ANEXO DE CÁLCULOS

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1 – GENERALIDADES

Os cálculos efectuados para verificar a estabilidade das obras de arte objecto do presente projecto e proceder ao dimensionamento dos seus elementos estruturais, foram feitos recorrendo á legislação Portuguesa em vigor e utilizando um programa de cálculo automático na determinação dos esforços da estrutura porticada que modula as estruturas em causa.

A verificação da estabilidade é feita em domínio elástico e o cálculo dos elementos do betão armado é efectuado á ruptura.

As acções consideradas na análise estrutural foram:

Permanentes

Peso próprio dos elementos

Impulso de terras adjacentes

Variáveis

Sobrecarga do veículo tipo - classe I

Sobrecarga distribuida de 4 KN/m2 e acção pontual de 50 KN

Frenagem

Sismo

As combinações de acções utilizadas na análise foram:

C1: 1.35* (permanentes)+1.5*(sobrecarga distrubuida+carga pontual)+ 1.5* frenagem

C2: 1.5*(permanentes) + 1.5 veículo tipo

C3: 1.0* (permanentes) + 1.5 (sismos) + 0.6* (sobrecarg uniforme + acção pontual de 50 KN).

A análise do pórtico é feita por metro linear da sua largura.

Quantificação das acções:

a) Pesos próprios 14.4 KN/m2

b) Impulsos de terras :

Sobrecarga nos aterros : 10 KN/m2

γ = 18 KN/m3 Φ= 35 graus Ka = 0.27 Ko = 0.50

Tensão do terreno na parte superior do montante : 2.7 KN/m2

Tensão do terreno na parte inferior do montante: 9*h KN/m2

c) Veículo tipo

A acção de cada fiada de rodado é admitida ditribuida por dois metros de largura de laje.

Assim, por roda e por metro de largura de laje serão 50 KN.

d) Frenagem

30 KN/m de largura do tabuleiro

e) Acção sísmica

$\beta = \beta o * \alpha / \eta$ α = 1.0 --- Zona A Tipo de terreno.... III η =2.0

f = 12 Hz βo =0.32 F = 0.18 * Peso

Modulação estrutural

As estruturas porticadas foram dicretizadas em vários elementos e o vão utilizado o segundo o viez, quando exista.

Após os resultados do cálculo automático os esforços foram combinados de modo a reter para cada elemento o esforço mais gravoso, base do seu dimensionamento.

Os materiais utilizados são o betão armado, integrado pelo betão C 25/30 e aço A500 NR.

2 – O.A.1

Os esforços condicionantes no dimensionamento da presente estrutura são:

a) Pórtico

Montantes:

Secção da base Nsd = 309 KN Vsd = 139 KN Msd = 186 KN

Dimensionamento á flexão composta com compressão:

υ = 0.0308 μ = 0.0309 ω = 0.05 As = 11.5 cm2

Tabuleiro:

Secção no apoio: Msd = -541 KN.m Msd/bd2 =1788 ρ = 0.44 As = 24.2 cm2

Secção a meio vão: Msd = 409 KN.m Msd/bd2 = 1352 ρ = 0.33 As = 18.15 cm2

O valor máximo do corte no tabuleiro verifica-se para a situação do veículo tipo colocado junto aos apoios:

Vsd= 348 KN/m

O valor resistente da laje do tabuleiro só com a contribuição do betão é de 260 KN/m .

Há que absorver 90KN com armaduras de aço:

Vwd=.9*.55*Asw*435000/.30 Asw=1.25 cm2/m

Fundações:

Espessura = 0.70 m largura = 3.0 m

Esforços na base do montante Nsd = 361 KN Msd = 186 KN.m

Tensões no terreno σ1 = 244 KN/m2 σ2 = -4 KN/m2

Esforços na sapata: Msd = 141 KN.m Msd/bd2 = 333 ρ = 0.078 As = 5.07 cm2

Verificação ao punçoamento:

Vrd = 0.6 * (1.6-0.6)*750*0.6*2 = 540 KN/m > 360 KN/m (carga de punçoamento).

b) Muretes de ala

Estas peças constam de consolas com a espessura de 0.30 m , sob a acção do impulso das terras

Msd = 30 KN.m Msd/bd2 = 420 ρ = 0.10 As = 2.7 cm2

3 – O.A.2

As acções nesta obra de arte são idênticas ás das O.A.1 e O.A.3 excepto no impulso de terras nos montantes por estes apresentarem uma maior altura:

Tensão das terras na parte superior dos montantes σ1 = 2.7 KN/m2
Tensão das terras na parte inferior dos montantes σ2 = 58.5 KN/m2

a) Pórtico

Momentos:

A meio vão Msd = 239 KN/m
No apoio da laje Msd = - 255 KN/m
Na base do montante Msd = -235 KN/m

Esforços transversos:

No apoio da laje Vsd = 191 KN
No montante Vsd = 199 KN

Esforços axiais:

No tabuleiro Nsd = 119 KN/m
Base do montante Nsd = 191 KN/m

Em relação aos esforços verificados na O.A.3 vê-se que os presentes embora semelhantes lhes são inferiores, pelo que se reterão aqueles no dimensionamento, excepto os da base do montante.

Nsd = 272 KN Msd = 253 KN.m

Ánalise em flexão composta: υ = 0.325 μ = 0.0562 ω = 0.10 As = A´s= 10 cm2

Esforços na base do montante Nsd = 272 KN Msd = 235 KN.m

Tensões no solo $\sigma 1 = 335$ KN/m2 $\sigma 2 = -117$ KN/m2 σ ref = 258 KN/m2

Armaduras Msd = 129 KN.m Msd/bd2 = 637 $\rho = 0.15$ As = 6.75 cm2

Vigas de bordadura:

Viga de montante altura: 1.20 m largura: 0.30 m

Viga curva com raio de 12.5 m. $\alpha = 22.5$ graus L = 13.0 m

Esforços: $X = q\ r^2\ ((2^* \sin \alpha - \alpha * \cos \alpha)/ \alpha - 1)$

$M = X \cos \varphi - q\ r^2\ (1 - \cos \varphi)$

$Mt = X \sin \varphi - q\ r^2\ (\varphi - \sin \varphi)$

X = 178 M = 178 KN.m Mt = 10 Kn.m M(-) = -311 KN.m

V = 260 KN

Abordando a anàlise como viga recta porticada

Msd (-) = - 325 KN.m e Msd(+) = 398 KN.m

Dimensionamento das armaduras:

M(-) = -325 M/bd2 = 820 $\rho = 0.20$ As = 7 cm2

M(+) = 398 M/bd2 = 1003 $\rho = 0.243$ As = 8.4 cm2

Vcd = 260 KN Vwd = 101 KN

Mom . torsor resistente:

def = 0.24 def/12 = 0.02 hef = 0.04 Aef =0.30 m2

Tcd = 18 KN

Com estribos 8 mm espeçados de 0.20 m temos Ttd = 130 KN.

Trd = Tcd + Ttd

Excede largamente o momento torsor actuante.

Viga de bordo de jusante:

Idem , com L = 9.60 m

Msd = 206 Msd/bd2 = 520 ρ = 0.125 As = 4.3 cm2

Msd = -257 Msd/bd2 = 650 ρ = 0.155 As = 5.3 cm2

Mt = 5 KN.m

Foi feita uma análise á altura de terra máxima possível colocar sobre a laje, na zona central da rotunda, a fim de não exceder os esforços mais gravosos verificados anteriormente, tendo-se concluido ser de 1.20 m .

b) MUROS DE ALA

Vamos verificar a estabilidade dos muros de ala para as alturas de 7 m , 5.5 m , 4 m e 3m.

As acções consideradas são o impulso activo das terras sobre os muros levando em conta a acção sísmica calculada pelo método de Mononobe-Okabe e ainda uma sobrecarga uniforme sobre o aterro de 10 KN/m2.

MURO com H= 7.0 m

Espessura na base: 0.6 m Largura da sapata: 3.5 m

Impulsos, I = 123.3 KN Acréscimo sísmico, Io = 51.5 KN

a) Verificação da segurança ao derrube

Mder = 521 KN

Mest = 857 KN

Coef. de seg. ao derrube : 1.64

b) Verificação da seg. ao deslizamento

P * tg Φ ≥ I + Io

312.2 ≥ 174.8

Coef. de seg. ao deslizamento : 1.79

c) Tensões no solo

M = 365 KN.m
N = 446 KN

σ 1 = 305 KN/m2 σ 2 = -51 KN/m2

d) Armaduras

h = 0.60 m M = 521 KN.m M/bh2 = 1722 ρ = 0.43 As = 23.6 cm2

MURO com H= 5.5 m

Espessura na base: 0.5 m Largura da sapata: 3.0 m

Impulsos, I = 81.7 KN Acréscimo sísmico, Io = 1.05*h*h KN

a) Verificação da segurança ao derrube

Mder = 254 KN

Mest = 502 KN

Coef. de seg. ao derrube : 1.98

b) Verificação da seg. ao deslizamento

P * tg Φ ≥ I + Io

213 ≥ 113

Coef. de seg. ao deslizamento : 1.88

c) Tensões no solo

M = 210 KN.m
N = 305 KN

σ 1 = 241 KN/m2 σ 2 = - 39 KN/m2

d) Armaduras

h = 0.50 m M = 305 KN.m M/bh2 = 1506 ρ = 0.37 As = 16.6 cm2

MURO com H= 4.0 m

Espessura na base: 0.45 m Largura da sapata: 2.20 m

Impulsos, I = 43.2 KN Acréscimo sísmico, Io = 1.05*h*h KN

a) Verificação da segurança ao derrube

Mder = 97 KN

Mest = 191 KN

Coef. de seg. ao derrube : 1.96

b) Verificação da seg. ao deslizamento

P * tg Φ ≥ I + Io

103.7 ≥ 60

Coef. de seg. ao deslizamento : 1.72

c) Armaduras

h = 0.45 m M = 117 KN.m M/bh2 = 902 ρ = 0.22 As = 7.8 cm2

MURO com H= 3.0 m

Espessura na base: 0.40 m Largura da sapata: 1.70 m

Impulsos, I = 24.3 KN Acréscimo sísmico, Io = 9.5 KN

a) Verificação da segurança ao derrube

Mder = 50 KN

Mest = 86.4 KN

Coef. de seg. ao derrube : 1.73

b) Verificação da seg. ao deslizamento

$P * tg \Phi \geq I + Io$

$57.9 \geq 33.8$

Coef. de seg. ao deslizamento : 1.71

c) Armaduras

h = 0.4 m M = 50 KN.m M/bh2 = 686 $\rho = 0.16$ As = 4.3 cm2

4 – O.A.3

Do mesmo modo que as outras obras de arte , apresentam-se a seguir os esforços condicionantes no dimensionamento dos elementos desta estrutura

a) Pórtico

Montantes:

Secção da base Nsd = 243 KN Vsd = 82 KN Msd = - 45 KN e + 63 KN

Dimensionamento á flexão composta com compressão:

$\upsilon = 0.029$ $\mu = 0.026$ $\omega = 0.0313$ As = 6 cm2

Tabuleiro:

Secção no apoio: Msd = -298 KN.m Msd/bd2 =1408 ρ = 0.345 As = 15.9 cm2

Secção a meio vão: Msd = 279 KN.m Msd/bd2 = 1318 ρ = 0.325 As = 15 cm2

O valor máximo do corte no tabuleiro verifica-se para a situação do veículo tipo colocado junto aos apoios:

Vsd= 217 KN/m

O valor resistente da laje do tabuleiro só com a contribuição do betão é de 235 KN/m .

Fundações:

Espessura = 0.60 m largura = 2.5 m

Esforços na base do montante Nsd = 280 KN Msd = 108 KN.m

Tensões no terreno σ1 = 218 KN/m2 σ2 = 8 KN/m2

Esforços na sapata: Msd = 87 KN.m Msd/bd2 = 287 ρ = 0.068 As = 3.8 cm2

Verificação ao punçoamento:

Vrd = 0.6 * (1.6-0.5)*750*0.5*2 = 495 KN/m > 97 KN/m (carga de punçoamento).

b) Muretes de ala

Estas peças constam de consolas com a espessura de 0.30 m , sob a acção do impulso das terras

Msd = 30 KN.m Msd/bd2 = 420 ρ = 0.10 As = 2.7 cm2

Nas páginas anexas a esta memória são apresentadas as listagens do cálculo automático para cada obra.

\PORTICOS\OA1A.EST

nos	X(m)	Y(m)
1	0.000	0.000
2	0.000	2.050
3	0.000	4.100
4	1.400	4.100
5	2.900	4.100
6	4.400	4.100
7	5.900	4.100
8	7.400	4.100
9	8.900	4.100
10	10.400	4.100
11	11.800	4.100
12	11.800	2.050
13	11.800	0.000

Tipos	Elast(KN/m2)	Iner(m4)	Area(m2)
1	3.05E+07	1.80E-02	6.00E-01

Barras	Ext1	Ext2	Tipo
1	1	2	1
2	2	3	1
3	3	4	1
4	4	5	1
5	5	6	1
6	6	7	1
7	7	8	1
8	8	9	1
9	9	10	1
10	10	11	1
11	12	11	1
12	13	12	1

Ap.rig.	No	X	Y	R
1	1	1	1	1
2	13	1	1	1

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	3	0.000	1.400	1.69E+01	1.69E+01	1
2	4	0.000	1.500	1.69E+01	1.69E+01	1
3	5	0.000	1.500	1.69E+01	1.69E+01	1
4	6	0.000	1.500	1.69E+01	1.69E+01	1
5	7	0.000	1.500	1.69E+01	1.69E+01	1
6	8	0.000	1.500	1.69E+01	1.69E+01	1
7	9	0.000	1.500	1.69E+01	1.69E+01	1
8	10	0.000	1.400	1.69E+01	1.69E+01	1

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-1.53E-04	-1.12E-05	7.24E-05
3	1.95E-05	-2.23E-05	-3.18E-04
4	1.49E-05	-6.87E-04	-5.79E-04
5	9.91E-06	-1.57E-03	-5.59E-04
6	4.96E-06	-2.26E-03	-3.31E-04
7	0.00E+00	-2.51E-03	0.00E+00
8	-4.96E-06	-2.26E-03	3.31E-04
9	-9.91E-06	-1.57E-03	5.59E-04
10	-1.49E-05	-6.87E-04	5.79E-04
11	-1.95E-05	-2.23E-05	3.18E-04
12	1.53E-04	-1.12E-05	-7.24E-05
13	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-9.97E+01	-6.05E+01	8.13E+01	-9.97E+01	-6.05E+01	-4.26E+01
2	2	3	-9.97E+01	-6.05E+01	-4.26E+01	-9.97E+01	-6.05E+01	-1.67E+02
3	3	4	-6.05E+01	9.97E+01	-1.67E+02	-6.05E+01	7.60E+01	-4.35E+01
4	4	5	-6.05E+01	7.60E+01	-4.35E+01	-6.05E+01	5.07E+01	5.16E+01
5	5	6	-6.05E+01	5.07E+01	5.16E+01	-6.05E+01	2.54E+01	1.09E+02
6	6	7	-6.05E+01	2.54E+01	1.09E+02	-6.05E+01	0.00E+00	1.28E+02
7	7	8	-6.05E+01	0.00E+00	1.28E+02	-6.05E+01	-2.53E+01	1.09E+02
8	8	9	-6.05E+01	-2.54E+01	1.09E+02	-6.05E+01	-5.07E+01	5.16E+01
9	9	10	-6.05E+01	-5.07E+01	5.16E+01	-6.05E+01	-7.61E+01	-4.35E+01
10	10	11	-6.05E+01	-7.61E+01	-4.35E+01	-6.05E+01	-9.97E+01	-1.67E+02
11	12	11	-9.97E+01	6.05E+01	4.26E+01	-9.97E+01	6.05E+01	1.67E+02
12	13	12	-9.97E+01	6.05E+01	-8.13E+01	-9.97E+01	6.05E+01	4.26E+01

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	3	0.000	1.400	1.69E+01	1.69E+01	1
2	4	0.000	1.500	1.69E+01	1.69E+01	1
3	5	0.000	1.500	1.69E+01	1.69E+01	1
4	6	0.000	1.500	1.69E+01	1.69E+01	1
5	7	0.000	1.500	1.69E+01	1.69E+01	1
6	8	0.000	1.500	1.69E+01	1.69E+01	1
7	9	0.000	1.500	1.69E+01	1.69E+01	1
8	10	0.000	1.400	1.69E+01	1.69E+01	1

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-1.53E-04	-1.12E-05	7.24E-05
3	1.95E-05	-2.23E-05	-3.18E-04
4	1.49E-05	-6.87E-04	-5.79E-04
5	9.91E-06	-1.57E-03	-5.59E-04
6	4.96E-06	-2.26E-03	-3.31E-04
7	0.00E+00	-2.51E-03	0.00E+00
8	-4.96E-06	-2.26E-03	3.31E-04
9	-9.91E-06	-1.57E-03	5.59E-04
10	-1.49E-05	-6.87E-04	5.79E-04
11	-1.95E-05	-2.23E-05	3.18E-04
12	1.53E-04	-1.12E-05	-7.24E-05
13	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-9.97E+01	-6.05E+01	8.13E+01	-9.97E+01	-6.05E+01	-4.26E+01
2	2	3	-9.97E+01	-6.05E+01	-4.26E+01	-9.97E+01	-6.05E+01	-1.67E+02
3	3	4	-6.05E+01	9.97E+01	-1.67E+02	-6.05E+01	7.60E+01	-4.35E+01
4	4	5	-6.05E+01	7.60E+01	-4.35E+01	-6.05E+01	5.07E+01	5.16E+01
5	5	6	-6.05E+01	5.07E+01	5.16E+01	-6.05E+01	2.54E+01	1.09E+02
6	6	7	-6.05E+01	2.54E+01	1.09E+02	-6.05E+01	0.00E+00	1.28E+02
7	7	8	-6.05E+01	0.00E+00	1.28E+02	-6.05E+01	-2.53E+01	1.09E+02
8	8	9	-6.05E+01	-2.54E+01	1.09E+02	-6.05E+01	-5.07E+01	5.16E+01
9	9	10	-6.05E+01	-5.07E+01	5.16E+01	-6.05E+01	-7.61E+01	-4.35E+01
10	10	11	-6.05E+01	-7.61E+01	-4.35E+01	-6.05E+01	-9.97E+01	-1.67E+02
11	12	11	-9.97E+01	6.05E+01	4.26E+01	-9.97E+01	6.05E+01	1.67E+02
12	13	12	-9.97E+01	6.05E+01	-8.13E+01	-9.97E+01	6.05E+01	4.26E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	6	0.00E+00	-5.00E+01	0.00E+00
2	7	0.00E+00	-5.00E+01	0.00E+00
3	8	0.00E+00	-5.00E+01	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-1.65E-04	-8.40E-06	7.81E-05
3	2.10E-05	-1.68E-05	-3.43E-04
4	1.60E-05	-7.56E-04	-6.68E-04
5	1.07E-05	-1.83E-03	-7.18E-04
6	5.35E-06	-2.76E-03	-4.62E-04
7	0.00E+00	-3.12E-03	0.00E+00
8	-5.35E-06	-2.76E-03	4.62E-04
9	-1.07E-05	-1.83E-03	7.18E-04
10	-1.60E-05	-7.56E-04	6.68E-04
11	-2.10E-05	-1.68E-05	3.43E-04
12	1.65E-04	-8.40E-06	-7.81E-05
13	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-7.50E+01	-6.53E+01	8.78E+01	-7.50E+01	-6.53E+01	-4.60E+01
2	2	3	-7.50E+01	-6.53E+01	-4.60E+01	-7.50E+01	-6.53E+01	-1.80E+02
3	3	4	-6.53E+01	7.50E+01	-1.80E+02	-6.53E+01	7.50E+01	-7.48E+01
4	4	5	-6.53E+01	7.50E+01	-7.48E+01	-6.53E+01	7.50E+01	3.77E+01
5	5	6	-6.53E+01	7.50E+01	3.77E+01	-6.53E+01	7.50E+01	1.50E+02
6	6	7	-6.53E+01	2.50E+01	1.50E+02	-6.53E+01	2.50E+01	1.88E+02
7	7	8	-6.53E+01	-2.50E+01	1.88E+02	-6.53E+01	-2.50E+01	1.50E+02
8	8	9	-6.53E+01	-7.50E+01	1.50E+02	-6.53E+01	-7.50E+01	3.77E+01
9	9	10	-6.53E+01	-7.50E+01	3.77E+01	-6.53E+01	-7.50E+01	-7.48E+01
10	10	11	-6.53E+01	-7.50E+01	-7.48E+01	-6.53E+01	-7.50E+01	-1.80E+02
11	12	11	-7.50E+01	6.53E+01	4.60E+01	-7.50E+01	6.53E+01	1.80E+02
12	13	12	-7.50E+01	6.53E+01	-8.78E+01	-7.50E+01	6.53E+01	4.60E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	7	0.00E+00	-5.00E+01	0.00E+00

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	3	0.000	1.400	4.00E+00	4.00E+00	1
2	4	0.000	1.500	4.00E+00	4.00E+00	1
3	5	0.000	1.500	4.00E+00	4.00E+00	1
4	6	0.000	1.500	4.00E+00	4.00E+00	1
5	7	0.000	1.500	4.00E+00	4.00E+00	1
6	8	0.000	1.500	4.00E+00	4.00E+00	1
7	9	0.000	1.500	4.00E+00	4.00E+00	1
8	10	0.000	1.400	4.00E+00	4.00E+00	1

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-9.39E-05	-5.44E-06	4.43E-05
3	1.19E-05	-1.09E-05	-1.95E-04
4	9.11E-06	-4.27E-04	-3.72E-04
5	6.07E-06	-1.02E-03	-3.91E-04
6	3.04E-06	-1.52E-03	-2.59E-04
7	0.00E+00	-1.73E-03	0.00E+00
8	-3.04E-06	-1.52E-03	2.59E-04
9	-6.07E-06	-1.02E-03	3.91E-04
10	-9.11E-06	-4.27E-04	3.72E-04
11	-1.19E-05	-1.09E-05	1.95E-04
12	9.39E-05	-5.44E-06	-4.43E-05
13	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-4.86E+01	-3.70E+01	4.98E+01	-4.86E+01	-3.70E+01	-2.61E+01
2	2	3	-4.86E+01	-3.70E+01	-2.61E+01	-4.86E+01	-3.70E+01	-1.02E+02
3	3	4	-3.70E+01	4.86E+01	-1.02E+02	-3.70E+01	4.30E+01	-3.79E+01
4	4	5	-3.70E+01	4.30E+01	-3.79E+01	-3.70E+01	3.70E+01	2.21E+01
5	5	6	-3.70E+01	3.70E+01	2.21E+01	-3.70E+01	3.10E+01	7.31E+01
6	6	7	-3.70E+01	3.10E+01	7.31E+01	-3.70E+01	2.50E+01	1.15E+02
7	7	8	-3.70E+01	-2.50E+01	1.15E+02	-3.70E+01	-3.10E+01	7.31E+01
8	8	9	-3.70E+01	-3.10E+01	7.31E+01	-3.70E+01	-3.70E+01	2.21E+01
9	9	10	-3.70E+01	-3.70E+01	2.21E+01	-3.70E+01	-4.30E+01	-3.79E+01
10	10	11	-3.70E+01	-4.30E+01	-3.79E+01	-3.70E+01	-4.86E+01	-1.02E+02
11	12	11	-4.86E+01	3.70E+01	2.61E+01	-4.86E+01	3.70E+01	1.02E+02
12	13	12	-4.86E+01	3.70E+01	-4.98E+01	-4.86E+01	3.70E+01	2.61E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	3	1.50E+01	0.00E+00	0.00E+00
2	11	1.50E+01	0.00E+00	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	1.17E-04	3.94E-07	-9.47E-05
3	3.10E-04	7.89E-07	-7.45E-05
4	3.10E-04	-6.94E-05	-2.79E-05
5	3.10E-04	-8.23E-05	8.21E-06
6	3.10E-04	-5.20E-05	2.99E-05
7	3.10E-04	0.00E+00	3.71E-05
8	3.10E-04	5.20E-05	2.99E-05
9	3.10E-04	8.23E-05	8.21E-06
10	3.10E-04	6.94E-05	-2.79E-05
11	3.10E-04	-7.89E-07	-7.45E-05
12	1.17E-04	-3.94E-07	-9.47E-05
13	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	3.52E+00	1.50E+01	-4.07E+01	3.52E+00	1.50E+01	-9.98E+00
2	2	3	3.52E+00	1.50E+01	-9.98E+00	3.52E+00	1.50E+01	2.08E+01
3	3	4	0.00E+00	-3.52E+00	2.08E+01	0.00E+00	-3.52E+00	1.58E+01
4	4	5	0.00E+00	-3.52E+00	1.58E+01	0.00E+00	-3.52E+00	1.06E+01
5	5	6	0.00E+00	-3.52E+00	1.06E+01	0.00E+00	-3.52E+00	5.28E+00
6	6	7	0.00E+00	-3.52E+00	5.28E+00	0.00E+00	-3.52E+00	0.00E+00
7	7	8	0.00E+00	-3.52E+00	0.00E+00	0.00E+00	-3.52E+00	-5.28E+00
8	8	9	0.00E+00	-3.52E+00	-5.28E+00	0.00E+00	-3.52E+00	-1.06E+01
9	9	10	0.00E+00	-3.52E+00	-1.06E+01	0.00E+00	-3.52E+00	-1.58E+01
10	10	11	0.00E+00	-3.52E+00	-1.58E+01	0.00E+00	-3.52E+00	-2.08E+01
11	12	11	-3.52E+00	1.50E+01	-9.98E+00	-3.52E+00	1.50E+01	2.08E+01
12	13	12	-3.52E+00	1.50E+01	-4.07E+01	-3.52E+00	1.50E+01	-9.98E+00

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	3	1.75E+01	0.00E+00	0.00E+00
2	11	1.75E+01	0.00E+00	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	1.36E-04	4.60E-07	-1.10E-04
3	3.61E-04	9.20E-07	-8.70E-05
4	3.61E-04	-8.10E-05	-3.25E-05
5	3.61E-04	-9.61E-05	9.58E-06
6	3.61E-04	-6.07E-05	3.48E-05
7	3.61E-04	0.00E+00	4.32E-05
8	3.61E-04	6.07E-05	3.48E-05
9	3.61E-04	9.61E-05	9.58E-06
10	3.61E-04	8.10E-05	-3.25E-05
11	3.61E-04	-9.20E-07	-8.70E-05
12	1.36E-04	-4.60E-07	-1.10E-04
13	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	4.11E+00	1.75E+01	-4.75E+01	4.11E+00	1.75E+01	-1.16E+01
2	2	3	4.11E+00	1.75E+01	-1.16E+01	4.11E+00	1.75E+01	2.42E+01
3	3	4	0.00E+00	-4.11E+00	2.42E+01	0.00E+00	-4.11E+00	1.85E+01
4	4	5	0.00E+00	-4.11E+00	1.85E+01	0.00E+00	-4.11E+00	1.23E+01
5	5	6	0.00E+00	-4.11E+00	1.23E+01	0.00E+00	-4.11E+00	6.16E+00
6	6	7	0.00E+00	-4.11E+00	6.16E+00	0.00E+00	-4.11E+00	0.00E+00
7	7	8	0.00E+00	-4.11E+00	0.00E+00	0.00E+00	-4.11E+00	-6.16E+00
8	8	9	0.00E+00	-4.11E+00	-6.16E+00	0.00E+00	-4.11E+00	-1.23E+01
9	9	10	0.00E+00	-4.11E+00	-1.23E+01	0.00E+00	-4.11E+00	-1.85E+01
10	10	11	0.00E+00	-4.11E+00	-1.85E+01	0.00E+00	-4.11E+00	-2.42E+01
11	12	11	-4.11E+00	1.75E+01	-1.16E+01	-4.11E+00	1.75E+01	2.42E+01
12	13	12	-4.11E+00	1.75E+01	-4.75E+01	-4.11E+00	1.75E+01	-1.16E+01

\PH2.EST

nos	X(m)	Y(m)
1	0.000	0.000
2	0.000	3.250
3	0.000	6.500
4	1.000	6.500
5	2.500	6.500
6	4.000	6.500
7	5.500	6.500
8	7.000	6.500
9	8.000	6.500
10	8.000	3.250
11	8.000	0.000

Tipos	Elast(KN/m2)	Iner(m4)	Area(m2)
1	3.05E+07	1.04E-02	5.00E-01
2	3.05E+07	1.04E-02	5.00E-01

Barras	Ext1	Ext2	Tipo
1	1	2	2
2	2	3	1
3	3	4	1
4	4	5	1
5	5	6	1
6	6	7	1
7	7	8	1
8	8	9	1
9	10	9	1
10	11	10	2

Ap.rig.	No	X	Y	R
1	1	1	1	1
2	11	1	1	1

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	3	0.000	1.000	1.44E+01	1.44E+01	1
2	4	0.000	1.500	1.44E+01	1.44E+01	1
3	5	0.000	1.500	1.44E+01	1.44E+01	1
4	6	0.000	1.500	1.44E+01	1.44E+01	1
5	7	0.000	1.500	1.44E+01	1.44E+01	1
6	8	0.000	1.000	1.44E+01	1.44E+01	1

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-2.26E-04	-1.23E-05	6.92E-05
3	3.30E-06	-2.46E-05	-2.80E-04
4	2.48E-06	-3.62E-04	-3.69E-04
5	1.24E-06	-8.63E-04	-2.61E-04
6	0.00E+00	-1.07E-03	0.00E+00
7	-1.24E-06	-8.63E-04	2.61E-04
8	-2.48E-06	-3.62E-04	3.69E-04
9	-3.30E-06	-2.46E-05	2.80E-04
10	2.26E-04	-1.23E-05	-6.92E-05
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-5.76E+01	-1.26E+01	2.72E+01	-5.76E+01	-1.26E+01	-1.37E+01
2	2	3	-5.76E+01	-1.26E+01	-1.37E+01	-5.76E+01	-1.26E+01	-5.46E+01
3	3	4	-1.26E+01	5.76E+01	-5.46E+01	-1.26E+01	4.32E+01	-4.17E+00
4	4	5	-1.26E+01	4.32E+01	-4.17E+00	-1.26E+01	2.16E+01	4.44E+01
5	5	6	-1.26E+01	2.16E+01	4.44E+01	-1.26E+01	0.00E+00	6.06E+01
6	6	7	-1.26E+01	0.00E+00	6.06E+01	-1.26E+01	-2.16E+01	4.44E+01
7	7	8	-1.26E+01	-2.16E+01	4.44E+01	-1.26E+01	-4.32E+01	-4.17E+00
8	8	9	-1.26E+01	-4.32E+01	-4.17E+00	-1.26E+01	-5.76E+01	-5.46E+01
9	10	9	-5.76E+01	1.26E+01	1.37E+01	-5.76E+01	1.26E+01	5.46E+01
10	11	10	-5.76E+01	1.26E+01	-2.72E+01	-5.76E+01	1.26E+01	1.37E+01

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	1	0.000	3.250	6.12E+01	3.20E+01	0
2	2	0.000	3.250	3.20E+01	2.70E+00	0
3	9	0.000	3.250	-3.20E+01	-2.70E+00	0
4	10	0.000	3.250	-6.12E+01	-3.20E+01	0

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	7.45E-04	0.00E+00	-5.98E-05
3	1.33E-05	0.00E+00	3.32E-04
4	9.98E-06	2.91E-04	2.49E-04
5	4.99E-06	5.71E-04	1.25E-04
6	0.00E+00	6.65E-04	0.00E+00
7	-4.99E-06	5.71E-04	-1.25E-04
8	-9.98E-06	2.91E-04	-2.49E-04
9	-1.33E-05	0.00E+00	-3.32E-04
10	-7.45E-04	0.00E+00	5.98E-05
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	0.00E+00	1.57E+02	-1.66E+02	0.00E+00	5.68E+00	7.26E+01
2	2	3	0.00E+00	5.68E+00	7.26E+01	0.00E+00	-5.07E+01	-2.64E+01
3	3	4	-5.07E+01	0.00E+00	-2.64E+01	-5.07E+01	0.00E+00	-2.64E+01
4	4	5	-5.07E+01	0.00E+00	-2.64E+01	-5.07E+01	0.00E+00	-2.64E+01
5	5	6	-5.07E+01	0.00E+00	-2.64E+01	-5.07E+01	0.00E+00	-2.64E+01
6	6	7	-5.07E+01	0.00E+00	-2.64E+01	-5.07E+01	0.00E+00	-2.64E+01
7	7	8	-5.07E+01	0.00E+00	-2.64E+01	-5.07E+01	0.00E+00	-2.64E+01
8	8	9	-5.07E+01	0.00E+00	-2.64E+01	-5.07E+01	0.00E+00	-2.64E+01
9	10	9	0.00E+00	-5.68E+00	-7.26E+01	0.00E+00	5.07E+01	2.64E+01
10	11	10	0.00E+00	-1.57E+02	1.66E+02	0.00E+00	-5.68E+00	-7.26E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	5	0.00E+00	-5.00E+01	0.00E+00
2	6	0.00E+00	-5.00E+01	0.00E+00
3	7	0.00E+00	-5.00E+01	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-4.00E-04	-1.60E-05	1.22E-04
3	5.84E-06	-3.20E-05	-4.95E-04
4	4.38E-06	-6.40E-04	-6.81E-04
5	2.19E-06	-1.61E-03	-5.18E-04
6	0.00E+00	-2.02E-03	0.00E+00
7	-2.19E-06	-1.61E-03	5.18E-04
8	-4.38E-06	-6.40E-04	6.81E-04
9	-5.84E-06	-3.20E-05	4.95E-04
10	4.00E-04	-1.60E-05	-1.22E-04
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-7.50E+01	-2.23E+01	4.82E+01	-7.50E+01	-2.23E+01	-2.42E+01
2	2	3	-7.50E+01	-2.23E+01	-2.42E+01	-7.50E+01	-2.23E+01	-9.66E+01
3	3	4	-2.23E+01	7.50E+01	-9.66E+01	-2.23E+01	7.50E+01	-2.16E+01
4	4	5	-2.23E+01	7.50E+01	-2.16E+01	-2.23E+01	7.50E+01	9.09E+01
5	5	6	-2.23E+01	2.50E+01	9.09E+01	-2.23E+01	2.50E+01	1.28E+02
6	6	7	-2.23E+01	-2.50E+01	1.28E+02	-2.23E+01	-2.50E+01	9.09E+01
7	7	8	-2.23E+01	-7.50E+01	9.09E+01	-2.23E+01	-7.50E+01	-2.16E+01
8	8	9	-2.23E+01	-7.50E+01	-2.16E+01	-2.23E+01	-7.50E+01	-9.66E+01
9	10	9	-7.50E+01	2.23E+01	2.42E+01	-7.50E+01	2.23E+01	9.66E+01
10	11	10	-7.50E+01	2.23E+01	-4.82E+01	-7.50E+01	2.23E+01	2.42E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	6	0.00E+00	-5.00E+01	0.00E+00

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	3	0.000	1.000	4.00E+00	4.00E+00	1
2	4	0.000	1.500	4.00E+00	4.00E+00	1
3	5	0.000	1.500	4.00E+00	4.00E+00	1
4	6	0.000	1.500	4.00E+00	4.00E+00	1
5	7	0.000	1.500	4.00E+00	4.00E+00	1
6	8	0.000	1.000	4.00E+00	4.00E+00	1

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-2.10E-04	-8.74E-06	6.43E-05
3	3.07E-06	-1.75E-05	-2.60E-04
4	2.30E-06	-3.36E-04	-3.57E-04
5	1.15E-06	-8.50E-04	-2.88E-04
6	0.00E+00	-1.09E-03	0.00E+00
7	-1.15E-06	-8.50E-04	2.88E-04
8	-2.30E-06	-3.36E-04	3.57E-04
9	-3.07E-06	-1.75E-05	2.60E-04
10	2.10E-04	-8.74E-06	-6.43E-05
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-4.10E+01	-1.17E+01	2.53E+01	-4.10E+01	-1.17E+01	-1.27E+01
2	2	3	-4.10E+01	-1.17E+01	-1.27E+01	-4.10E+01	-1.17E+01	-5.07E+01
3	3	4	-1.17E+01	4.10E+01	-5.07E+01	-1.17E+01	3.70E+01	-1.17E+01
4	4	5	-1.17E+01	3.70E+01	-1.17E+01	-1.17E+01	3.10E+01	3.93E+01
5	5	6	-1.17E+01	3.10E+01	3.93E+01	-1.17E+01	2.50E+01	8.13E+01
6	6	7	-1.17E+01	-2.50E+01	8.13E+01	-1.17E+01	-3.10E+01	3.93E+01
7	7	8	-1.17E+01	-3.10E+01	3.93E+01	-1.17E+01	-3.70E+01	-1.17E+01
8	8	9	-1.17E+01	-3.70E+01	-1.17E+01	-1.17E+01	-4.10E+01	-5.07E+01
9	10	9	-4.10E+01	1.17E+01	1.27E+01	-4.10E+01	1.17E+01	5.07E+01
10	11	10	-4.10E+01	1.17E+01	-2.53E+01	-4.10E+01	1.17E+01	1.27E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	3	1.50E+01	0.00E+00	0.00E+00
2	9	1.50E+01	0.00E+00	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	6.79E-04	2.15E-06	-3.35E-04
3	1.64E-03	4.31E-06	-1.71E-04
4	1.64E-03	-1.08E-04	-5.94E-05
5	1.64E-03	-1.08E-04	4.79E-05
6	1.64E-03	0.00E+00	8.37E-05
7	1.64E-03	1.08E-04	4.79E-05
8	1.64E-03	1.08E-04	-5.94E-05
9	1.64E-03	-4.31E-06	-1.71E-04
10	6.79E-04	-2.15E-06	-3.35E-04
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	1.01E+01	1.50E+01	-5.71E+01	1.01E+01	1.50E+01	-8.34E+00
2	2	3	1.01E+01	1.50E+01	-8.34E+00	1.01E+01	1.50E+01	4.04E+01
3	3	4	0.00E+00	-1.01E+01	4.04E+01	0.00E+00	-1.01E+01	3.03E+01
4	4	5	0.00E+00	-1.01E+01	3.03E+01	0.00E+00	-1.01E+01	1.52E+01
5	5	6	0.00E+00	-1.01E+01	1.52E+01	0.00E+00	-1.01E+01	0.00E+00
6	6	7	0.00E+00	-1.01E+01	0.00E+00	0.00E+00	-1.01E+01	-1.52E+01
7	7	8	0.00E+00	-1.01E+01	-1.52E+01	0.00E+00	-1.01E+01	-3.03E+01
8	8	9	0.00E+00	-1.01E+01	-3.03E+01	0.00E+00	-1.01E+01	-4.04E+01
9	10	9	-1.01E+01	1.50E+01	-8.34E+00	-1.01E+01	1.50E+01	4.04E+01
10	11	10	-1.01E+01	1.50E+01	-5.71E+01	-1.01E+01	1.50E+01	-8.34E+00

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	3	1.00E+01	0.00E+00	0.00E+00
2	9	1.00E+01	0.00E+00	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	4.53E-04	1.44E-06	-2.23E-04
3	1.09E-03	2.87E-06	-1.14E-04
4	1.09E-03	-7.20E-05	-3.96E-05
5	1.09E-03	-7.18E-05	3.20E-05
6	1.09E-03	0.00E+00	5.58E-05
7	1.09E-03	7.18E-05	3.20E-05
8	1.09E-03	7.20E-05	-3.96E-05
9	1.09E-03	-2.87E-06	-1.14E-04
10	4.53E-04	-1.44E-06	-2.23E-04
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	6.73E+00	%9.9999999288	-3.81E+01	6.73E+00	%9.9999999288	-5.56E+00
2	2	3	6.73E+00	%9.9999999291	-5.56E+00	6.73E+00	%9.9999999291	2.69E+01
3	3	4	0.00E+00	-6.73E+00	2.69E+01	0.00E+00	-6.73E+00	2.02E+01
4	4	5	0.00E+00	-6.73E+00	2.02E+01	0.00E+00	-6.73E+00	1.01E+01
5	5	6	0.00E+00	-6.73E+00	1.01E+01	0.00E+00	-6.73E+00	0.00E+00
6	6	7	0.00E+00	-6.73E+00	0.00E+00	0.00E+00	-6.73E+00	-1.01E+01
7	7	8	0.00E+00	-6.73E+00	-1.01E+01	0.00E+00	-6.73E+00	-2.02E+01
8	8	9	0.00E+00	-6.73E+00	-2.02E+01	0.00E+00	-6.73E+00	-2.69E+01
9	10	9	-6.73E+00	%9.999999929	-5.56E+00	-6.73E+00	%9.999999929	2.69E+01
10	11	10	-6.73E+00	%9.9999999286	-3.81E+01	-6.73E+00	%9.9999999286	-5.56E+00

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nos	X(m)	Y(m)
1	0.000	0.000
2	0.000	1.870
3	0.000	3.750
4	1.430	3.750
5	2.930	3.750
6	4.430	3.750
7	5.930	3.750
8	7.430	3.750
9	8.860	3.750
10	8.860	1.870
11	8.860	0.000

Tipos	Elast(KN/m2)	Iner(m4)	Area(m2)
1	3.05E+07	1.04E-02	5.00E-01

Barras	Ext1	Ext2	Tipo
1	1	2	1
2	2	3	1
3	3	4	1
4	4	5	1
5	5	6	1
6	6	7	1
7	7	8	1
8	8	9	1
9	10	9	1
10	11	10	1

Ap.rig.	No	X	Y	R
1	1	1	1	1
2	11	1	1	1

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	3	0.000	1.430	1.44E+01	1.44E+01	1
2	4	0.000	1.500	1.44E+01	1.44E+01	1
3	5	0.000	1.500	1.44E+01	1.44E+01	1
4	6	0.000	1.500	1.44E+01	1.44E+01	1
5	7	0.000	1.500	1.44E+01	1.44E+01	1
6	8	0.000	1.430	1.44E+01	1.44E+01	1

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-1.04E-04	-7.82E-06	5.48E-05
3	8.96E-06	-1.57E-05	-2.32E-04
4	6.07E-06	-5.08E-04	-3.98E-04
5	3.03E-06	-1.04E-03	-2.76E-04
6	0.00E+00	-1.26E-03	0.00E+00
7	-3.03E-06	-1.04E-03	2.76E-04
8	-6.07E-06	-5.08E-04	3.98E-04
9	-8.96E-06	-1.57E-05	2.32E-04
10	1.04E-04	-7.82E-06	-5.48E-05
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-6.38E+01	-3.09E+01	3.82E+01	-6.38E+01	-3.09E+01	-1.95E+01
2	2	3	-6.38E+01	-3.09E+01	-1.95E+01	-6.38E+01	-3.09E+01	-7.75E+01
3	3	4	-3.09E+01	6.38E+01	-7.75E+01	-3.09E+01	4.32E+01	-1.03E+00
4	4	5	-3.09E+01	4.32E+01	-1.03E+00	-3.09E+01	2.16E+01	4.76E+01
5	5	6	-3.09E+01	2.16E+01	4.76E+01	-3.09E+01	0.00E+00	6.38E+01
6	6	7	-3.09E+01	0.00E+00	6.38E+01	-3.09E+01	-2.16E+01	4.76E+01
7	7	8	-3.09E+01	-2.16E+01	4.76E+01	-3.09E+01	-4.32E+01	-1.03E+00
8	8	9	-3.09E+01	-4.32E+01	-1.03E+00	-3.09E+01	-6.38E+01	-7.75E+01
9	10	9	-6.38E+01	3.09E+01	1.95E+01	-6.38E+01	3.09E+01	7.75E+01
10	11	10	-6.38E+01	3.09E+01	-3.82E+01	-6.38E+01	3.09E+01	1.95E+01

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	1	0.000	1.870	3.65E+01	1.96E+01	0
2	2	0.000	1.880	1.96E+01	2.70E+00	0
3	9	0.000	1.880	-1.96E+01	-2.70E+00	0
4	10	0.000	1.870	-3.65E+01	-1.96E+01	0

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	5.51E-05	0.00E+00	-1.05E-05
3	5.12E-06	0.00E+00	4.45E-05
4	3.47E-06	5.34E-05	3.01E-05
5	1.73E-06	8.73E-05	1.51E-05
6	0.00E+00	9.86E-05	0.00E+00
7	-1.73E-06	8.73E-05	-1.51E-05
8	-3.47E-06	5.34E-05	-3.01E-05
9	-5.12E-06	0.00E+00	-4.45E-05
10	-5.51E-05	0.00E+00	1.05E-05
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	0.00E+00	5.58E+01	-3.51E+01	0.00E+00	3.33E+00	1.52E+01
2	2	3	0.00E+00	3.33E+00	1.52E+01	0.00E+00	-1.76E+01	-3.19E+00
3	3	4	-1.76E+01	0.00E+00	-3.19E+00	-1.76E+01	0.00E+00	-3.19E+00
4	4	5	-1.76E+01	0.00E+00	-3.19E+00	-1.76E+01	0.00E+00	-3.19E+00
5	5	6	-1.76E+01	0.00E+00	-3.19E+00	-1.76E+01	0.00E+00	-3.19E+00
6	6	7	-1.76E+01	0.00E+00	-3.19E+00	-1.76E+01	0.00E+00	-3.19E+00
7	7	8	-1.76E+01	0.00E+00	-3.19E+00	-1.76E+01	0.00E+00	-3.19E+00
8	8	9	-1.76E+01	0.00E+00	-3.19E+00	-1.76E+01	0.00E+00	-3.19E+00
9	10	9	0.00E+00	-3.33E+00	-1.52E+01	0.00E+00	1.76E+01	3.19E+00
10	11	10	0.00E+00	-5.58E+01	3.51E+01	0.00E+00	-3.33E+00	-1.52E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	5	0.00E+00	-5.00E+01	0.00E+00
2	6	0.00E+00	-5.00E+01	0.00E+00
3	7	0.00E+00	-5.00E+01	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-1.70E-04	-9.20E-06	8.93E-05
3	1.46E-05	-1.84E-05	-3.78E-04
4	9.89E-06	-8.51E-04	-7.06E-04
5	4.94E-06	-1.84E-03	-5.30E-04
6	0.00E+00	-2.26E-03	0.00E+00
7	-4.94E-06	-1.84E-03	5.30E-04
8	-9.89E-06	-8.51E-04	7.06E-04
9	-1.46E-05	-1.84E-05	3.78E-04
10	1.70E-04	-9.20E-06	-8.93E-05
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-7.50E+01	-5.02E+01	6.22E+01	-7.50E+01	-5.02E+01	-3.18E+01
2	2	3	-7.50E+01	-5.02E+01	-3.18E+01	-7.50E+01	-5.02E+01	-1.26E+02
3	3	4	-5.02E+01	7.50E+01	-1.26E+02	-5.02E+01	7.50E+01	-1.90E+01
4	4	5	-5.02E+01	7.50E+01	-1.90E+01	-5.02E+01	7.50E+01	9.35E+01
5	5	6	-5.02E+01	2.50E+01	9.35E+01	-5.02E+01	2.50E+01	1.31E+02
6	6	7	-5.02E+01	-2.50E+01	1.31E+02	-5.02E+01	-2.50E+01	9.35E+01
7	7	8	-5.02E+01	-7.50E+01	9.35E+01	-5.02E+01	-7.50E+01	-1.90E+01
8	8	9	-5.02E+01	-7.50E+01	-1.90E+01	-5.02E+01	-7.50E+01	-1.26E+02
9	10	9	-7.50E+01	5.02E+01	3.18E+01	-7.50E+01	5.02E+01	1.26E+02
10	11	10	-7.50E+01	5.02E+01	-6.22E+01	-7.50E+01	5.02E+01	3.18E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	6	0.00E+00	-5.00E+01	0.00E+00

C.Dist	Barra	a(m)	b(m)	Fa(KN/m)	Fb(KN/m)	Vert
1	3	0.000	1.430	4.00E+00	4.00E+00	1
2	4	0.000	1.500	4.00E+00	4.00E+00	1
3	5	0.000	1.500	4.00E+00	4.00E+00	1
4	6	0.000	1.500	4.00E+00	4.00E+00	1
5	7	0.000	1.500	4.00E+00	4.00E+00	1
6	8	0.000	1.430	4.00E+00	4.00E+00	1

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-9.02E-05	-5.24E-06	4.75E-05
3	7.76E-06	-1.05E-05	-2.01E-04
4	5.25E-06	-4.51E-04	-3.72E-04
5	2.63E-06	-9.82E-04	-2.96E-04
6	0.00E+00	-1.23E-03	0.00E+00
7	-2.63E-06	-9.82E-04	2.96E-04
8	-5.25E-06	-4.51E-04	3.72E-04
9	-7.76E-06	-1.05E-05	2.01E-04
10	9.02E-05	-5.24E-06	-4.75E-05
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-4.27E+01	-2.67E+01	3.30E+01	-4.27E+01	-2.67E+01	-1.69E+01
2	2	3	-4.27E+01	-2.67E+01	-1.69E+01	-4.27E+01	-2.67E+01	-6.71E+01
3	3	4	-2.67E+01	4.27E+01	-6.71E+01	-2.67E+01	3.70E+01	-1.01E+01
4	4	5	-2.67E+01	3.70E+01	-1.01E+01	-2.67E+01	3.10E+01	4.09E+01
5	5	6	-2.67E+01	3.10E+01	4.09E+01	-2.67E+01	2.50E+01	8.29E+01
6	6	7	-2.67E+01	-2.50E+01	8.29E+01	-2.67E+01	-3.10E+01	4.09E+01
7	7	8	-2.67E+01	-3.10E+01	4.09E+01	-2.67E+01	-3.70E+01	-1.01E+01
8	8	9	-2.67E+01	-3.70E+01	-1.01E+01	-2.67E+01	-4.27E+01	-6.71E+01
9	10	9	-4.27E+01	2.67E+01	1.69E+01	-4.27E+01	2.67E+01	6.71E+01
10	11	10	-4.27E+01	2.67E+01	-3.30E+01	-4.27E+01	2.67E+01	1.69E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	3	1.50E+01	0.00E+00	0.00E+00
2	9	1.50E+01	0.00E+00	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	1.47E-04	5.58E-07	-1.30E-04
3	3.84E-04	1.12E-06	-9.40E-05
4	3.84E-04	-7.53E-05	-1.79E-05
5	3.84E-04	-6.19E-05	3.05E-05
6	3.84E-04	0.00E+00	4.66E-05
7	3.84E-04	6.19E-05	3.05E-05
8	3.84E-04	7.53E-05	-1.79E-05
9	3.84E-04	-1.12E-06	-9.40E-05
10	1.47E-04	-5.58E-07	-1.30E-04
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	4.55E+00	1.50E+01	-3.61E+01	4.55E+00	1.50E+01	-8.04E+00
2	2	3	4.55E+00	1.50E+01	-8.04E+00	4.55E+00	1.50E+01	2.02E+01
3	3	4	0.00E+00	-4.55E+00	2.02E+01	0.00E+00	-4.55E+00	1.37E+01
4	4	5	0.00E+00	-4.55E+00	1.37E+01	0.00E+00	-4.55E+00	6.83E+00
5	5	6	0.00E+00	-4.55E+00	6.83E+00	0.00E+00	-4.55E+00	0.00E+00
6	6	7	0.00E+00	-4.55E+00	0.00E+00	0.00E+00	-4.55E+00	-6.83E+00
7	7	8	0.00E+00	-4.55E+00	-6.83E+00	0.00E+00	-4.55E+00	-1.37E+01
8	8	9	0.00E+00	-4.55E+00	-1.37E+01	0.00E+00	-4.55E+00	-2.02E+01
9	10	9	-4.55E+00	1.50E+01	-8.04E+00	-4.55E+00	1.50E+01	2.02E+01
10	11	10	-4.55E+00	1.50E+01	-3.61E+01	-4.55E+00	1.50E+01	-8.04E+00

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	3	1.00E+01	0.00E+00	0.00E+00
2	9	1.00E+01	0.00E+00	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	9.81E-05	3.72E-07	-8.66E-05
3	2.56E-04	7.46E-07	-6.26E-05
4	2.56E-04	-5.02E-05	-1.19E-05
5	2.56E-04	-4.12E-05	2.03E-05
6	2.56E-04	0.00E+00	3.11E-05
7	2.56E-04	4.12E-05	2.03E-05
8	2.56E-04	5.02E-05	-1.19E-05
9	2.56E-04	-7.46E-07	-6.26E-05
10	9.81E-05	-3.72E-07	-8.66E-05
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	3.03E+00	%9.9999999893	-2.41E+01	3.03E+00	%9.9999999893	-5.36E+00
2	2	3	3.03E+00	%9.9999999899	-5.36E+00	3.03E+00	%9.9999999899	1.34E+01
3	3	4	0.00E+00	-3.03E+00	1.34E+01	0.00E+00	-3.03E+00	9.10E+00
4	4	5	0.00E+00	-3.03E+00	9.10E+00	0.00E+00	-3.03E+00	4.55E+00
5	5	6	0.00E+00	-3.03E+00	4.55E+00	0.00E+00	-3.03E+00	0.00E+00
6	6	7	0.00E+00	-3.03E+00	0.00E+00	0.00E+00	-3.03E+00	-4.55E+00
7	7	8	0.00E+00	-3.03E+00	-4.55E+00	0.00E+00	-3.03E+00	-9.10E+00
8	8	9	0.00E+00	-3.03E+00	-9.10E+00	0.00E+00	-3.03E+00	-1.34E+01
9	10	9	-3.03E+00	%9.9999999892	-5.36E+00	-3.03E+00	%9.9999999892	1.34E+01
10	11	10	-3.03E+00	%9.9999999891	-2.41E+01	-3.03E+00	%9.9999999891	-5.36E+00

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	4	0.00E+00	-5.00E+01	0.00E+00
2	5	0.00E+00	-5.00E+01	0.00E+00
3	6	0.00E+00	-5.00E+01	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-9.17E-05	-1.26E-05	1.74E-05
3	2.41E-04	-2.53E-05	-4.53E-04
4	2.37E-04	-9.05E-04	-6.67E-04
5	2.33E-04	-1.72E-03	-3.58E-04
6	2.29E-04	-1.88E-03	1.48E-04
7	2.24E-04	-1.36E-03	4.96E-04
8	2.20E-04	-5.61E-04	5.09E-04
9	2.16E-04	-1.16E-05	2.10E-04
10	2.05E-04	-5.80E-06	-1.39E-04
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-1.03E+02	-4.40E+01	4.41E+01	-1.03E+02	-4.40E+01	-3.82E+01
2	2	3	-1.03E+02	-4.40E+01	-3.82E+01	-1.03E+02	-4.40E+01	-1.21E+02
3	3	4	-4.40E+01	1.03E+02	-1.21E+02	-4.40E+01	1.03E+02	2.60E+01
4	4	5	-4.40E+01	5.27E+01	2.60E+01	-4.40E+01	5.27E+01	1.05E+02
5	5	6	-4.40E+01	2.73E+00	1.05E+02	-4.40E+01	2.73E+00	1.09E+02
6	6	7	-4.40E+01	-4.73E+01	1.09E+02	-4.40E+01	-4.73E+01	3.82E+01
7	7	8	-4.40E+01	-4.73E+01	3.82E+01	-4.40E+01	-4.73E+01	-3.27E+01
8	8	9	-4.40E+01	-4.73E+01	-3.27E+01	-4.40E+01	-4.73E+01	-1.00E+02
9	10	9	-4.73E+01	4.40E+01	1.75E+01	-4.73E+01	4.40E+01	1.00E+02
10	11	10	-4.73E+01	4.40E+01	-6.48E+01	-4.73E+01	4.40E+01	1.75E+01

C.Conc	No	Fx(KN)	Fy(KN)	M(KNm)
1	3	0.00E+00	-5.00E+01	0.00E+00
2	4	0.00E+00	-5.00E+01	0.00E+00
3	5	0.00E+00	-5.00E+01	0.00E+00

Nos	X(m)	Y(m)	R(rad)
1	0.00E+00	0.00E+00	0.00E+00
2	-3.10E-05	-1.57E-05	-1.43E-05
3	2.34E-04	-3.14E-05	-3.16E-04
4	2.32E-04	-6.06E-04	-4.05E-04
5	2.29E-04	-1.04E-03	-1.37E-04
6	2.27E-04	-1.01E-03	1.49E-04
7	2.24E-04	-6.68E-04	2.78E-04
8	2.22E-04	-2.53E-04	2.49E-04
9	2.19E-04	-5.48E-06	7.39E-05
10	1.44E-04	-2.73E-06	-1.06E-04
11	0.00E+00	0.00E+00	0.00E+00

Barra	Ex1	Ex2	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)	E.Nor(KN)	E.Trs(KN)	M.Flt(KNm)
1	1	2	-1.28E+02	-2.59E+01	2.18E+01	-1.28E+02	-2.59E+01	-2.66E+01
2	2	3	-1.28E+02	-2.59E+01	-2.66E+01	-1.28E+02	-2.59E+01	-7.53E+01
3	3	4	-2.59E+01	7.77E+01	-7.53E+01	-2.59E+01	7.77E+01	3.58E+01
4	4	5	-2.59E+01	2.77E+01	3.58E+01	-2.59E+01	2.77E+01	7.74E+01
5	5	6	-2.59E+01	-2.23E+01	7.74E+01	-2.59E+01	-2.23E+01	4.40E+01
6	6	7	-2.59E+01	-2.23E+01	4.40E+01	-2.59E+01	-2.23E+01	1.05E+01
7	7	8	-2.59E+01	-2.23E+01	1.05E+01	-2.59E+01	-2.23E+01	-2.29E+01
8	8	9	-2.59E+01	-2.23E+01	-2.29E+01	-2.59E+01	-2.23E+01	-5.48E+01
9	10	9	-2.23E+01	2.59E+01	6.13E+00	-2.23E+01	2.59E+01	5.48E+01
10	11	10	-2.23E+01	2.59E+01	-4.23E+01	-2.23E+01	2.59E+01	6.13E+00