.35	0.84	4.02	0.28	15.80	0.48
2	10%	56.60	1.35	8.35	0.84	4.02	0.28	15.80	0.33
3	20%	56.60	1.26	8.35	0.79	4.02	0.28	15.80	0.20
4	30%	56.60	1.13	8.35	0.70	4.02	0.28	15.80	0.14
5	40%	56.60	0.96	8.35	0.60	4.02	0.28	15.80	0.12
6	50%	56.60	0.82	8.35	0.51	4.02	0.28	15.80	0.10
7	60%	56.60	1.18	8.35	0.74	4.02	0.28	15.80	0.14
8	70%	56.60	1.55	8.35	0.97	4.02	0.28	15.80	0.19
9	80%	56.60	1.78	8.35	1.11	4.02	0.28	15.80	0.21
10	90%	56.60	1.89	8.35	1.18	4.02	0.28	15.80	0.24
11	100%	56.60	2.02	8.35	1.26	4.02	0.28	15.80	0.36
C	0%	56.60	1.35	8.35	0.84	4.02	0.28	15.80	0.48

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton^*m]	ϕ^*M_n [Ton^*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/(ϕ^*M_n)
1	0%	56.60	-3.98	-8.35	2.51	4.02	0.28	15.80	0.48
2	10%	56.60	-2.77	-8.35	1.74	4.02	0.28	15.80	0.33
3	20%	56.60	-1.70	-8.35	1.06	4.02	0.28	15.80	0.20
4	30%	56.60	-0.82	-8.35	0.51	4.02	0.28	15.80	0.14
5	40%	56.60	-0.14	-8.35	0.08	4.02	0.28	15.80	0.12
6	50%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.10
7	60%	56.60	-0.02	-8.35	0.01	4.02	0.28	15.80	0.14
8	70%	56.60	-0.57	-8.35	0.35	4.02	0.28	15.80	0.19
9	80%	56.60	-1.21	-8.35	0.76	4.02	0.28	15.80	0.21
10	90%	56.60	-1.97	-8.35	1.23	4.02	0.28	15.80	0.24
11	100%	56.60	-2.98	-8.35	1.87	4.02	0.28	15.80	0.36
C	0%	56.60	-3.98	-8.35	2.51	4.02	0.28	15.80	0.48



Span: 6-7

Member No: 184

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

ρ maxtop = 1.55%

ρ maxbot = 1.55%

Limit spacing between bars for cracking control:

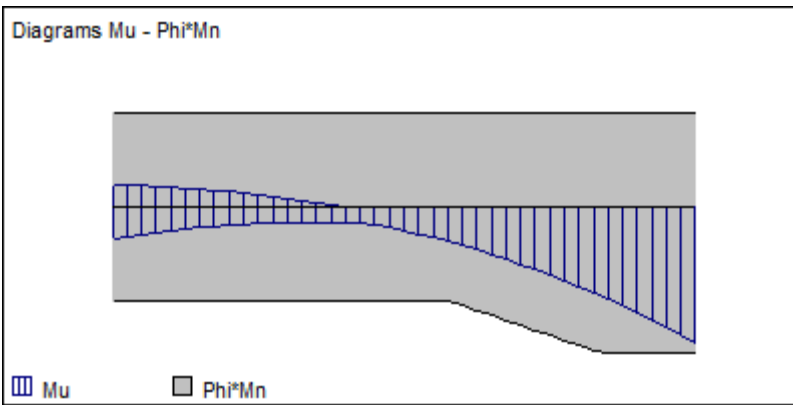
sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	56.60	1.99	8.35	1.25	4.02	0.28	15.80	0.34
2	10%	56.60	1.75	8.35	1.09	4.02	0.28	15.80	0.25
3	20%	56.60	1.33	8.35	0.83	4.02	0.28	15.80	0.19
4	30%	56.60	0.74	8.35	0.46	4.02	0.28	15.80	0.16
5	40%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.17
6	50%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.25
7	60%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.39
8	70%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.48
9	80%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.57
10	90%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.73
11	100%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.93
C	100%	56.60	0.00	8.35	0.00	4.02	0.28	15.80	0.93

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	56.60	-2.83	-8.35	1.78	4.02	0.28	15.80	0.34
2	10%	56.60	-2.08	-8.35	1.30	4.02	0.28	15.80	0.25
3	20%	56.60	-1.59	-8.35	1.00	4.02	0.28	15.80	0.19
4	30%	56.60	-1.37	-8.35	0.86	4.02	0.28	15.80	0.16
5	40%	56.60	-1.41	-8.35	0.88	4.02	0.28	15.80	0.17
6	50%	56.60	-2.10	-8.35	1.32	4.02	0.28	15.80	0.25
7	60%	56.67	-3.40	-8.66	2.14	4.17	0.29	4.47	0.39
8	70%	56.67	-5.04	-10.46	3.19	5.07	0.36	4.47	0.48
9	80%	56.67	-7.01	-12.22	4.47	5.98	0.42	4.47	0.57
10	90%	56.67	-9.32	-12.81	4.72	6.28	0.44	4.47	0.73
11	100%	56.67	-11.97	-12.81	5.85	6.28	0.44	4.47	0.93
C	100%	56.67	-11.97	-12.81	5.85	6.28	0.44	4.47	0.93



Span: 7-8

Member No: 14

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

ρ maxtop = 1.55%

ρ maxbot = 1.55%

Limit spacing between bars for cracking control:

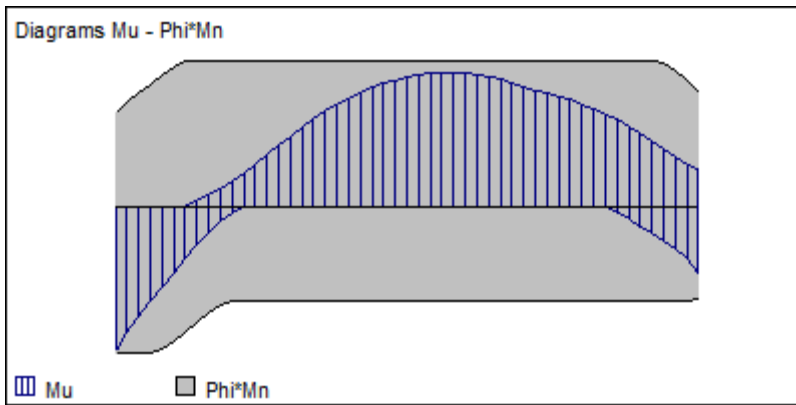
sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	56.60	0.00	8.35	0.00	4.02	0.28	4.47	0.99
2	10%	56.67	0.00	12.34	0.00	6.04	0.43	4.47	0.49
3	20%	56.67	2.32	12.81	1.45	6.28	0.44	4.47	0.18
4	30%	56.67	6.25	12.81	3.97	6.28	0.44	4.47	0.49
5	40%	56.67	9.58	12.81	4.72	6.28	0.44	4.47	0.75
6	50%	56.67	11.42	12.81	5.56	6.28	0.44	4.47	0.89
7	60%	56.67	11.77	12.81	5.74	6.28	0.44	4.47	0.92
8	70%	56.67	10.62	12.81	5.16	6.28	0.44	4.47	0.83
9	80%	56.67	9.06	12.81	4.72	6.28	0.44	4.47	0.71
10	90%	56.67	6.51	12.81	4.14	6.28	0.44	4.47	0.51
11	100%	56.67	3.26	10.15	2.05	4.92	0.35	4.47	0.70
C	0%	56.60	0.00	8.35	0.00	4.02	0.28	4.47	0.99

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	56.67	-12.72	-12.81	6.23	6.28	0.44	4.47	0.99
2	10%	56.67	-5.77	-11.80	3.66	5.76	0.41	4.47	0.49
3	20%	56.60	-0.53	-8.35	0.33	4.02	0.28	4.47	0.18
4	30%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.49
5	40%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.75
6	50%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.89
7	60%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.92
8	70%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.83
9	80%	56.60	0.00	-8.35	0.00	4.02	0.28	15.80	0.71
10	90%	56.60	-1.70	-8.35	1.06	4.02	0.28	15.80	0.51
11	100%	56.60	-5.75	-8.17	3.65	3.93	0.28	15.80	0.70
C	0%	56.67	-12.72	-12.81	6.23	6.28	0.44	4.47	0.99

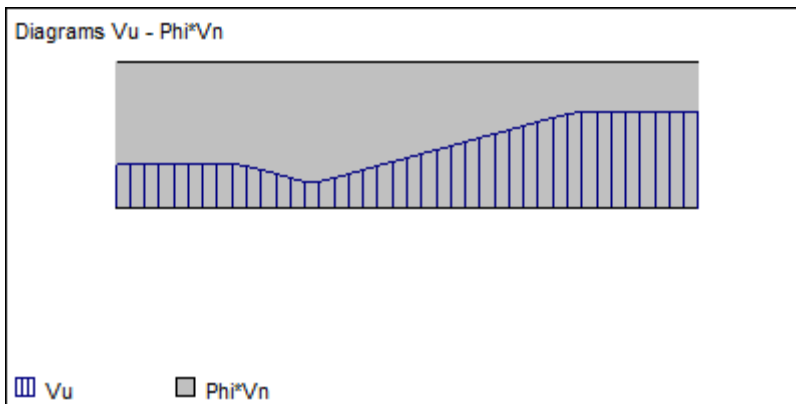


SHEAR AND TORSION

Span: 1-2

Member No: 191

Station		Stirrups		Spc prov	Spc lim	Tu	ϕ^*Tn	AI	Vu	Vs	Vc	ϕ^*Vn	$Vu/(\phi^*Vn)$
No.	Dist	Diam	VCT	[cm]	[cm]	[Ton*m]	[Ton*m]	[cm ²]	[Ton]	[Ton]	[Ton]	[Ton]	
1	0%	6mm	V	15.00	27.17	0.25	1.15	0.00	4.54	9.01	10.90	14.93	0.30
2	10%	6mm	V	15.00	27.17	0.25	1.15	0.00	4.54	9.01	10.90	14.93	0.30
3	20%	6mm	V	15.00	27.17	0.25	1.15	0.00	4.54	9.01	10.90	14.93	0.30
4	30%	6mm		15.00	27.17	0.25	1.15	0.00	3.15	9.01	10.90	14.93	0.21
5	40%	6mm		15.00	27.17	0.25	1.15	0.00	3.56	9.01	10.90	14.93	0.24
6	50%	6mm	V	15.00	27.17	0.25	1.15	0.00	5.17	9.01	10.90	14.93	0.35
7	60%	6mm	V	15.00	27.17	0.25	1.15	0.00	6.78	9.01	10.90	14.93	0.45
8	70%	6mm	V	15.00	27.17	0.25	1.11	0.00	8.40	9.01	10.90	14.93	0.56
9	80%	6mm	V	15.00	27.17	0.25	0.87	0.00	9.79	9.02	10.91	14.95	0.65
10	90%	6mm	V	15.00	27.17	0.25	0.87	0.00	9.79	9.02	10.91	14.95	0.65
11	100%	6mm	V	15.00	27.17	0.25	0.87	0.00	9.79	9.02	10.91	14.95	0.65
C	80%	6mm	V	15.00	27.17	0.25	0.87	0.00	9.79	9.02	10.91	14.95	0.65



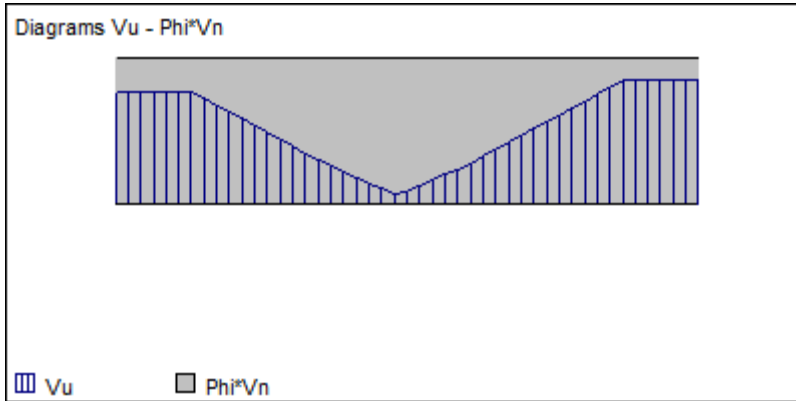
Span: 2-3

Member No: 41

Station		Stirrups		Spc prov	Spc lim	Tu	ϕ^*Tn	AI	Vu	Vs	Vc	ϕ^*Vn	$Vu/(\phi^*Vn)$
No.	Dist	Diam	VCT	[cm]	[cm]	[Ton*m]	[Ton*m]	[cm ²]	[Ton]	[Ton]	[Ton]	[Ton]	
1	0%	6mm	V	15.00	27.17	0.19	0.57	0.00	11.62	9.02	10.91	14.95	0.78
2	10%	6mm	V	15.00	27.17	0.19	0.57	0.00	11.62	9.02	10.91	14.95	0.78
3	20%	6mm	V	15.00	27.17	0.19	0.95	0.00	9.32	9.02	10.91	14.94	0.62
4	30%	6mm	V	15.00	27.17	0.19	1.15	0.00	6.03	9.02	10.91	14.94	0.40
5	40%	6mm		15.00	27.17	0.19	1.15	0.00	3.05	9.02	10.91	14.94	0.20
6	50%	6mm		15.00	27.17	0.19	1.15	0.00	1.32	9.02	10.91	14.94	0.09
7	60%	6mm		15.00	27.17	0.19	1.15	0.00	3.90	9.02	10.91	14.94	0.26
8	70%	6mm	V	15.00	27.17	0.19	1.15	0.00	7.14	9.02	10.91	14.94	0.48

9	80%	6mm	V	15.00	27.17	0.19	0.77	0.00	10.43	9.02	10.91	14.94	0.70
10	90%	6mm	V	15.00	22.27	0.19	0.38	0.00	12.73	9.01	10.90	14.93	0.85
11	100%	6mm	V	15.00	22.27	0.19	0.38	0.00	12.73	9.01	10.90	14.93	0.85

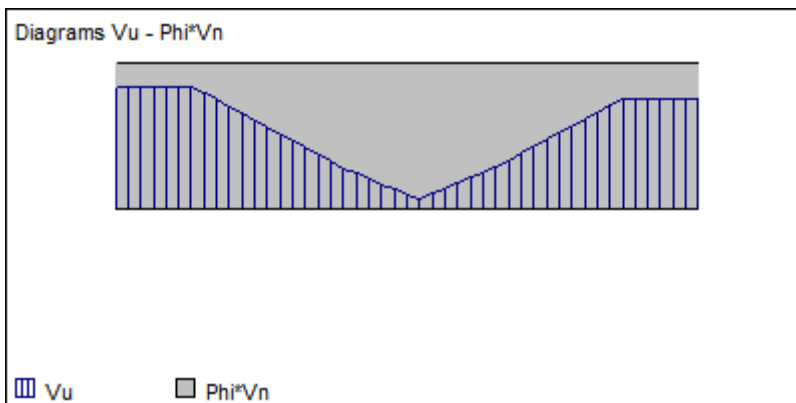
C	89%	6mm	V	15.00	22.27	0.19	0.38	0.00	12.73	9.01	10.90	14.93	0.85



Span: 3-4 Member No: 186

Station No.	Dist	Stirrups Diam	VCT	Spc prov [cm]	Spc lim [cm]	Tu [Ton*m]	ϕ^*Tn [Ton*m]	AI [cm ²]	Vu [Ton]	Vs [Ton]	Vc [Ton]	ϕ^*Vn [Ton]	Vu/(ϕ^*Vn)
1	0%	6mm	V	15.00	22.74	0.14	0.39	0.00	12.63	9.01	10.90	14.93	0.85
2	10%	6mm	V	15.00	22.74	0.14	0.39	0.00	12.63	9.01	10.90	14.93	0.85
3	20%	6mm	V	15.00	27.17	0.14	0.78	0.00	10.37	9.02	10.91	14.94	0.69
4	30%	6mm	V	15.00	27.17	0.14	1.15	0.00	7.13	9.02	10.91	14.94	0.48
5	40%	6mm		15.00	27.17	0.14	1.15	0.00	3.96	9.02	10.91	14.94	0.27
6	50%	6mm		15.00	27.17	0.14	1.15	0.00	1.44	9.02	10.91	14.94	0.10
7	60%	6mm		15.00	27.17	0.14	1.15	0.00	2.99	9.02	10.91	14.94	0.20
8	70%	6mm	V	15.00	27.17	0.14	1.15	0.00	5.84	9.02	10.91	14.94	0.39
9	80%	6mm	V	15.00	27.17	0.14	0.99	0.00	9.08	9.02	10.91	14.94	0.61
10	90%	6mm	V	15.00	27.17	0.14	0.61	0.00	11.34	9.02	10.91	14.94	0.76
11	100%	6mm	V	15.00	27.17	0.14	0.61	0.00	11.34	9.02	10.91	14.94	0.76

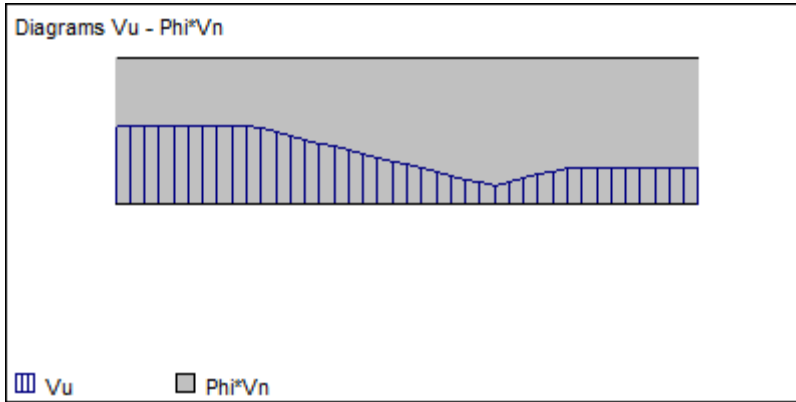
C	0%	6mm	V	15.00	22.74	0.14	0.39	0.00	12.63	9.01	10.90	14.93	0.85



Span: 4-5 Member No: 17

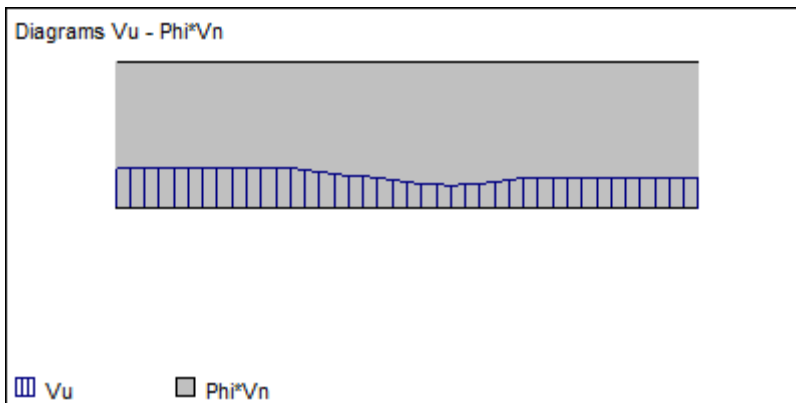
Station No.	Dist	Stirrups Diam	VCT	Spc prov [cm]	Spc lim [cm]	Tu [Ton*m]	ϕ^*Tn [Ton*m]	AI [cm ²]	Vu [Ton]	Vs [Ton]	Vc [Ton]	ϕ^*Vn [Ton]	Vu/(ϕ^*Vn)
1	0%	6mm	V	15.00	27.17	0.24	1.15	0.00	8.00	9.02	10.91	14.94	0.54
2	10%	6mm	V	15.00	27.17	0.24	1.15	0.00	8.00	9.02	10.91	14.94	0.54
3	20%	6mm	V	15.00	27.17	0.24	1.15	0.00	8.00	9.02	10.91	14.94	0.54
4	30%	6mm	V	15.00	27.17	0.24	1.15	0.00	6.98	9.01	10.90	14.93	0.47

5	40%	6mm	V	15.00	27.17	0.24	1.15	0.00	5.50	9.01	10.90	14.93	0.37
6	50%	6mm		15.00	27.17	0.24	1.15	0.00	4.02	9.01	10.90	14.93	0.27
7	60%	6mm		15.00	27.17	0.24	1.15	0.00	2.54	9.01	10.90	14.93	0.17
8	70%	6mm		15.00	27.17	0.24	1.15	0.00	2.61	9.01	10.90	14.93	0.18
9	80%	6mm		15.00	27.17	0.24	1.15	0.00	3.63	9.01	10.90	14.93	0.24
10	90%	6mm		15.00	27.17	0.24	1.15	0.00	3.63	9.01	10.90	14.93	0.24
11	100%	6mm		15.00	27.17	0.24	1.15	0.00	3.63	9.01	10.90	14.93	0.24
C	0%	6mm	V	15.00	27.17	0.24	1.15	0.00	8.00	9.02	10.91	14.94	0.54



Span: 5-6 Member No: 16

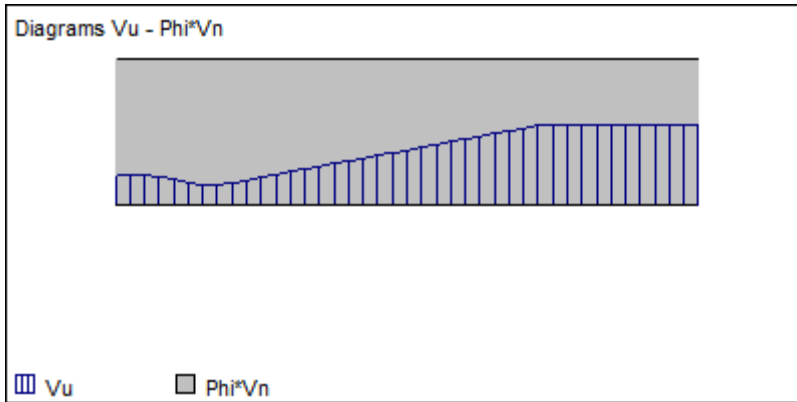
Station No.	Dist	Stirrups Diam	VCT	Spc prov [cm]	Spc lim [cm]	Tu [Ton*m]	ϕ^*Tn [Ton*m]	AI [cm ²]	Vu [Ton]	Vs [Ton]	Vc [Ton]	ϕ^*Vn [Ton]	$Vu/(\phi^*Vn)$
1	0%	6mm		15.00	27.17	0.04	1.15	0.00	4.02	9.01	10.90	14.93	0.27
2	10%	6mm		15.00	27.17	0.04	1.15	0.00	4.02	9.01	10.90	14.93	0.27
3	20%	6mm		15.00	27.17	0.04	1.15	0.00	4.02	9.01	10.90	14.93	0.27
4	30%	6mm		15.00	27.17	0.04	1.15	0.00	4.00	9.01	10.90	14.93	0.27
5	40%	6mm		15.00	27.17	0.04	1.15	0.00	3.35	9.01	10.90	14.93	0.22
6	50%	6mm		15.00	27.17	0.04	1.15	0.00	2.70	9.01	10.90	14.93	0.18
7	60%	6mm		15.00	27.17	0.04	1.15	0.00	2.40	9.01	10.90	14.93	0.16
8	70%	6mm		15.00	27.17	0.04	1.15	0.00	3.05	9.01	10.90	14.93	0.20
9	80%	6mm		15.00	27.17	0.04	1.15	0.00	3.07	9.01	10.90	14.93	0.21
10	90%	6mm		15.00	27.17	0.04	1.15	0.00	3.07	9.01	10.90	14.93	0.21
11	100%	6mm		15.00	27.17	0.04	1.15	0.00	3.07	9.01	10.90	14.93	0.21
C	0%	6mm		15.00	27.17	0.04	1.15	0.00	4.02	9.01	10.90	14.93	0.27



Span: 6-7 Member No: 184

Station No.	Dist	Stirrups Diam	VCT	Spc prov [cm]	Spc lim [cm]	Tu [Ton*m]	ϕ^*Tn [Ton*m]	AI [cm ²]	Vu [Ton]	Vs [Ton]	Vc [Ton]	ϕ^*Vn [Ton]	$Vu/(\phi^*Vn)$
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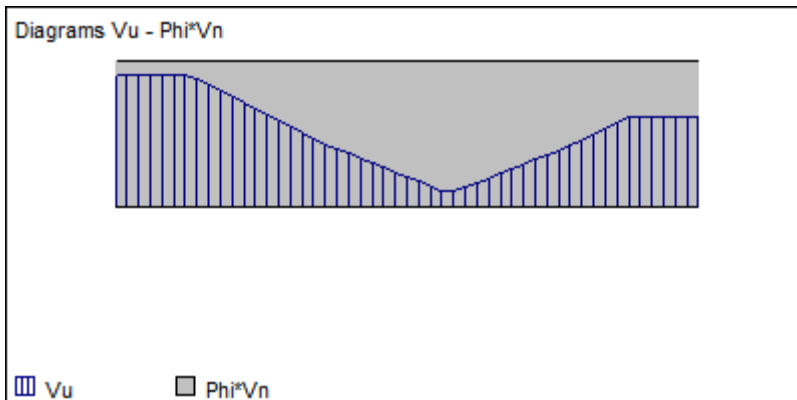
1	0%	6mm		15.00	27.17	0.26	1.15	0.00	3.07	9.01	10.90	14.93	0.21
2	10%	6mm		15.00	27.17	0.26	1.15	0.00	2.63	9.01	10.90	14.93	0.18
3	20%	6mm		15.00	27.17	0.26	1.15	0.00	2.29	9.01	10.90	14.93	0.15
4	30%	6mm		15.00	27.17	0.26	1.15	0.00	3.41	9.01	10.90	14.93	0.23
5	40%	6mm	V	15.00	27.17	0.26	1.15	0.00	4.53	9.01	10.90	14.93	0.30
6	50%	6mm	V	15.00	27.17	0.26	1.15	0.00	5.65	9.01	10.90	14.93	0.38
7	60%	6mm	V	15.00	27.17	0.26	1.15	0.00	6.77	9.02	10.91	14.95	0.45
8	70%	6mm	V	15.00	27.17	0.26	1.15	0.00	7.89	9.02	10.91	14.95	0.53
9	80%	6mm	V	15.00	27.17	0.26	1.14	0.00	8.23	9.02	10.91	14.95	0.55
10	90%	6mm	V	15.00	27.17	0.26	1.14	0.00	8.23	9.02	10.91	14.95	0.55
11	100%	6mm	V	15.00	27.17	0.26	1.14	0.00	8.23	9.02	10.91	14.95	0.55
C	75%	6mm	V	15.00	27.17	0.26	1.14	0.00	8.23	9.02	10.91	14.95	0.55



Span: 7-8

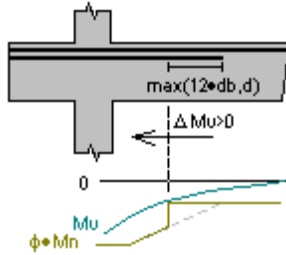
Member No: 14

Station No.	Dist	Stirrups Diam	Stirrups VCT	Spc prov [cm]	Spc lim [cm]	Tu [Ton*m]	$\phi*Tn$ [Ton*m]	AI [cm ²]	Vu [Ton]	Vs [Ton]	Vc [Ton]	$\phi*Vn$ [Ton]	$Vu/(\phi*Vn)$
1	0%	6mm	V	15.00	18.52	0.08	0.38	0.00	13.66	9.02	10.91	14.95	0.91
2	10%	6mm	V	15.00	18.52	0.08	0.38	0.00	13.66	9.02	10.91	14.95	0.91
3	20%	6mm	V	15.00	27.17	0.08	0.62	0.00	11.26	9.02	10.91	14.95	0.75
4	30%	6mm	V	15.00	27.17	0.08	1.14	0.00	8.24	9.02	10.91	14.95	0.55
5	40%	6mm	V	15.00	27.17	0.08	1.15	0.00	5.46	9.02	10.91	14.95	0.37
6	50%	6mm		15.00	27.17	0.08	1.15	0.00	3.10	9.02	10.91	14.95	0.21
7	60%	6mm		15.00	27.17	0.08	1.15	0.00	2.04	9.02	10.91	14.95	0.14
8	70%	6mm	V	15.00	27.17	0.08	1.15	0.00	4.40	9.02	10.91	14.95	0.29
9	80%	6mm	V	15.00	27.17	0.08	1.15	0.00	6.84	9.02	10.91	14.95	0.46
10	90%	6mm	V	15.00	27.17	0.08	0.97	0.00	9.24	9.02	10.91	14.95	0.62
11	100%	6mm	V	15.00	27.17	0.08	0.97	0.00	9.24	9.02	10.91	14.95	0.62
C	0%	6mm	V	15.00	18.52	0.08	0.38	0.00	13.66	9.02	10.91	14.95	0.91



Notes

- * Only the design bending forces (M_u), shear forces (V_u) and torsion moments (T_u) are considered in the design.
- * Values shown in red are not in compliance with a provision of the code
- * The positive and negative flexural reinforcement includes the longitudinal reinforcement required to resist torsion. Refer to the note below on the VCT column to determine when torsion and compression bars are provided. The longitudinal reinforcement area considers the minimum area required by Code (10.5).
- * When the moments diagram increases in the same direction of the development length of the bars, the bars will not contribute to the member strength for a Code specified distance equal to $\max(12 \cdot d_b, d)$.



- * If the section at which member flexural strength is being calculated is within the development length of a group of bars, the bars will contribute to the bending capacity an amount proportional to their actual length / their full development length.
- * The transverse reinforcement is ordered from left to right.
- * The program does not consider ACI318-05 section 12.11.3 whereby the bar diameter is limited according to the location of the bar cut-off.
- * A_{sprov} is the provided reinforcement, considering the reduction due to the development length as described previously.
- * "C" shows the span critical station.
- * L_d, L_{dh} = Development length of each bar. If the bar ends with a hook, it considers the L_{dh} length.
- * Splice lengths shown are not reduced by the factor A_{sreq}/A_{sprov} .
- * s_b = Free distance between top or bottom bars corresponding to the layer closest to the extreme face of the beam (layer1). It is not calculated when there is only one bar.
- * Stirrups VCT = Flag that determines if stirrups are required to resist shear forces (V), torsion (T) or to confine the the longitudinal compression bars from buckling (C).
- * Closed = Flag that indicates if the stirrups are closed (yes) or open (no).
- * $M_u/(\phi \cdot M_n)$ = Critical strength ratio for the station. If the value is in red, it is larger than 1.0
- * A_l = Total additional longitudinal reinforcement required by torsion.
- * s_{pa} = stirrup spacing provided by the user.
- * $s_{pa\ lim}$ = spacing limits due to geometry. (11.5.5.1, 11.5.5.3, 21.3.3.2, 21.12.4.2)



Current Date: 03/07/2014 08:09 p.m.

Units system: Metric

File name: C:\Users\Coco\Dropbox\MC Soluciones Ingenieriles\Proyectos en Proceso\017- Sarmiento (Proyecto)\Ram\C20.ccd\

Design Results

Reinforced Concrete Columns

GENERAL INFORMATION:

Design Code : ACI 318-2005

Load Conditions included in design:

id1 : 1.4DL
 id2 : 1.2DL+0.5LL+EQxpo+0.5EQzpo
 id3 : 1.2DL+0.5LL+EQxpo+0.5EQzne
 id4 : 1.2DL+0.5LL+EQxne+0.5EQzpo
 id5 : 1.2DL+0.5LL+EQxne+0.5EQzne
 id6 : 0.9DL+EQxpo+0.5EQzpo
 id7 : 0.9DL+EQxpo+0.5EQzne
 id8 : 0.9DL+EQxne+0.5EQzpo
 id9 : 0.9DL+EQxne+0.5EQzne
 id11 : 1.2DL+1.6LL
 id12 : 0.9DL+1.5V
 id13 : 1.2DL+0.5LL+0.5EQxpo+EQzpo
 id14 : 1.2DL+0.5LL+0.5EQxpo+EQzne
 id15 : 1.2DL+0.5LL+0.5EQxne+EQzpo
 id16 : 1.2DL+0.5LL+0.5EQxne+EQzne
 id17 : 0.9DL+0.5EQxpo+EQzpo
 id18 : 0.9DL+0.5EQxpo+EQzne
 id19 : 0.9DL+0.5EQxne+EQzpo
 id20 : 0.9DL+0.5EQxne+EQzne

Moment frame : Ordinary

Materials

Concrete, f'c	: 0.21 [Ton/cm2]	Steel, fy	: 4.22 [Ton/cm2]
Concrete type	: Normal	Steel, fyt	: 4.22 [Ton/cm2]
Modulus of elasticity	: 219.50 [Ton/cm2]	Type of splices	: Tangential
Unit weight	: 2.40 [Ton/m3]	Minimum provided Rho	: 0.010
Epoxy coated	: No	Maximum provided Rho	: 0.080

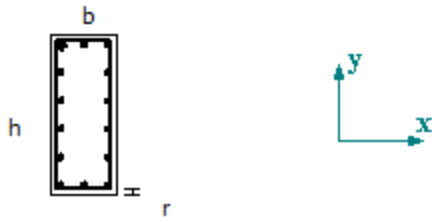
General status : OK

COLUMN DATA : 1

Geometry

Section type : Rectangular
 Column location : Center
 Distance between levels : 3.90 [m]
 Width b (// to axis x) : 25.00 [cm]
 Height h (// to axis y) : 60.00 [cm]

Rebar



Longitudinal	:	14-20mm
Free cover	:	2.50 [cm]
As provided	:	43.96 [cm ²]
Provided Rho	:	0.029
Number of bars // to axis x	:	3
Spacing between bars	:	6.40 [cm]
Number of bars // to axis y	:	6
Spacing between bars	:	8.36 [cm]
Transverse	:	28 6mm c/ 11.00cm
Number of legs // to axis x	:	2
Number of legs // to axis y	:	2
Initial spacing (Sini)	:	0.00 [cm]

Design parameters

Slenderness	Axis yy	Axis xx
Lu[cm]	390.00	390.00
K	1.00	1.00
Klu/r	54.04	22.52
Cm	0.00	0.00
Pc[Ton]	278.18	1602.34
Sway	Yes	Yes

Forces

Condition	Position	Pu [Ton]	Muxx [Ton*m]	Muyy [Ton*m]	Vx [Ton]	Vy [Ton]	Transverse load	
							xx	yy
id1	Top	-34.44	1.75	-4.80	-2.59	-0.94	No	No
	Bottom	-36.40	-1.90	5.29	-2.59	-0.94	No	No
id2	Top	-28.55	11.67	2.10	0.99	-5.91	No	No
	Bottom	-30.23	-11.39	-1.77	0.99	-5.91	No	No
id3	Top	-31.39	-2.95	2.72	1.31	1.50	No	No
	Bottom	-33.08	2.88	-2.39	1.31	1.50	No	No
id4	Top	-35.12	6.29	-11.52	-5.97	-3.19	No	No
	Bottom	-36.81	-6.17	11.75	-5.97	-3.19	No	No
id5	Top	-37.97	-8.33	-10.89	-5.65	4.21	No	No
	Bottom	-39.65	8.11	11.13	-5.65	4.21	No	No
id6	Top	-17.43	11.12	3.41	1.66	-5.67	No	No
	Bottom	-18.69	-10.97	-3.05	1.66	-5.67	No	No
id7	Top	-20.27	-3.49	4.03	1.98	1.74	No	No
	Bottom	-21.54	3.30	-3.67	1.98	1.74	No	No
id8	Top	-24.00	5.75	-10.20	-5.30	-2.95	No	No
	Bottom	-25.27	-5.75	10.47	-5.30	-2.95	No	No
id9	Top	-26.85	-8.87	-9.58	-4.98	4.46	No	No
	Bottom	-28.11	8.53	9.85	-4.98	4.46	No	No
id11	Top	-41.48	2.04	-5.02	-2.57	-0.95	No	No
	Bottom	-43.17	-1.67	5.01	-2.57	-0.95	No	No
id12	Top	-22.14	1.13	-3.08	-1.66	-0.60	No	No
	Bottom	-23.40	-1.22	3.40	-1.66	-0.60	No	No
id13	Top	-28.77	17.63	-1.62	-0.91	-8.94	No	No
	Bottom	-30.45	-17.22	1.92	-0.91	-8.94	No	No

id14	Top	-34.46	-11.60	-0.37	-0.27	5.88	No	No
	Bottom	-36.14	11.33	0.68	-0.27	5.88	No	No
id15	Top	-32.06	14.94	-8.42	-4.39	-7.58	No	No
	Bottom	-33.74	-14.61	8.68	-4.39	-7.58	No	No
id16	Top	-37.74	-14.29	-7.18	-3.75	7.24	No	No
	Bottom	-39.43	13.94	7.44	-3.75	7.24	No	No
id17	Top	-17.65	17.09	-0.30	-0.24	-8.69	No	No
	Bottom	-18.92	-16.80	0.64	-0.24	-8.69	No	No
id18	Top	-23.34	-12.14	0.94	0.40	6.13	No	No
	Bottom	-24.60	11.75	-0.60	0.40	6.13	No	No
id19	Top	-20.94	14.40	-7.11	-3.72	-7.33	No	No
	Bottom	-22.20	-14.19	7.40	-3.72	-7.33	No	No
id20	Top	-26.63	-14.83	-5.86	-3.08	7.49	No	No
	Bottom	-27.89	14.36	6.16	-3.08	7.49	No	No

RESULTS OF COLUMN: 1

Column status : OK

Biaxial compression

Controlling condition : id5
 Stress in bars : fs<0
 Dowel splice length : 50.00 [cm]
 Bar clear spacing at splices : 4.40 [cm]

Condition	Pos.	Pu [Ton]	Mcxx [Ton*m]	Mcyy [Ton*m]	δ_{nsxx}	δ_{nsyy}	Cmxx	Cmyy
id1	Top	-34.44	1.75	-4.80	1.00	1.00	0.400	0.400
	Bot.	-36.40	-1.90	5.29	1.00	1.00	0.400	0.400
id2	Top	-28.55	11.67	2.10	1.00	1.00	0.400	0.400
	Bot.	-30.23	-11.39	-1.77	1.00	1.00	0.400	0.400
id3	Top	-31.39	-2.95	2.72	1.00	1.00	0.400	0.400
	Bot.	-33.08	2.88	-2.39	1.00	1.00	0.400	0.400
id4	Top	-35.12	6.29	-11.52	1.00	1.00	0.400	0.400
	Bot.	-36.81	-6.17	11.75	1.00	1.00	0.400	0.400
id5	Top	-37.97	-8.33	-10.89	1.00	1.00	0.400	0.400
	Bot.	-39.65	8.11	11.13	1.00	1.00	0.400	0.400
id6	Top	-17.43	11.12	3.41	1.00	1.00	0.400	0.400
	Bot.	-18.69	-10.97	-3.05	1.00	1.00	0.400	0.400
id7	Top	-20.27	-3.49	4.03	1.00	1.00	0.400	0.400
	Bot.	-21.54	3.30	-3.67	1.00	1.00	0.400	0.400
id8	Top	-24.00	5.75	-10.20	1.00	1.00	0.400	0.400
	Bot.	-25.27	-5.75	10.47	1.00	1.00	0.400	0.400
id9	Top	-26.85	-8.87	-9.58	1.00	1.00	0.400	0.400
	Bot.	-28.11	8.53	9.85	1.00	1.00	0.400	0.400
id11	Top	-41.48	2.04	-5.02	1.00	1.00	0.400	0.400
	Bot.	-43.17	-1.67	5.01	1.00	1.00	0.400	0.400
id12	Top	-22.14	1.13	-3.08	1.00	1.00	0.400	0.400
	Bot.	-23.40	-1.22	3.40	1.00	1.00	0.400	0.400
id13	Top	-28.77	17.63	-1.62	1.00	1.00	0.400	0.400
	Bot.	-30.45	-17.22	1.92	1.00	1.00	0.400	0.400
id14	Top	-34.46	-11.60	-0.37	1.00	1.00	0.400	0.400
	Bot.	-36.14	11.33	0.68	1.00	1.00	0.400	0.400
id15	Top	-32.06	14.94	-8.42	1.00	1.00	0.400	0.400
	Bot.	-33.74	-14.61	8.68	1.00	1.00	0.400	0.400
id16	Top	-37.74	-14.29	-7.18	1.00	1.00	0.400	0.400
	Bot.	-39.43	13.94	7.44	1.00	1.00	0.400	0.400
id17	Top	-17.65	17.09	-0.30	1.00	1.00	0.400	0.411
	Bot.	-18.92	-16.80	0.64	1.00	1.00	0.400	0.411
id18	Top	-23.34	-12.14	0.94	1.00	1.00	0.400	0.400
	Bot.	-24.60	11.75	-0.60	1.00	1.00	0.400	0.400
id19	Top	-20.94	14.40	-7.11	1.00	1.00	0.400	0.400
	Bot.	-22.20	-14.19	7.40	1.00	1.00	0.400	0.400
id20	Top	-26.63	-14.83	-5.86	1.00	1.00	0.400	0.400

Bot.	-27.89	14.36	6.16	1.00	1.00	0.400	0.400
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Condition	Pos.	ϕ^*M_{nxx} [Ton*m]	ϕ^*M_{nyy} [Ton*m]	$M_c/(\phi^*M_n)$	$P_u/(\phi^*P_n)$	Asreq/Asprov	Demand: Capacity Ratio
id1	Top	4.98	-13.63	0.35	0.15	0.86	0.35
	Bot.	-4.89	13.62	0.39	0.16	0.86	0.39
id2	Top	28.00	5.04	0.42	0.12	0.86	0.42
	Bot.	-29.11	-4.51	0.39	0.13	0.86	0.39
id3	Top	-12.22	11.28	0.24	0.14	0.86	0.24
	Bot.	13.13	-10.87	0.22	0.14	0.86	0.22
id4	Top	7.08	-12.96	0.89	0.15	0.86	0.89
	Bot.	-6.82	12.99	0.90	0.16	0.86	0.90
id5	Top	-9.28	-12.14	0.90	0.16	0.86	0.90
	Bot.	8.90	12.21	0.91	0.17	0.86	0.91
id6	Top	23.30	7.15	0.48	0.08	0.86	0.48
	Bot.	-24.26	-6.74	0.45	0.08	0.86	0.45
id7	Top	-10.50	12.12	0.33	0.09	0.86	0.33
	Bot.	10.82	-12.02	0.31	0.09	0.86	0.31
id8	Top	7.35	-13.04	0.78	0.10	0.86	0.78
	Bot.	-7.18	13.08	0.80	0.11	0.86	0.80
id9	Top	-11.00	-11.89	0.81	0.12	0.86	0.81
	Bot.	10.43	12.05	0.82	0.12	0.86	0.82
id11	Top	5.40	-13.31	0.38	0.18	0.86	0.38
	Bot.	-4.52	13.55	0.37	0.19	0.86	0.37
id12	Top	5.06	-13.84	0.22	0.10	0.86	0.22
	Bot.	-4.97	13.84	0.25	0.10	0.86	0.25
id13	Top	32.70	-3.00	0.54	0.12	0.86	0.54
	Bot.	-31.42	3.51	0.55	0.13	0.86	0.55
id14	Top	-36.34	-1.16	0.32	0.15	0.86	0.32
	Bot.	34.29	2.06	0.33	0.16	0.86	0.33
id15	Top	16.80	-9.47	0.89	0.14	0.86	0.89
	Bot.	-16.23	9.65	0.90	0.15	0.86	0.90
id16	Top	-17.78	-8.93	0.80	0.16	0.86	0.80
	Bot.	17.13	9.14	0.81	0.17	0.86	0.81
id17	Top	37.90	-0.67	0.45	0.08	0.86	0.45
	Bot.	-36.42	1.39	0.46	0.08	0.86	0.46
id18	Top	-33.94	2.63	0.36	0.10	0.86	0.36
	Bot.	35.51	-1.81	0.33	0.11	0.86	0.33
id19	Top	18.47	-9.12	0.78	0.09	0.86	0.78
	Bot.	-17.88	9.32	0.79	0.10	0.86	0.79
id20	Top	-20.57	-8.13	0.72	0.11	0.86	0.72
	Bot.	19.70	8.45	0.73	0.12	0.86	0.73

Shear

S provided	:	11.00 [cm]	S required	:	11.25 [cm]
Sini provided	:	0.00 [cm]	Sini required	:	5.63 [cm]

Dir	Condition	Pos.	Vu [Ton]	Vc [Ton]	Vs [Ton]	ϕ^*V_n [Ton]	Vu/(ϕ^*V_n)
	Gob.						

2	id13	Top	8.94	12.58	12.48	18.80	0.48
		Bot.	8.94	12.67	12.48	18.86	0.48
3	id4	Top	5.97	12.13	4.88	12.76	0.47
		Bot.	5.97	12.21	4.88	12.82	0.47

Notes

- * Torsion is not considered for design.
- * Only columns with rectangular or circular sections are designed.
- * Each column is verified considering only the forces at the ends of the member.
- * The transverse reinforcement is ordered from bottom to top of the column.
- * L_u = Unsupported length.
- * K = Effective length factor.
- * C_m = A factor relating actual moment diagram to an equivalent uniform moment diagram.
- * Sway = True if column is considered unbraced in its local axis.
- * M_c = Factored moment to be used for design. Considers the slenderness effects of the column. $M_c = M_u \cdot \delta_{ns}$.
- * δ_{n2} = Amplification factor to account for small P-delta effects ($P-\delta$).
- * M_n = Nominal moment strength.
- * $M_c / (\phi \cdot M_n)$ = Strength ratio. The bar graphs indicate the relative ratio of $M_c / (\phi \cdot M_n)$ for each load condition. If a bar is shown in red the ratio is greater than one.



Current Date: 03/07/2014 08:12 p.m.

Units system: Metric

File name: C:\Users\Coco\Dropbox\MC Soluciones Ingenieriles\Proyectos en Proceso\017- Sarmiento (Proyecto)\Ram\VF36.rcb\

Design Results

Reinforced concrete beams

GENERAL INFORMATION:

Design Code : ACI 318-2005

Load conditions included in the design:

id1 = 1.4DL
 id2 = 1.2DL+0.5LL+EQxpo+0.5EQzpo
 id3 = 1.2DL+0.5LL+EQxpo+0.5EQzne
 id4 = 1.2DL+0.5LL+EQxne+0.5EQzpo
 id5 = 1.2DL+0.5LL+EQxne+0.5EQzne
 id6 = 0.9DL+EQxpo+0.5EQzpo
 id7 = 0.9DL+EQxpo+0.5EQzne
 id8 = 0.9DL+EQxne+0.5EQzpo
 id9 = 0.9DL+EQxne+0.5EQzne
 id11 = 1.2DL+1.6LL
 id12 = 0.9DL+1.5V
 id13 = 1.2DL+0.5LL+0.5EQxpo+EQzpo
 id14 = 1.2DL+0.5LL+0.5EQxpo+EQzne
 id15 = 1.2DL+0.5LL+0.5EQxne+EQzpo
 id16 = 1.2DL+0.5LL+0.5EQxne+EQzne
 id17 = 0.9DL+0.5EQxpo+EQzpo
 id18 = 0.9DL+0.5EQxpo+EQzne
 id19 = 0.9DL+0.5EQxne+EQzpo
 id20 = 0.9DL+0.5EQxne+EQzne

Moment frame : Ordinary

Materials

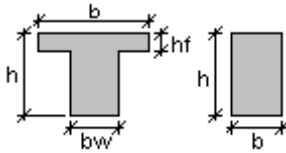
Concrete, f'c	: 0.21 [Ton/cm2]	Longitudinal reinforcement, fy	: 4.22 [Ton/cm2]
Concrete type	: Normal	Transversal reinforcement, fyt	: 4.22 [Ton/cm2]
Concrete elasticity modulus	: 219.50 [Ton/cm2]	Steel elasticity modulus	: 2038.89 [Ton/cm2]
Unit weight	: 2.40 [Ton/m3]	Epoxy coated	: No

DATA AND RESULTS

Status : OK

Geometry

Axis	Col position	Bottom width [cm]	Top width [cm]	Dist x [m]
1	Center	0.00	25.00	0.00
2	Center	0.00	40.00	2.63
3	Center	0.00	0.00	3.23
4	Center	0.00	0.00	4.08
5	Center	0.00	40.00	5.15
6	Center	0.00	40.00	7.30

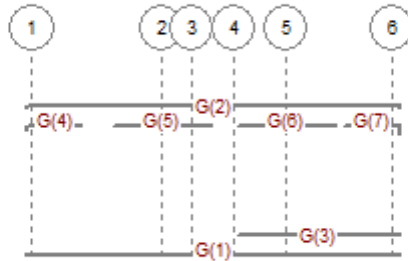


Span	Dist between axes [m]	Member No	Section	b [cm]	h [cm]	bw [cm]	hf [cm]
1-2	2.63	103	•	25.00	30.00	--	--
2-3	0.60	100	•	25.00	30.00	--	--
3-4	0.85	99	•	25.00	30.00	--	--
4-5	1.07	98	•	25.00	30.00	--	--
5-6	2.15	95	•	25.00	30.00	--	--

Rebar

Free cover : 2.00 [cm]

Longitudinal reinforcement



Group	Quantity	Diameter	Pos	Ref. Axis 1	Dist1 [m]	Ref. Axis 2	Dist2 [m]	Hook1	Hook2
1	2	12mm	Bottom	1	-0.10	6	0.15	Yes	Yes
2	2	12mm	Top	1	-0.10	6	0.15	Yes	Yes
3	1	12mm	Bottom	5	-1.00	6	0.15	No	No
4	1	12mm	Top	1	-0.10	1	1.00	Yes	No
5	2	12mm	Top	2	-1.00	2	1.00	No	No
6	2	12mm	Top	5	-1.00	5	1.00	No	No
7	1	12mm	Top	6	-1.00	6	0.15	No	Yes

Development and splice lengths

Group	Diameter	Ld [cm]	Ldh [cm]	Splice L. [cm]	Total L [m]
1	12mm	54.00	20.00	70.00	7.88
2	12mm	70.00	20.00	90.00	7.88
3	12mm	54.00	20.00	70.00	3.30
4	12mm	70.00	20.00	90.00	1.28
5	12mm	70.00	20.00	90.00	2.00
6	12mm	70.00	20.00	90.00	2.00
7	12mm	70.00	20.00	90.00	1.32

Transverse reinforcement

Span	Diameter	Quantity	c/ [cm]	Legs	Closed
1-2	6mm	21	13.00	2	Yes
2-3	6mm	6	11.00	2	Yes
3-4	6mm	7	13.00	2	Yes
4-5	6mm	9	13.00	2	Yes

5-6 6mm 17 13.00 2 Yes

Initial spacing of stirrups:

Span	Initial S [cm]	Sin lim [cm]
0-1	1.50	14.00
1-2	2.50	14.00
2-3	3.50	14.00
3-4	1.50	14.00
4-5	3.50	14.00

FLEXURE

Span: 1-2

Member No: 103

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

ρ maxtop = 1.55%

ρ maxbot = 1.55%

Limit spacing between bars for cracking control:

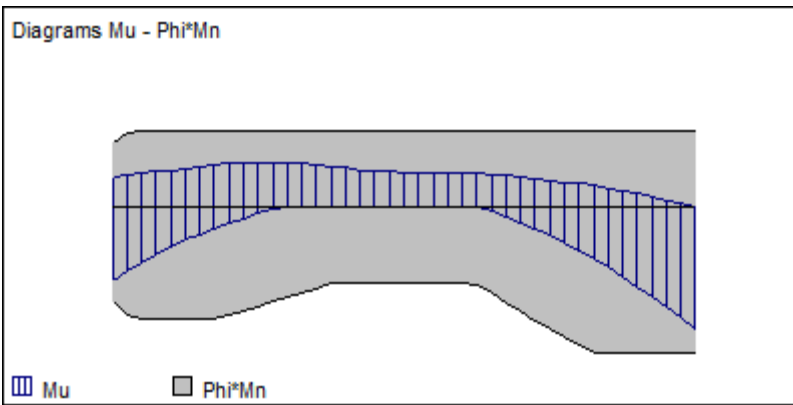
sb lim = 30.48 [cm]

Positive bending moments

Station No. Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1 0%	26.80	0.85	1.87	1.13	1.90	0.28	16.20	0.78
2 10%	26.80	1.07	2.21	1.43	2.26	0.34	16.20	0.49
3 20%	26.80	1.26	2.21	1.68	2.26	0.34	16.20	0.57
4 30%	26.80	1.29	2.21	1.73	2.26	0.34	16.20	0.58
5 40%	26.80	1.14	2.21	1.52	2.26	0.34	16.20	0.52
6 50%	26.80	1.02	2.21	1.35	2.26	0.34	16.20	0.46
7 60%	26.80	0.99	2.21	1.32	2.26	0.34	16.20	0.45
8 70%	26.80	0.88	2.21	1.17	2.26	0.34	16.20	0.40
9 80%	26.80	0.68	2.21	0.90	2.26	0.34	16.20	0.31
10 90%	26.80	0.39	2.21	0.52	2.26	0.34	16.20	0.55
11 100%	26.80	0.00	2.21	0.00	2.26	0.34	16.20	0.84
C 100%	26.80	0.00	2.21	0.00	2.26	0.34	16.20	0.84

Negative bending moments

Station No. Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1 0%	26.80	-2.13	-2.75	2.23	2.85	0.43	7.50	0.78
2 10%	26.80	-1.16	-3.24	1.56	3.39	0.51	7.50	0.49
3 20%	26.80	-0.47	-3.14	0.62	3.28	0.49	7.50	0.57
4 30%	26.80	0.00	-2.63	0.00	2.71	0.40	7.50	0.58
5 40%	26.80	0.00	-2.21	0.00	2.26	0.34	7.50	0.52
6 50%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.46
7 60%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.45
8 70%	26.80	-0.45	-3.04	0.60	3.17	0.47	4.60	0.40
9 80%	26.80	-1.26	-4.04	1.69	4.30	0.64	4.60	0.31
10 90%	26.80	-2.31	-4.23	2.37	4.52	0.67	4.60	0.55
11 100%	26.80	-3.54	-4.23	3.72	4.52	0.67	4.60	0.84
C 100%	26.80	-3.54	-4.23	3.72	4.52	0.67	4.60	0.84



Span: 2-3

Member No: 100

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

ρ maxtop = 1.55%

ρ maxbot = 1.55%

Limit spacing between bars for cracking control:

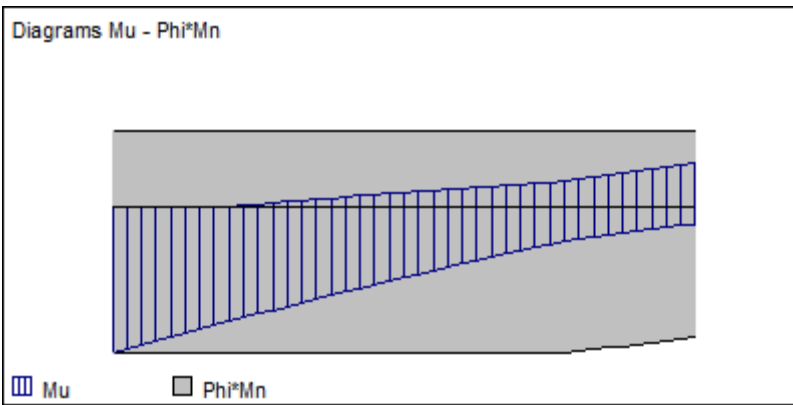
sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	26.80	0.00	2.21	0.00	2.26	0.34	16.20	1.00
2	10%	26.80	0.00	2.21	0.00	2.26	0.34	16.20	0.89
3	20%	26.80	0.02	2.21	0.02	2.26	0.34	16.20	0.79
4	30%	26.80	0.16	2.21	0.21	2.26	0.34	16.20	0.68
5	40%	26.80	0.29	2.21	0.38	2.26	0.34	16.20	0.58
6	50%	26.80	0.42	2.21	0.55	2.26	0.34	16.20	0.49
7	60%	26.80	0.53	2.21	0.71	2.26	0.34	16.20	0.39
8	70%	26.80	0.65	2.21	0.86	2.26	0.34	16.20	0.30
9	80%	26.80	0.82	2.21	1.08	2.26	0.34	16.20	0.37
10	90%	26.80	1.06	2.21	1.41	2.26	0.34	16.20	0.48
11	100%	26.80	1.30	2.21	1.75	2.26	0.34	16.20	0.59
C	0%	26.80	0.00	2.21	0.00	2.26	0.34	16.20	1.00

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	26.80	-4.22	-4.23	4.51	4.52	0.67	4.60	1.00
2	10%	26.80	-3.77	-4.23	3.98	4.52	0.67	4.60	0.89
3	20%	26.80	-3.33	-4.23	3.48	4.52	0.67	4.60	0.79
4	30%	26.80	-2.90	-4.23	3.01	4.52	0.67	4.60	0.68
5	40%	26.80	-2.47	-4.23	2.54	4.52	0.67	4.60	0.58
6	50%	26.80	-2.06	-4.23	2.23	4.52	0.67	4.60	0.49
7	60%	26.80	-1.66	-4.23	2.23	4.52	0.67	4.60	0.39
8	70%	26.80	-1.26	-4.23	1.69	4.52	0.67	4.60	0.30
9	80%	26.80	-0.94	-4.21	1.25	4.50	0.67	4.60	0.37
10	90%	26.80	-0.71	-3.99	0.94	4.24	0.63	4.60	0.48
11	100%	26.80	-0.50	-3.77	0.66	3.98	0.59	4.60	0.59
C	0%	26.80	-4.22	-4.23	4.51	4.52	0.67	4.60	1.00



Span: 3-4

Member No: 99

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

ρ maxtop = 1.55%

ρ maxbot = 1.55%

Limit spacing between bars for cracking control:

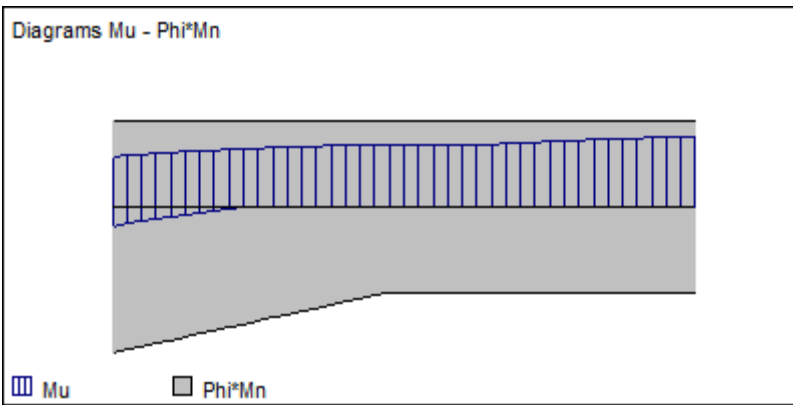
sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	26.80	1.30	2.21	1.75	2.26	0.34	16.20	0.59
2	10%	26.80	1.40	2.21	1.89	2.26	0.34	16.20	0.64
3	20%	26.80	1.49	2.21	2.00	2.26	0.34	16.20	0.67
4	30%	26.80	1.55	2.21	2.09	2.26	0.34	16.20	0.70
5	40%	26.80	1.59	2.21	2.15	2.26	0.34	16.20	0.72
6	50%	26.80	1.62	2.21	2.18	2.26	0.34	16.20	0.73
7	60%	26.80	1.62	2.21	2.19	2.26	0.34	16.20	0.74
8	70%	26.80	1.66	2.21	2.23	2.26	0.34	16.20	0.75
9	80%	26.80	1.73	2.21	2.23	2.26	0.34	16.20	0.79
10	90%	26.80	1.79	2.21	2.23	2.26	0.34	16.20	0.81
11	100%	26.80	1.81	2.21	2.23	2.26	0.34	16.20	0.82
C	100%	26.80	1.81	2.21	2.23	2.26	0.34	16.20	0.82

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm ²]	Asprov [cm ²]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	26.80	-0.50	-3.77	0.66	3.98	0.59	4.60	0.59
2	10%	26.80	-0.26	-3.44	0.34	3.61	0.54	4.60	0.64
3	20%	26.80	-0.03	-3.12	0.04	3.25	0.48	4.60	0.67
4	30%	26.80	0.00	-2.79	0.00	2.88	0.43	4.60	0.70
5	40%	26.80	0.00	-2.45	0.00	2.52	0.38	4.60	0.72
6	50%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.73
7	60%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.74
8	70%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.75
9	80%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.79
10	90%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.81
11	100%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.82
C	100%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.82



Span: 4-5

Member No: 98

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

ρ maxtop = 1.55%

ρ maxbot = 1.55%

Limit spacing between bars for cracking control:

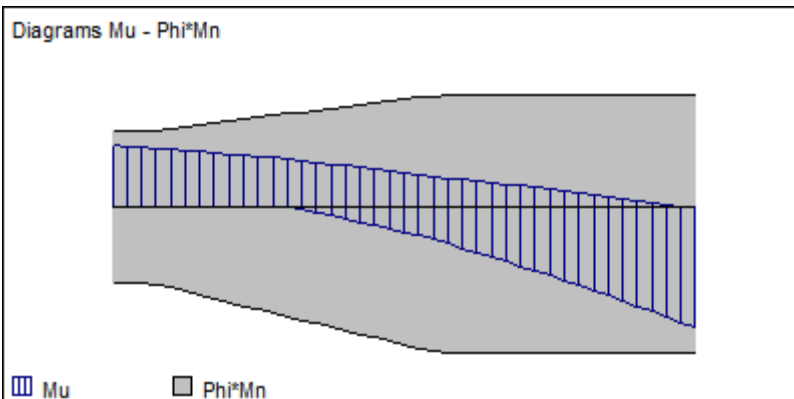
sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	26.80	1.83	2.21	2.23	2.26	0.34	16.20	0.83
2	10%	26.80	1.67	2.28	2.23	2.34	0.35	7.50	0.73
3	20%	26.80	1.54	2.50	2.08	2.57	0.38	7.50	0.62
4	30%	26.80	1.38	2.71	1.86	2.80	0.42	7.50	0.51
5	40%	26.80	1.20	2.92	1.60	3.03	0.45	7.50	0.41
6	50%	26.80	0.98	3.13	1.30	3.26	0.49	7.50	0.31
7	60%	26.80	0.79	3.24	1.05	3.39	0.51	7.50	0.28
8	70%	26.80	0.61	3.24	0.81	3.39	0.51	7.50	0.41
9	80%	26.80	0.41	3.24	0.55	3.39	0.51	7.50	0.54
10	90%	26.80	0.19	3.24	0.25	3.39	0.51	7.50	0.68
11	100%	26.80	0.00	3.24	0.00	3.39	0.51	7.50	0.83
C	0%	26.80	1.83	2.21	2.23	2.26	0.34	16.20	0.83

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.83
2	10%	26.80	0.00	-2.36	0.00	2.42	0.36	4.60	0.73
3	20%	26.80	0.00	-2.78	0.00	2.88	0.43	4.60	0.62
4	30%	26.80	0.00	-3.20	0.00	3.34	0.50	4.60	0.51
5	40%	26.80	-0.34	-3.61	0.45	3.80	0.57	4.60	0.41
6	50%	26.80	-0.73	-4.01	0.97	4.26	0.64	4.60	0.31
7	60%	26.80	-1.20	-4.23	1.60	4.52	0.67	4.60	0.28
8	70%	26.80	-1.73	-4.23	2.23	4.52	0.67	4.60	0.41
9	80%	26.80	-2.29	-4.23	2.35	4.52	0.67	4.60	0.54
10	90%	26.80	-2.88	-4.23	2.99	4.52	0.67	4.60	0.68
11	100%	26.80	-3.51	-4.23	3.68	4.52	0.67	4.60	0.83
C	0%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.83



Span: 5-6

Member No: 95

Percentage of moment redistribution

Support A = 0.00%

Support B = 0.00%

Code specified max Rho:

ρ maxtop = 1.55%

ρ maxbot = 1.55%

Limit spacing between bars for cracking control:

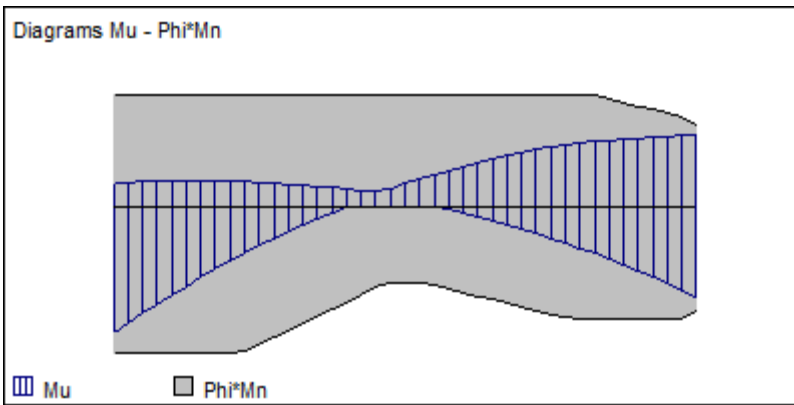
sb lim = 30.48 [cm]

Positive bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	26.80	0.68	3.24	0.90	3.39	0.51	7.50	0.87
2	10%	26.80	0.76	3.24	1.01	3.39	0.51	7.50	0.61
3	20%	26.80	0.75	3.24	1.00	3.39	0.51	7.50	0.37
4	30%	26.80	0.65	3.24	0.86	3.39	0.51	7.50	0.20
5	40%	26.80	0.53	3.24	0.70	3.39	0.51	7.50	0.16
6	50%	26.80	0.68	3.24	0.90	3.39	0.51	7.50	0.21
7	60%	26.80	1.19	3.24	1.59	3.39	0.51	7.50	0.37
8	70%	26.80	1.58	3.24	2.13	3.39	0.51	7.50	0.49
9	80%	26.80	1.85	3.24	2.23	3.39	0.51	7.50	0.57
10	90%	26.80	2.00	2.93	2.23	3.04	0.45	7.50	0.68
11	100%	26.80	2.11	2.37	2.23	2.44	0.36	7.50	0.89
C	100%	26.80	2.11	2.37	2.23	2.44	0.36	7.50	0.89

Negative bending moments

Station No.	Dist	d[cm]	Mu[Ton*m]	ϕ *Mn[Ton*m]	Asreq [cm2]	Asprov [cm2]	ρ (%)	sb [cm]	Mu/(ϕ *Mn)
1	0%	26.80	-3.68	-4.23	3.89	4.52	0.67	4.60	0.87
2	10%	26.80	-2.57	-4.23	2.65	4.52	0.67	4.60	0.61
3	20%	26.80	-1.58	-4.23	2.13	4.52	0.67	4.60	0.37
4	30%	26.80	-0.71	-3.60	0.94	3.79	0.57	4.60	0.20
5	40%	26.80	-0.02	-2.77	0.03	2.86	0.43	4.60	0.16
6	50%	26.80	0.00	-2.21	0.00	2.26	0.34	16.20	0.21
7	60%	26.80	-0.19	-2.49	0.25	2.56	0.38	7.50	0.37
8	70%	26.80	-0.65	-2.91	0.86	3.02	0.45	7.50	0.49
9	80%	26.80	-1.20	-3.24	1.61	3.39	0.51	7.50	0.57
10	90%	26.80	-1.84	-3.24	2.23	3.39	0.51	7.50	0.68
11	100%	26.80	-2.65	-3.05	2.73	3.17	0.47	7.50	0.89
C	100%	26.80	-2.65	-3.05	2.73	3.17	0.47	7.50	0.89

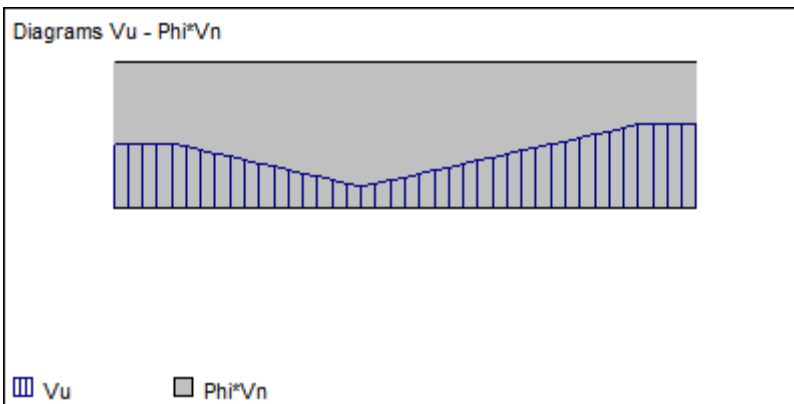


SHEAR AND TORSION

Span: 1-2

Member No: 103

Station		Stirrups		Spc prov	Spc lim	Tu	ϕ^*T_n	AI	Vu	Vs	Vc	ϕ^*V_n	$V_u/(\phi^*V_n)$
No.	Dist	Diam	VCT	[cm]	[cm]	[Ton*m]	[Ton*m]	[cm ²]	[Ton]	[Ton]	[Ton]	[Ton]	
1	0%	6mm	V	13.00	13.40	0.01	0.61	0.00	3.34	4.92	5.16	7.56	0.44
2	10%	6mm	V	13.00	13.40	0.01	0.61	0.00	3.34	4.92	5.16	7.56	0.44
3	20%	6mm	V	13.00	13.40	0.01	0.61	0.00	2.67	4.92	5.16	7.56	0.35
4	30%	6mm	V	13.00	13.40	0.01	0.61	0.00	1.98	4.92	5.16	7.56	0.26
5	40%	6mm		13.00	13.40	0.01	0.61	0.00	1.30	4.92	5.16	7.56	0.17
6	50%	6mm		13.00	13.40	0.01	0.61	0.00	1.60	4.92	5.16	7.56	0.21
7	60%	6mm	V	13.00	13.40	0.01	0.61	0.00	2.28	4.92	5.16	7.56	0.30
8	70%	6mm	V	13.00	13.40	0.01	0.61	0.00	2.96	4.92	5.16	7.56	0.39
9	80%	6mm	V	13.00	13.40	0.01	0.61	0.00	3.65	4.92	5.16	7.56	0.48
10	90%	6mm	V	13.00	13.40	0.01	0.53	0.00	4.32	4.92	5.16	7.56	0.57
11	100%	6mm	V	13.00	13.40	0.01	0.53	0.00	4.32	4.92	5.16	7.56	0.57
C	100%	6mm	V	13.00	13.40	0.01	0.53	0.00	4.32	4.92	5.16	7.56	0.57



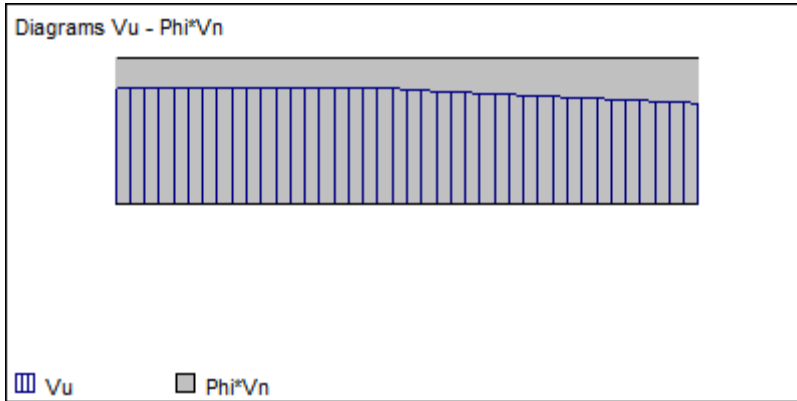
Span: 2-3

Member No: 100

Station		Stirrups		Spc prov	Spc lim	Tu	ϕ^*T_n	AI	Vu	Vs	Vc	ϕ^*V_n	$V_u/(\phi^*V_n)$
No.	Dist	Diam	VCT	[cm]	[cm]	[Ton*m]	[Ton*m]	[cm ²]	[Ton]	[Ton]	[Ton]	[Ton]	
1	0%	6mm	VT	11.00	11.45	0.16	0.28	2.47	6.56	5.82	5.16	8.23	0.80
2	10%	6mm	VT	11.00	11.45	0.16	0.28	2.47	6.56	5.82	5.16	8.23	0.80
3	20%	6mm	VT	11.00	11.45	0.16	0.28	2.47	6.56	5.82	5.16	8.23	0.80
4	30%	6mm	VT	11.00	11.45	0.16	0.28	2.47	6.56	5.82	5.16	8.23	0.80
5	40%	6mm	VT	11.00	11.45	0.16	0.28	2.47	6.56	5.82	5.16	8.23	0.80
6	50%	6mm	VT	11.00	11.45	0.16	0.29	2.47	6.47	5.82	5.16	8.23	0.79
7	60%	6mm	VT	11.00	11.45	0.16	0.32	2.47	6.32	5.82	5.16	8.23	0.77
8	70%	6mm	VT	11.00	11.45	0.16	0.34	2.47	6.16	5.82	5.16	8.23	0.75

9	80%	6mm	VT	11.00	11.45	0.16	0.37	2.47	6.00	5.82	5.16	8.23	0.73
10	90%	6mm	VT	11.00	11.45	0.16	0.39	2.47	5.85	5.82	5.16	8.23	0.71
11	100%	6mm	VT	11.00	11.45	0.16	0.42	2.47	5.69	5.82	5.16	8.23	0.69

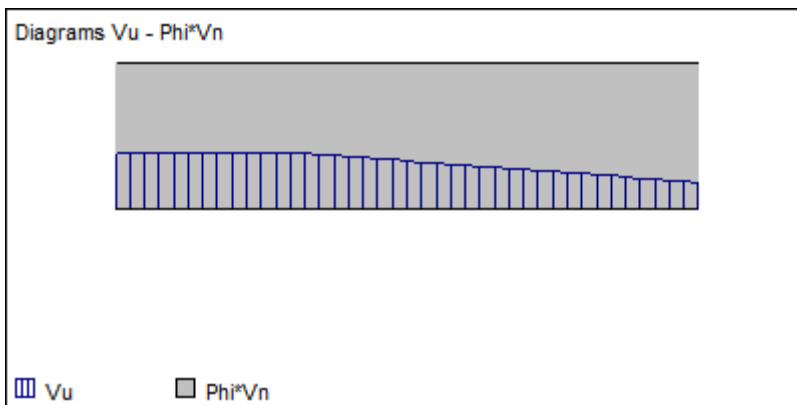
C	0%	6mm	VT	11.00	11.45	0.16	0.28	2.47	6.56	5.82	5.16	8.23	0.80



Span: 3-4 Member No: 99

Station No.	Dist	Stirrups Diam	Stirrups VCT	Spc prov [cm]	Spc lim [cm]	Tu [Ton*m]	ϕ^*Tn [Ton*m]	AI [cm ²]	Vu [Ton]	Vs [Ton]	Vc [Ton]	ϕ^*Vn [Ton]	$Vu/(\phi^*Vn)$
1	0%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.91	4.92	5.16	7.56	0.38
2	10%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.91	4.92	5.16	7.56	0.38
3	20%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.91	4.92	5.16	7.56	0.38
4	30%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.91	4.92	5.16	7.56	0.38
5	40%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.72	4.92	5.16	7.56	0.36
6	50%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.50	4.92	5.16	7.56	0.33
7	60%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.28	4.92	5.16	7.56	0.30
8	70%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.05	4.92	5.16	7.56	0.27
9	80%	6mm		13.00	13.40	0.05	0.61	0.00	1.83	4.92	5.16	7.56	0.24
10	90%	6mm		13.00	13.40	0.05	0.61	0.00	1.61	4.92	5.16	7.56	0.21
11	100%	6mm		13.00	13.40	0.05	0.61	0.00	1.39	4.92	5.16	7.56	0.18

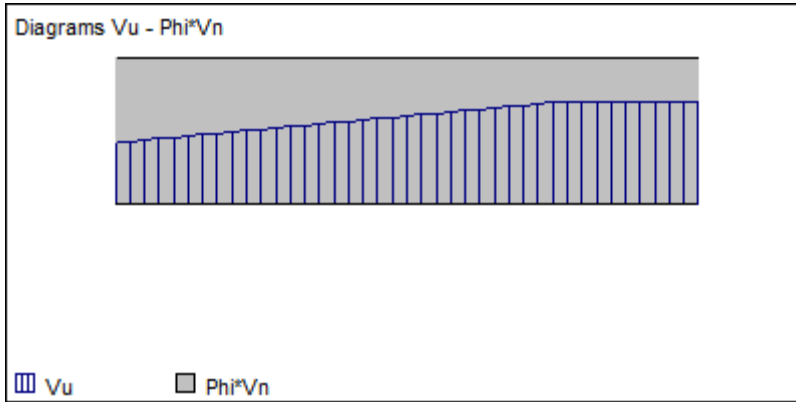
C	0%	6mm	V	13.00	13.40	0.05	0.61	0.00	2.91	4.92	5.16	7.56	0.38



Span: 4-5 Member No: 98

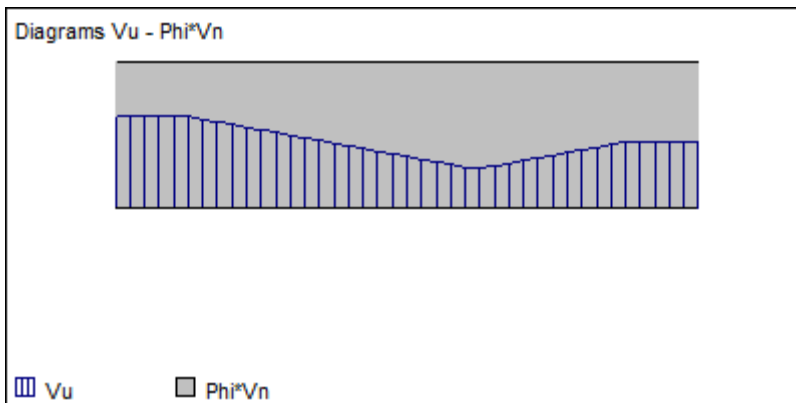
Station No.	Dist	Stirrups Diam	Stirrups VCT	Spc prov [cm]	Spc lim [cm]	Tu [Ton*m]	ϕ^*Tn [Ton*m]	AI [cm ²]	Vu [Ton]	Vs [Ton]	Vc [Ton]	ϕ^*Vn [Ton]	$Vu/(\phi^*Vn)$
1	0%	6mm	V	13.00	13.40	0.10	0.61	0.00	3.18	4.92	5.16	7.56	0.42
2	10%	6mm	V	13.00	13.40	0.10	0.61	0.00	3.45	4.92	5.16	7.56	0.46
3	20%	6mm	V	13.00	13.40	0.10	0.61	0.00	3.73	4.92	5.16	7.56	0.49
4	30%	6mm	V	13.00	13.40	0.10	0.58	0.00	4.01	4.92	5.16	7.56	0.53

5	40%	6mm	V	13.00	13.40	0.10	0.54	0.00	4.29	4.92	5.16	7.56	0.57
6	50%	6mm	V	13.00	13.40	0.10	0.49	0.00	4.57	4.92	5.16	7.56	0.60
7	60%	6mm	V	13.00	13.40	0.10	0.45	0.00	4.85	4.92	5.16	7.56	0.64
8	70%	6mm	V	13.00	13.40	0.10	0.40	0.00	5.13	4.92	5.16	7.56	0.68
9	80%	6mm	V	13.00	13.40	0.10	0.38	0.00	5.26	4.92	5.16	7.56	0.70
10	90%	6mm	V	13.00	13.40	0.10	0.38	0.00	5.26	4.92	5.16	7.56	0.70
11	100%	6mm	V	13.00	13.40	0.10	0.38	0.00	5.26	4.92	5.16	7.56	0.70
C	100%	6mm	V	13.00	13.40	0.10	0.38	0.00	5.26	4.92	5.16	7.56	0.70



Span: 5-6 Member No: 95

Station No.	Dist	Stirrups Diam	VCT	Spc prov [cm]	Spc lim [cm]	Tu [Ton*m]	$\phi*Tn$ [Ton*m]	AI [cm ²]	Vu [Ton]	Vs [Ton]	Vc [Ton]	$\phi*Vn$ [Ton]	$Vu/(\phi*Vn)$
1	0%	6mm	V	13.00	13.40	0.02	0.46	0.00	4.76	4.92	5.16	7.56	0.63
2	10%	6mm	V	13.00	13.40	0.02	0.46	0.00	4.76	4.92	5.16	7.56	0.63
3	20%	6mm	V	13.00	13.40	0.02	0.53	0.00	4.34	4.92	5.16	7.56	0.57
4	30%	6mm	V	13.00	13.40	0.02	0.61	0.00	3.78	4.92	5.16	7.56	0.50
5	40%	6mm	V	13.00	13.40	0.02	0.61	0.00	3.22	4.92	5.16	7.56	0.43
6	50%	6mm	V	13.00	13.40	0.02	0.61	0.00	2.66	4.92	5.16	7.56	0.35
7	60%	6mm	V	13.00	13.40	0.02	0.61	0.00	2.10	4.92	5.16	7.56	0.28
8	70%	6mm	V	13.00	13.40	0.02	0.61	0.00	2.46	4.92	5.16	7.56	0.33
9	80%	6mm	V	13.00	13.40	0.02	0.61	0.00	3.02	4.92	5.16	7.56	0.40
10	90%	6mm	V	13.00	13.40	0.02	0.61	0.00	3.45	4.92	5.16	7.56	0.46
11	100%	6mm	V	13.00	13.40	0.02	0.61	0.00	3.45	4.92	5.16	7.56	0.46
C	0%	6mm	V	13.00	13.40	0.02	0.46	0.00	4.76	4.92	5.16	7.56	0.63

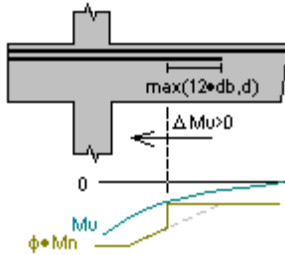


Notes

- * Only the design bending forces (M_u), shear forces (V_u) and torsion moments (T_u) are considered in the design.
- * Values shown in red are not in compliance with a provision of the code

* The positive and negative flexural reinforcement includes the longitudinal reinforcement required to resist torsion. Refer to the note below on the VCT column to determine when torsion and compression bars are provided. The longitudinal reinforcement area considers the minimum area required by Code (10.5).

* When the moments diagram increases in the same direction of the development length of the bars, the bars will not contribute to the member strength for a Code specified distance equal to $\max(12 \cdot d_b, d)$.



* If the section at which member flexural strength is being calculated is within the development length of a group of bars, the bars will contribute to the bending capacity an amount proportional to their actual length / their full development length.

* The transverse reinforcement is ordered from left to right.

* The program does not consider ACI318-05 section 12.11.3 whereby the bar diameter is limited according to the location of the bar cut-off.

* A_{sprov} is the provided reinforcement, considering the reduction due to the development length as described previously.

* "C" shows the span critical station.

* L_d, L_{dh} = Development length of each bar. If the bar ends with a hook, it considers the L_{dh} length.

* Splice lengths shown are not reduced by the factor A_{sreq}/A_{sprov} .

* s_b = Free distance between top or bottom bars corresponding to the layer closest to the extreme face of the beam (layer1). It is not calculated when there is only one bar.

* Stirrups VCT = Flag that determines if stirrups are required to resist shear forces (V), torsion (T) or to confine the longitudinal compression bars from buckling (C).

* Closed = Flag that indicates if the stirrups are closed (yes) or open (no).

* $M_u/(\phi \cdot M_n)$ = Critical strength ratio for the station. If the value is in red, it is larger than 1.0

* A_l = Total additional longitudinal reinforcement required by torsion.

* S_{pa} = stirrup spacing provided by the user.

* $S_{pa\ lim}$ = spacing limits due to geometry. (11.5.5.1, 11.5.5.3, 21.3.3.2, 21.12.4.2)